June 25, 1940. E. B. ROYLE 2,205,732

SHOVELING MACHINE

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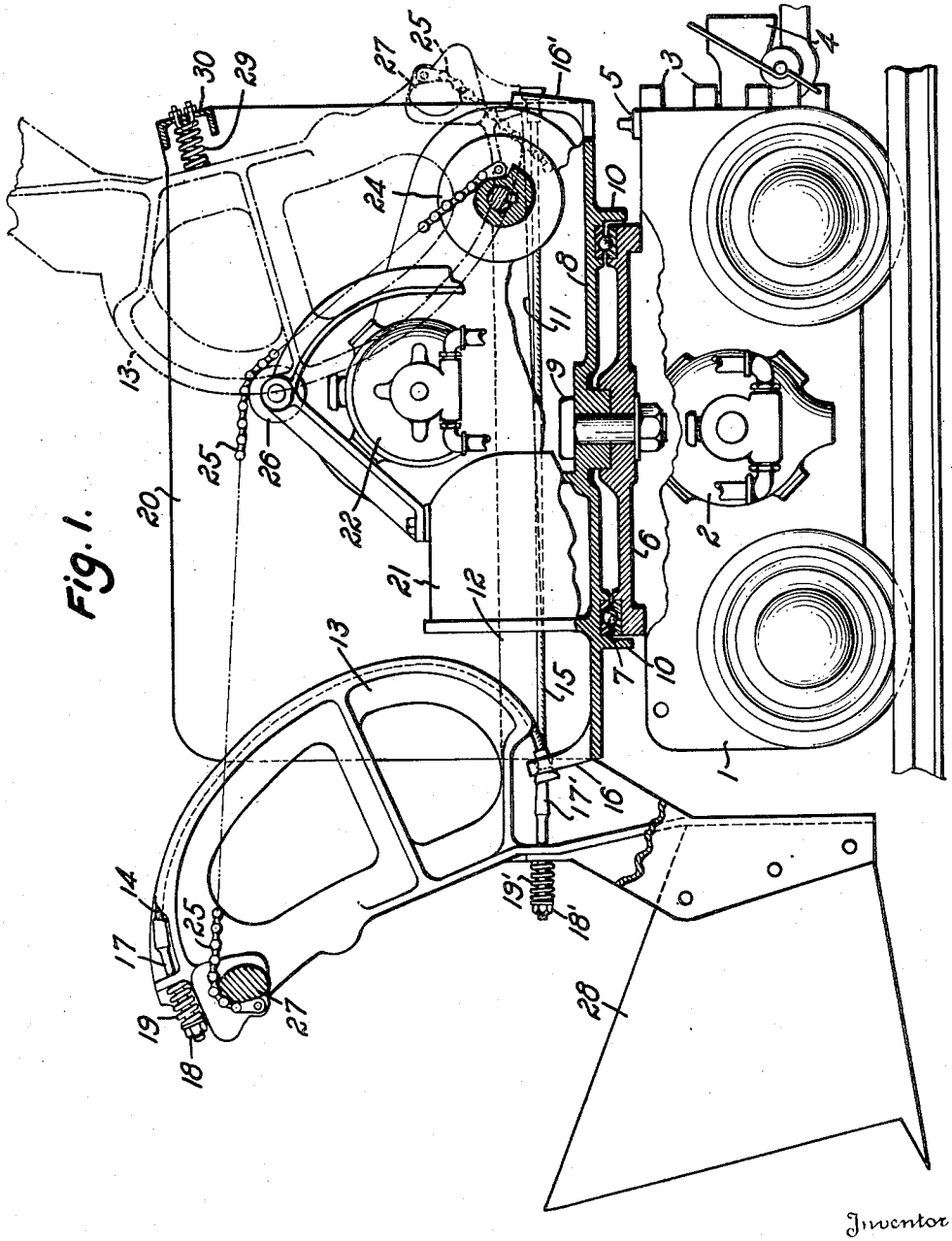


Fig. 1.

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Fig. 2.

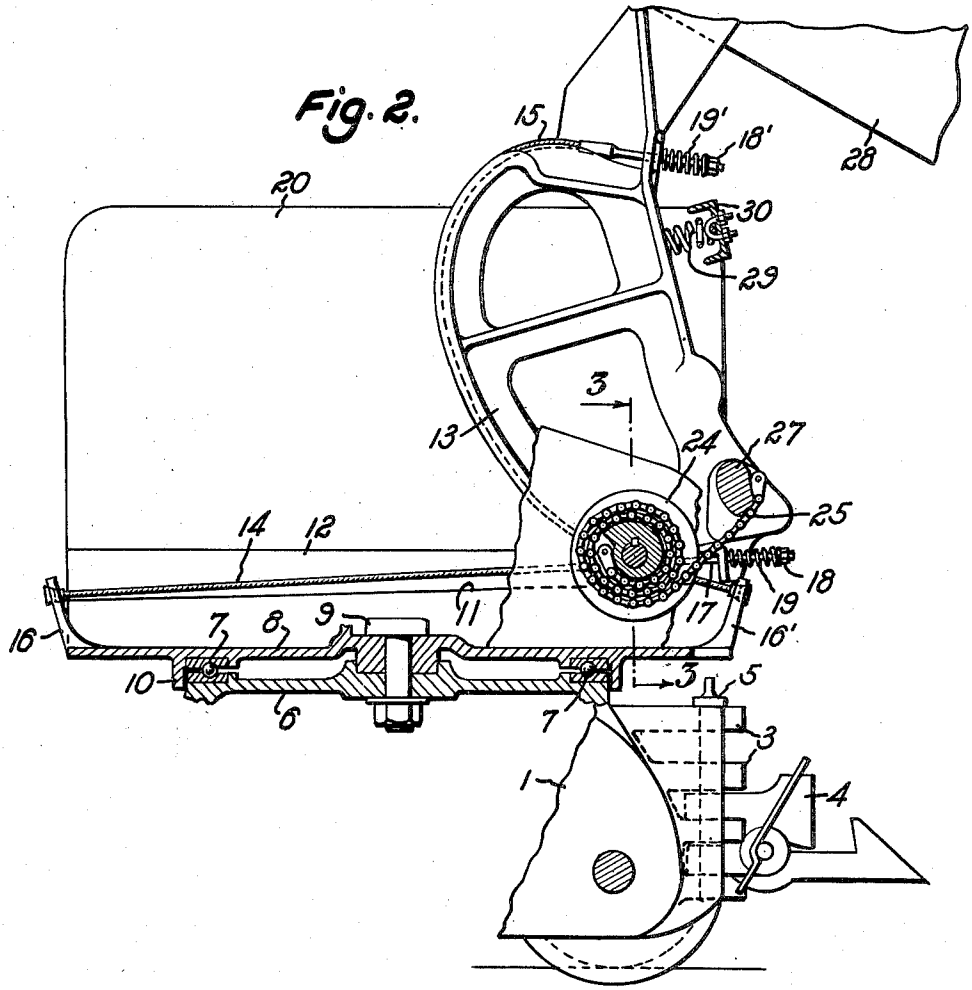
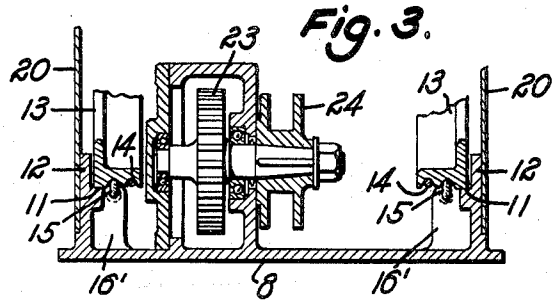


Fig. 3.



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SHOVELING MACHINE

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Application May 16, 1939, Serial No. 274,047

1 Claim. (Cl. 214—132)

This invention relates to shoveling machines and particularly to shoveling machines or muckers of the type employed for loading muck or other material into cars or trucks in underground or surface works.

Machines of the general type contemplated by this invention are described and claimed in United States Letters Patent Nos. 1,906,000 and 1,906,001, to John S. Finlay and Edwin B. Royle, and No. 2,134,582 to Edwin B. Royle. These machines include a car, tractor or equivalent movable support carrying a table or deck, a dipper or bucket at one end of a rocker or frame that rolls upon the deck to carry the dipper from a lowered position at the front of the car to an elevated dumping position at the rear of the car, and a motor or motors for moving the car and actuating the rocker.

An object of the present invention is to provide a shoveling mucker of the rocker frame type in which the mechanical connections between the rocker frame and its operating motor reduce the power consumption, protect the motor from shock, and increase the speed of operation. More specifically, an object is to provide a shoveling machine including a dipper or bucket on a rocking frame, a motor for rocking the frame into elevated position to engage a resilient stop, whereby the load in the dipper is discharged by its momentum; and a mechanical drive between the motor and the frame, the drive including a pull-back chain connected to a point on the rocking frame such that the line of pull passes through the instantaneous rolling axis of the frame as or just before the rocking frame strikes the stop.

These and other objects and advantages of the invention will be apparent from the following specification when taken with the accompanying drawings in which:

Fig. 1 is a substantially central longitudinal section through an embodiment of the invention, the rocker being shown in the digging position in full lines and in fully retracted or dumping position in broken lines;

Fig. 2 is a similar, but fragmentary, sectional view showing the rocker in dumping position; and

Fig. 3 is a fragmentary transverse sectional view taken on line 3—3 of Fig. 2.

In the drawings, the reference numeral 1 identifies a small car or truck that may be run in opposite directions on the ground or, as shown, on tracks by a reversing air or electric motor 2. The rear end of the truck is provided with a series of uniformly spaced horizontal plates 3 for receiving the notched end of a coupler 4 to support it at different heights above the track, the coupler being locked in place by a pin 5. This flexibility in the location of the coupler adapts the shoveling machine for use with cars of different design and, in the case of underground work, with end dump cars that have couplings at different levels and may come to the shoveling machine in either direction.

The top 6 of the truck 1 supports a large diameter ball bearing or track 7 on which the upper deck 8 rests. A king pin 9 secures the upper deck to the truck for turning movement, and an annular flange 10 depends below the deck and closely encircles the bearing 7 to protect it against the entrance of dirt. The side edges of the deck 8 carry or are formed as rails 11 that slope upwardly at a small angle from the forward end of the deck, and guide flanges 12 extend above the rails 11 at their outer sides.

The skeleton side frames of the rocker structure 13 have curved lower surfaces for rolling engagement with the rails 11, the radius of curvature of the surfaces increasing from the forward to the rear ends of the curved sections. The curved surfaces are grooved to receive guide cables 14, 15 whose ends are connected, but in reverse manner, to the rocker structure and the deck 8. The forward end of each cable 14 has a ball end seated in a socket shaped hole in a lug 16 that projects above the deck 8, and the other end of each cable 14 has a threaded cable fitting 17 that passes through an opening in a flange at the rear of the rocker structure 13 and receives a nut 18 that is turned down upon the cable tensioning spring 19. Ball ends on cables 15 seat in sockets in lugs 16' at the rear of the deck 8, and cable fittings 17' at forward ends of the cables 15 extend through openings in the rocker structure 13 to receive nuts 18' that are turned down on fittings 17' to compress the springs 19'.

Side plates 20 are secured to the flanges 12 and the controls for the motors are mounted on one of the side plates at a convenient height for the operator who stands on a running board at the side of the truck 1. The machine preferably has a centering mechanism 21 for automatically bringing the upper deck into line with the wheel base upon lifting the dipper from a side-digging position. The centering mechanism may be of the type described in my prior Patent No. 2,134,582, but the exact design is not an important feature of this invention.

The reversing motor 22 for operating the rocker

structure is supported on or from the deck 8 and is connected through gearing, not shown, to the gear 23 having a shaft on which the relatively small diameter reel 24 is splined. The motor may be of any desired type and, as illustrated, is an air motor. The reel 24 is located substantially at the center line of the deck 8 and has wide side flanges between which a tension member, such as a cable or a flat chain 25, is wound in successive turns of a single thickness to increase the radius of the pull on the chain as the rocker structure moves towards dumping position. The cable or chain 25 extends over an idler 26 (when the rocker structure is in forward position) and is secured to a yoke or spreader bar 27 that joins the side frames of the rocker 13.

The dipper or scoop 28 is mounted on the side frames beyond the curved track sections and depends below the deck 8 when the rocker structure is in forward position. Bumper springs 29 on a cross bar 30 engage the side frames of the rocker structure when it reaches dumping position, and the load in the dipper is thrown rearwardly into a car or truck when the high speed motion of rocker structure is stopped by the bumper springs.

The general method of operation is the same as that of the devices described in the above patents. With the dipper 28 in lowered position, the truck 1 is advanced to force the edge of the dipper into a muck pile. Motor 22 is then started, and the rocker structure is turned clockwise by chain 25 and rolled along the track 11 to carry the dipper through the muck pile and then upwardly and rearwardly into dumping position. The progressively increasing radius of curvature of the rolling surfaces of the rocker structure results in an acceleration of the rocker structure as it rolls rearwardly. The rocker structure rebounds from the springs 29 and returns to its forward position by gravity when the motor 22 is reversed.

According to this invention, a further acceleration is obtained as the chain 25 winds upon the reel 24 in successive layers to increase the length of the "work arm" through which motor 22 applies a pull to the rocker structure. The pull exerted upon the rocker structure at the beginning of the digging action is approximately perpendicular to the short radius of the rocker structure (due to the idler 26) while the chain 25 is tangent to the small diameter hub of the reel 24. The motor 22 thus moves the rocker structure at slow speed at the beginning of the cycle, but develops its maximum power for the digging action. As the rocker structure rolls rearwardly, the curved surfaces of the side frames, due to the location of the yoke bar 27, provide a progressively decreasing radius of action for the pull-back chain and simultaneously an increasing radius for the arcuate path of travel of the bucket 28. These changes, with the increase in the lever arm of the reel 24 as the chain 25 winds upon it, result in a smooth, even acceleration of the bucket 28.

The profile of the rolling surfaces of the rocker is so related to the location of the reel 24 that the pull of the chain 25 passes approximately through the line connecting the two contact points on rails 11 when the rocker structure reaches dumping position. The ever increasing radius of the chain pull tends to stall the motor and, preferably, the point of dead pull at which the motor must stall is located a fraction of an inch in advance of the rocker position at which it engages the bumper springs. The springs 29 may be adjustable, if desired, to vary the contact point with respect to the point of dead pull of the chain 25, to regulate the degree of shock imparted to the discharging load. The load is discharged by its momentum and the frame and dipper rebound freely from the bumper springs to start a return movement by gravity but under control of the operator through regulation of the reversing motor 22. The dead pull feature provides a relatively long interval within which the operator may reverse the motor drive to obtain the maximum advantage of the rebound of the frame from springs 28 for the acceleration of the frame on its return movement into loading position.

The described construction of the guide cables 14, 15 facilitates the replacement of these parts as the worn cables may be pulled out through lugs 16, 16', respectively, after removal of the nuts 18, 18'. It is not necessary to remove the fittings 17 from the cables as the maximum diameter of the fittings is less than that of the openings in the lugs 16, 16'. Similarly, the new cables are quickly installed by passing the cable fitting end through the lugs of deck 8 and the openings in the rocker 13, slipping the tensioning spring in place, and threading the nut on the end of the cable fitting.

The relative acceleration effects of the changing rolling radius of the rocker structure, the changing radius of application of the pull to the rocker structure, and of the changing lever arm of the motor as the pull-back member winds upon the reel 24 may be varied over wide ranges. It is to be understood that the invention is not restricted to the particular embodiment herein shown and described, and that various changes may be made in the design and relation of the several parts of the combination without departing from the spirit of my invention as set forth in the following claim.

I claim:

A shoveling machine comprising a supporting structure, a rocker structure having curved surfaces for rolling on said supporting structure, a dipper carried at an end of said rocker structure beyond said curved surfaces, a flexible pull-back member having one end connected to a point on said rocker structure and the other to a reel, said reel having side flanges between which said member may be wound in successive layers of a single thickness, power means for rotating said reel a plurality of turns to roll said rocking structure from a dipper loading position to a dipper dumping position, thereby to accelerate said dipper as it approaches dumping position, and resilient bumpers positioned on said supporting structure to engage and stop the rocker structure in dipper dumping position, said reel and said point on the rocker structure being relatively positioned to create a pull through the instantaneous rolling axis of the rocker structure when said rocking structure engages said resilient bumpers.

EDWIN B. ROYLE.