March 4, 1947. E. BARKER 2,416,893

PORTABLE LOADING MACHINE

Filed Nov. 20, 1944 3 Sheets-Sheet 1

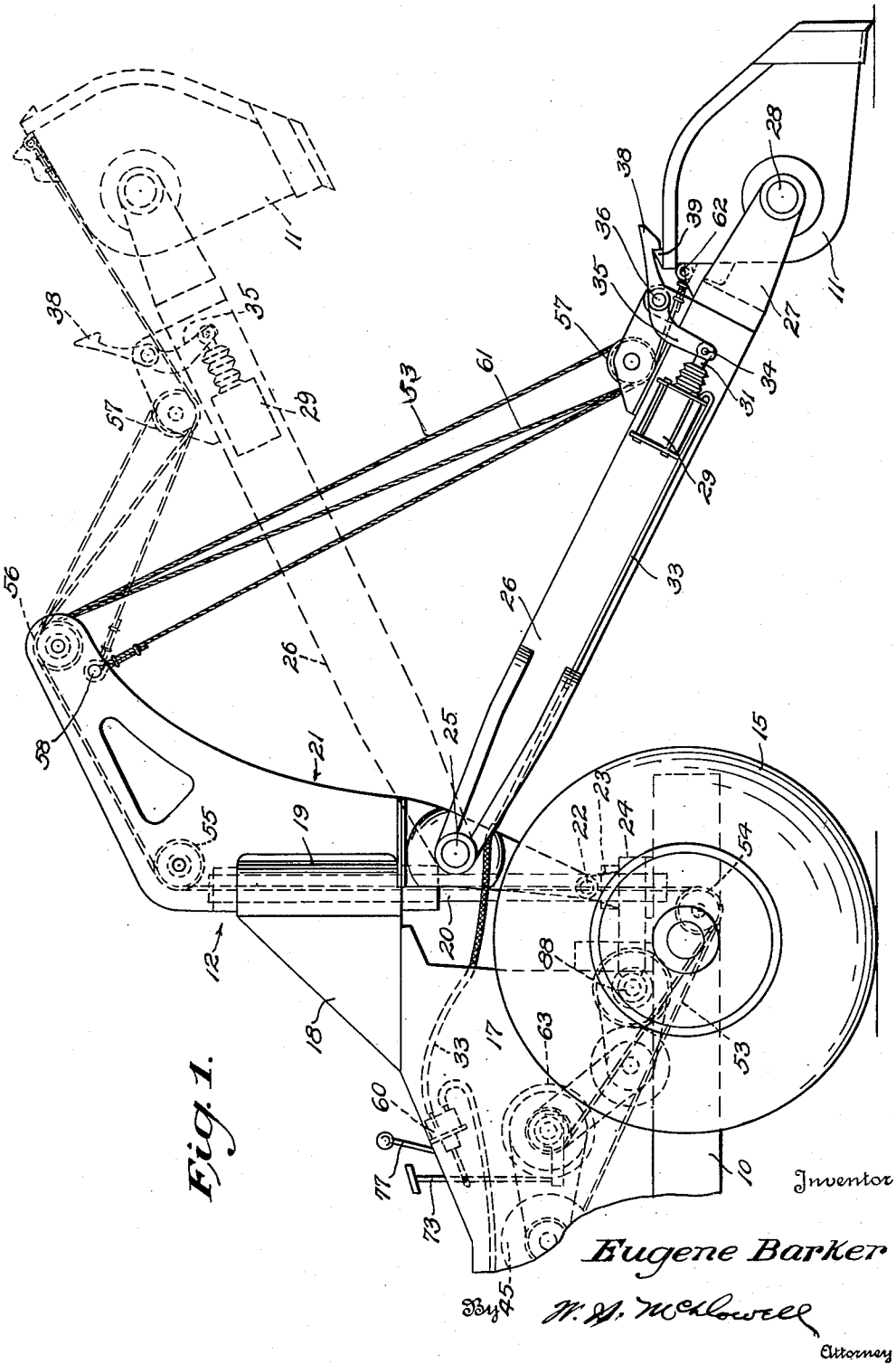

Fig. 1.

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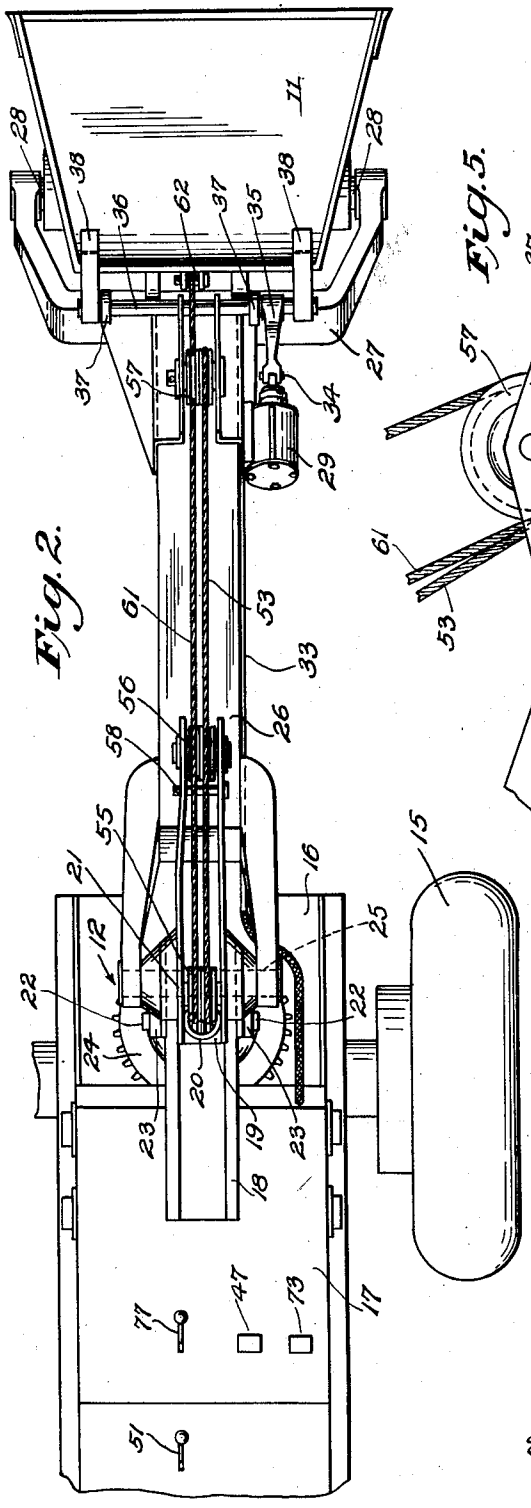

Fig. 2.

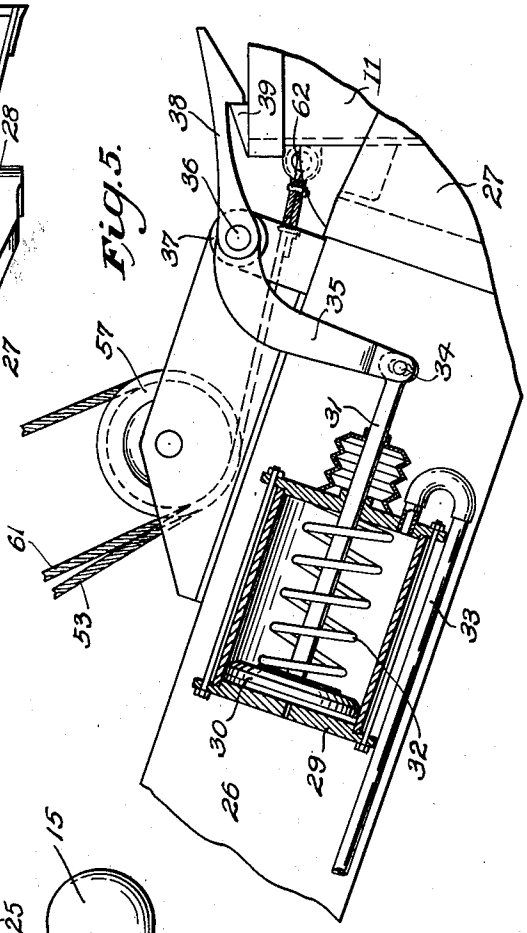

Fig. 5.

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Fig. 3.

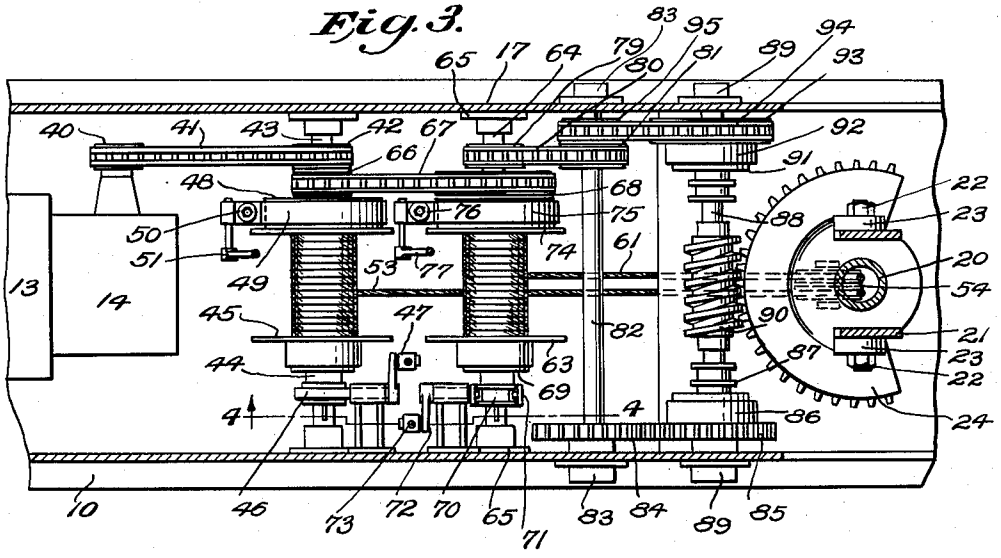
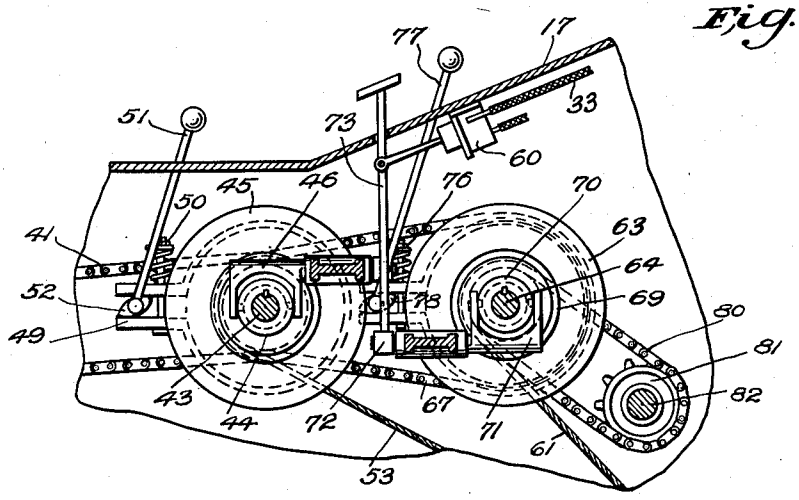


Fig. 4.



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Patented Mar. 4, 1947 2,416,893

UNITED STATES PATENT OFFICE

2,416,893

PORTABLE LOADING MACHINE

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Application November 20, 1944, Serial No. 564,193

3 Claims. (Cl. 214—132)

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This invention relates to portable loading machines and, more particularly, to loading machines of the type utilizing an automotive base vehicle having mounted on one end thereof a power actuated scoop, or other form of load receiver so supported as to be adapted for swinging movement about vertical and horizontal axes for receiving, lifting and laterally turning to discharge positions materials contained therein.

In the operation of such portable loaders, it has been customary to restore the boom carried pivotally movable scoop from its downwardly tilted load-discharging position to a substantially horizontal load-receiving position by lowering the boom to bring the scoop into contact with the ground, thereby causing the scoop to rotate to a position where it can be latched, or otherwise held in rigid association with the boom, for material-gathering operations. The dropping of the scoop on the ground often injures the same and its mounting mechanism and, in addition, delays rapid operation of the machine.

Therefore, it is an object of the present invention to provide a loader of the character indicated wherein improved mechanism is provided for restoring the scoop, or other load receiver, to its latched material-receiving and gathering position while the associated boom is elevated, or prior to the engagement of the scoop with the ground when the boom is being lowered, so that upon being completely lowered to the desired grade line, the scoop will be instantly available to carry out material gathering and loading operations.

It is another object of the invention to provide an improved latch mechanism for holding the scoop of such a loader in its material-gathering and elevating positions in relation to the boom, and wherein said mechanism includes a fluid-actuated means for effecting the release of the scoop following raising of the boom, so that the scoop may revolve to its downwardly tilted material-discharging position.

A further object is to provide a loading machine of this nature with cables and actuating means therefor for raising and lowering the boom and its associated scoop in vertical planes and for restoring the scoop, following downward tilting thereof, to its position of engagement with the latch mechanism.

Still, a further object of the invention is to provide a helical loader of the character indicated with improved and simplified cable controls, wherein the controls are of such nature as to enable a single machine operator conveniently to manipulate the same and regulate with nicety the operating positions of the boom and scoop in all their material gathering, elevating and discharging positions.

For an understanding of other objects and advantages of my invention, reference is to be had to the following description and the accompanying drawings, wherein:

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Fig. 1 is a fragmentary side elevational view of a loading machine formed in accordance with the present invention, the material-handling scoop of the machine being shown in full lines in its lowered or material-gathering position, and by broken lines in its elevated material-discharging position;

Fig. 2 is a top plan view of the forward end of the loading machine;

Fig. 3 is a similar view on a somewhat larger scale disclosing the cable-winding drum mechanism for turning the boom-carrying mast;

Fig. 4 is a detail vertical sectional view on the plane indicated by the line 4—4 of Fig. 3;

Fig. 5 is a detail longitudinal sectional view taken through the vacuum-operated cylinder for controlling the operation of the scoop-latching mechanism.

Referring more particularly to the drawings, the numeral 10 designates the chassis or frame of an automotive base vehicle, the numeral 11 designates the material-handling scoop, shovel or other load carrier and the numeral 12 designates the mast employed in the raising and lowering of the scoop and swinging the same horizontally to desired positions of material discharge.

The mast is carried by the frame 10 at its forward or material-handling end, the opposite or rear end of the frame being provided with one or more ground-engaging steering wheels, not shown. Suitably supported by the chassis or frame 10 at the rear end of the vehicle is a power plant 13, ordinarily an internal combustion engine, and associated with the same are the usual clutch, change speed-transmission and differential units adapted for reception in a housing 14. The frame at its forward end is provided with a pair of traction wheels 15 which are adapted to be suitably driven by power derived from the engine 13, substantially as set forth in my prior copending application, Serial No. 554,032, filed September 14, 1944, and of which this application is a continuation-in-part.

The traction wheels are arranged on opposite sides of the frame 10 in order to sustain the loads imposed thereon by the scoop 11 and the mast 12, the weight of these elements serving to maintain the wheels 15 in firm tractive engagement with the ground so that the same may exert high tractive effort in advancing the scoop or bucket into the materials to be loaded.

The frame 10 is formed with a bed plate 16 and a machinery-enclosing casing 17, the upper and forward part of the latter being suitably braced to effect the support of a bracket 18. This bracket is formed with a vertical bearing 19 for the reception of a tubular column 20, the latter forming

a component part of the mast structure. The lower end of this column projects through an opening provided in the bed plate 16 in which the column is rotatably journaled.

Mounted on the column 20 to turn about the vertical axis thereof is a vertically disposed mast frame 21. This frame comprises a pair of duplicative, transversely spaced and vertically extending plates which, at their lower ends, are bolted as at 22 in connection with ears 23 integrally formed with and arising from a worm gear 24, the latter being rotated by mechanism driven by the engine 13, whereby to effect turning movement of the mast frame about the vertical axis of the column 20.

Pivotally connected as at 25 to the frame 21 is the inner end of a boom 26. The outer end of the boom terminates in a yoke 27, to the spaced arms of which the scoop or bucket 11 is pivotally united as at 28. The pivotal axis 28 is disposed somewhat eccentrically of the scoop 11, so that when the latter is released, by a mechanism hereinafter described, the scoop will turn in a downward direction, permitting of the gravitational discharge of its contents, as shown in Fig. 1.

To hold the scoop in its closed or material-receiving position, the outer end of the boom at one side thereof is provided with a cylinder 29. Slidably positioned in this cylinder is a piston 30, having a piston rod 31 extending to a position exteriorly of the cylinder. A coil spring 32 surrounds the piston rod 31 within the cylinder and bears at one end on the piston 30 to normally force the latter toward the rear of the cylinder. To overcome the force of the spring 32 and move the piston in opposition thereto, I have shown the forward end of the cylinder as being in communication with a pipe line 33 which extends to a vacuum or suction pump, not shown, on the frame 10 so that through a suitable valve operation air may be withdrawn from the cylinder to allow the air pressure in back of the piston 30 to move the latter forwardly of the cylinder, against the opposition of the spring. It will be understood that other suitable controls may be substituted for that here described, such as allowing liquid under pressure to actuate the piston against its spring resistance.

The outer end of the piston rod 31 is pivotally connected as at 34 to the depending end of a crank arm 35. The hub of this arm is fixed to a rock shaft 36 journaled in bearings 37 carried by the outer end of the boom. At its ends, the shaft 36 carries a pair of latching pawls 38 which have retaining engagement with shoulders 39 provided on the upper rear edges of the scoop or bucket 11, thereby holding the latter in its active material-receiving position. It will be evident that the spring 32 in the cylinder 29 serves positively to maintain the pawls in latching engagement with the bucket shoulders.

To raise and lower the scoop or bucket, swing the same horizontally and control the operating positions thereof, use is made of the cable controls shown more particularly in Figs. 3 and 4. Leading from the transmission casing of the engine 13 is a power take-off shaft, the latter having mounted on the outer end thereof a sprocket 40. Passing around this sprocket is an endless chain 41, which is also trained over a sprocket 42 mounted on a hoist line shaft 43, the ends of the latter being journaled to bearings carried by the frame 10. Slidably keyed on this shaft is the throw collar of a clutch 44, the driven element of this clutch being connected with a cable drum 45 loosely

mounted for rotation on the shaft 43. Engaged with the annular groove of the clutch collar is a pivotally mounted shifting fork 46, which is adapted to be manually oscillated through the control 47. The drum 45 also carries a brake wheel 48, and adapted for engagement with the periphery of this wheel is a brake band 49. This band is adapted to be held in braking engagement with the wheel 48 by means of a spring 50, but the brake may be released through the manual operation of a throw lever 51. This lever operates a spreader 52 arranged between the spaced ends of the brake band, so that through the operation of the lever 51, the brake may be set to either apply braking forces to the drum 45 or to release the latter from such braking forces.

Connected with the drum 45 is one end of a hoist line or cable 53. The latter extends from the drum 45 to a sheave 54 rotatably supported by the frame 10 at the lower end of the tubular column 20, and from the sheave 54, the line 53 extends upwardly through said column, passing over a sheave 55 supported by the mast frame 21 contiguous to the upper end of said column. From sheave 55, the hoist line extends to another sheave 56 rotatably mounted on the outer part of the overhanging and outwardly projecting upper region of the mast frame 21. From the sheave 56, the hoist line extends to pass around a sheave 57 rotatably mounted on the outer end of the boom 26, and from this sheave, the hoist line is trained upwardly and has the outer end thereof dead-ended or anchored as at 58 on the mast frame. Thus, when power is imparted to the drum 45 to wind the hoist line about the same, the boom and its associated scoop may be raised from, for example, the lowered position shown in full lines in Fig. 1 to the upper or elevated position shown by broken lines. After the boom has been thus elevated, a control valve 60 of the suction line 33 is actuated, lifting the latching pawls 38 and allowing the scoop or bucket to turn on the fulcrums provided by the yoke 27 so that material may be discharged gravitationally from said scoop or bucket.

An advantage found in my present construction resides in the employment of a scoop-actuating line or cable 61, so that through the use of which the scoop or bucket may be restored to its closed or material-receiving position when the boom is elevated and prior to complete lowering of the same. By so doing, it is unnecessary, as in prior constructions, to drop the scoop on the ground or grade line in order that it may be rotated to assume a material-receiving position. The cable 61 is connected, as at 62, to the upper rear portion of the scoop and passes around one of the guide grooves in the boom sheave 57. From this sheave, the cable 61 is extended to pass over guide grooves provided in the frame sheaves 55 and 56, passing from the latter downwardly and around the sheave 54 at the bottom of the column 20, the cable being then extended to a drum 63 rotatably mounted on the frame 10 adjacent to and in parallelism with the hoist line drum 45. The drum 63 is mounted for rotation on a supporting shaft 64, the latter having its ends received for rotation within frame-carried bearings 65. The hoist line shaft 43 has fixed thereto a sprocket 66 over which passes an endless chain 67, the latter being also trained over a sprocket 68 fixed to the supporting shaft 64 of the drum 63. The sprocket 68 is sufficiently larger in diameter than the sprocket 66 in order that the drum 63 may rotate at approximately

one-half the speed of the drum 45, this being made necessary since the hoist line 53 is doubled upon itself between the outer ends of the mast frame 21 and the boom 26.

Like the drum 45, the drum 63 has fixed thereto the driven member of a clutch 69. The driving member of the clutch includes an annularly grooved hub or sleeve 70 keyed to rotate with the drum shaft 64. A rockably mounted fork 71 suitably supported by one of the cross members of the frame 10, cooperates with the hub 70 to throw the clutch into and out of driving engagement with the drum 63. The shaft of the fork is equipped with a crank arm 72 having a manually operated stem 73. Also, the drum 63 is provided with a brake wheel or flange 74 around which passes a brake band 75. This brake mechanism is of the manually releasable spring-loaded type and like the band 49 previously described, the spaced ends of the band 75 are normally forced together by a coil spring 76. By means of a pivotally mounted throw lever 77, a cam 78, arranged between the ends of the brake bands 75, may be operated to resist the action of a spring 76 and remove frictional drag from the wheels 74 at will of the operator.

Through this arrangement, when the scoop or bucket occupies the material-discharging position shown in dotted lines in Fig. 1, the same will be restored to its closed or material-receiving position by operating the drum 63 to wind the cable 61 about the same, thus restoring the scoop to a position where it may be latched through the operation of the pawls 38. The actuating stem 73 may also be connected with the control of the suction valve 60, permitting these units to be operated synchronously.

To swing the boom and scoop horizontally to various positions of material discharge, the drum shaft 64 is provided with a sprocket 79 around which is passed an endless chain 80, the latter leading to a second sprocket 81 provided on a countershaft 82. This shaft is journaled in bearings 83 carried by the frame 10. At one end, the shaft 82 has fixed thereto a spur gear 84 which meshes with a corresponding gear 85 carried by a clutch 86, the driven element 87 of this clutch being slidably keyed on a mast-rotating shaft 88. This shaft is journaled in bearings 89 carried by the vehicle frame 10.

At its center, the shaft 88 has fixed thereto a worm 90 which meshes with the teeth of the worm gear 24. At its other end, the shaft 88 has slidably keyed thereto a driven element 91 of a clutch 92, the driving member of this clutch being provided with a sprocket 93 around which passes an endless chain 94, the latter being also trained for passage around a sprocket 95 fixed to the countershaft 82. Through manual controls, the clutches 86 and 92 may be operated to rotate the mast shaft 88 in different directions so that the boom may be swung to the right or left, as desired.

Two different methods of operation are possible with this construction, each having its peculiar advantages: 1. By maintaining a slight constant brake drag on the clutch 69 which operates the drum 63 for the scoop line 61, the scoop or bucket closes automatically following tripping thereof at any boom height, and no attention need be paid to the closing line clutch control except to release it for dumping the scoop or bucket. In this case, accurate timing between the hoisting and scoop line drum clutches is not important. In the second method, by controlling the scoop line with a manually engageable clutch and the manually releasable spring-loaded brake, the said scoop line can be used as a hoisting assist. In this case, the single closing line speed must be exactly one-half the two-part hoisting line speed.

The step by step cycles are as follows, although a skilled operator will be able to overlap certain steps to save time. Under the first method of operation above indicated, the machine operator lowers the scoop or bucket to the ground line or other desired grade line. This is done by releasing the spring-loaded brake on the drum 45 which controls the effective length of the hoist cable 53. The brake drag on the drum 63 while sufficient to close the scoop or bucket, is not great enough to support the weight of the boom and the bucket, and will not interfere with the lowering of the latter. Following such lowering, the machine is operated to produce forward traction through the drive wheels 15 and also the hoist line 53 may be actuated, separately or in combination with such forward traction to force the scoop or bucket into the material undergoing loading. The constant brake drag on the drum 63 keeps slack out of the line 61 during this operation. Thereafter, by the use of the hoist line 53, the boom and bucket are raised to the desired dumping height. If the receiver for the material to be dumped is disposed laterally to the right or left of the machine, the clutches of the mast shaft 88 are operated to swing the boom to the right or left as desired.

When the bucket has been properly located over the receiver, the bucket is tripped so that it will gravitate to its material-discharging position. This is accomplished as follows: Depress the control pedal or stem 73, thus releasing clutch 69 and removing tension from the cable 61. The pedal or stem 73 is also connected to the vacuum valve 60. So depressing said control causes the vacuum cylinder 29 to release the latching pawls 38. The bucket or scoop then rotates clockwise about its pivotal fulcrums 28 owing to its own unbalanced weight, and discharging its contents. The boom 26 is held suspended during this operation by the automatic action of the spring-loaded brake operating upon the drum 45 on which the hoist cable 53 is wound.

Following the discharge of the bucket contents, the bucket is returned to its latched or closed position. This is accomplished by merely releasing the bucket line clutch pedal 73, which allows the clutch 69 to reengage the drum 63, thus restoring tension in the closing or scoop line 61, and causing rotation of the bucket in a counterclockwise direction until it is stopped by the boom and is relatched by the pawls 38. The release of the pedal 73 also returns the vacuum control valve to neutral position, allowing the spring 32 to return the pawls 38 positively to their engaged positions. The boom is turned to swing the bucket to the front of the machine, and the bucket is relowered to the grade line for a further operation.

In the second method of operation, in which the bucket closing cable 61 is used in combination with the boom-hoisting cable 53 as a hoisting assist, the said cables or lines are first operated with the forward tractive effort of the machine to fill the scoop or bucket with the material to be loaded and thereafter to raise the scoop or bucket to the desired dumping height. To discharge material from the bucket, the pedal 73 is depressed, thus releasing the brake 75 and removing tension from cable 61. Simultaneously, the vacuum valve 60 is operated to disengage the

latching pawls and thereby cause the bucket to swing to its discharging position. The boom **26** is held suspended during this operation by the automatic spring-loaded brake **49** operating on the drum **45** to which the hoist cable is connected. Thereafter, the boom is lowered to the desired level for the next loading operation. By allowing the bucket-closing line drum brake **75** to remain engaged, the bucket automatically closes as the boom is lowered. After the bucket is so closed, further lowering of the boom simply causes the brake **75** to slip. When the bucket is dumped at low levels, there will not be sufficient boom-lowering motion to close the bucket automatically, as described above. Under such extreme conditions, the bucket is closed by engaging the clutch **69**.

In view of the foregoing, it will be seen that the present invention provides an improved loading machine for use in industrial capacities where bulk materials of various kind are required to be elevated, or otherwise transferred from one location to another. Also, the machine is characterized by its mechanical simplicity and ability to receive and handle heavy loads expeditiously with precise control thereover, enabling the loaded scoop to have its contents discharged at any desired point within the working range of the machine, the controls being under the convenient regulation of a single machine operator.

I claim:

1. In a loading machine, a portable self-prope'led base vehicle having an operating engine, an upright mast frame supported on and adjacent to one end of said base vehicle for turning movement about a substantially vertical axis, a boom having its inner end pivotally mounted on said mast frame for lateral turning movement in unison therewith and independent raising and lowering movement relative thereto, a material-receiving bucket pivotally carried by the outer end of said boom for turning movement about an eccentric axis, power actuated cable and drum means for raising and lowering said boom and the bucket carried thereby, additional power actuated cable and drum means carried by said base vehicle and connected with said bucket for restoring the latter to its material-receiving position following dumping of the contents thereof and assisting said first named cable and drum means in raising and lowering said boom, latch devices pivotally carried by the outer end of said boom and cooperative with said bucket to retain the latter in its material-receiving position following restoration thereof to said position by said additional cable means, a cylinder mounted on the outer end of said boom adjacent to said latch devices, a spring-pressed piston slidably mounted in said cylinder and provided with an externally projecting piston rod, operating connections uniting the externally projecting end of said piston rod with said latch devices, and remotely controlled suction-producing means cooperative with said cylinder for moving said piston against spring resistance, whereby to move said latch devices to inactive bucket-releasing positions.

2. In a loading machine, a wheeled portable self-propelled base vehicle, an upright mast frame supported on and adjacent to one end of said base vehicle for turning movement about a substantially vertical axis, a boom having its inner end pivotally united with said mast frame for swinging movement laterally in unison with the mast frame and independent vertical raising and lowering movement, a material-receiving bucket mounted for turning movement about a substantially horizontal axis provided on the outer end of said boom, a boom-hoisting cable having one end thereof secured to said mast frame, sheaves carried by the outer end of said boom and said mast frame and about which intermediate portions of said cable are passed, a power driven drum mounted on said base vehicle and to which the other end of said cable is secured, a source of power for driving said drum, a manually controlled clutch for governing the application of power to said drum from said source of power, a manually releasable spring-loaded brake for said drum, a bucket cable connected at its outer end with said bucket for moving the latter from an open downwardly tilted position of material discharge to a closed relatively elevated position for material reception, said bucket cable having the intermediate portions thereof trained about the boom and mast frame sheaves, a second drum rotatably mounted on said base vehicle and to which the inner end of said bucket cable is secured, a manually operated clutch uniting said second drum with said source of power, a manually releasble spring-loaded brake for said second drum, latch devices movably carried by the outer end of said boom and engageable with said bucket to retain positively the latter in its material-receiving position independently of said bucket cable, and remotely controlled means carried by the outer end of said boom for moving said latch devices between positions of bucket engagement and disengagement.

3. In a loading machine, an automotive base vehicle having an operating engine, an upright vertically disposed support at one end of said base vehicle, a boom having its inner end articulately joined with said support for turning movement about both vertical and horizontal axes, a bucket pivotally supported for turning movement on the outer end of said boom, a movable latching device normally restraining turning movement of said bucket with respect to said boom but releasable to admit of such turning movement when the contents of the bucket are to be discharged, a drum rotatably supported on said base vehicle, a cable connected with said bucket at one end and with said drum at its other, the intermediate portion of said cable being trained through guides carried by said boom and its support, power driven means actuated by said engine for rotating said drum, said means including a clutch, fluid-actuated means mounted on the outer end of said boom for operating said latching device, a control valve on said base vehicle for governing the operation of said fluid-actuated means, and a common manually operated control device for effecting simultaneously the operation of the drum clutch and control valve.

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