

Nov. 3, 1936.

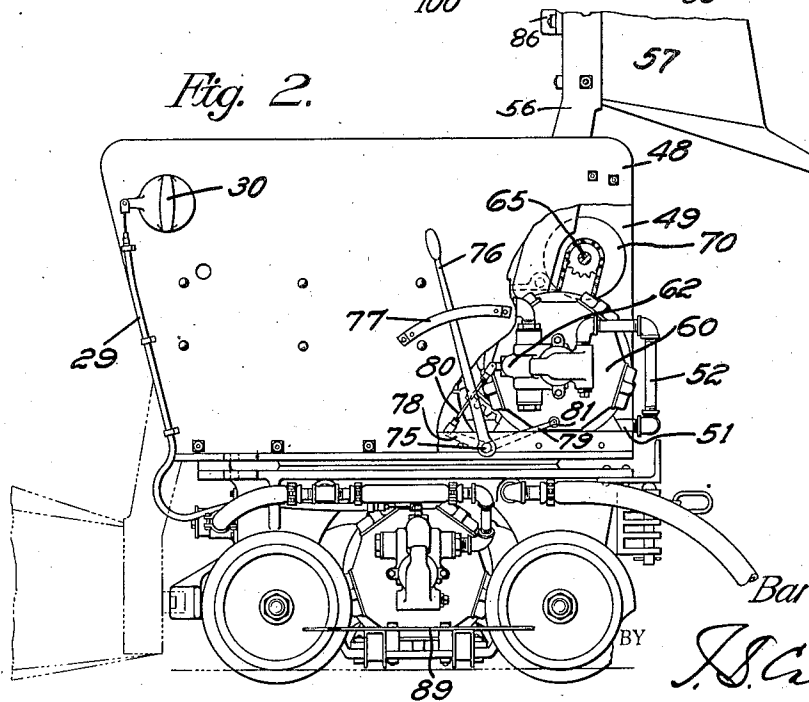
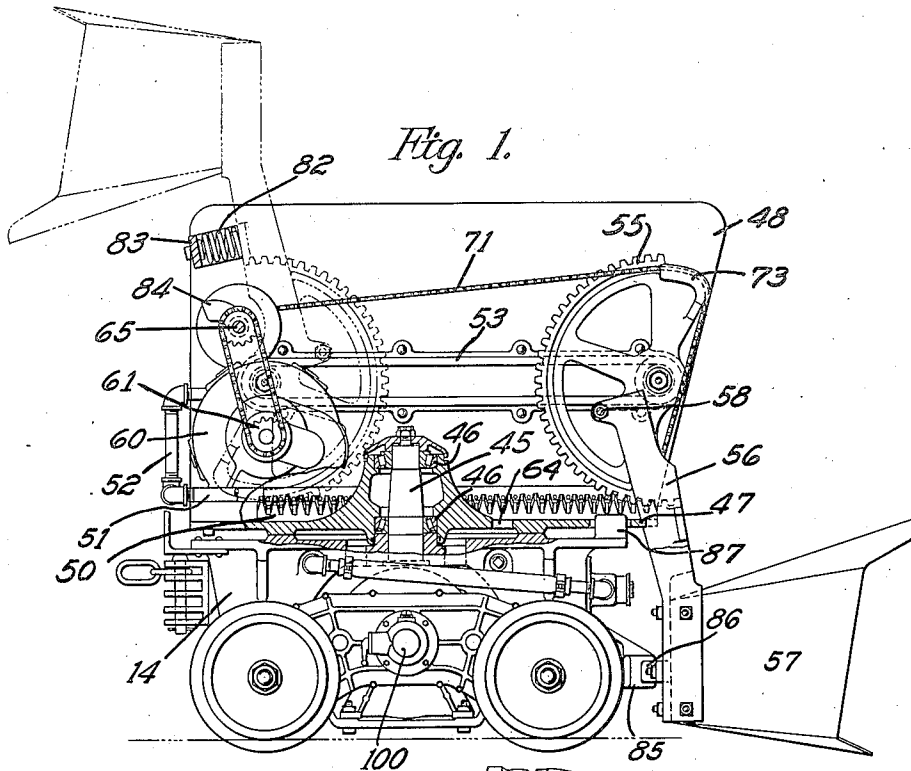
B. R. SHEETS

2,059,660

ORE LOADING MACHINE

Filed Sept. 9, 1935

5 Sheets-Sheet 1



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Nov. 3, 1936.

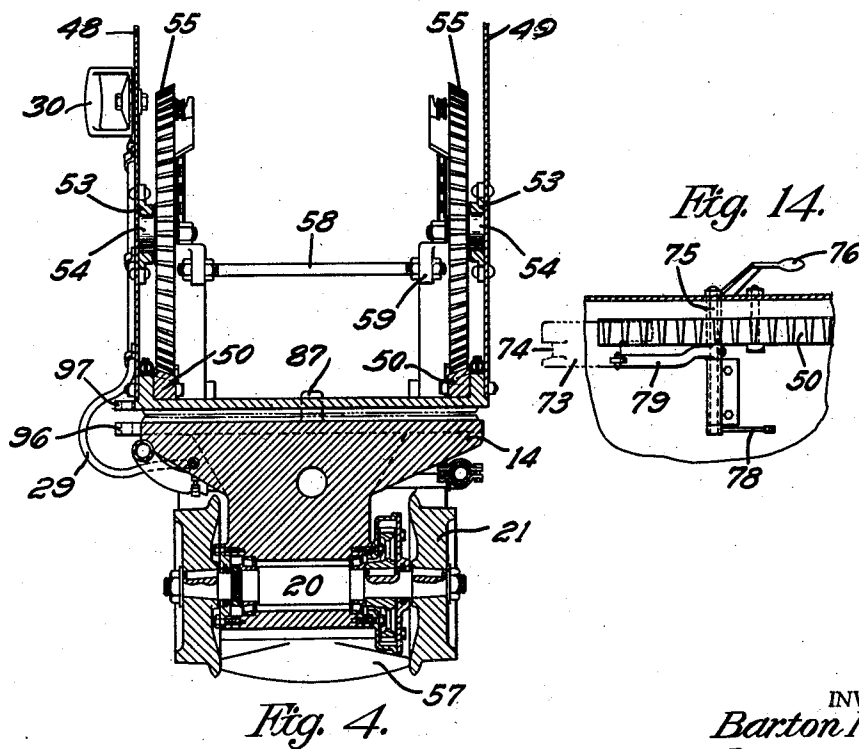
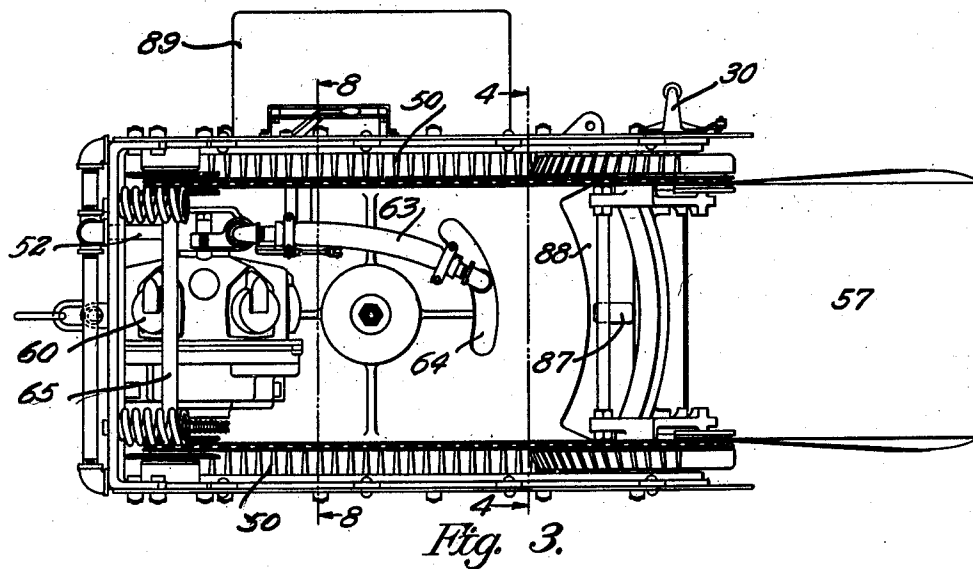
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5 Sheets-Sheet 2



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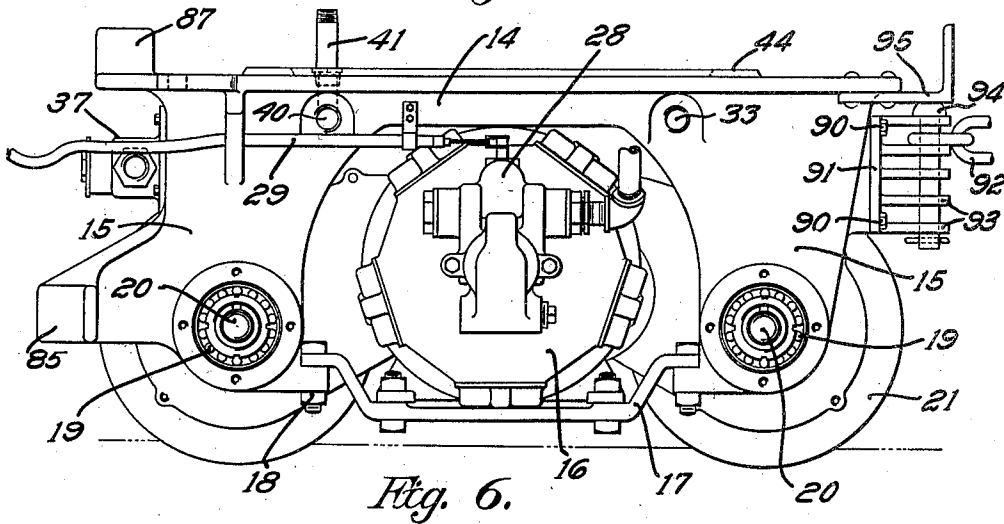
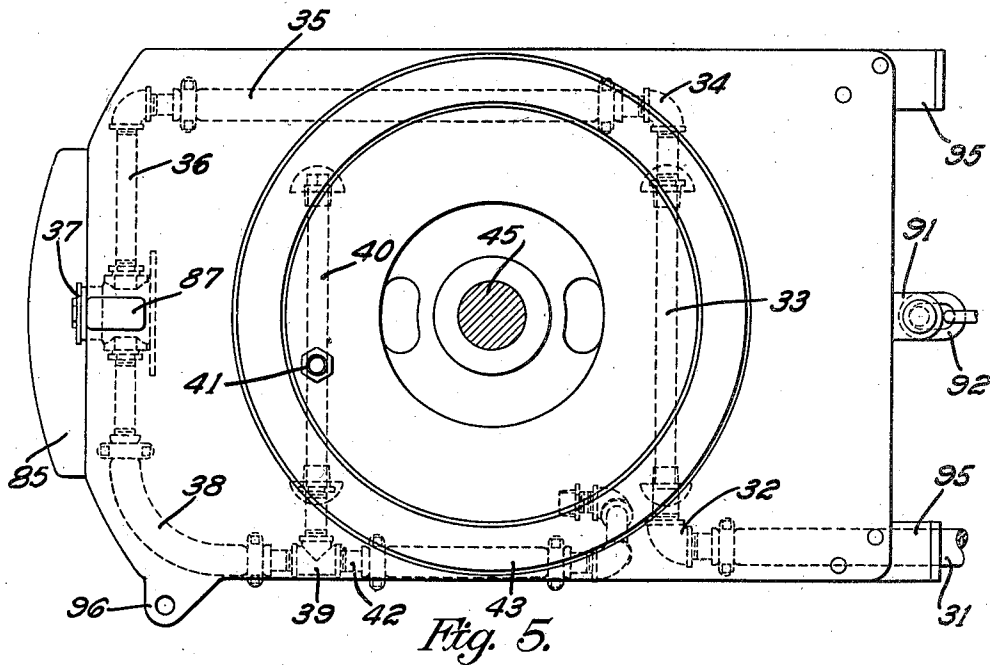
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ORE LOADING MACHINE

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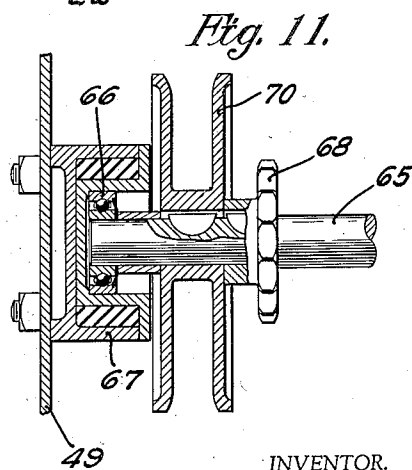
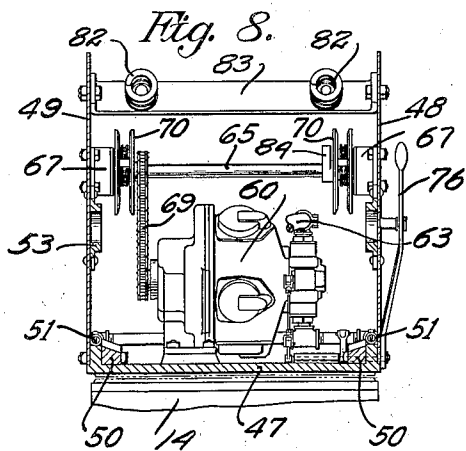
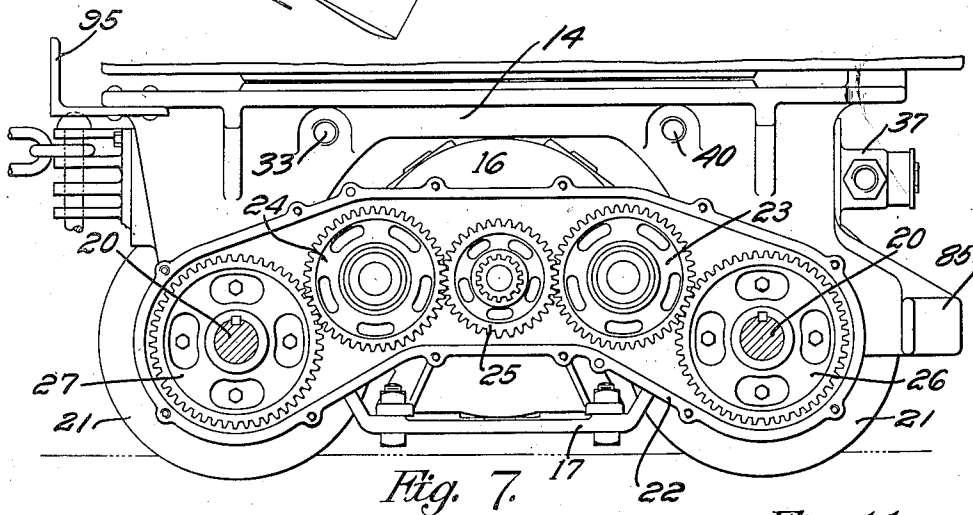
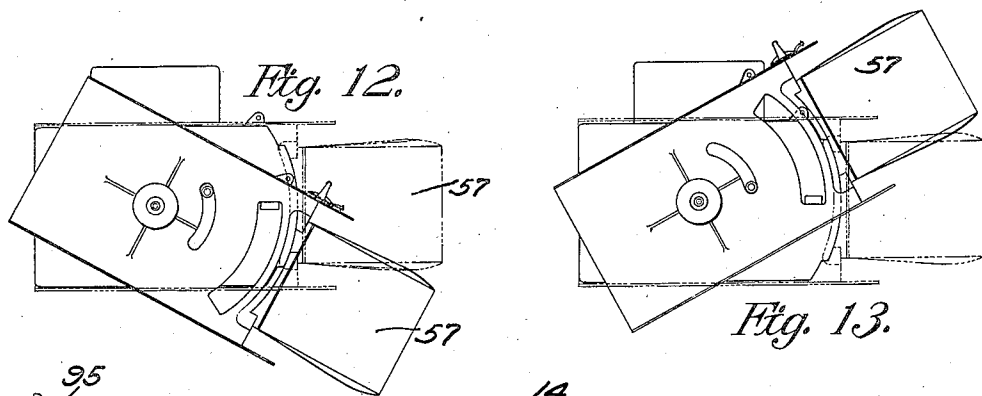
B. R. SHEETS

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ORE LOADING MACHINE

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5 Sheets-Sheet 4



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ORE LOADING MACHINE

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5 Sheets-Sheet 5

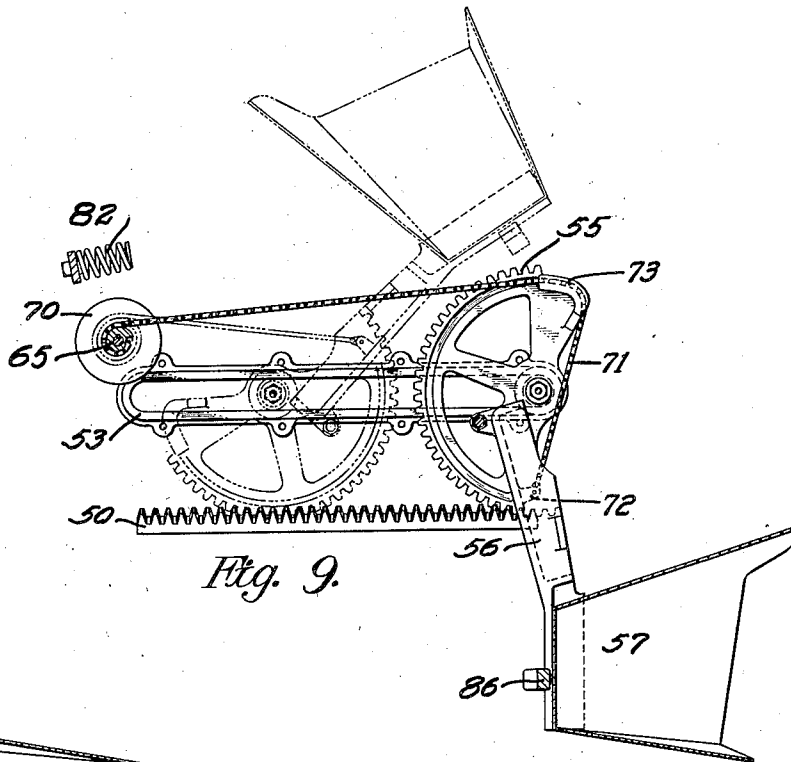


Fig. 9.

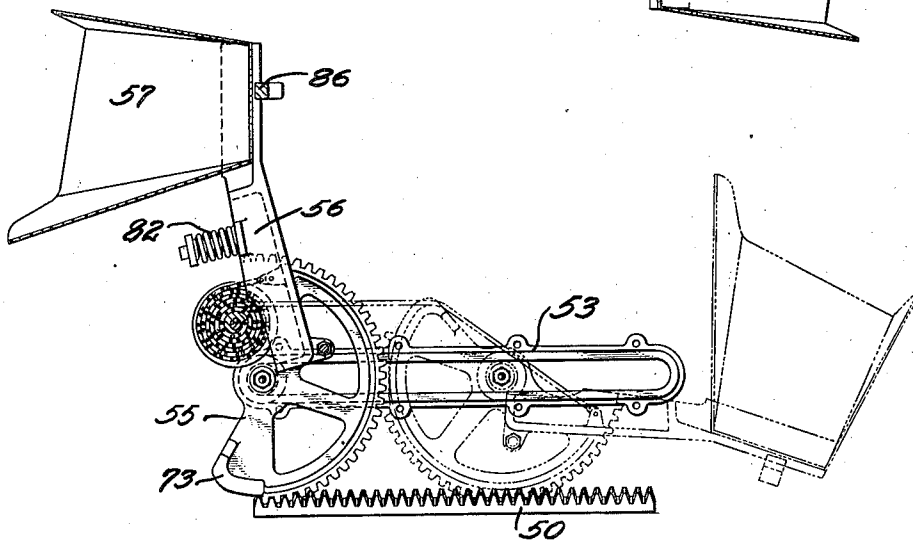


Fig. 10.

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UNITED STATES PATENT OFFICE

2,059,660

ORE LOADING MACHINE

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Application September 9, 1935, Serial No. 39,684

5 Claims. (Cl. 214—132)

My invention relates to improvements in mechanical loaders and is more particularly directed to that type of machine adapted for loading material, such as mine muck, in cars.

5 The main object of the invention is to provide a loader having a shovel mounted upon a rocking support, said support being moved to and fro in horizontally disposed guideways, and during such movement said rocking support causing
10 a swinging action of the shovel within a limited area and without undue strain to the mechanical parts of the unit.

Another object of the invention is to provide a loader light in structure, compact and positive
15 in its operation, and of such a size that it might be used in underground work, permitting its movement from place to place within a mine without dismantling.

Still another object of the invention is to provide a mechanism wherein the shovel of the
20 loader may be moved to its several functioning positions within a limited area and such movements being under the control of the operator at all times.

25 A further object of the invention is to provide a mechanical loader mounted upon a traction truck and so positioned thereupon as to permit lateral swing of the shovel in combination with a longitudinal swing.

30 Another object of the invention is to provide means controlled by the shovel during its swinging movement to interrupt the flow of operating fluid to the shovel operating motor and such means being operated at a period prior to the
35 dumping action.

Another object of the invention lies in the provision of means for initially returning the shovel from its dumping position to such a point in its movement that its return to its loading position
40 may be completed by gravity.

These and other objects of the invention will be apparent from the hereinafter specification when considered in view of the accompanying
45 drawings, in which

Figure 1 is a vertical sectional view taken longitudinally through the center of the loading unit showing certain parts thereof in elevation.

Figure 2 is a side elevation of Figure 1 as
50 viewed from the operator's side of the unit, showing certain parts of the structure broken away in order to disclose more clearly the operating motor for the shovel.

Figure 3 is a top plan view of Figure 1 with
55 the shovel in its loading position.

Figure 4 is a sectional view taken on the line 4—4 of Figure 3.

Figure 5 is a top plan view of the main truck upon which the shovel mechanism is mounted.

Figure 6 is a side elevation of Figure 5 with
5 certain parts broken away to disclose structural details and particularly the location of the driving motor for the truck.

Figure 7 is a view similar to Figure 6 but showing the truck as viewed from the opposite side 10 and disclosing particularly the driving gears for the traction wheels.

Figure 8 is a sectional view taken on the line 8—8 of Figure 3.

Figure 9 is a diagrammatic view showing the
15 position occupied by the shovel in the act of loading and the position assumed during its travel to its dumping position.

Figure 10 is a similar view showing the shovel in its dumping position and also the position
20 occupied by the shovel during the period of its travel.

Figure 11 is a detailed view showing the manner of mounting the rotatable shaft controlling the movement of the shovel.

Figures 12 and 13 indicate diagrammatically
25 the positions which the shovel may occupy with respect to the main truck, and

Figure 14 is a detailed view showing the trip mechanism operated by the shovel when approaching its dumping position.

Briefly, the invention hereinabout to be described is directed to a loading or mucking machine designed particularly for use in mine work and it naturally follows that such a machine must
35 be small and compact in its structure and positive in its operation.

The mucker as a unit includes a truck mounted upon suitable traction elements operating upon the usual narrow gauge mine track. Mounted
40 upon this truck is a body structure rotatable about a vertical axis and provided with the necessary controlling elements and driving means for moving a scoop shovel to a loading position and from the loading position to a dumping position,
45 the dumping position being somewhat elevated from the loading position. The movement of the shovel from one position to the other being permitted within a limited head room.

The unit as a whole includes suitable motive
50 means, preferably of a type operated by compressed air, whereby the unit is propelled back and forth upon its track, together with a second motive means for operating the shovel independently of the truck movement. The unit is
55

constructed in such a manner as to provide a positive guide for the shovel during its movement from one position to the other, together with a positive locking element for maintaining the shovel at any point within its operating limits. Certain automatic means have been provided for controlling the flow of air to the shovel operating means and for insuring the positive return of the shovel subsequent to its dumping period.

Referring to the accompanying drawings wherein like reference numerals denote corresponding parts throughout, the numeral 14 indicates in general a truck member upon which a rotatable shovel supporting structure is mounted, the same being referred to and described more fully hereinafter. The truck element is composed of a casting having a rectangular flat top face with depending legs 15 at its front and rear portions. The mid portion of the casting is substantially U shaped as shown in Figure 6, receiving therein a driving motor 16 mounted upon brackets 17 fixed as at 18 to portions of the depending legs 15. The driving motor 16 may be of any desired structure, type and size, but as pointed out above it is most desirable that such a motor be operated by compressed air and including a reversible valve whereby the directional rotation of the motor may be changed.

The depending legs 15 have rotatably mounted therein, upon suitable ball bearing structures 19, axles 20 having keyed to the outer ends of each traction wheels 21 adapted for rail engagement.

As shown in Figure 7 one side of the truck casting 14 has detachably secured thereto a suitable gear housing 22 within which gears 23 and 24 are mounted for rotation upon stub shafts fixed to the casing. These gears mesh with a drive gear 25 keyed to the main shaft of the motor 16.

The gears 23 and 24 positioned within the housing further mesh with larger gears 26 and 27 keyed to the axles 20. With this structure it will be apparent that upon operation of the driving motor the axles 20 will be caused to rotate, thus affording the means for imparting driving force to the traction wheels.

To control the flow of fluid passing to the driving motor 16 a reversing valve 28 is provided, the details of which may be of any desired structure, but preferably one in which the controlling element may be operated by remote control through the medium of a flexible connection 29, connected to a control handle 30 pivotally mounted on the operator's side of a rotatable structure herein-after described.

From the above it will be evident that upon the proper control of the valve 28 the truck as a unit may be caused to move in any desired direction longitudinally of its track.

Operating fluid for the driving motor 16, preferably compressed air, is supplied through a flexible conduit 31 which is connected to an angular nipple 32 fixed within one end of a cored passageway 33 extending transversely through the main portion of the truck casting. The opposite end of the passageway 33 has fixed therein an angular coupling 34 to which is attached a hose section 35, the opposite end being connected to an angular conduit 36 leading to a suitable pressure regulator 37 fixed in the front end of the truck casting. This pressure regulator 37 is of any desired structure, but preferably one that might be manually adjusted to regulate the pressure of the fluid which passes therefrom and enters the several operating motors of the unit. In some instances the pressure of the operating fluid

in the main supply line may exceed that desirable for efficient operation of the motors and by the proper adjustment of the pressure regulator the pressure of the operating fluid may be reduced as desired.

Passing from the pressure regulator 37 is a flexible conduit 38 which leads to a suitable T 39, one leg of which is screwed within a second cored passageway 40 extending transversely of the front end of the truck casting. Between the ends of this cored passageway 40 is positioned a vertical extending pipe 41 from which fluid may be conducted for a purpose hereinafter set forth. The other outlet from the T 39 has fixed thereto a nipple 42 to which is connected a flexible conduit 43 leading to the valve mechanism 28 of the driving motor, previously referred to.

The upper face of the truck casting 14 is provided with an upstanding annular ring 44 which forms a continuous bearing surface for a corresponding ring formed upon the under face of a rotatable structure mounted for movement upon a spindle 45 fixed to the truck casting, as shown in Figure 1, and being provided with suitable anti-friction bearing elements 46. This rotatable structure or body is composed of a rectangular base plate 47 having centrally thereof an upstanding portion which encases the spindle 45 and supports the several bearing elements 46 positioned between the spindle and the base plate. The plate 47 has fixed adjacent its longitudinal edges upstanding side boards 48 and 49, while its end portions are open permitting through one the movement of the operating shovel and at the other free access to the shovel operating means.

Positioned upon the base plate 47 and adjacent the inner face of each side board are longitudinally extending racks 50 the active face of each being cut on an incline as shown in Figure 8 permitting muck and the like which might accumulate thereupon to fall down upon the base plate. In order to further maintain these racks free of falling ore, particularly muck, there is positioned between each rack and the adjacent side board a perforated pipe 51 through which jets of fluid are discharged at such an angle as to blow the accumulated debris there off. These pipes 51 are connected to a common pipe 52 which leads to the exhaust side of a reversible valve, controlling the flow of fluid to a motor hereinafter described. Thus it will be seen that during the period that the motor is operating the exhaust therefrom is utilized to maintain the racks 50 clean.

Each side board has detachably secured thereto upon its inner face and approximately midway of its height, a longitudinal elongated guide element 53 having upper and lower bearing surfaces between which a rolling hub 54 is positioned. The hubs 54 are formed upon adjacent faces of gear segments 55 which are cut and shaped so as to intermesh with the stationary racks 50 fixed upon the base plate. From the structure just set forth it will be observed that the segments 55 are supported solely by the guide elements 53 and merely engage the racks 50 to insure a rolling movement of the segments during their movement within the guide elements 53 in a manner hereinafter described.

Each gear segment 55 has detachably positioned thereupon an outwardly projecting arm 56 and these arms form a support for a suitable shovel 57. In order to maintain the gear segments 55

in their proper spaced relation to each other there is, in combination with the shovel 57, a tie bar 58 fixed to the rear ends of the projecting arms as shown at 59.

To move the gear elements 55 longitudinally of the racks 50 there is provided a suitable operating motor, and while it may be of any desired type, one operated by pressure fluid is most preferred. Such a motor is indicated at 60 and is mounted in any convenient manner to the rear end of the base plate 47. The motor 60 is similar to the driving motor 16 and includes a reversible valve 62 to which suitable operating means is connected. Motive fluid for the motor is conveyed through a flexible conduit 63, one end of which is connected to the upstanding pipe 41 fixed to the truck casting, while the other end is connected to the reversible valve. The pipe 41 extends through an elongated curved slot 64 formed in the base plate 47 and concentrically with the spindle 45, thus permitting movement of the base plate with respect to the truck casting.

As illustrated in Figure 8 the drive shaft of the motor 60 has keyed thereto a sprocket gear 61. Positioned over the motor is a horizontally disposed driven shaft 65 mounted in suitable ball bearings 66 resiliently supported in bracket elements 67 fixed to the inner faces of the side boards. The shaft 65 has keyed thereupon a sprocket gear 68 to which power from the sprocket gear 61 fixed to the shaft of the motor is transmitted by a chain 69.

The driven shaft 65 has keyed adjacent each side wall a flanged wheel 70 upon which a cable or chain 71 is adapted to be wound, one end of each chain 71 being secured to the hub portion of the wheel 70 while its other end is secured as at 72 to the furthestmost portion of the gear segment 55. The opposite end of the gear segment has on its inner face an enlargement 73 having formed in its periphery a groove 74 into which the chain 71 might fall when the shovel has been lowered to its loading position. Attention is particularly called to this structure inasmuch as the manner of connecting the cables to the gear elements permits increased leverage to the lifting action of the shovel at a period when it is most desirable.

To control the directional rotation of the motor 60, through the valve 62, there is mounted upon the base plate a shaft 75 adapted to be oscillated by an operating lever 76 which is keyed to one end of the shaft and lies parallel with the outer face of one of the side boards. The upper end of the lever is guided in its movement by a suitable quadrant 77. As shown in Figures 2 and 14 the shaft 75 is provided with outwardly extending arms 78 and 79 the former being connected, through the medium of a suitable link 80, to the reversible valve 62. With this structure it will be observed that upon movement of the lever the position of the valve within its chest may be moved to properly control the operation of the motor.

The second outwardly extending arm 79 carried by the shaft 75 is provided at its free end with a horizontally disposed roller 81 positioned adjacent one of the racks 50 and adapted to be struck by the enlarged portion 73 carried by the adjacent gear segment. The result of this structure being that during that period when the shovel is approaching its dumping position, the enlarged portion 73 carried by the segment depresses the arm 79, oscillating the shaft and

through the valve 62 cutting off the supply of motive fluid passing to the motor. Upon the interruption of the flow of operating fluid the shovel continues in its swinging motion to its dumping position, until its supporting arms engage shock absorbing springs 82 positioned upon a bar 83 extending horizontally between the side boards of the structure. Inasmuch as the shovel in approaching its dumping position is moving rather rapidly when it is stopped abruptly by the shock absorbing springs 82 the contents of the shovel are thrown outwardly.

After the bucket has assumed the dumping position as shown by dotted lines in Figure 1 and the contents thereof have been discharged, the hand lever 76, controlling the valve 62, is accordingly moved to permit motive fluid to enter the motor in a reverse direction, causing the motor to rotate accordingly whereupon the tension to the cables is relieved permitting the shovel to drop by gravity to its loading position as indicated in full lines in Figure 1. To insure the initial movement of the bucket from its dumping position there is fixed upon the horizontally disposed shaft 65 a curved arm 84 which upon rotary movement of the shaft contacts one of the supporting arms of the shovel and moves the shovel back beyond its perpendicular line so that its weight together with that of its supporting structure will insure its return to its loading position.

When the shovel has returned to its loading position and during its period of loading, the truck casting 14 at its front end carries a curved bearing block 85 against which the rear end of the shovel may abut when in its loading position. If desirable, the rear end of the shovel may be provided with a bearing element 86. Thus it will be evident that all strain incident to the loading action, particularly when that action is in a horizontal line, is absorbed by the bearing block, thus giving a direct push to the shovel and at the same time forming a rigid support therefor. Furthermore, the shovel may be moved progressively into the pile of material by movement of the truck upon the track.

Should the material in which the shovel is working extend beyond the forward line of track it is, of course, apparent that the shovel operating mechanism may be moved with respect to the truck casting, but inasmuch as this movement is only desirable within a limited area it is necessary to provide means for limiting the outward swing of the shovel, and with this in view there is provided upon the truck casting an upstanding lug 87 which projects through a curved slot 88 formed in the base plate of the shovel supporting structure. The ends of this slot 88 are adapted to abut the lug 87 limiting the swing of the shovel within the confines of the usual mine tunnel.

Positioned upon the side of the truck casting corresponding to that side upon which the operator would stand when operating the several control levers, there is provided a suitable platform 89 supported by the motor supporting bracket 17, previously referred to. This platform 89 is of such a width and length as to provide a suitable standing place for the operator during the movement of the truck upon the track, and at such periods as when operating the unit within confined quarters.

The rear end of the truck casting 14 has fixed centrally thereof by suitable studs 90 a connecting element 91 to which the coupling link 92 of

an ore car, not shown, may be connected. This connecting element includes a plate having formed integral therewith a plurality of outstanding spaced fingers 93 having aligned openings in their end portions which receive therein a locking pin 94 which is inserted through the openings after the coupling link 92 of the ore car has been inserted between any two adjacent fingers. Fixed to the rear end of the truck casting 14 and at each corner thereof is an angle bar 95 serving merely as a bumper element protecting the unit from damage when ore cars are assuming their place behind the unit.

As disclosed in Figure 4 the upper face of the truck casting 14 has projecting outwardly therefrom a finger portion 96 corresponding to a like finger portion 97 formed integral with the base plate 47. When the base plate 47 and the structure carried thereby is in longitudinal alignment with the truck casting 14, these two outwardly extending fingers fall one over the other and as each finger is provided with an opening a suitable bolt or the like may be dropped therethrough to hold the two elements in alignment. This is particularly desirable when moving the unit to and from its work.

As shown in Figure 1, the outward face of the gear casing 22 has secured thereto, in line with the longitudinal center of the shaft of the motor 16 any desirable clutch, indicated generally at 100, its purpose being to disconnect the motor drive gear from its shaft, thus permitting a continued operation of the motor without imparting movement to the several gears 23 and 24. This clutch permits movement of the unit upon its track at periods when compressed air is being supplied the motor.

Having thus described in detail the structure of the unit as a whole, the following is a description of its operation.

The machine is advanced into a pile of material by the driving motor 16 with the shovel lowered as shown in the full line position in Figure 1. Advancement of the machine continues until the shovel is filled with material, and should necessity arise where a digging action is essential to the filling of the shovel, the shovel lifting motor 60 may be momentarily operated causing the drums 70 carried by the horizontally rotating shaft 65 to revolve, winding thereupon the shovel lifting cables or chains 71; thus giving a digging movement to the shovel. When the shovel is filled, motive fluid is supplied the shovel actuating motor, causing a continued rotation of the shaft and the winding drums carried thereby, the result being that the shovel supporting rockers are drawn backwardly toward the end of the rotating frame being guided in such movement by the supporting elements 53. During this backward movement of the shovel supporting elements, a rocking motion is imparted to the segments 55 by reason of their engagement with the stationary racks 50, thus giving a rocking action as well as a straight pull action, the result being that the shovel is elevated as its operating means is drawn backwardly toward the end of its supporting frame. This action continues until the shovel reaches approximately its dumping position, whereupon the operator cuts off the supply of motive fluid to the operating motor, permitting the shovel to dump by its own momentum, and during such action the supporting elements therefor strike the shock absorbing springs 82 positioned upon the rear end of the super structure. The inertia caused by this ac-

tion throws the material from the bucket into the ore car which is coupled to the unit. Ordinarily when the motive fluid is cut off from the shovel operating motor the recoil of the springs is sufficient to start the return of the dipper by gravity to its loading position. However, should this recoil fail, there is provided upon the horizontally disposed driven shaft 65 the kicker element 84 which during the rotation of the driven shaft engages one of the shovel supporting arms and moves the shovel back to a position slightly beyond its perpendicular line, thus permitting the shovel to drop by gravity to its loading position. The machine is then ready to repeat its cycle of operation. During the period of operation just described, should the operator fail to cut off the supply of motive fluid to the operating motor prior to the shovel dumping its contents, automatic means as set forth in Figure 14 is provided and this merely includes a lever fixed to an oscillating shaft, the lever being struck by the rolling segment and depressed, during which movement the valve 62 is automatically closed.

From the structure it will be observed that the dipper may be moved from one side of the truck to the other, as more definitely shown in Figures 12 and 13 in the drawings. This movement of the shovel permits the scooping up of material lying outside of the path in which the unit as a whole travels. It is, of course, understood that movement of the unit to and from its work is accomplished by the driving motor 16 and that this force may be utilized at some periods in loading the shovel inasmuch as the shovel during its loading period bears directly upon the truck casting.

It is quite apparent that the foregoing description merely amplifies the structure shown in the accompanying drawings, and it is, of course, understood that one embodiment of the invention is disclosed. The structural details which have been shown are more or less minor to the essence of the invention which lies in the provision of a rolling element supported in a fixed position, and during the movement of the rolling element the scoop shovel is thrown from one position to another.

What I claim is:

1. In a machine of the class described the combination of a motive propelled truck and a carriage pivotally mounted thereupon, guide elements carried by the carriage, segments supported by the guide elements and movable longitudinally of the carriage, motive means for moving said segments, a shovel fixed to the segments, elements carried by the carriage and engageable with the segments for imparting a rocking movement to the segments and the shovel carried thereby, said shovel during such movement swinging upwardly over the carriage from a loading position to an elevated dumping position, means for automatically interrupting the operation of the motive means prior to the shovel assuming its dumping position, manual means for changing the directional rotation of the motor, and a cam element operated by the motor and engageable with the shovel for initially moving the same from its dumping position to such a point in its travel where it is returned to its loading position by gravity.

2. In a shoveling and loading machine, the combination of a truck and a carriage mounted thereupon and movable about a vertical axis, a

shovel movably mounted upon the carriage and adapted to move thereover from its loading to its dumping positions, motive means for propelling the truck, a second motive means for moving the
5 shovel, manually controlled elements mounted upon the carriage and moving therewith for effecting control of both motive means, automatic means operated by the shovel for stopping one of said motive means, and one of said motive means
10 when thrown in reverse operating an element for moving the shovel from its dumping position to a point whereby it will return to its loading position by gravity.

3. In a shoveling and loading machine the combination of a carriage and a shovel movably
15 mounted thereon and adapted to swing from a loading position to a dumping position, reversible motor means for moving the shovel from one position to the other, means rotated by the motor
20 means during the movement of the shovel, the last said means when rotating in one direction moving the shovel from a dumping position to a point in its return travel whereby it will be returned to its loading position by gravity.

4. In a shoveling and loading machine the combination of a carriage and a shovel mounted thereon, said shovel adapted to move from one functioning position to another, reversible motor
5 means for moving the shovel to its several positions, controlling means for the motor, an element movable by the motor means, and said element when movable in one direction engaging
10 the shovel to move the same from a dumping position to a point in its return travel whereby continued movement to a loading position is caused by gravity.

5. In a shoveling and loading machine the combination of a carriage and a shovel movably
15 mounted thereon, motor means for moving the shovel from a loading position to a dumping position and controlling its movement from the dumping position to the loading position, an element movable by the motor means, and said element engaging the shovel when in the dumping
20 position to initially start the same upon its return to its loading position.

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