Nov. 6, 1923. 1,472,907

A. M. GOW

LOADING MACHINE

Filed Jan. 16, 1919 3 Sheets-Sheet 1

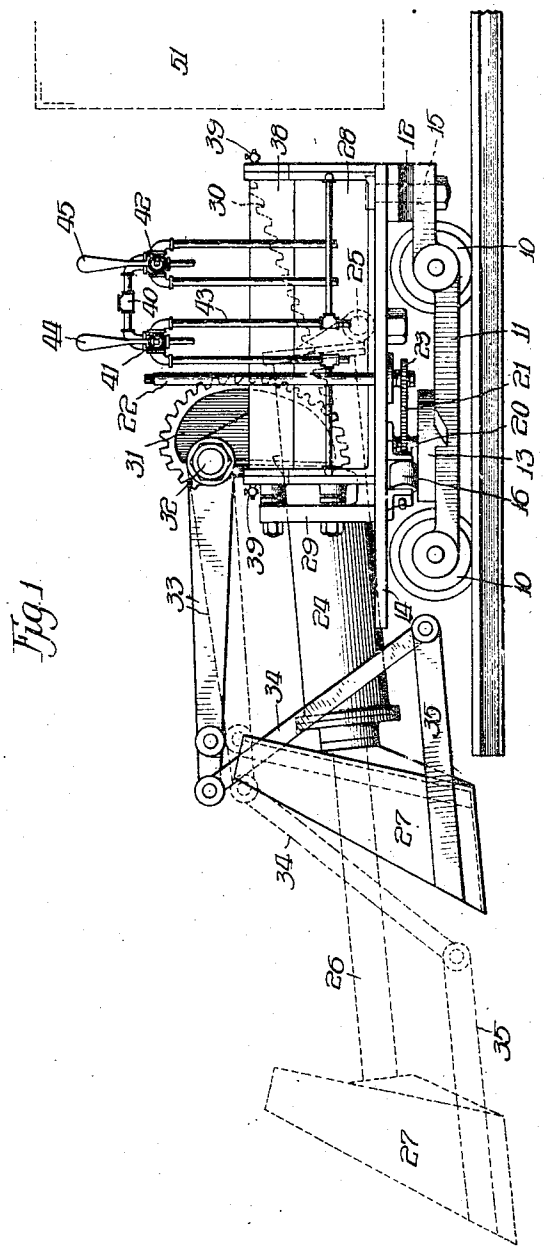

Fig 1

WITNESSES:

R. Burkhardt.

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Nov. 6, 1923.

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3 Sheets-Sheet 2

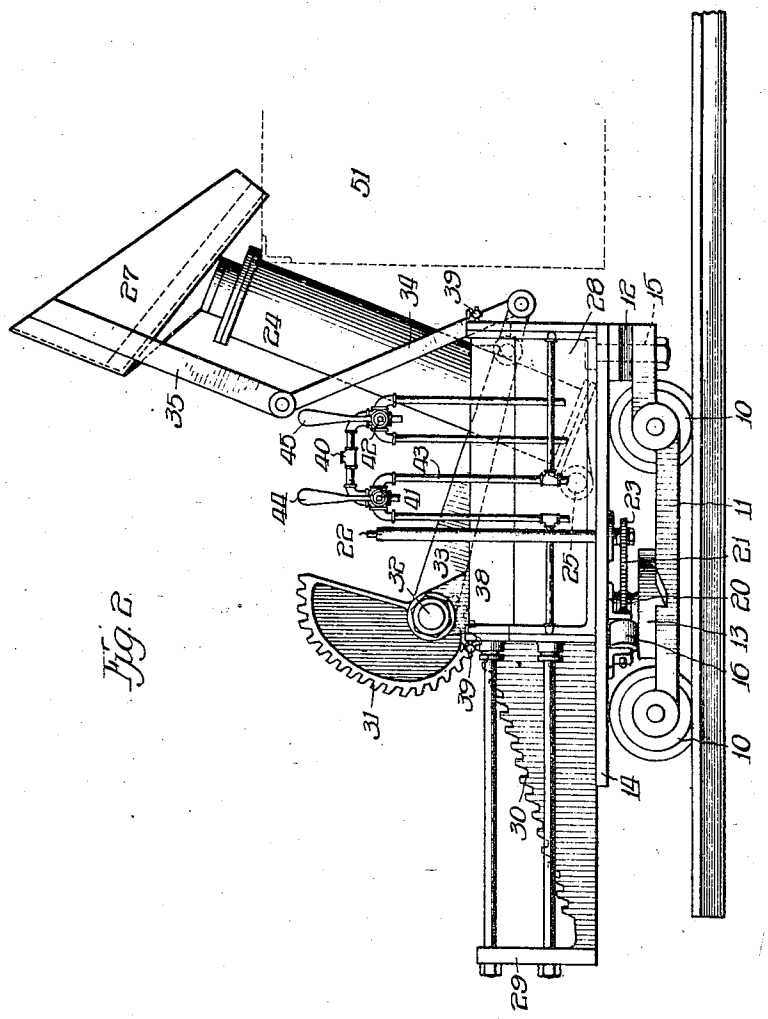

Fig. 2.

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Filed Jan. 16, 1919 3 Sheets-Sheet 3

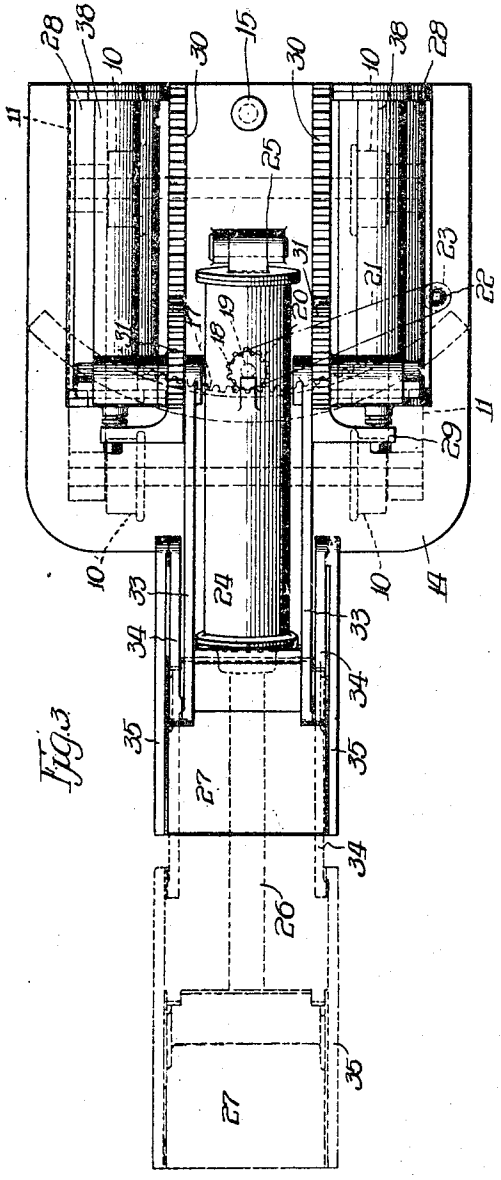

Fig. 3

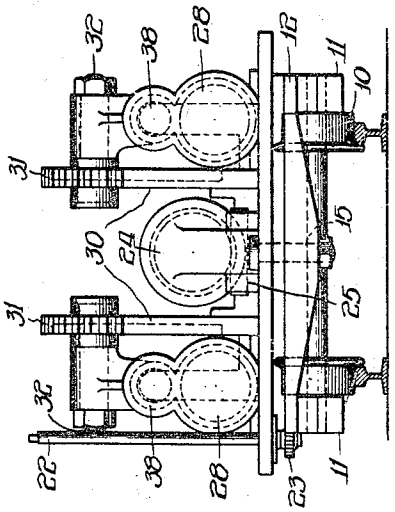

Fig 4

WITNESSES:

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Patented Nov. 6, 1923. 1,472,907

UNITED STATES PATENT OFFICE.

ALEXANDER M. GOW, OF DULUTH, MINNESOTA; AMERICAN EXCHANGE NATIONAL BANK OF DULUTH EXECUTORS OF SAID ALEXANDER M. GOW, DECEASED.

LOADING MACHINE.

Application filed January 16, 1919. Serial No. 271,351.

To all whom it may concern:

Be it known that I, ALEXANDER M. GOW, a citizen of the United States, residing at Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Loading Machines, of which the following is a specification.

This invention relates to a loading machine and is particularly designed for use underground in mines where the space in which it is to operate is limited and the material difficult to shovel by hand into tram cars.

One object of the invention is to simplify and improve loading machines whereby the various parts thereof cooperate in a novel manner and in which the greatest power may be transmitted to the shovel of the loading machine at the time of greatest resistance.

Another object is to provide a simple, durable and compact loading machine adapted to meet successfully the requirements for its particular use.

These and other objects are accomplished by means of the mechanism disclosed on the accompanying sheets of drawings, in which—

Figure 1 is a side elevation of my loading machine.

Figure 2 is a side elevation of the same machine with the shovel in dumping position.

Figure 3 is a plan view of the same machine with the parts arranged as shown in full lines in Figure 1, and

Figure 4 is a rear end view of the same machine.

The various novel features of my invention will be apparent from the following description and drawings and will be particularly pointed out in the appended claims.

The parts of my machine are essentially a truck resting upon the usual tracks, a platform mounted upon the truck pivoted at one end and adapted to swing laterally, a thrusting cylinder having a piston rod carrying a shovel or dipper, the cylinder being pivotally mounted on the platform, an arm adapted to swing in a vertical plane carrying a link connected to the shovel, a rotating cylinder adapted by means of a rack and gear to rotate the arm, the cylinder being mounted upon the platform, and a cushioning or a cataract cylinder adapted to check or steady the motion of the parts at different stages of the operation.

The truck comprises four wheels 10, two side frames 11, a rear cross bar 12 connecting said side frames and a front cross bar 13 connecting the forward portion of said side frames. The platform 14 is pivoted to the rear cross bar 12 by a vertically arranged king bolt 15, and rests upon the front cross bar 13 through rollers 16. The rear face of the front cross bar 13 carries a curved rack 17. Meshing with the rack 17 is a gear 18 mounted on a vertical shaft 19 which is supported by the platform 14. Upon this vertical shaft 19 also is mounted a sprocket wheel 20 driven by a sprocket chain 21, said chain also passing around a sprocket wheel 23 mounted upon one end of a vertical operating shaft 22. The upper end of this shaft 23 is adapted to receive a wrench (not shown). It is obvious that if the shaft 22 is rotated, motion will be transmitted through the sprocket wheel 23, chain 21 and sprocket wheel 20 to gear 18. Rack 17 being stationary, the platform 14 will be rotated on the king bolt 15 to one side or the other depending upon the direction of the rotation of the shaft 22.

A thrusting cylinder 24 at its rear end is pivotally connected at 25 to the platform 14 so that the cylinder may oscillate in a vertical plane. The piston mounted within the thrusting cylinder 24 has a piston rod 26, to the outer end of which is secured a shovel or dipper 27. It is apparent therefore, that when the piston is reciprocated back and forth in the thrusting cylinder 24, the shovel 27 will be actuated in the same sense.

This thrusting cylinder is mounted centrally with respect to the platform 14 and is interposed between two cylinders 28 which may be called rotating cylinders, their function being to raise and swing the shovel 27 over the machine proper for dumping purposes and to lower same preparatory to a thrusting or digging action. These cylinders 28 are mounted on the platform 14 and have pistons which are operatively connected to a cross head 29 to which is secured or with which there is integrally formed two racks 30 which are reciprocated in accordance with the movement of the cross head 29. It will be noted that the racks 30 are inclined, the highest portion thereof being to the rear of the machine. Each of these

racks 30 meshes with an eccentric gear 31, each one of said gears being mounted upon a separate shaft 32. An arm 33 is secured to each one of the gears 31 and moved in unison therewith in a vertical plane. The outer ends of these arms are connected to each other, and secured to the outer ends of these arms 33 are links 34 which links are connected to braces 35 secured to opposite sides of or forming a part of the shovel 27. It is obvious that regardless of the position of the shovel 27 the forward movement of the pistons in cylinders 28 will cause the racks 30 to move forwardly rotating the gears 31 and causing the outer ends of arms 33 to move in the arc of a circle, thereby carrying the shovel from a position in front of the machine backwardly over the machine to a dumping position, as shown in Figure 2, thus dumping the contents of the shovel into any suitable receptacle such as a tram car 51.

On the top of each of the rotating cylinders 28 is mounted a check or cataract cylinder 38 having pistons, the rods of which are secured to the cross head 29, consequently the pistons in the cylinders 38 move in unison with the pistons in the rotating cylinders 28. At each end of the cylinders 38 is a release cock 39. Obviously if the release cocks are closed the pistons in cylinders 38 will tend to compress air and offer resistance to the motion transmitted to the pistons in cylinders 28. The amount that the cocks 39 are open will determine the amount of resistance. If desired liquid may be used in the cylinder and the opposite ends of each cylinder connected by a pipe thus forming a device known as the cataract cylinder. It will be understood that I do not limit myself to the use of any particular type of check device.

This machine preferably is operated by compressed air. A pipe 40 is provided for air hose connections in the usual manner thus applying air to the two-four way valves 41 and 42. Valve 41 is so designed that the backward movement of its handle 44 will cause air to pass through a pipe 43 to the rear end of each of the cylinders 28 and upon a forward movement will cause air to be supplied to the front end of each of said cylinders. Accordingly if valve handle 44 is thrown rearwardly air will be admitted to the rear end of each of the cylinders 28 causing the cross head 29 and racks 30 to move forwardly, the eccentric gears 31 thereby being rotated in a clockwise direction, arms 33 thereby being raised and the dipper or shovel 27 moved upwardly and rearwardly over the machine to the dumping position shown in Figure 2. If the valve 41 is now moved into forward position air will be passed to the front of the cylinder and the shovel will be returned forwardly to its lower position. Valve 42 having a handle 45 controls the passage of air to the thrusting cylinder 24. If the handle be moved into a forward position the shovel will be thrust forwardly and if the handle is moved rearwardly the shovel will be moved rearwardly. These machines of necessity are operated by men of no mechanical training, many of whom cannot speak English. It is necesary therefore that the method of operation be simplified to the utmost limit and the dangers incident to false moves be reduced to a minimum.

By the use of the eccentric gears 31 operated by the diagonal or inclined racks 30, I am enabled to develop and transmit the greatest amount of power at the time of greatest resistance. In this connection it will be understood that when the shovel is down and extended forwardly and has a full load, the greatest amount of power is required to raise the shovel. With my arrangement the leverage at this time is the greatest. As the shovel is raised and the eccentric gears 31 ride up on the inclined racks 30, the leverage decreases. It will be appreciated that if the gears were made circular the length of the racks necessarily would be increased beyond the limits of the machine. However, by providing the eccentric gears and inclined racks, it is possible to provide transmission mechanism operable within the limits of the machine which mechanism develops and causes distribution of power in proportion to the resistance to be overcome. I do not limit myself to the arangement shown but claim broadly any means whereby the arm 33 may be caused to swing in a vertical plane to move the dipper from a digging to a dumping position.

In connection with the operation of the machine, the loader having been placed within reach of the ore to be loaded, the shovel may be swung to the right or left by means of actuating the shaft 22, the shovel thereby being moved to a point at which it is desired to dig. The valve handle 45 is moved forward and the shovel 27 accordingly is thrust forwardly. If it meets no resistance greater than it can overcome the shovel will fill with dirt or ore. The valve handle 45 then may be turned to the neutral position which is that shown in the drawings and is that position occupied by the handle which permits no fluid to pass in either direction. Valve handle 44 may then be thrown rearwardly, arms 33 accordingly being swung upwardly exerting a pull on the braces 35 tending both to lift the shovel and withdraw it from the pile. As the shovel is raised the piston rod 26 returns into the cylinder 24. The shovel travels to the rear of the machine and over the top thereof whereby it dumps its load into the tram car. By reversing the valve 41 the shovel

is returned to a digging position. Let it be supposed that during a forward thrust of the shovel an obstruction such as a rock which it cannot overcome is encountered. Under such conditions the valve handle 44 is moved rearwardly thus raising the arms 33 and the shovel 27 until the obstruction is cleared. Obviously too, the forward and backward motion of the dipper can be accomplished at any height above the ground level.

During the operation of the machine a stop is placed on the rails back of the machine to prevent its being forced rearwardly by the forward push of the thrusting cylinder. To move the machine forwardly the shovel is extended and held by a bar and then air is admitted to the front end of the thrusting cylinder thus pulling the machine forwardly.

It is my intention to cover all modifications of the invention falling within the spirit and scope of the following claims.

I claim:

1. In a loading machine, the combination of a truck, a thrusting cylinder pivotally mounted on said truck for vertical swinging movement, a shovel operatively connected to said thrusting cylinder, and operatively associated cylinders on opposite sides of said thrusting cylinder and operatively connected to the shovel for raising the same over the truck for dumping purposes, and at the same time swinging the thrusting cylinder about its pivot.

2. In a loading machine, the combination of a truck, a thrusting cylinder pivotally connected thereto and having a piston with a rod, a shovel rigidly mounted on said piston rod, and operatively connected power units on opposite sides of said thrusting cylinder operatively connected to said shovel for raising the shovel over the truck for dumping purposes, the piston rod to which the shovel is connected moving into the cylinder as the shovel is lifted.

3. In a loading machine, the combination of a truck, a platform pivotally mounted thereon for lateral movement, means for moving said platform laterally, a thrusting cylinder pivotally mounted on said platform for vertical swinging movement, a shovel operatively connected to the piston of said thrusting cylinder whereby the shovel may be moved in a direction for taking a load, and power units mounted on said platform on opposite sides of said thrusting cylinder for swinging said shovel over the truck for dumping the load.

4. In a loading machine, the combination of a truck, a platform pivotally mounted thereon for lateral movement, means for moving said platform laterally, a thrusting cylinder pivotally mounted on said platform for vertical swinging movement, a shovel operatively connected to the piston of said thrusting cylinder whereby the shovel may be moved in a direction for taking a load, and power units mounted on said platform on opposite sides of said thrusting cylinder for swinging said shovel over the truck for dumping the load, said power units including operatively connected eccentric gears and inclined racks whereby the lifting leverage exerted upon the shovel is varied as the shovel travels.

5. In a loading machine, the combination of a truck including side frames and cross bars, one of said cross bars having a rack formed thereon, a platform pivotally connected to said truck and having operating mechanism including a gear meshing with said rack whereby the platform may be moved laterally, a shovel, a thrusting cylinder operatively connected to said shovel and being pivotally connected to said platform for vertical swinging movement, and power means for swinging said shovel and cylinder over the platform for dumping purposes.

6. In a loading machine, the combination of a truck including side frames and cross bars, one of said cross bars having a rack formed thereon, a platform pivotally connected to said truck and having operating mechanism including a gear meshing with said rack whereby the platform may be moved laterally, a shovel, a thrusting cylinder operatively connected to said shovel and being pivotally connected to said platform for vertical swinging movement, and power means for swinging said shovel over the platform for dumping purposes, said power means including an eccentric gear and an inclined rack in mesh therewith.

7. In a loading machine, the combination of a dipper, a piston rod rigidly secured thereto, a pivotally mounted cylinder for actuating the piston rod back and forth, an arm pivotally mounted above the cylinder, a link connecting the arm and the dipper, and means whereby the arm may be moved in a vertical plane to cause movement of the dipper from a digging to a dumping position.

8. In a loading machine, the combination of a dipper, a fluid actuating cylinder for moving the dipper forward and backward, said cylinder capable of motion in a vertical plane, and a second fluid actuating cylinder adapted by the motion of its piston to move the dipper from a digging position in front of the machine through a vertical plane into a dumping position in the rear of the machine.

9. In a loading machine, the combination of a truck, a platform mounted on the truck; mechanism whereby the platform may be moved in a horizontal plane upon the truck; a cylinder pivotally mounted on the platform and capable of movement in a vertical

plane; a dipper adapted to be moved forward and back by the piston rod of said cylinder; a shaft located above and transversely to said cylinder; means for rotating the shaft; and link connections between the shaft and dipper whereby the rotation of the shaft in one direction shall cause the cylinder and dipper to travel in a vertical plane from a digging to a dumping position and its rotation in the other direction from a dumping to a digging position.

Signed at Duluth, Minn., this 11th day of January, 1919.

ALEXANDER M. GOW.