Nov. 6, 1951 E. H. LICHTENBERG 2,573,720

SCRAPING, LOADING AND CARRY OFF EARTH WORKING MACHINE

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FIG. 1.

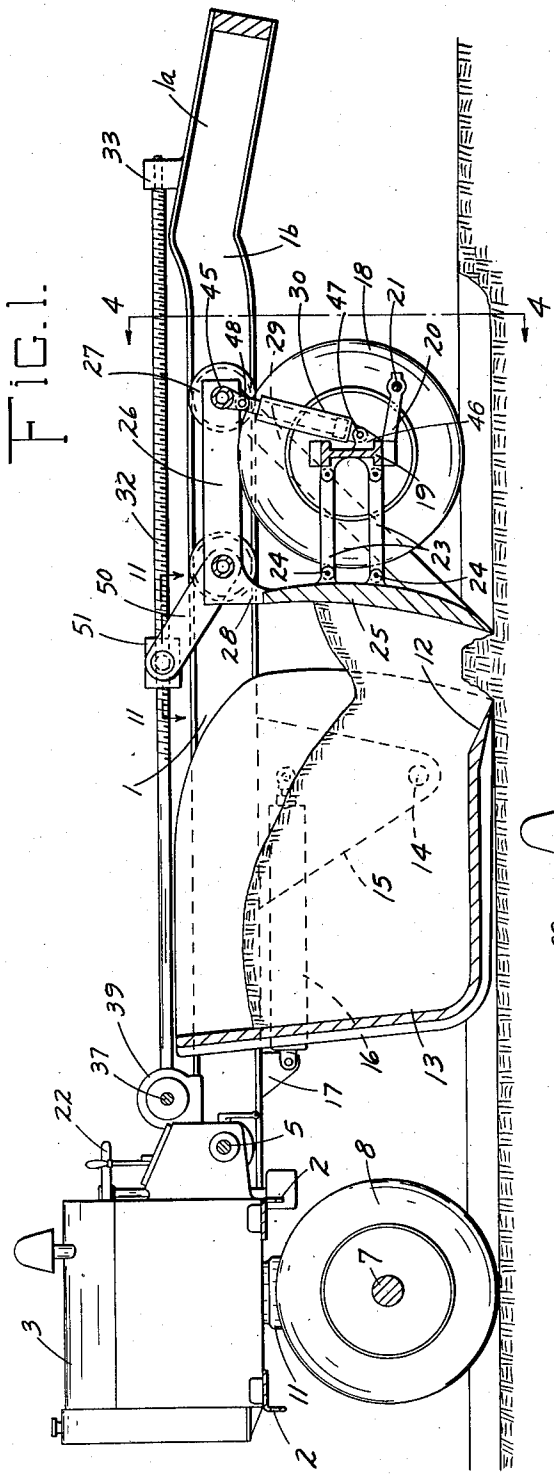
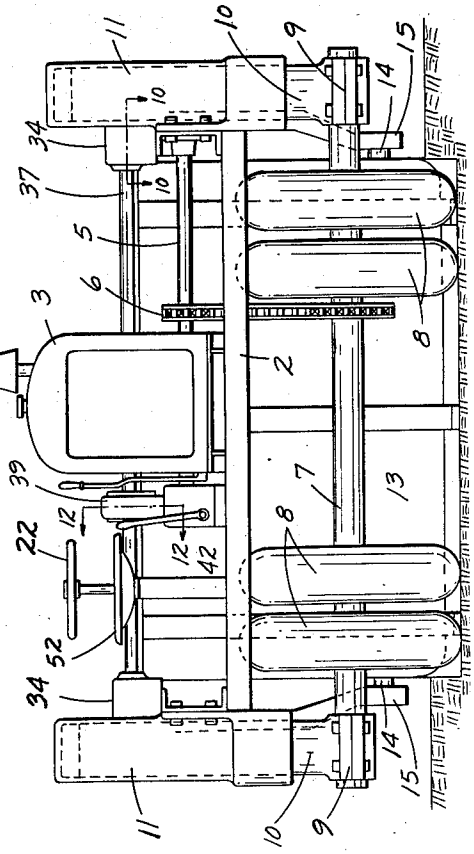


FIG. 5.



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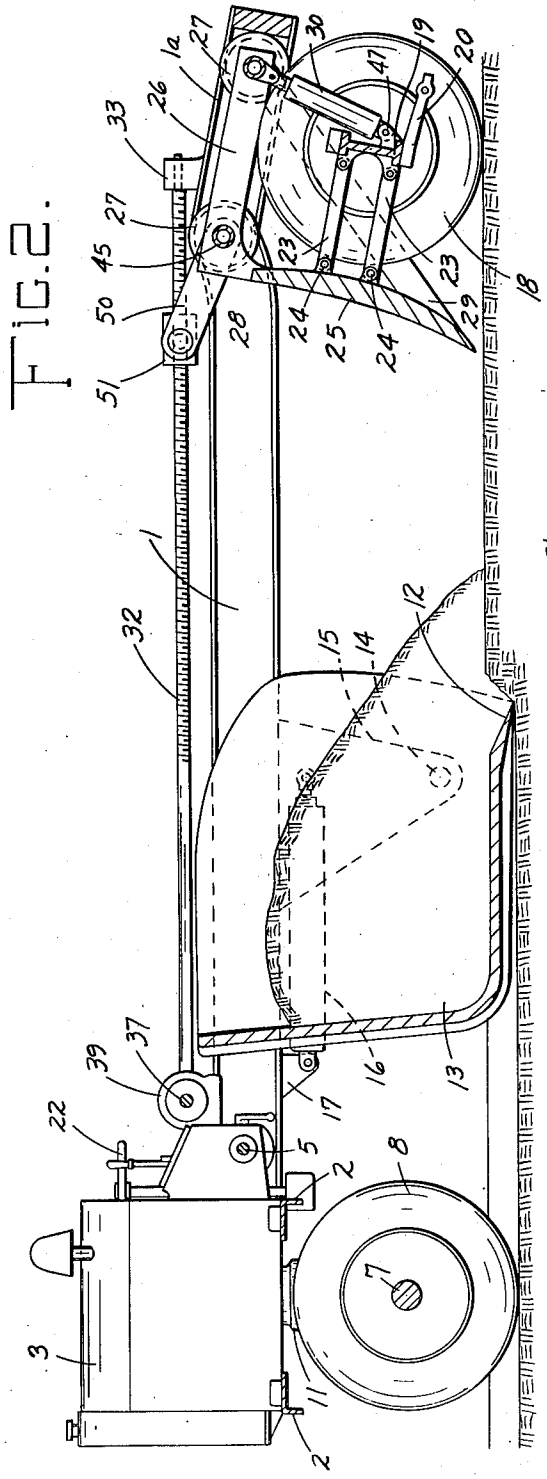


FIG. 2.

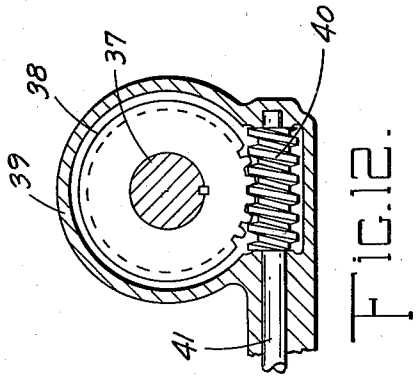


FIG. 12.

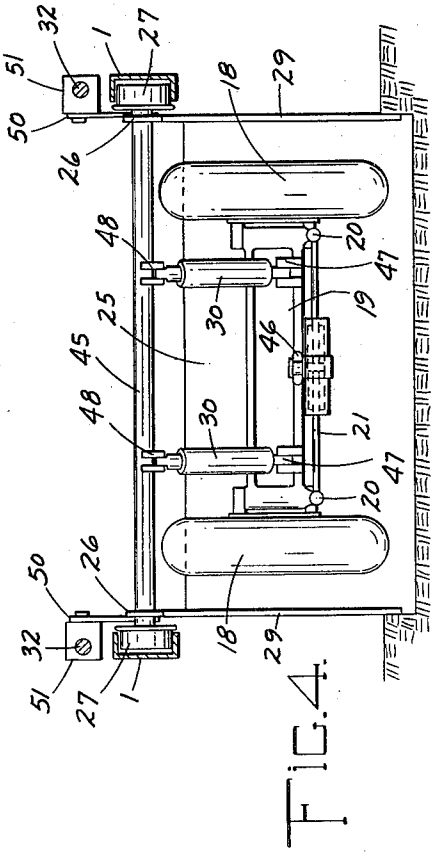


FIG. 4.

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SCRAPING, LOADING AND CARRY OFF EARTH WORKING MACHINE

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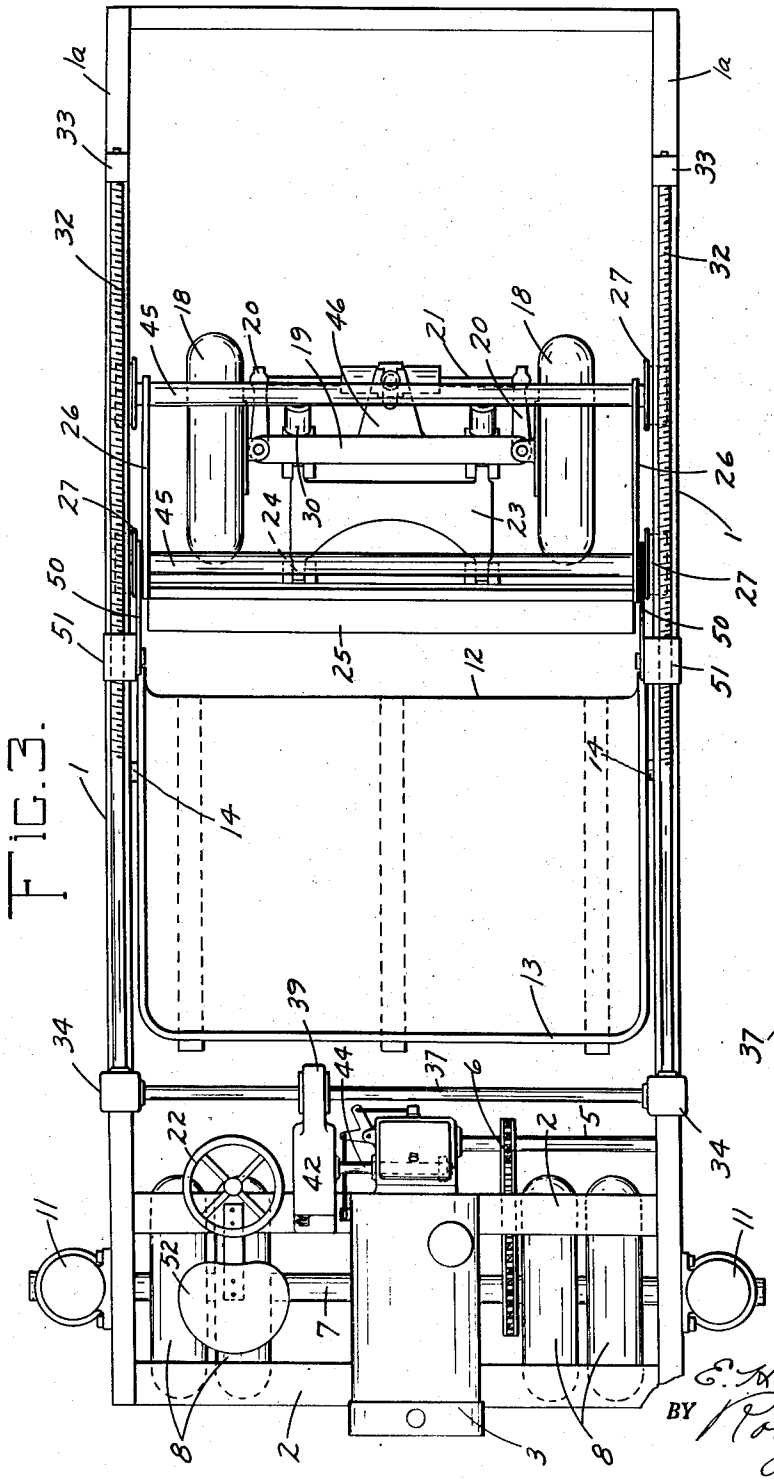


FIG. 3.

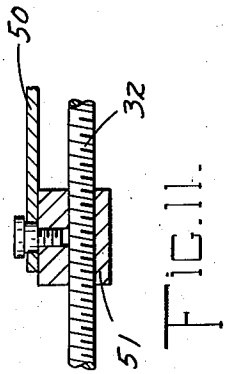


FIG. 11.

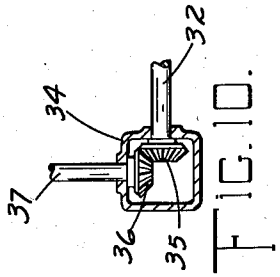


FIG. 10.

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FIG. 6.

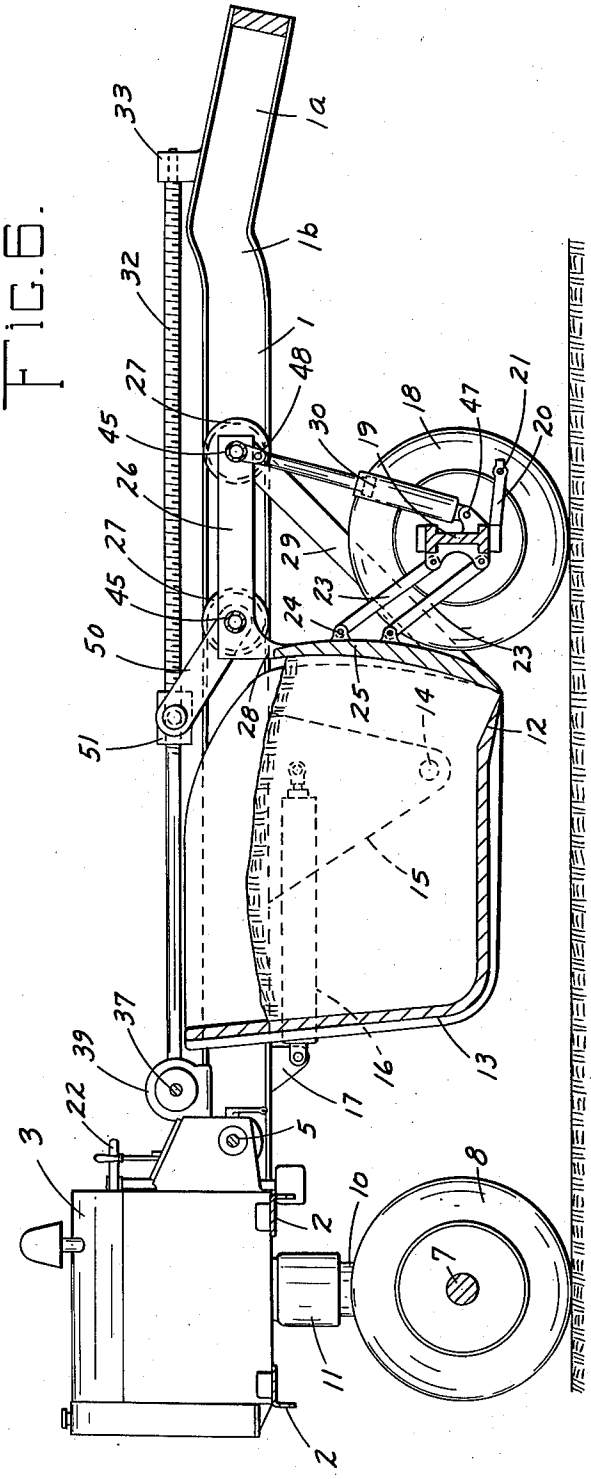


FIG. 9.

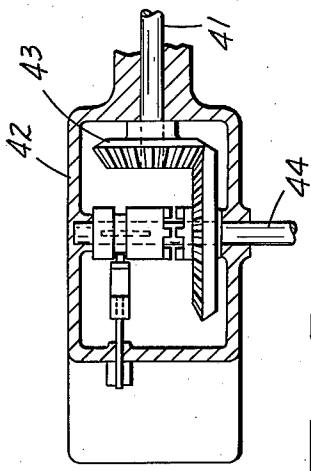


FIG. 8.

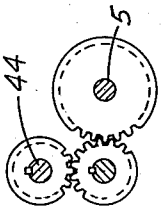
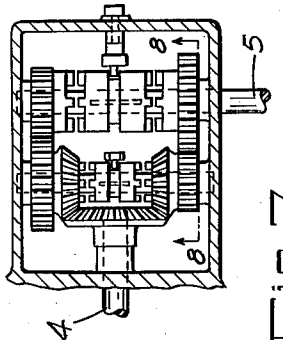


FIG. 7.



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2,573,720

SCRAPING, LOADING, AND CARRY-OFF EARTH WORKING MACHINE

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Application November 4, 1947, Serial No. 783,899

4 Claims. (Cl. 37—126)

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My present invention involves certain novel improvements in dirt scraping and hauling vehicles of the type in which the dirt carrying body or bowl is mounted upon the frame of the vehicle and is adapted to be propelled forwardly for digging scraping action for loading the bowl with the major portion of the material to be carried off. In addition to said bowl and scraper arrangement as described the type of scraper to which my invention especially relates involves the employment of a front scraping unit comprising a digging scraper blade adapted to dig in a rearward direction a material amount of virgin or undug earth so as to scrape said earth into the load receiving body or bowl.

My present invention resides primarily in the mounting means for the secondary or front digging scraper unit, in conjunction with the frame such that the weight of the front truck of the vehicle and to a certain extent the front portion of the frame may be exerted upon the front digging scraper directly for causing the digging scraping action thereof into the movement of said scraping unit toward the rear scraper and bowl which carries such latter scraper.

Another feature of novelty of my present improved construction of scraper vehicle resides in the provision of a special form of frame which works in conjunction with the supporting means for the front scraping unit in a manner such that when the said unit is caused to travel rearwardly upon the frame the initial digging and continued digging adjustment of the front scraping device is obtained.

Still another object of my invention resides in providing certain novel mounting means for the front truck of the scraping vehicle which mounting means works in conjunction with the front scraping unit and has operating devices whereby to enable the front truck to be raised and lowered for causing the frame of the vehicle to drop relatively to the ground surface, and for raising said frame in an opposite direction.

With the foregoing and other objects in view my invention will be clearly understood upon referring to the following description in conjunction with the annexed drawings.

In the drawings:

Figure 1 is a longitudinal sectional view of a scraper vehicle built in accordance with my invention showing the front scraper in the operation of digging virgin earth and scraping the latter rearwardly toward the rear bowl or body of the vehicle.

Figure 2 is a view similar to Figure 1 showing

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the vehicle as when it is being propelled forwardly to cause the digging scraping action of the scraper which is carried by the rear bowl or body of the machine, the forward or front scraping unit being disposed in an inoperative condition as seen in this figure, but ready to be moved rearwardly into action for the purposes of its use.

Figure 3 is a top plan view of a machine or vehicle embodying the invention.

Figure 4 is a front elevation of the front scraper unit, the view being taken on the line 4—4 of Figure 1.

Figure 5 is a rear elevation of the machine.

Figure 6 is a longitudinal sectional view of my loading and carrying off vehicle with the front bowl closed by the front or secondary scraper and the frame of the vehicle with the body or bowl thereof elevated for traveling purposes for carrying off the materials to a place at which they may be dumped.

Figure 7 is a view showing the general type of transmission mechanism used for operation of the scraper for traveling at relatively high speed to carry the material from the place of digging and scraping, to travel back to the said place of action of the vehicle, and for operating the vehicle forwardly for forward digging and scraping and for actuating the front scraper in a rearward direction.

Figure 8 is a sectional view taken on the line 8—8 of Figure 7.

Figure 9 is a horizontal sectional view through a drive gear and clutch housing by which the operating shafts for the front scraper are adapted to be driven in opposite directions.

Figure 10 is a horizontal sectional view through one of the beveled gear casings showing the beveled gear connections between the ends of the transverse driving shaft for the front scraper, and the longitudinal screw shafts connected by the beveled gearing to the said transverse driving shaft.

Figure 11 is a fragmentary sectional view taken about on the line 11—11 of Figure 1.

Figure 12 is a fragmentary sectional view taken about on the line 12—12 of Figure 5.

I now shall describe the specific construction of my scraper vehicle referring particularly to the drawings.

In the drawings 1 designates spaced channels or sides comprising portions of the frame of my vehicle, the same being connected at intervals by intermediate transverse cross members or beams 2 for providing a braced frame construc-

tion. On the frame is mounted a motor 3 and the driving shaft of the motor designated 4 operates chain speed and reverse gearing of any conventional type as illustrated in Figure 7, whereby to actuate the propelling shaft 5 connected by a sprocket chain 6 running over suitable sprockets on the shaft 5 and the axle shaft 7 that carries and drives the rear wheels 8 of my vehicle.

A pair of said wheels is preferably used at each side of the vehicle at the rear end thereof. As seen in Figure 5 the axle shaft 7 is supported at its opposite ends in suitable bearings 9 at the lower ends of piston units 10 which are mounted in cylinders 11 attached to opposite sides of frame members 1 at the rear ends thereof.

By introducing a pressure fluid into the cylinders 11 at the top ends thereof it will be obvious that the piston units 10 thereof may be forced downwardly and thus carry the wheels 8 and the axle 7 as a unit away from the underside of the frame members 1 and 2. Such action will elevate the frame structure at the rear end thereof as readily to be seen by reference to Figure 6.

Releasing of the pressure fluid from the upper ends of the cylinders 11 will correspondingly permit the piston units 10 to move upwardly in the cylinders and thus lower the frame of the machine of its rear end, to a position for example as shown in Figure 1, at which time the scraper 12 at the front end of the body or bowl 13 of the vehicle is engaged for digging action in the earth.

The pressurizing connections leading to the rams or cylinders 11 are not shown because they may be of any conventional type for supplying a pressure fluid, air or liquid through suitable conduits from a pressure tank or other source of pressure.

The body or bowl 13 may largely be of conventional construction already known. It is equipped with the usual blade 12 referred to and is supported by pivot means 14 carried in hangers or depending side plates 15 on the frame members 1. For unloading the bowl or body 13 of materials which may be received therein I provide a pair of rams or hydraulic units designated at 16 one end of each of which unit is attached to a bracket plate 17 on the frame of the vehicle and the other end to the adjacent side of the bowl or body 13. The units 16 may be pressurized as customary and well known in this art in order to move the piston member of each unit out of the cylinder member thereof whereby to effect a tilting of the bowl 13 on its pivots 14 for a discharging dumping action.

The front end of the frame of my vehicle is adapted to be supported upon the front wheels 18. These wheels are mounted upon the ends of a cross axle 19 and each wheel 18 is operable by steering arm 20 for effecting a pivotal or turning movement of the wheel for steering purposes. The steering arms 20 are connected by a drag link 21 for insuring simultaneous and corresponding movements of the arms when operated by suitable connections leading back to the rear end of the machine to a steering wheel 22, the connections not being shown because they are conventional and do not involve any invention.

The front axle 19 of my vehicle is supported in part by means of parallel link connections 23 leading from the rear side thereof to points of pivotal connection 24 on the front side of a secondary scraper 25 which is mounted some distance in advance of the bowl or body 13 of my vehicle and adapted to be caused to diggingly engage in the undug earth in advance of said bowl and scrape this undug earth when actually dug by the front scraper, back into the rear bowl 13.

The front scraper 25 is carried primarily by means of a carriage 26 having rollers 27 that are mounted to ride or operate in the space between upper and lower webs of the channels which form the sides 1 of the frame of my machine. At the rear end thereof the carriage 26 has rigid connection with the front scraper 25 as seen at 28 by rigid bracket means and the front end of the carriage 26 is likewise rigidly connected to the lower end portion of the scraper 25 at its front side by means of the braces 29 inclining downwardly and rearwardly from the front end of the carriage 26 to the lower portion of the scraper 25.

The front axle unit of my machine, carrying the front wheels 18 is movable upwardly and downwardly independently of the scraper 25, or relatively thereto. For operating the front axle unit and the supported wheels 18 carried thereby I employ a pair of rams generally designated at 30, these rams comprising ordinary piston and cylinder units.

The front ends of the frame members 1 of my vehicle are peculiarly formed with downwardly inclined extreme portions 1*a* which at their rear ends emerge into reversely and downwardly inclined cam portions 1*b* that straighten out rearwardly and have the channel members of the frame parts 1 merely continuations rearwardly thereof.

The portions 1*a* and 1*b* at the front ends of the sides 1 of my frame are so offset as seen in the drawings that when the carriage 26 has been moved forwardly to the extreme front end of the frame members 1, as seen in Figure 2 the rear end of the carriage will be tilted upwardly so as to raise the digging blade 25 sufficiently that it will not penetrate the earth. In such position and with the wheels 18 and the axle 19 disposed with the rams 30 in their collapsed condition, also see Figure 2, the wheels 18 may travel on the surface in which the excavation is being made by the rear bowl scraper 12 and the scraper 25 will ride freely above the earth surface.

A rearward movement of the carriage 26 on the side members 1 of the frame will compel a rocking of the carriage to cause the front digging scraper 26 to engage into the undug earth in advance of the bowl 13, and maintain said scraper in such position while it moves rearwardly, whereby this front scraper will perform a digging and scraping action of fresh materials from the virgin earth and cause the latter to enter the front end of the bowl 13 which is of course open.

For operating the carriage 26 I utilize a pair of screw shafts 32 one disposed above each of the side members 1 of the frame. At their front ends these shafts are mounted in varying extensions 33 on the frame members 1 at their portions 1*a*.

At their rear ends the screw shafts 32 enter beveled gear housings 34 (see Figure 10) the same supported near the rear ends of the side members 1 of the vehicle. The shafts 32 carry beveled gears 35 at their rear ends and these beveled gears mesh with other beveled gears 36 carried by a transverse driving shaft 37 on which is keyed a worm wheel 38 in a suitable housing 39. A worm meshes with the wheel 38 and is designated 40 and is carried by a shaft 41 leading rearwardly from the shaft 37 and entering a clutch and gear housing 42. The shaft 41 has a gear 43 keyed to its rear end in the housing 42 and said shaft

may be driven in reverse directions by suitable operating connections between the transmission gearing shown in Figure 7 and the gear 43, the details of which connections are immaterial to the invention. The output shaft from the transmission gearing to the clutch and gear housing 42 is designated 44 and suitable manual control means will be provided for the clutch mechanism in the housing 42 so as to render the shaft 41 operable to drive the shaft 37 reversely and thereby drive the screw shaft 32 in reverse direction, one direction for moving the carriage 26 forwardly on the frame members 22 and in a second direction for moving the carriage rearwardly on said frame.

It will of course be understood that the carriage 26 includes a side member mounted on rollers 27 adjacent to each of the channels 1, the two side members being connected by cross rods 45 which provide shafts on which the rollers 27 are adapted to revolve.

It is also notable that projecting forwardly from the central portion of the front axle 19 is an arm 46 to which arm is attached the lower end of the hydraulic ram or unit 30 at the lower cylinder end thereof, as seen at 47, the upper end of the ram or unit 30 being attached pivotally to a suitable bracket on the carriage 26, as seen at 48 in Figure 6.

The operation of a dirt loading carrying and dumping vehicle of the class which I have described in accordance with the details above given is as follows:

It is assumed that the vehicle has arrived at the site from which the dirt is to be excavated and carried off. At such time the carriage 26 may be caused to move forwardly on the frame members 1 until it reaches practically the front extremities of said frame members. Such a position has been assumed by the carriage according to the showing of Figure 2 and it will be apparent also that in Figure 2 the bowl 13 has been lowered to bring its cutting blade 12 into digging scraping engagement with the earth, by the operation of the hydraulic units 10 and 11 at the rear end of the vehicle frame. The secondary or front scraper 25 is now in an inactive position and upraised from the earth's surface and the front wheels are disposed as shown in Figure 2 by reason of the operation of the rams 30.

Under power of the engine 3 transmitted through the transmission mechanism previously referred to, to the rear axle shaft 7 the vehicle will be propelled forwardly while the various parts previously referred to are substantially in the position of Figure 2. Under such conditions the bowl 13 will be caused to receive a relatively large amount of material dug and scraped up by means of the rear bowl scraper 12. Under many working conditions it is impracticable to fill the bowl 13 entirely for at times the traction effort exerted at the rear wheels 8 will not be sufficient to cause a forward movement of the machine. At such a time the wheels 8 will merely spin and no more dirt can be excavated and caused to pass into the bowl 13 by the forward propulsion of the machine. When a condition such as the above has been reached, or at any time when the operator wishes to accelerate the complete filling of the bowl 13 with a pay load, the screw shafts 32 may be operated to cause the same to pull forwardly on the carriage 26 by means of the pull links 50 which are pivotally attached to opposite sides of the rear portion of the carriage 26 and have pivotal connection as seen more clearly in Figure 11 with internally threaded lock or nut members 51 through which the screw shafts pass and the threads of which are engaged by the threads of said shaft 32. The pulling forward action of the front scraper 25 is depicted in Figure 1 in which it will be seen that the carriage 26 has been moved forwardly from the position of Figure 2 in which it maintains the front scraper upraised and inactive, to a position on the portion of the sides 1 of the frame in rear of the parts 1*a* and 1*b*.

It will be obvious that as the carriage 26 is shifted rearwardly from the front parts 1*a* and 1*b* of the frame sides 1 the carriage will be caused to move rearwardly in a downward rocking motion, for operating the front scraper to gradually cause it to penetrate into the earth to a predetermined depth limited by the disposition of the main long parts of the side members 1. Once the scraper 25 has penetrated the predetermined depth into the undug earth in advance of the bowl 13, its continued rearward movement toward the bowl 13 will cause it to excavate virgin earth by digging action and scrape said earth in a rearward manner to cause it to be forced into the front end of the bowl 13 which is open and which is not fully filled at the front portion for obvious reasons. When the scraper 25 reaches the point where it closes the front end of the bowl 13 as seen in Figure 6 the rearward movement of the scraper and digging unit 25 is discontinued and the bowl is then in closed condition with a full pay load ready to be carried off.

The next action to be performed is to use the rear hydraulic units 10 and 11 to raise the rear end of the frame and then employ the front rams 30 or hydraulic units as they may be called to push downwardly upon the axle 19 and the wheels 18 which are mounted thereon. In this way the front end of the frame of the machine is elevated to a distance about even with the distance of elevation of the rear end and the vehicle is now ready to travel off under the guiding power of the motor 3 to the place where the load is to be dumped. The travel off speed of the vehicle may be a relatively high speed because the vehicle is of course mounted upon rubber tires as seen. When the vehicle reaches the place where the load is to be dumped the operator will cause the screw shafts 32 to be operated to move the scraper and closing member 25 forwardly in spaced relation to the front end of the bowl 13. Thereupon the operator will operate the hydraulic unit 16 and thus cause a tilting action of the bowl 13 in a forward direction upon the pivot trunnion 14 that supports the bowl on the brackets 15, the dumping action of the bowl emptying the same of the materials which have been previously dug and scraped thereinto by the conjoint operation of the blade 12 and the scraper 25 with its digging lower edge blade which is in unit therewith.

After the scraping vehicle has been dumped in the manner specified, with the frame at the elevation of dumping, the vehicle may be driven at high speed back to the place of excavating and the operation of causing the blade 12 and the scraper 25 to perform repeated digging and bowl filling operations for the material will be carried on again as previously described.

Of course if it is desired that the bowl 13 be rocked to a dumping position closer or farther from the surface level this disposition of the bowl may be effected by the control of the operator

who works the hydraulic units or rams 10—11 and 30. As stated before the pressure fluid connections leading to the various rams or hydraulic units are not shown because they may be such as commonly used in the art of scraping vehicles, being already well known types of operating fluid connections, under the control of a series of valves that may be located on a control board adjacent to the operator of the machine who is seated at the steering wheel 22 on a seat 52 as seen best in Figure 3 of the drawing.

As seen in Figure 1 the whole weight of the front part of my machine has been transferred to the digging and scraping unit 25, as limited only by the engagement of the bowl 13 at its bottom, and the scraper 12. Should it be desired not to so dispose the front weight on the scraper, as may be preferable for certain kinds of excavation the rams 30 in Figure 1 may be operated to cause the wheels 18 to engage the earth where it has been dug and scraped by the scraper 25, to relieve the weight loading of said scraper as may be best for efficient operation.

As stated the transmission driving means from the engine to the rear traction wheels is intended to be conventional, as well as the driving and clutching means for the actuation of the screw shafts 32.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is—

1. In a dirt scraping, loading and carry-off machine, in combination, a wheeled vehicle including a frame, front and rear axles and wheels thereon, a bowl mounted thereon and having a forwardly facing digging scraper, a secondary front digging scraper mounted on said frame and movable toward the bowl and its scraper to dig and scrape material into said bowl, a sliding carriage supporting the front scraper on the frame, means to move the front scraper rearwardly toward the bowl, and said frame being formed with unitary guide portions to support the front scraper inactive while stationary and above the earth to be scraped, and also formed with other guide portions to direct the front scraper into the earth as it is moved in the direction of the rear scraper, and pivotal connections between the front axle and the front scraper, combined with a device intermediate the carriage and front axle to move the latter vertically relatively to the frame.

2. In a dirt scraping, loading and carry-off machine, in combination, a wheeled vehicle including a frame, front and rear axles, wheels mounted on said axles, a bowl mounted on the frame and having a forwardly facing digging scraper, a secondary front digging scraper arranged in advance of the bowl and movable toward the bowl and its scraper to dig and scrape material into the bowl, a carriage slidably mounted for movement longitudinally of and upon the frame and supporting said secondary front scraper, said frame being provided with means to guide the carriage and move the front scraper from a substantially vertical position to an inclined non-digging position, supporting links pivotally connecting the front scraper with the front axle aforesaid, and a moving device intermediate the carriage and the front axle for moving the front axle and its wheels downwardly relatively to the frame to carry the front scraper from digging position to a non-digging position.

3. A dirt scraping, loading and carry-off machine as claimed in claim 2 combined with motor operated screw members mounted on the frame longitudinally thereof, nut members on the said screw members movable longitudinally of the latter incident to rotation of the screw members, and link members connecting said nut members with the carriage whereby to shift the carriage longitudinally of the frame incident to rotation of the screw members.

4. A dirt scraping machine as claimed in claim 2, wherein the front end portions of the frame are provided with downwardly inclined guide portions adapted to cooperate with the carriage as the latter is moved along the frame to rock said carriage and move the same to an angular position correspondingly shifting the front scraper to an angular non-digging position.

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