Feb. 1, 1938. J. F. KNAPP 2,107,118

EARTH MOVING DEVICE

Filed Jan. 10, 1936 3 Sheets-Sheet 1

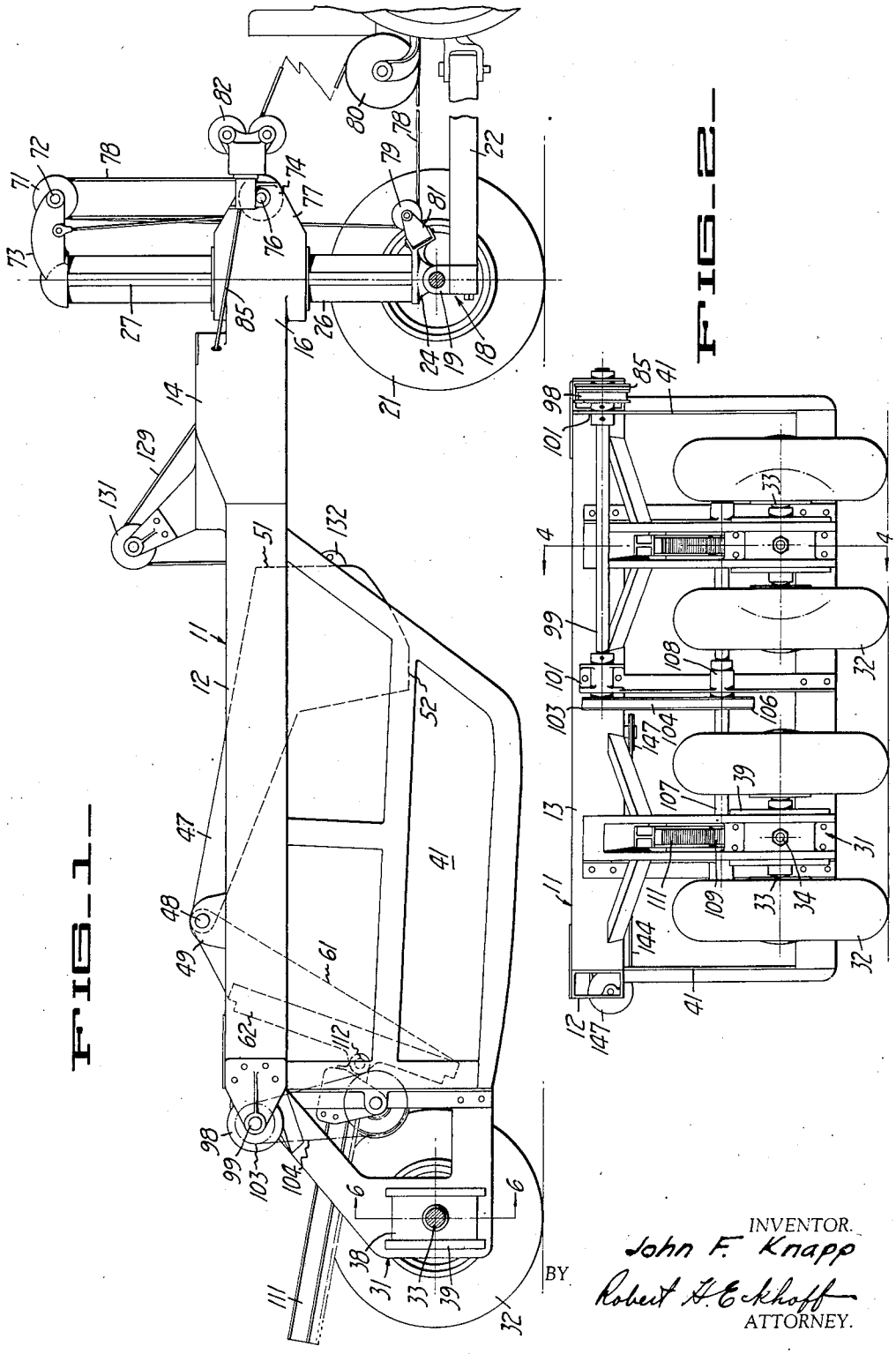


FIG. 1.

FIG. 2.

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Filed Jan. 10, 1936 3 Sheets-Sheet 2

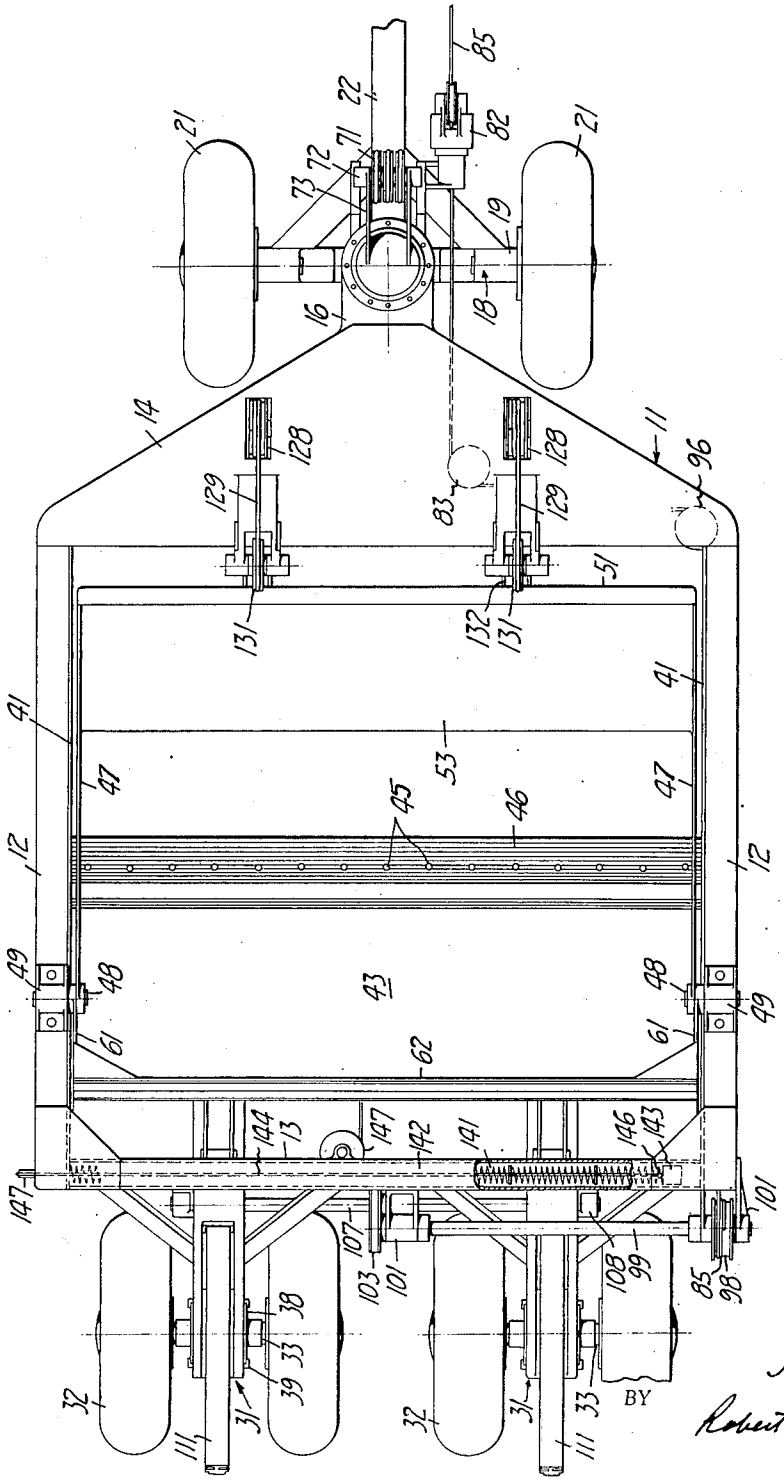


FIG. 3

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EARTH MOVING DEVICE

Filed Jan. 10, 1936 3 Sheets-Sheet 3

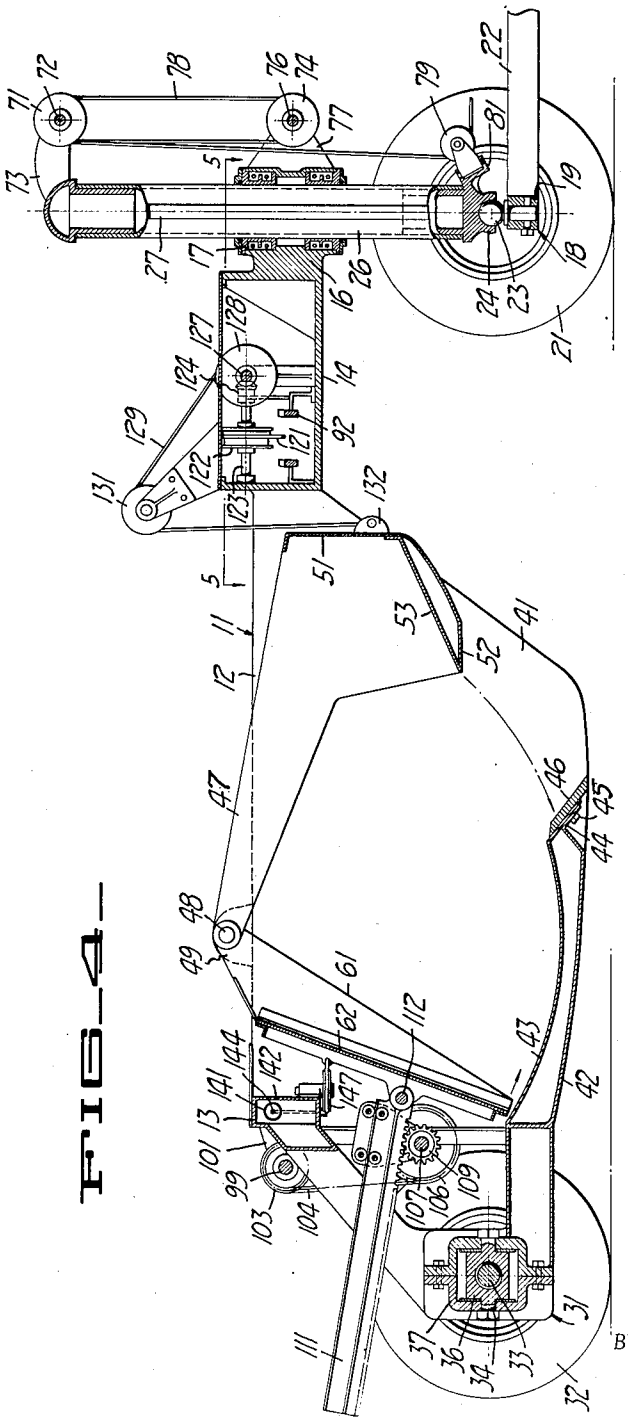


FIG. 4.

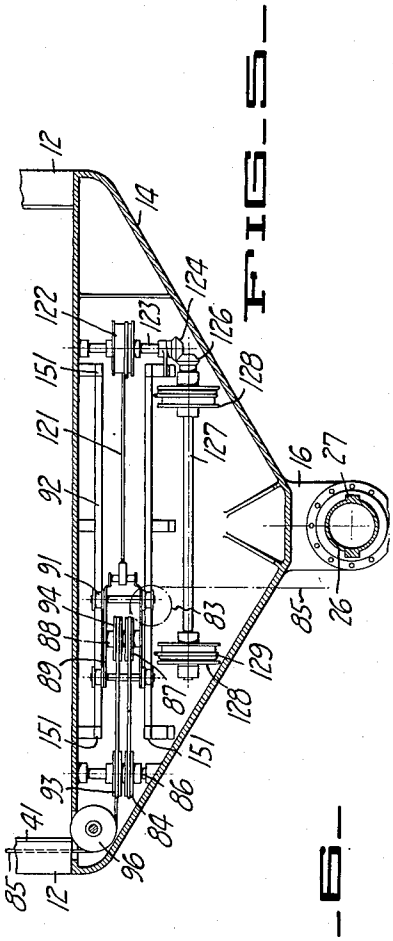


FIG. 5.

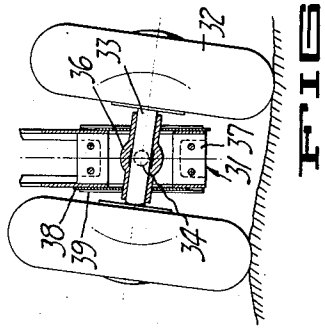


FIG. 6.

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UNITED STATES PATENT OFFICE

2,107,118

EARTH MOVING DEVICE

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Application January 10, 1936, Serial No. 58,552

5 Claims. (Cl. 37—126)

This invention relates to a new and improved scraper structure, particularly one designed to establish a ground level, pick up the scraped earth and retain it within its own structure for subsequent transportation and release at a desired place. While structures capable of accomplishing these functions have been available heretofore, they have been characterized by certain failings. For example, these scrapers are usually drawn by tractors and are controlled by the tractor operator. The control effected over them is such that the elevation of a cutting blade relative to the earth can be controlled as can reception of the scraped earth and its retention. To accomplish these several functions various control schemes have been worked out, usually employing cables. The machines available to contactors and earth excavators include as many as four different cables, several of which were usually quite long. These cables require frequent renewing and on one commercially available scraper it has been reliably established that the cable cost per day of operation was $15.00. When it is remembered that the investment in the scraper is quite a large sum, in the neighborhood of $5,000, that a heavy large tractor is required and that tractor operator's salary must be included, it will be readily apparent that the daily operating cost of one of these units is relatively high and that a considerable portion of this cost is made up in cable maintenance alone. In the machine of my invention I have simplified the control and have reduced the number or cables required as well as simplifying the working of each cable to the end that its life would be increased.

It is in general an object of the present invention to improve upon scraper structures, to simplify the control thereof and, in a cable operating mechanism, to reduce the number of cables employed as well as the severity of use to which the cable is subjected to the end that the cable operating cost may be reduced.

Structures of the character herein considered are used in the working over of terrains which are far from level. These structures are also employed for transportation of heavy loads of earth. To secure adequate support for rolling of these structures it is usual to provide a plurality of trucks having on each truck a plurality of wheels. It is my observation that a considerable portion of the maintenance cost of these structures can be charged to the fact that the wheels are not provided upon the structures in such a manner that the structure, through the wheels, could readily accommodate itself to the terrain over which it was passing. The consequent result is that passage of the structure over any uneven ground racks and works the structure. As a consequence, the structures have to be repaired constantly.

It is a further object of the present invention to improve upon the supporting means provided for scraper structures and, more particularly, is an object to provide a suitable truck mounting and support for a scraper structure enabling the scraper to be moved over rough, uneven terrain without the terrain effecting a working in the scraper structure.

Present structures of the type herein considered include the operating mechanism over the bowl. This prevents loading with a power shovel. (See Patent 1,891,266 of December 20, 1932.) The machine of my invention is free of this objection, it being an object of my invention to provide a machine of the class described which can be loaded by a power shovel without danger to operating mechanism.

In addition to the foregoing objects, the invention includes other objects and features of advantage, some of which, together with the foregoing, will appear hereinafter when the present preferred scraper structure of my invention is disclosed.

In the drawings accompanying and forming a part of this specification Figure 1 is a side elevation, partly in section, illustrating the preferred scraper structure of my invention.

Figure 2 is a rear view showing the truck means supporting the scraper.

Figure 3 is a plan view.

Figure 4 is a section taken along the line 4—4 of Figure 2.

Figure 5 is a section taken along the line 5—5 of Figure 4 illustrating the control mechanism in some detail.

Figure 6 is a section on line 6—6 of Figure 1.

The frame

The scraper of the present invention includes a strong steel frame 11 made up of a plurality of members, usually secured together by spot welding. This frame includes side members 12, end member 13 and a forward member 14 joining the side members 12 and extending forwardly to provide a support 16 in which are provided bearings 17.

A front truck 18, including an axle 19 upon which are positioned wheels 21, is provided. A draw bar 22 extends forwardly to be attached to

a suitable hitch on such a vehicle as a tractor used to propel the scraper. The axle 19 carries a ball member 23 which is received in a socket 24 at the bottom of a post 26. This post extends through bearings 17 and includes guides 27 thereon, cooperating with the bearings 17 to restrict the movement between the bearings and the post to only a sliding movement, rotational movement being prevented by the guides 27. At the rear of the frame truck support members 31 are provided, these members being suitably attached and braced to frame structure and extending to the rear of the scraper to permit suitable clearance for wheels 32.

The wheels 32 are provided in pairs, each pair being mounted upon an axle 33, each axle being carried in one of the supporting members 31. As appears in Figure 4, each axle is supported for a limited rotational movement in a direction parallel to the transverse axis of the bowl and transversely to the direction of movement of the wheels 32 so that each truck can, independently of the other truck, readily accommodate itself to any inequalities in the terrain over which the vehicle passes. As appears in Figure 4, this oscillatory mounting of each axle is secured by supporting the axle in the support member 31 by means of stub shafts 34 which are suitably attached and positioned in each member 31 by trunnions 36 and trunnion bearings 37. Means are provided for sealing each axle support to prevent the entrance of foreign matter into the trunnion bearings. In the form disclosed this means comprises a plate 38 engaged with the axle and slidable in gibs 39 provided on each side of the plate. Each plate is long enough to seal the opening in the wheel support means in any extreme position of the axle. The entrance of dirt and dust and other foreign matter is thus prevented.

The bowl

Secured to the frame members 12 are suitable side plates 41. Between these side plates are extended a bottom plate 42 and an arcuate plate 43. At their forward ends these plates are joined together and thus provide a lip 44 to which is attached a suitable cutting blade 46, bolts 45 being usually utilized for this purpose so that the cutting blade can be readily changed or replaced.

Upon advancing the scraper over the ground the cutting blade 46 will cut off and pick up earth, this earth being deposited upon the arcuate plate 43 to be retained therein.

Since the point at which it is desired to dump a load from the scraper may be a considerable distance from the point at which the load is picked up, since transportation of the load may result in accidental discharge of a part thereof, I provide means for retaining the earth in the bowl. This means is shown as comprising two arms 47 carried upon stub shafts 48 which are in turn carried by brackets 49 on side frame members 12. These arms extend forwardly and provide a hoe structure with transverse plate 51 which is welded between the arms 47. It is to be noted that plate 51 includes a face 52 which engages the cutting blade and thus insures a tight closure for the bowl. A plate 53 is extended between the arms 47 and is attached to the plate 51 to continue the configuration of the bowl when the face 52 is in engagement with the cutting edge and to otherwise strengthen this structure. The entire structure just described provides a door which serves to retain earth cut by blade 46 during cutting and carrying.

To provide for removal of earth carried upon the bowl I support another pair of arms 61 from stub shafts 48 and extend between these arms a plate 62, thus providing an end gate. It is to be noted that the center of the arcuate plate 43 is the center of the stub shafts 48 and that plate 62 will sweep over and wipe off earth upon the plate 43 so that the bowl can be readily emptied.

The blade elevating mechanism

Means are provided for raising and lowering the frame 11 so that the position of the cutting blade 46 relative to the earth can be adjusted. In the form disclosed this means comprises a plurality of pulleys 71 supported upon a shaft 72 carried by forwardly extending arms 73 on the post 26. A second set of pulleys indicated at 74 are supported upon a shaft 76 carried upon arms 77 are positioned upon the frame structure. A cable 78 is secured to the frame and is extended about the several pulleys to secure a multiplication in the power applied on cable 78. The cable extends about a guide pulley 79 positioned by support 81 for universal movement. The pulley extends to a suitable hoist mechanism, usually a hoist at the rear of a tractor, a hoist being that indicated at 80.

The closure and end gate operating mechanism

In accordance with this invention a single cable is provided for operating both the closure means and the end gate structure. This is accomplished in the form disclosed in the drawings by extending a single cable 85 to a universal guide means indicated at 82 into certain operating mechanism carried in the transverse forwardly extending frame portion 14 which, in effect, provides a box structure for receiving and protecting this mechanism against the entrance of dust, dirt and the effect of the elements. Cable 85 enters this box-like structure and passes about a guide pulley 83 to a pulley 84 carried upon shaft 86 which is fixed in position in the box structure 14. The cable then passes to a pulley 87 on a shaft 88. The shaft 88 is carried upon a movable carriage 89 supported by rollers 91 upon a track 92. This track extends transversely of the scraper structure and supports the carriage for a limited transverse movement between stops 151. The cable then passes about pulley 93 on shaft 86 and pulley 94 on shaft 88, and then about guide pulley 96 which passes the cable down through the right hand side member 12 to a pulley 98. Pulley 98 is carried upon a shaft 99 supported in bearings 101 upon frame member 13. The shaft extends for a goodly portion across the machine, as will presently appear.

It is to be noted, as appears in Figure 3, that the cable is attached to the pulley so that movement of the cable to the right in Figure 3 will result in a clock-wise rotation of shaft 99. Shaft 99 carries at the extreme left hand end thereof (Figure 2) a gear 103 over which passes a chain 104. This chain also extends about a sprocket wheel 106 on a shaft 107 which is supported in bearings 108. Upon this shaft are secured pinions 109 in engagement with racks 111. Each rack is secured by a hinge 112 to plate 62, each rack extending rearwardly through the supporting members 31 being protected thereby. It will thus be seen that upon a clockwise rotation of pulley 98 the pinions 109 will similarly rotate in a clockwise direction and racks 111 will advance from left to

right in Figure 4 to move the end gate forward over the arcuate bowl member 43 and thus eliminate from the bowl dirt piled therein.

To provide for raising and lowering of the closure member provided by arms 47 and plates 51 and 53 I attach cable 121 to the carriage 89, the other end of the cable being wound around pulley 122 to which its end is attached. Pulley 122 is carried upon shaft 123 suitably supported in bearings in the box structure 14. At one end of shaft 123 is provided a miter gear 124 in mesh with a like miter gear 126 on an end of shaft 127. This shaft is also suitably supported and carries two pulleys 128. Cables 129 are attached to and wound about each of the pulleys 128, these cables extending over guide pulleys 131 for attachment to ear 132 on plate 51. The travel of the carriage over the track between limit stops 151 is effective to raise and lower the closure.

To provide for the return of the end gate I extend a spring 141 in a housing 142 transversely on the scraper bowl so as to secure a goodly length thereof. A piston 143 engages an end of this spring and to this piston is attached a cable 144 by means of an eye bolt 146. This cable is extended to the end gate about suitable guide pulleys 147 so that when the end gate is moved forward it is only against the bias of the spring so that the spring always urges the end gate to return to that position in which it appears in Figure 4.

Operation

While it is believed that the operation of the structure is relatively clear from the foregoing description, it will be again pointed out upon a pulling of cable 78, a raising and lowering of the cutting blade relative to the edge can be secured, the cable passing over suitable pulleys provided between the frame of the scraper and the post 26. As to operation of the bowl, once the bowl is filled it is raised relative to the earth, the closure means provided by arms 47 and plates 51 and 53 being lowered into position. Normally the scraper is operated in that position in which it appears in Figure 4 with the scraper blade being in contact with the earth. When the closure means is to be lowered, the operator simply releases the tension upon cable 85, the weight of the closure means returning the carriage from the position in which it appears in Figure 5 to the right hand side of the scraper structure in which position the closure means will be lowered and face 52 will be in engagement with the cutting blade 46.

When it is desired to dump the load, the operator operates the hoist pulling on cable 85. This results in a transverse movement of the carriage since the spring and the load of the earth in the bowl prevent the end gate from moving until the carriage is brought into abutment with stop means 151 on the track. By the time the carriage abuts the left hand stop means, (Figure 4) the closure means is raised and dumping of the load will be possible upon advancement of the end gate. To secure dumping of the end gate, the operator continues reeling in the cable 85 by means of the hoist on the tractor, the continued pulling resulting in rotation of pulley 98 and advancement of racks 111 so that the end gate is pushed forward when the entire load has been dropped, the operator releases the hoist and the spring automatically returns the end gate to that position in which it appears in Figure 4.

It is to be pointed out that the load on the dirt moving gate is substantially uniform. Thus when the gate is first moved the load is made up of dirt on the bowl and little if any power is demanded by the spring. As the dirt is forced out over the cutting edge the dirt load decreases but more power is demanded by the spring. This results in a uniform loading on the cables and enables the operator to judge the operation of cleaning the bowl more accurately.

I claim:

1. In a scraper, a bowl, an end gate movable to sweep dirt off said bowl, a closure for said bowl; and means for raising and lowering said closure and for moving said end gate in one direction including a carriage movable transversely of said direction, a stop therefor, means connecting said carriage to said closure, and a cable for moving said carriage to engage said stop and, upon continued cable movement, for moving said end gate.

2. In a scraper, a bowl, an end gate movable to sweep dirt off said bowl, a closure for said bowl; and means for raising and lowering said closure and for moving said end gate in one direction including a carriage movable transversely of said direction, a stop therefor, means connecting said carriage to said closure, a cable for moving said carriage to engage said stop and, upon continued cable movement, for moving said end gate in one direction, and means for returning said gate after movement in said one direction including a spring urging said gate to return.

3. In a scraper, a bowl, an end gate movable to sweep dirt off said bowl, a closure for said bowl; and means for raising and lowering said closure and for moving said end gate in one direction including a carriage movable transversely of said direction, a stop therefor, means connecting said carriage to said closure, a cable for moving said carriage to engage said stop and, upon continued cable movement, for moving said end gate in one direction, and means for returning said gate after movement in said one direction including a spring compressed by movement of said gate in one direction urging said gate to return.

4. In a scraper, a frame including members defining an opening, a wheeled support for the frame, at the rear end thereof, a wheeled support at the front end of said frame, means at the front end of said frame for raising and lowering said frame with respect to said front end support to alter the relation of said frame to the earth, a bowl depending from said frame and secured thereto in a fixed relation beneath said opening, a gate hinged on said frame and movable over said bowl from one end to the other thereof to remove dirt, and means for operating said gate disposed on said frame and carried thereby entirely outside said opening to leave said opening unobstructed.

5. In a scraper, a rigid frame including members defining a substantially unobstructed opening, wheels positioned at one end of said frame, a truck, a dirigible connection between said frame and said truck, a bowl depending from said frame and secured thereto beneath said opening in a fixed relation, a gate movable over said bowl from one end to the other to eject dirt therefrom, a door for closing said bowl, means carried at the forward end of said frame for operating said gate and said door while leaving said opening unobstructed, and means carried at the forward end of said frame, and away from said opening for raising and lowering said bowl.

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