Dec. 24, 1946. W. G. VAN VOORHIS 2,413,124

LOADING MACHINE

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Fig. 2.

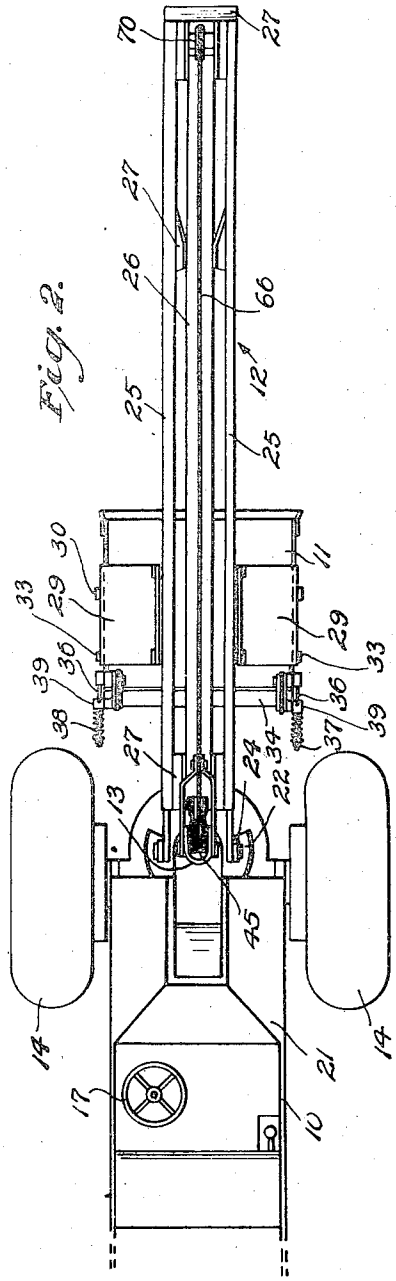
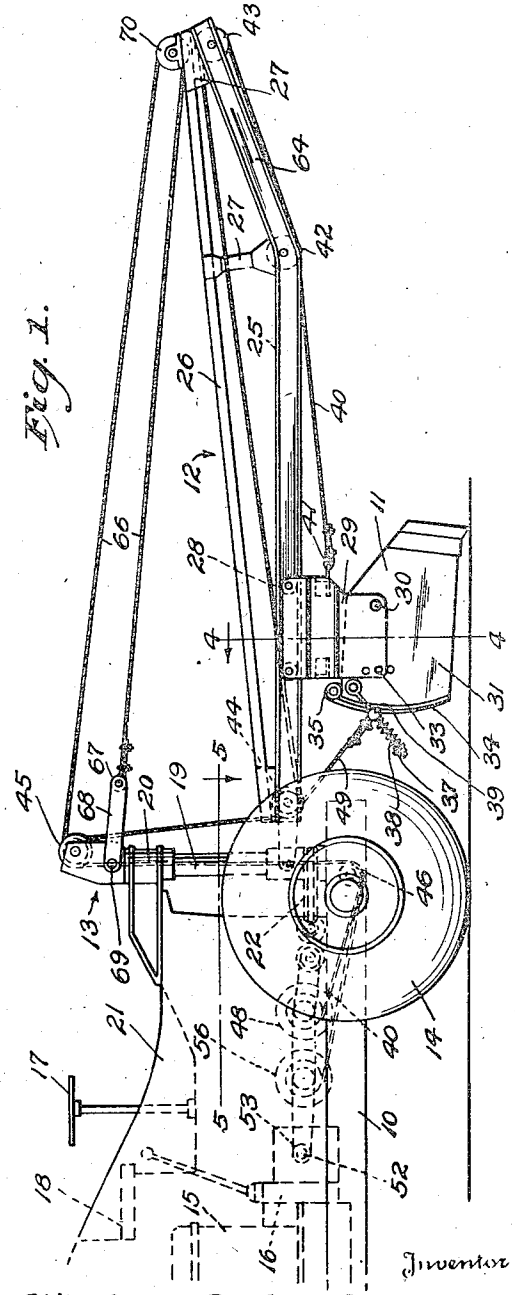


Fig. 1.



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Fig. 6.

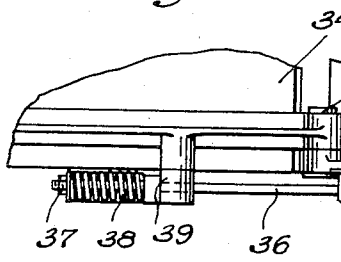


Fig. 3.

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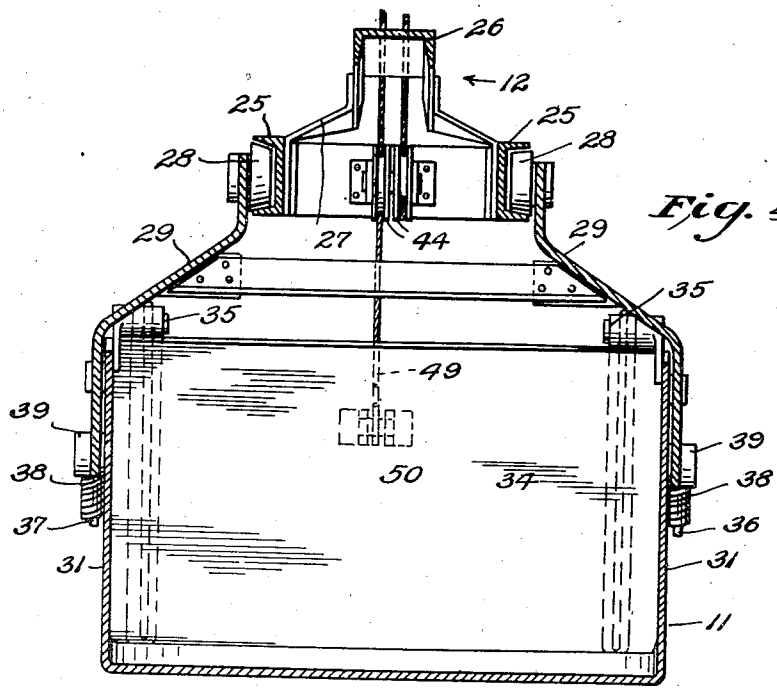


Fig. 4.

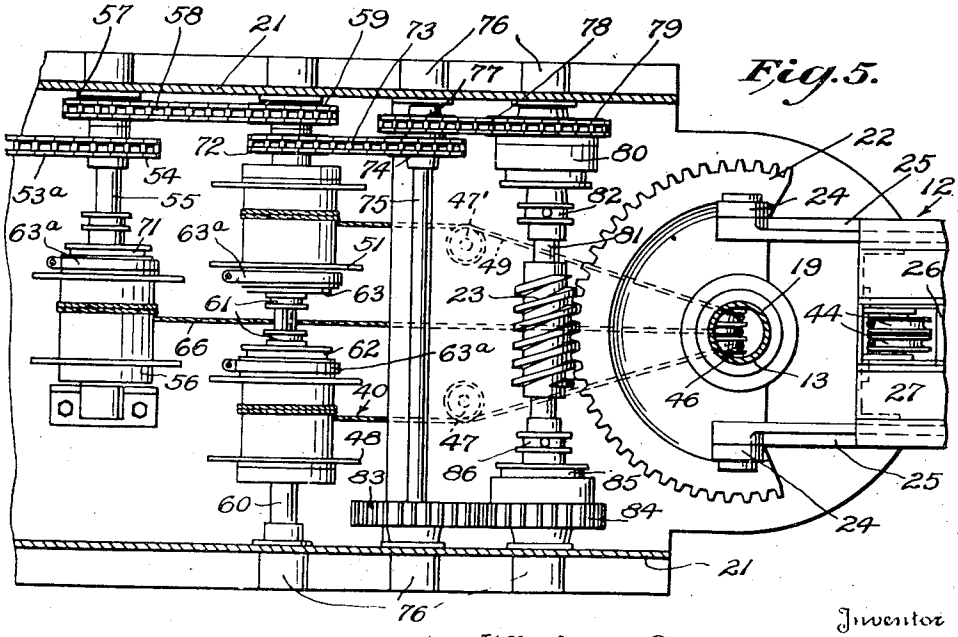


Fig. 5.

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2,413,124

UNITED STATES PATENT OFFICE

2,413,124

LOADING MACHINE

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Application September 20, 1944, Serial No. 554,923

3 Claims. (Cl. 214—102)

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This invention relates to loading machines and, more particularly, to loading machines of the type utilizing an automotive base vehicle having mounted on one end thereof a power line actuated drag scoop, the latter being adapted for turning movement about vertical and horizontal axes in order to receive, lift and laterally swing materials contained therein to various discharge positions.

It is an object of the invention to provide a loading machine of this character wherein improved power actuated means, under the convenient control of the machine operator, are provided for advancing the scoop when in a lowered position into the material to be loaded and thereafter to raise, lower and swing the scoop in vertical and/or horizontal arcs to cause it to assume a desired position of horizontal elevation and material discharge.

It is another object of the invention to provide a loading machine of this character with improved cable actuating means, operated by power derived from the engine of a base vehicle, for effecting lineal advance of the drag line scoop along a horizontally disposed boom into the materials to be loaded, the boom having its inner end pivotally mounted on the base vehicle for turning movement about horizontal and vertical axes, whereby when the scoop is loaded, said cable actuating means is operated to raise the boom and its scoop vertically to desired material-discharging positions.

It is a further object of the invention to provide a loading machine of the character indicated wherein the pivotally mounted boom is formed with a guideway for the movable support and guidance of a scoop-supporting carriage, the outer end of the guideway being angularly disposed in an upwardly inclined direction so that when the scoop reaches the outer end of the boom, the same will be so disposed as to facilitate the discharge of materials therefrom through the release of a swinging door provided at the back of the scoop.

Still a further object of the invention is to provide a loading machine of this nature characterized by the simplicity of its mechanical construction, the ease by which its operation may be governed, and its compact and sturdy mechanical design which renders the machine adaptable for hard usage over extended periods of service without mechanical failure.

For a further understanding of the invention, reference is to be had to the following description and the accompanying drawings, wherein:

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Fig. 1 is a side elevational view of a loading machine formed in accordance with the present invention;

Fig. 2 is a top plan view thereof;

Fig. 3 is a front elevational view of the machine, disclosing the boom and scoop in an elevated position at one side of the machine for discharge of the scoop contents into an associated vehicle;

Fig. 4 is a vertical transverse sectional view taken through the boom and the associated scoop on the plane indicated by the line 4—4 of Fig. 1;

Fig. 5 is a horizontal sectional view on the plane indicated by the line 5—5 of Fig. 1;

Fig. 6 is a fragmentary plan view on the plane indicated at 6—6 of Fig. 3.

Referring more particularly to the drawings, the numeral 10 designates a chassis or frame of an automotive base vehicle forming a part of my improved loading machine, the numeral 11 designates the material-handling scoop, shovel or other load carrier, the numeral 12 designates the boom employed in the raising and lowering of the scoop to cause the latter to assume desired positions of material gathering and discharge, and the numeral 13 designates a vertical vehicle-carried mast to which the boom is pivotally united at one end for turning movement about horizontal and vertical axes.

The mast is carried by the frame 10 at its forward or loading end and is disposed over a pair of ground-engaging power driven traction wheels 14. Mounted on the frame 10 is a power plant in the form of an internal combustion engine 15 having a change-speed transmission 16 of conventional design, adapted to impart power in any suitable manner to the wheels 14. The end of the frame 10 opposite to the wheels 14 is provided with steering wheels, not shown, which may be manipulated by the customary steering control 17, located conveniently to the operator's position 18.

The mast includes a tubular column 19 which is rotatably supported at its lower end in connection with bearings provided on the frame 10 and at its upper end in a bearing 20 projecting from the machinery-confining casing 21 of the frame. The bottom of the column has fixed thereto a worm gear segment 22, the teeth of which mesh with an engine-driven worm 23, by means of which the column may be rotated about its vertical axis. Formed with and arising from the segment 22 are ears 24 to which are pivoted for turning movement about a horizontal axis the inner ends of a pair of boom rails 25, the latter

being disposed on opposite sides of an inverted U-shaped beam 26, while the rails 25 are of channel-shaped formation to provide open-sided guides. The rails 25 and the beam 26 are rigidly united in spaced order by transverse bars 27 to form the complete boom.

Mounted for longitudinal travel in the guides provided by the rails 25 are rollers 28, the latter being mounted on inwardly projecting studs formed with a pair of carriage plates 29. The lower edges of these plates are pivotally united as at 30 with the vertical sides 31 of the scoop 11, so that the latter may be adjusted to raise or lower the operating positions of its forward edge 32, such adjustment being maintained by bolts 33 carried by the plates 29 and which are adapted for insertion into one of a plurality of openings formed in each of the sides 31 of said scoop. The forward end of the scoop is open and the openable rear end of the scoop is normally closed by a swinging back wall or dumping door 34, the latter being pivotally mounted as at 35 in connection with the upper rear end of the scoop.

The door 34 is normally held in its scoop-closing position by providing the sides of the scoop with a pair of pivoted bolts 36. The threaded free ends of these bolts receive nuts 37 against which press the outer ends of a pair of coil springs 38, the opposite ends of the latter being engaged with blocks 39 pivotally mounted for turning movement on the side edges of the door 34, the intermediate portions of the bolts 36 being slidably received in openings formed in said turnable blocks, the expansive force of said springs thus serving to hold the door in its position of scoop closure.

To cause linear advance of the scoop along the boom rails 25, use is made of a drag line or cable 40. One end of this cable is secured as at 41 to the forward edges of the carriage plates 29. From these plates, the cable 40 extends forwardly, passing around a guide sheave 42 carried by the intermediately disposed cross bars 27 of the boom. After contacting the sheave 42, the cable 40 extends forwardly, passing around a guide sheave 43 carried by the extreme outer end of the boom structure. After being trained around the guide sheave 43, the cable 40 extends rearwardly and longitudinally of the boom structure, passing around a guide sheave 44 located at the rear of the boom structure adjacent to its positions of pivotal connection with the gear segment 22.

From the sheave 44, the cable 40 extends upwardly passing over one of the multiple sheaves 45 mounted on the extreme upper end of the column 19. After passing around the sheave 45, the cable 40 is directed downwardly through the mast column 19 and is trained around one of the multiple sheaves 46 carried by the frame 10 immediately below the lower end of the column 19. The cable 40 then passes over a guide sheave 47 and is wound around and secured to a brake-controlled cable drum 48, so that when said drum is rotated, and the effective length of the cable 40 thereby contracted, the scoop will be advanced in a forward material-gathering direction on the boom structure 12.

To retract the scoop, that is, to draw the same rearwardly on the boom structure toward the base vehicle, use is made of a companion cable 49. The outer end of this cable is connected, as at 50 (Fig. 4) with the central portion of the rear door 34 and is extended to pass around one of the cable guide sheaves 44. The cable 49 then

passes upwardly and is trained over one of the guide sheaves 45, passing downwardly through the column 19, around one of the guide sheaves 46, thence over a pulley 47' to a second brake-controlled cable drum 51, so that when the effective length of the cable 49 is shortened, by winding its inner end about the drum 51, the drag scoop will be drawn rearwardly and longitudinally of the boom rails 25.

The cable drums 48 and 51 are adapted to be selectively operated, so that when one drum is being driven by the engine 15 to wind one of the cables thereabout, the other drum is free to rotate on its shaft to permit of the withdrawal of its associated cable therefrom. Thus, to actuate the drums, the engine transmission 16 is provided with a power take-off shaft 52 on which is mounted a sprocket 53. An endless chain 53a passes over this sprocket and is also trained over a second sprocket 54 mounted on the shaft 55 of a third cable drum 56 (see Fig. 5), the purpose of which will be hereinafter explained. The shaft 55 is provided with a second sprocket 57 around which is trained an endless chain 58, the latter being also trained over a sprocket 59 fixed to the shaft 60 on which the drums 48 and 51 are freely mounted for rotation. Slidably keyed on the shaft 60 are manually and independently operated control sleeves 61 carrying clutches 62 and 63, so that by shifting the sleeves 61, the clutches 62 and 63 may be selectively engaged to impart rotating power to the drums 48 and 51, thereby regulating the advance or retraction of the scoop on the boom structure. Band brakes 63a are provided on each of the drums to arrest rotation thereof as desired.

By reference to Figs. 1 and 3, it will be noted that the outer ends of the boom rails 25 are upwardly inclined as at 64, so that as the scoop is drawn into engagement with this upwardly inclined portion of the rails, the forward digging edge 32 of the scoop is elevated from the ground and the material contained within the scoop is thrown toward the rear thereof, toward the door 34, thus retaining the engaged materials within the confines of the scoop. After the scoop has been advanced to the forward end of the boom structure, the same may be raised to assume an elevated position of material-discharge, such as that depicted in Fig. 3 of the drawings, wherein the scoop is elevated to a position well above the ground and to one side or the other of the base vehicle, whereby to discharge the contents of the scoop, for example, into the body 65 of a dump truck or the like.

To effect such vertical movement of the boom structure and scoop, I employ a boom-raising and lowering cable 66. This cable is fastened at one end as at 67 to the outer ends of a pair of links 68 which are pivoted, as at 69, on the upper end of the column 19. From the links 68, the cable 66 extends forwardly, passing around a guide sheave 70 mounted on the extreme outer end of the boom structure, above the sheave 43. From the sheave 70, the cable extends rearwardly in substantially parallel relationship with its forwardly extending portion, and passes over one of the multiple sheaves 45. From the latter, the cable 66 extends downwardly through the column 19, and passes around one of the multiple sheaves 46 at the bottom of said column, being then extended to and wrapped around the body of the cable drum 56. This drum is loosely mounted on the shaft 55 but is adapted to be rotated by this shaft through the provision of the manually

operated clutch 71, the latter being slidably keyed to the shaft 55. Thus, when the drum 56 is power driven to wrap the cable 66 about the same, the shortening of the effective length of said cable effects upward turning movement of the boom structure and the scoop carried thereby, so that the boom and scoop may assume the elevated positions, illustrated in Fig. 3.

After the boom and scoop have been so elevated, and if the machine operator finds it desirable to swing the boom and scoop horizontally to a position lateral of the machine, such an operation is accomplished by partially rotating the gear segment 22 and the column 19. Such a turning operation is effected by power derived from the engine 15.

As shown in Fig. 5, the drum shaft 60 has fixed thereto a sprocket 72 around which is trained an endless chain 73, the latter being also trained over a sprocket 74 carried by a cross shaft 75, the latter being journaled in bearings 76 mounted on the frame 10, the shafts 55 and 60 being similarly journaled in corresponding bearings.

The cross shaft 75 has fixed thereto a second sprocket 77, having passed thereabout a drive chain 78 which is also trained over a sprocket 79 formed with a clutch 80, the latter being freely rotatable on a cross shaft 81 to which the worm 23 is secured. A manually operated throw sleeve 82 is splined to the shaft 81 and may be operated to cause the rotation of the worm shaft 81 in unison with the clutch 80 thus revolving the worm 23 and the segment 22 in one direction. To rotate said worm and segment in the opposite direction, the cross shaft 75 has fixed thereto a spur gear 83, which meshes with a corresponding gear 84 provided on a second clutch 85, also freely mounted for rotation on the worm shaft 81.

A second slidable manually operated control sleeve 86 is splined to the worm shaft 81 so that by manually shifting the sleeve 86 toward the clutch 85, the latter will be engaged to impart rotary motion to the worm 23 and the segment 22 in a direction opposite to that imparted to the same by the clutch 80. By this arrangement, the boom and scoop when in their elevated positions may be swung to one side or the other of the base vehicle through an arc of substantially 180°.

With the scoop elevated, as in Fig. 3, a pull imparted to the cable 40, while the cable 40 is held taut, will effect the opening of the door 34 against the pressure exerted thereon by the springs 38, the door swinging about its fulcrum 35 on the scoop body in a downward and inward direction, thus allowing the contents of the scoop to be discharged gravitationally with the scoop held in its elevated position.

In view of the foregoing, it will be seen that the present invention provides an improved loading machine for use in many industrial capacities where earth or other loose bulk materials of various kinds are required to be removed from the ground, or other base surface, and elevated to a desired position of discharge and deposit.

A practical advantage which the machine possesses is found in constructing and mounting the boom so that in addition to lifting the associated scoop in a vertical direction, it may also be revolved about a substantially vertical axis to locate the scoop laterally of the machine. This feature provides for greater facility in operation by reducing maneuvering operations of the automotive base vehicle. The power driven mechanism for turning the mast and boom structures is so constructed that it is locked against undue

horizontal swinging movement by the use of worm gearing. Also, the machine is further characterized by its mechanical simplicity and its ability to receive and handle heavy loads expeditiously with complete control thereover, enabling the loaded scoop to have its contents discharged at any desired point within the working range of the machine. In such operations as in the digging of trenches or ditches, the operating positions of the scoop may be reversed from that illustrated in the drawings, so that the scoop will dig as it is drawn inwardly toward the pivoted end of the boom. Also, the digging forward edge of the scoop may be either plain or toothed, as desired.

Various other changes may be made in the specific construction of my improved loading machine here disclosed as an exemplary embodiment, without departing necessarily from the scope of the invention as the same has been defined in the following claims.

Having thus described my invention, I claim:

1. In a loading machine, a base vehicle, a boom turnably mounted on said vehicle for pivotal raising and lowering movement in vertical planes and swinging movement in horizontal planes, a scoop suspended from said boom and movable longitudinally thereof, said scoop being openable at the rear end thereof to provide for discharge of its contents, a door hinged to said scoop and normally closing its open rear end, bolts pivoted to the sides of said scoop, turnable bearing elements carried by the side edges of said door for the slidable reception of said bolts, coil springs confined between the outer ends of said bolts and said turnable bearing elements, said springs normally serving to maintain said door in its position of scoop closure, and cable means connected with the scoop and its door for moving said scoop longitudinally of said boom and for effecting opening movement of said door against the resistance of said spring means when the scoop is retained in a stationary position on said boom.

2. In a loading machine, a base vehicle, a boom turnably mounted on said vehicle for pivotal raising and lowering movement in vertical planes and swinging movement in horizontal planes, a scoop suspended from said boom and movable longitudinally thereof, said scoop being openable at the rear end thereof to provide for discharge of its contents, a door hinged to said scoop and normally closing its open rear end, bolts pivoted to the sides of said scoop, turnable bearing elements carried by the side edges of said door for the slidable reception of said bolts, coil springs confined between the outer ends of said bolts and said turnable bearing elements, said springs normally serving to maintain said door in its position of scoop closure, a forwardly directed cable connected with said scoop to move the same outwardly along said boom, and a second cable connected with said door and operative to effect return movement of said scoop along said boom.

3. In a loading machine, a base vehicle, a boom turnably mounted on said vehicle for pivotal raising and lowering movement in vertical planes and swinging movement in horizontal planes, a scoop suspended from said boom and movable longitudinally thereof, said scoop being openable at the rear end thereof to provide for discharge of its contents, a door hinged to said scoop and normally closing its open rear end, bolts pivoted to the sides of said scoop, turnable bearing elements carried by the side edges of said door for the slidable reception of said bolts, coil springs

confined between the outer ends of said bolts and said turnable bearing elements, said springs normally serving to maintain said door in its position of scoop closure, a forwardly directed cable connected with said scoop to move the same outwardly along said boom, a second cable connected with said door and operative to effect return movement of said scoop along said boom, brake-controlled, power actuated drums mounted on said vehicle with which said cables are connected, and means for effecting selected rotation of said drums.

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