F. H. ARMSTRONG.

SHOVELING MACHINE.

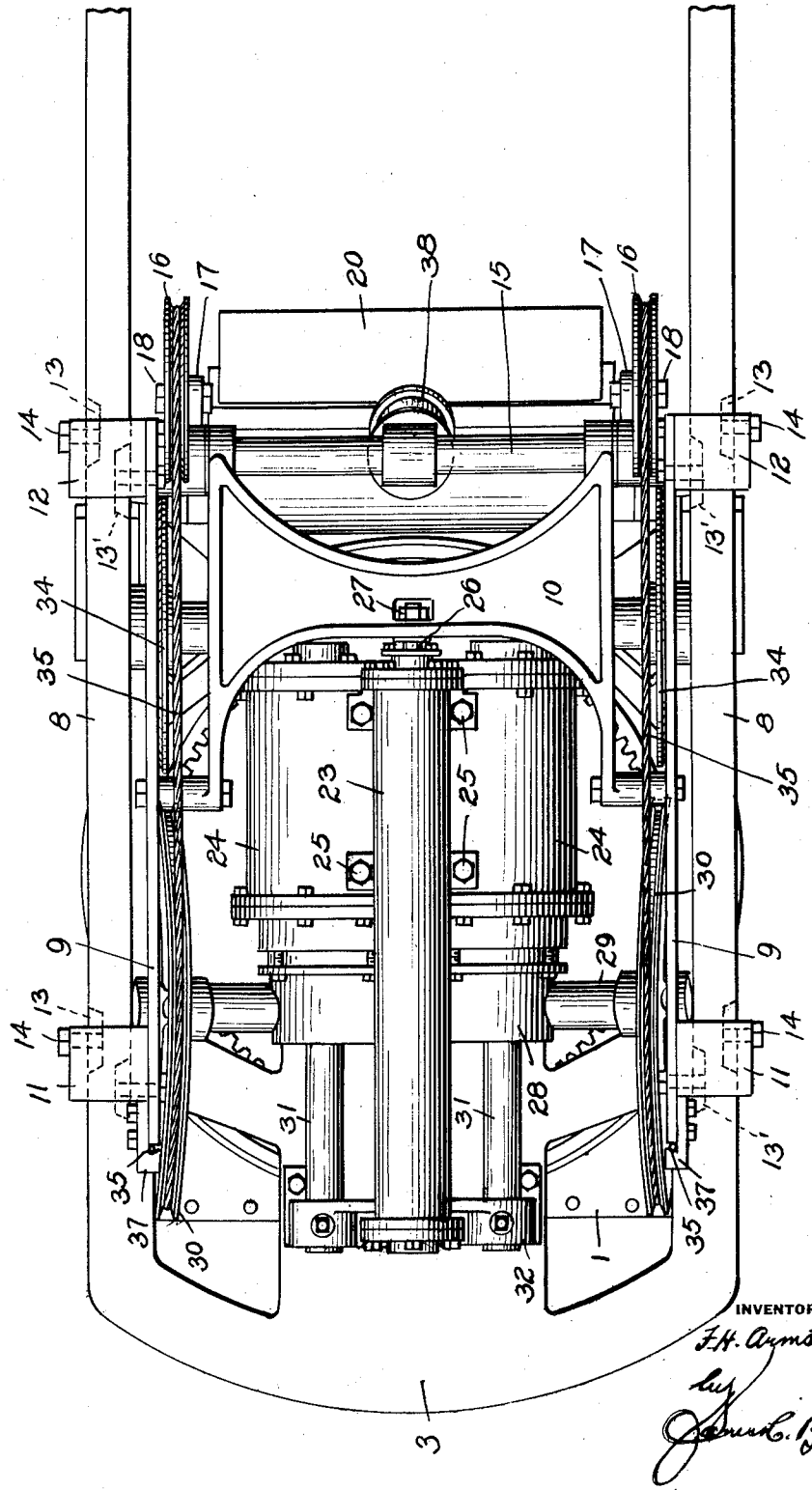
APPLICATION FILED JAN. 10, 1920.

1,360,997.

Patented Dec. 7, 1920.

3 SHEETS—SHEET 1.

FIG. 1.



INVENTOR

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by

Edmund C. Bradley

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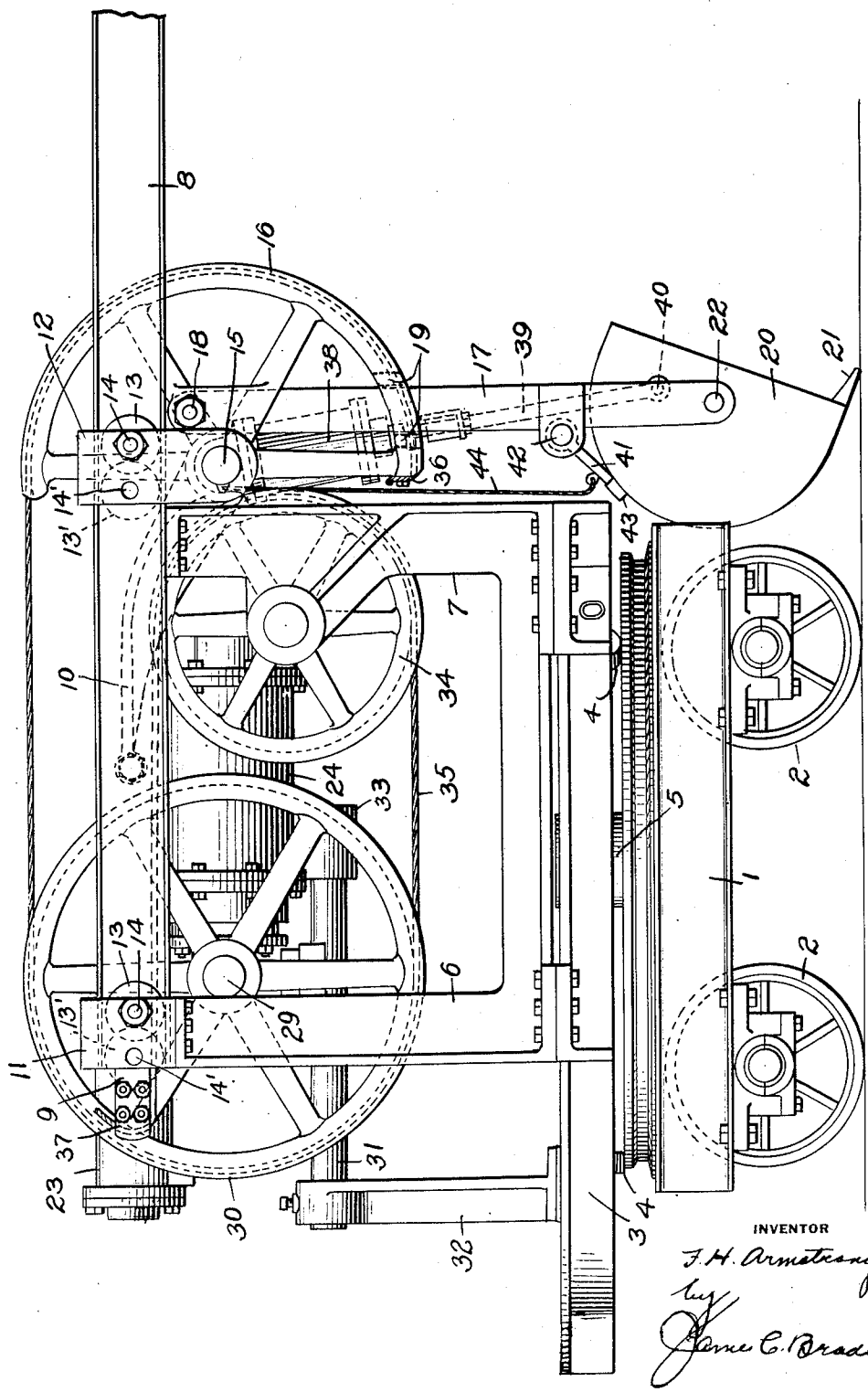
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3 SHEETS—SHEET 2.

FIG. 2.



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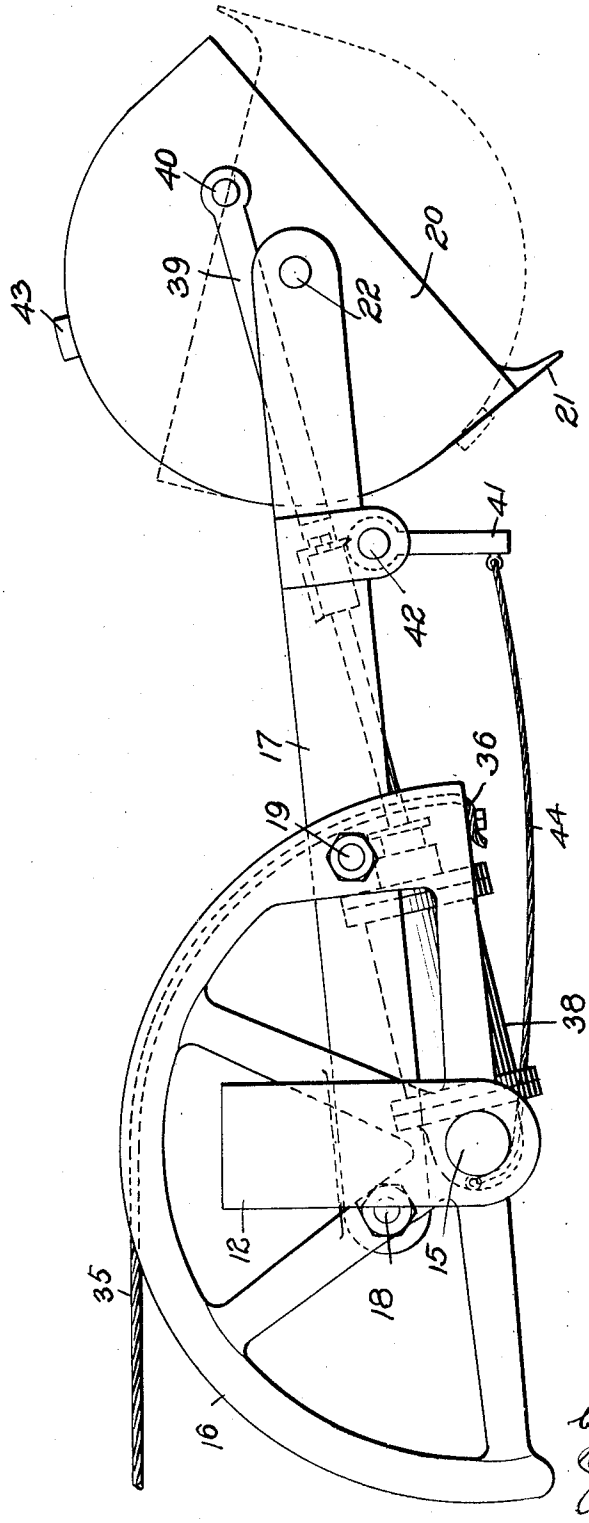
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3 SHEETS—SHEET 3.

FIG. 3.



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FRANK H. ARMSTRONG, OF VULCAN, MICHIGAN.

SHOVELING-MACHINE.

1,360,997. Specification of Letters Patent. Patented Dec. 7, 1920.

Application filed January 10, 1920. Serial No. 350,584.

To all whom it may concern:

Be it known that I, FRANK H. ARMSTRONG, a citizen of the United States, and a resident of Vulcan, in the county of Dickinson and State of Michigan, have made a new and useful Invention in Shoveling-Machines, of which the following is a specification.

The invention relates to shoveling machines or loaders designed to shovel loose material such as coal, zinc ore and the like from a pile and transfer it to cars at either side or the rear of the machine preferably located upon a track running parallel to the line of movement of the truck on which the shovel is mounted. The invention has for its principal objects; the provision of a construction of the type above described having an improved arrangement for maintaining the shovel at a proper digging angle during its forward movement preliminary to the upward swing; the provision of an improved and simplified means for controlling the dumping unloading operation of the shovel; the provision of a construction which can be operated where there is a minimum amount of head room; and in general, the provision of a simplified and improved machine of the type specified which is of relatively light, compact form, which is free from any complicated mechanism liable to get out of order, which is not liable to breakage due to the meeting of unexpected resistance in the material shoveled, and which can be operated to shovel with great rapidity and handle a wide variety of materials. One embodiment of the invention is illustrated in the accompanying drawings wherein;

Figure 1 is a plan view of the machine, Fig. 2 is a side elevation showing the shovel in one position, and Fig. 3 is a side elevation of the bucket and its operating arm when in discharge position.

Briefly stated, the apparatus in its preferred form embodies the following construction. A truck is provided upon which is mounted a turntable carrying a superstructure or framework provided at the upper portion thereof with a track extending forwardly past the front of the machine. On this track is mounted a carriage carrying a depending arm pivoted to the carriage at its upper end and provided with a shovel at its lower end.

The carriage is moved back and forth upon the track by means of a cylinder or ram and the arm carrying the shovel is swung about its pivotal support by means of a second cylinder or ram. Both of these cylinders or rams are carried upon the supporting framework and the arrangement is such that the carriage may be moved forward without tilting the arm or changing the digging angle of the shovel. After the carriage has been moved forward carrying the shovel into the material to be handled, the second cylinder is operated to swing the shovel arm upward to a substantially horizontal position, after which the framework is turned upon its axis to carry the shovel over a car or other receptacle which may be run in on a track paralleling the track upon which the shovel truck is mounted. The shovel is preferably pivoted upon the end of its supporting arm and may be dumped by tilting it. However any type of shovel might be employed such as one that did not require to be tilted in order to be dumped. The tilting of the shovel is preferably accomplished by means of a third cylinder carried upon the axle of the arm which carries the shovel. The term arm is used herein in its generic sense to indicate a movable shovel support which may be made up of one or a number of sections so arranged as to carry the shovel from its digging position to a position of discharge.

Referring now to the drawings; 1 is a truck provided with wheels 2 adapted to move either upon a track or upon the ground, and 3 is a turntable mounted to turn upon the rollers 4 around the vertical axis 5. Secured to the turntable is a superstructure or framework including the uprights 6 and 7. At the upper portion of the framework is the track for the carriage comprising a pair of horizontal I beams 8, 8, which extend at the right hand or front end of the machine out past the truck.

Mounted upon this track is a carriage of the construction indicated in Fig. 2. Such carriage comprises a pair of longitudinally extending bars 9, 9 lying inside of the I beams 8 and secured together by means of the transverse casting 10. At the four corners of the carriage are the brackets 11, 11 and 12, 12, such brackets being secured to the frame bars 9, 9 and extending down on both sides of the I beams as indicated in Fig. 2. These brackets carry the rollers 13

(Fig. 1) lying upon the outer sides of the I beams and being secured in position by means of the bolts 14.

The carriage constitutes the means for supporting the shovel and the operating arm therefor, such operating arm being carried by the brackets 12, which as indicated in Fig. 2 extend down below the I beams and carry a transverse shaft 15. Mounted upon this shaft are a pair of half pulley members 16, such pulley members being grooved to receive a cable or rope and carrying a pair of downwardly extending bars 17, 17 secured to the pulley members by the bolt 18 and between the lugs 19 on the rims of the pulley members. The pulley members in connection with the bars 17 constitute the shovel arm, the shovel being preferably of the half round type 20 having the digging edge 21 and pivoted upon the bars 17 at 22.

The carriage is moved back and forth by means of the cylinder 23 which is secured to the top of the pair of arm tilting cylinders 24, 24, (hereinafter described) by means of the bolts 25. This cylinder 23 has a plunger and a piston rod 26 secured at its right hand end to the cross bar of the carriage framework 10 by means of the nut 27. This cylinder as well as the other power cylinders hereinafter referred to may be operated either hydraulically or by compressed air depending on conditions. As shown in Fig. 1 the carriage is in its rearmost position and may be moved forward during the digging action a distance such as to bring the front end of the carriage adjacent the right hand ends of the I beams. The means for tilting the shovel arm about its pivotal support 15 comprises the pair of cylinders 24 secured rigidly to the framework and facing to the left as indicated in Fig. 2. The plungers 28 of these cylinders carry a non-rotatable transverse shaft 29 upon which the pulleys 30, 30 are mounted for rotation, the plungers constituting the support for the shaft. The plungers are guided at their lower side upon a pair of guide rods 31, 31, such guide rods being supported as indicated in Fig. 1, the left hand ends thereof being carried by the brackets 32 mounted upon the turntable, and the right hand ends thereof being carried by the brackets 33 depending from the lower sides of the cylinders 24.

Mounted upon the uprights 7 on each side of the machine are a pair of idler pulleys 34. On each side of the machine is a chain or cable 35 whose left hand end extends around the half pulley 16, and is secured at 36 to the lower portion of the pulley. Each cable extends around the pulley 30 and the pulley 34 and is secured by the clamp 37 to one of the side bars 9 of the carriage. It will be seen that when the cylinders 24 are operated to move the pulleys 30 to the left, the loops of the cables 35 will be lengthened or enlarged pulling the right hand ends of the cables to the left and swinging the lower end of the shovel arm with the shovel carried thereby to the right. It will also be noted that when the carriage is moved to the right by the cylinder 23 preliminary to swinging the shovel arm, such movement to the right does not cause any tilting of the shovel arm or change the digging angle of the shovel although the power means for tilting the shovel arm is carried by the framework of the machine which does not move with the carriage. This feature of operation is due to the fact that the left hand ends of the cables 35 are secured to the carriage (at 37, Fig. 2) so that when the carriage moves to the right both ends of the cables move to the right at the same speed so that no tilting action is imposed upon the shovel arm by the cables 35. The shovel may therefore be moved forward as far as may be desired without changing its angle before the operation of the cylinders 24 to swing the shovel upward to discharge position.

Also mounted upon the shaft 15 is the cylinder 38 for tilting the shovel to discharge it after such shovel has been moved to horizontal position and the machine turned upon the turntable to bring the shovel over the receiving car. This cylinder is provided with a suitable plunger and a piston 39 pivoted to the shovel at 40. A stop member 41 is also pivotally secured to the bars 17 at 42 and is adapted to engage the stop 43 upon the back of the shovel. This means serves to prevent the lower portion of the shovel from swinging to the rear during the digging movement of the shovel and relieves the operating means 38 and 39 from such strain. When the arm reaches the lateral position indicated in Fig. 3, the stop member is either pulled out of engagement with the stop or dropped out by gravity and the shovel is turned to the dumping position as shown. If it is desired that the stop member shall release by gravity, the power means must operate slightly to move the shovel in a counterclockwise direction at which time the stop member will drop down to the position illustrated. This release movement of the shovel is incidental to the normal operation as air pressure is maintained in the cylinder on the forward side of the plunger until the shovel arrives at dumping position. If desired the stop member may be pulled positively out of engagement with the stop. This may be done by the use of a cord or chain 44 secured at one end to the non-rotating shaft 15 and at the other end to the stop member 41, the slack in the cord being such that when the shovel arm reaches a certain position, the shortening of the cord due to winding around the

shaft 15 would pull the stop member out of engagement with the stop. The brackets 11, 11 and 12, 12 also carry rollers 13^1 upon the inner sides of the beams, the openings 14^1 being provided to permit of the insertion of the bearing pins upon which the rollers 13^1 are mounted.

The operation of the machine as a whole is as follows. The truck is run up to a position adjacent the material to be shoveled and a receiving car is either run in on a parallel track and placed along the side of the truck or run in on a transverse track and placed behing the truck. The cylinder 23 is then operated causing the carriage with its shovel arm to move forward carrying the shovel into the material to be shoveled. The shovel maintains a constant digging angle during this movement of the carriage due to the fact that both ends of the cables 35 move to the right with the carriage as heretofore explained. When the shovel has progressed into the material a sufficient distance to fill, the forward movement of the carriage is stopped and the cylinders 24 are operated to cause the shovel arm to swing upward, such movement being due to the lengthening of the loops in the cables 35 incident to the movement of the pulleys 30 to the left. During the movement of the shovel into the material it is held from turning by the stop member 41. When the shovel clears the material and while still on its upward path the turntable is operated to carry the shovel over the receiving car so that the shovel is in position to discharge when it arrives over the receiving car. On the release of the stop means 41, the cylinder 38 is operated to turn the shovel to the position shown in Fig. 3. During the return movement of the shovel arm to the starting position of Fig. 2, the cylinder 38 is operated to oscillate the shovel back to digging position, the stop member 41, at such time, dropping by gravity to holding position above the stop 43.

The cylinder 23 is made of much less cross section and power than the cylinders 24, 24, so that in case the shovel strikes an obstacle which might result in breakage or in the stopping of the machine, the carriage will be crowded to the rear by the operation of the cylinders 24, 24 and the shovel will automatically free itself of the obstruction. This result follows as the rearward movement of the carriage allows the shovel to act at a different angle with respect to the obstruction.

It will be seen that the machine is of simple compact construction, that it may be operated rapidly and effectively, and that it requires a minimum amount of head room since the shovel arm does not have to swing above a horizontal position in moving to the position of discharge.

What I claim is:

1. In combination in a shoveling machine, a carriage supporting frame work mounted to turn around a vertical axis, a carriage mounted for reciprocation thereon, a swinging arm pivoted to the carriage and carrying a shovel at its outer end, power means for reciprocating the carriage, other power means secured to said framework, a flexible operating means connected at one end to said arm and at its other end to said carriage, and means engaging said flexible means intermediate its ends and operated by said other power means for causing the ends of said flexible means to approach each other.

2. In combination in a shoveling machine, a framework mounted to turn around a vertical axis, a carriage mounted for reciprocation thereon, a swinging arm pivoted to the carriage and carrying a shovel at its outer end, power means for reciprocating the carriage, other power means mounted upon the framework, a flexible operating means connected at one end to said arm and at its other end to said carriage, and means engaging said flexible means intermediate its ends and operated by said other power means for causing the ends of said flexible means to approach each other, and power means mounted upon the carriage and having connection with the shovel for causing the discharge thereof after the arm and framework have been moved to dumping position.

3. In combination in a shoveling machine, a truck, a superstructure mounted thereon to swing about a vertical axis, a horizontal track mounted upon the upper portion of the superstructure extending out past and forward of the truck, a carriage mounted on the track, a depending arm pivoted to the carriage and provided at the lower end with a shovel, a cylinder and plunger for causing the forward movement of the carriage without tilting the arm, a second cylinder and plunger on the superstructure for swinging the arm forward and upward after said carriage has been moved forward on said track, and a third power cylinder and piston carried by the arm for dumping it after it reaches discharge position.

4. In combination in a shoveling machine, a carriage supporting framework mounted to turn around a vertical axis, a carriage mounted for reciprocation thereon, a swinging arm pivoted to the carriage and carrying a shovel at its outer end, power means for reciprocating the carriage, other power means secured to said framework upon which the carriage is mounted, a flexible operating means having a loop therein and connected at one end to said arm and at its other end to said carriage, and means operated by said other power means for enlarging said loop and so causing a retraction of the end of the loop attached to the swinging arm.

5. In combination in a shoveling machine, a carriage supporting framework mounted to turn around a vertical axis, a carriage mounted for reciprocation thereon, a swinging arm pivoted to the carriage and carrying a shovel at its outer end, power means for reciprocating the carriage, an idler pulley secured to said framework, a second pulley mounted for movement toward and from the idler pulley, flexible means connected at one end to said arm and at its other end to said carriage and extending around said pulleys, and other power means for moving said second pulley.

6. In combination in a shoveling machine, a truck, a superstructure mounted thereon to swing about a vertical axis, a horizontal track upon the upper portion of the superstructure extending out past and forward of the truck, a carriage mounted on the track, a depending arm pivoted to the carriage and provided at its lower end with a shovel, power means for causing the forward movement of the carriage without tilting said arm, a second power means for swinging the arm forward, and a prime mover carried by the arm for causing the discharge of the shovel.

7. In combination in a shoveling machine, a truck, a superstructure mounted thereon to swing about a vertical axis, a horizontal track upon the upper portion of the superstructure extending out past and forward of the truck, a carriage mounted on the track, a depending arm pivoted to the carriage and provided at its lower end with a shovel pivoted thereon, power means for causing the forward movement of said carriage, a second means for swinging the arm forward, and power means for tilting the shovel with respect to the arm to discharge it after it arrives at discharge position.

8. In combination in a shoveling machine, a truck, a superstructure mounted thereon to swing about a vertical axis, a horizontal track upon the upper portion of the superstructure extending out past and forward of the truck, a carriage mounted on the track, a depending arm pivoted to the carriage and provided at its lower end with a shovel pivoted thereon, power means for causing the forward movement of the carriage, a second power means for swinging the arm forward, and a prime mover carried by the arm for tilting the shovel to discharge it.

9. In combination in a shoveling machine, a truck, a superstructure mounted thereon to swing about a vertical axis, a horizontal track upon the upper portion of the superstructure extending out past and forward of the truck, a carriage mounted on the track, a depending arm pivoted thereon and provided at its lower end with a shovel pivoted thereon, power means for causing the forward movement of said carriage, a second power means for swinging the arm forward, a stop means for preventing the shovel from tilting in one direction during the movement of the arm from upright to substantially horizontal position and adapted to release automatically at said last position, and a third power means carried by the arm for tilting the shovel after the release of the stop means.

10. In combination in a shoveling machine, a swinging arm provided at its end with a shovel pivoted thereto, means for moving the arm from an upright to a lateral position, stop means for preventing the lower portion of the shovel from tilting to the rear during the movement from upright to lateral position, and means for tilting said lower portion of the shovel to the rear when the arm arrives at its lateral position and the stop means is released.

11. In combination in a shoveling machine, a swinging arm provided at its end with a shovel pivoted thereto, means for moving the arm from an upright to a lateral position, stop means for preventing the lower portion of the shovel from tilting to the rear during the movement from upright to lateral position, said stop means being moved by gravity to holding position when the arm is moved to upright position and being moved by gravity to release position when the arm reaches its lateral position, and means for tilting said lower portion of the shovel to the rear when the arm arrives at its lateral position and the stop means is released.

12. In combination in a shoveling machine, a truck, a superstructure mounted thereon to swing about a vertical axis, a horizontal track upon the upper portion of the superstructure extending out past and forward of the truck, a carriage mounted on the track, a depending arm pivoted to the carriage and provided at its lower end with a shovel pivotally connected to the arm, means for causing the forward movement of the carriage, other power means for swinging the arm forward and upward to approximately a horizontal position, and power means for turning the shovel about its pivotal connection to dump it without further upward movement of the arm after the superstructure has been turned a partial revolution about its vertical axis.

13. In combination in a shoveling machine, a truck, a superstructure mounted thereon to swing about a vertical axis, a horizontal track upon the upper portion of the superstructure extending out past and forward of the truck, a carriage mounted on the track, a depending arm pivoted to the carriage and provided with a shovel, power means for causing the forward movement of the carriage without tilting said arm,

other power means for swinging the arm forward and upward to approximately a horizontal position, and power means for tilting the shovel to dump it after the superstructure has been turned a partial revolution about its vertical axis and without any further upward movement of the arm.

14. In combination in a shoveling machine, a framework adapted to swing around a vertical axis, a laterally extending track upon the upper portion of the framework, a carriage mounted on the track, an arm pivoted to the carriage and provided at its free end with a shovel, a cylinder and plunger operating means secured to the framework, power means for moving the carriage back and forth, and connections between said operating means and the said arm for tilting the said arm arranged so that the back and forth movement of the carriage occurs without tilting said arm.

In testimony whereof, I have hereunto subscribed my name this 22nd day of December, 1919.

FRANK H. ARMSTRONG.

Witnesses:

RAYMOND TURNER,

A. F. BROCKETT.