March 8, 1949. J. S. PILCH 2,463,803

LOADING DEVICE FOR TRACTORS

Filed March 14, 1946 3 Sheets-Sheet 1

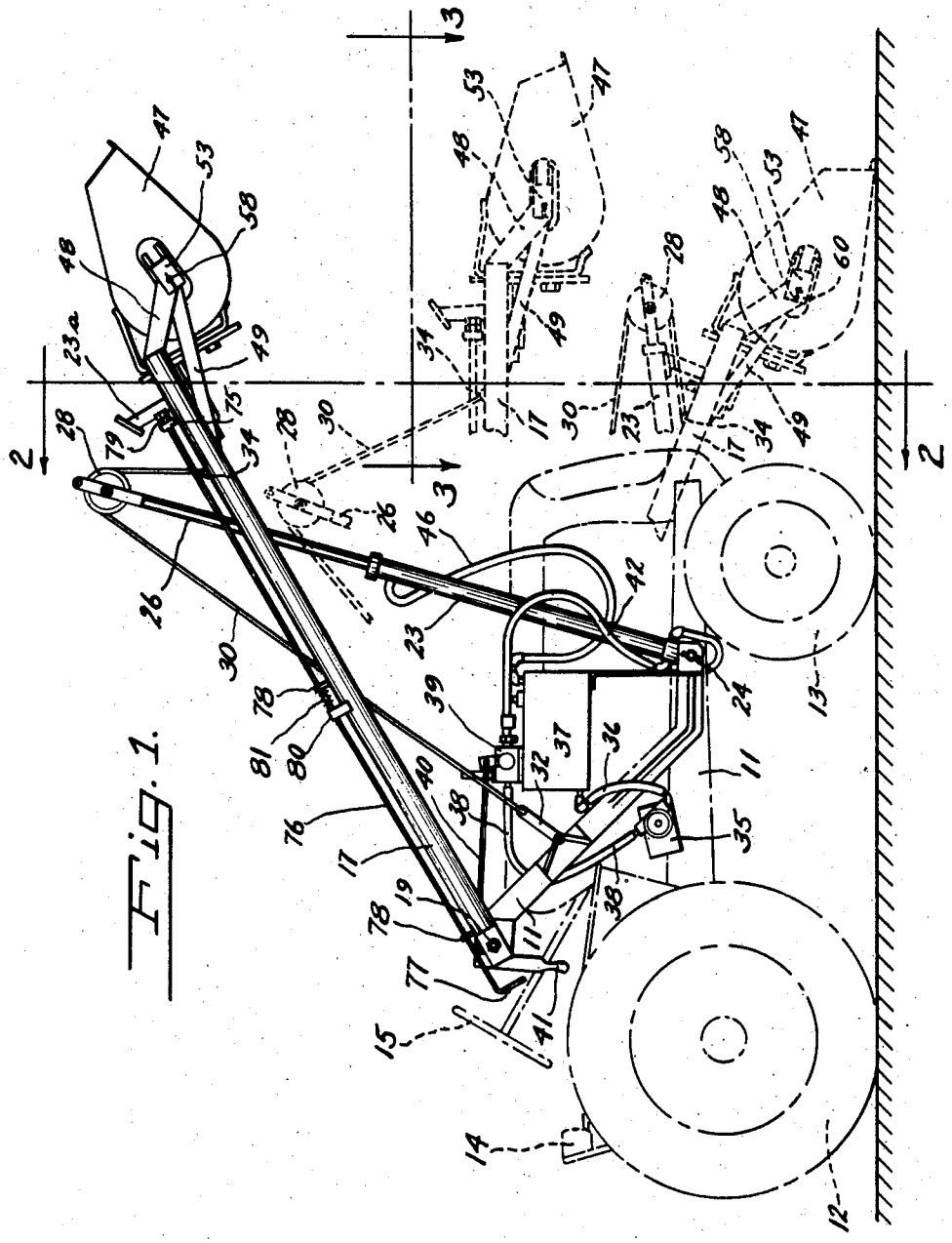


Fig. 1.

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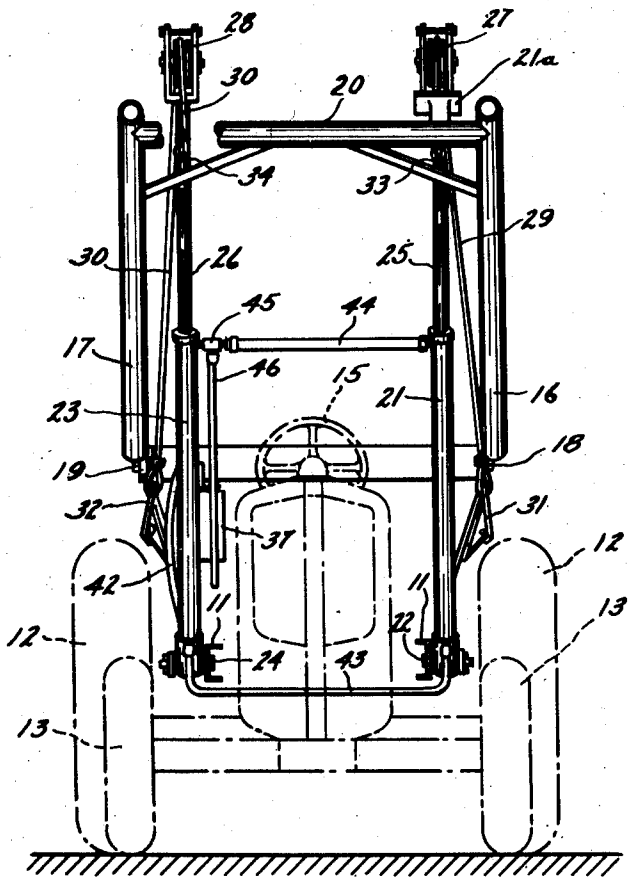


Fig. 2.

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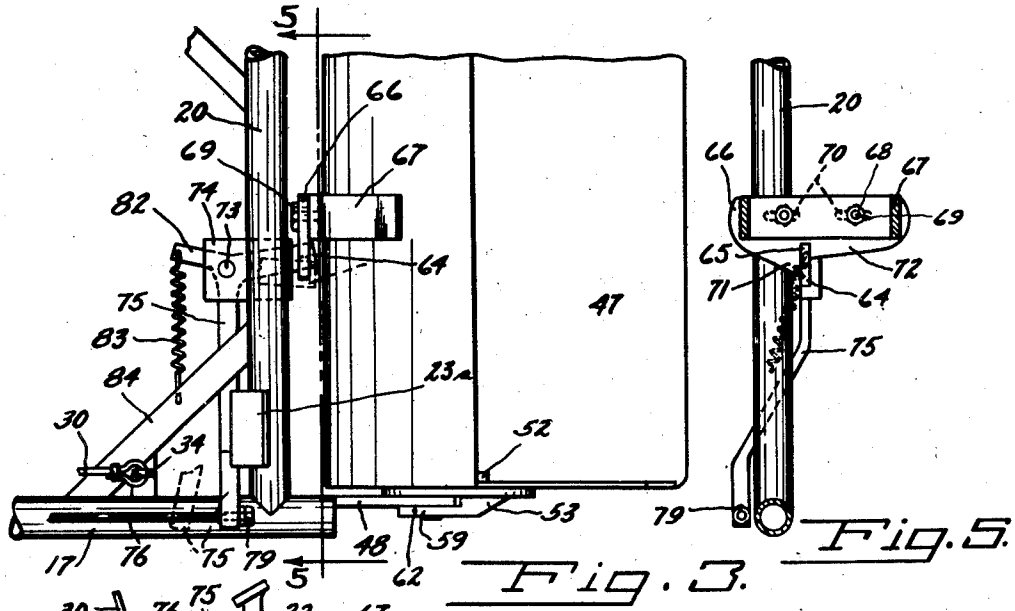


Fig. 3.

Fig. 5.

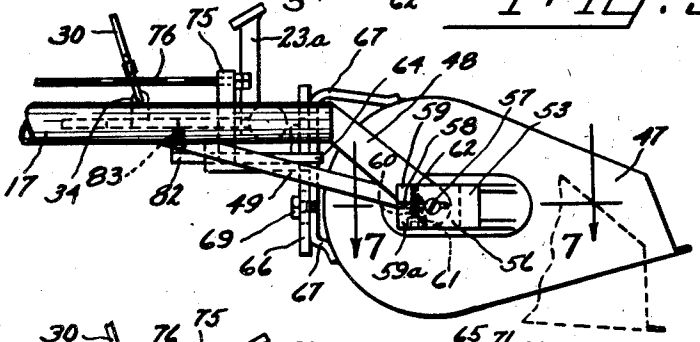


Fig. 4.

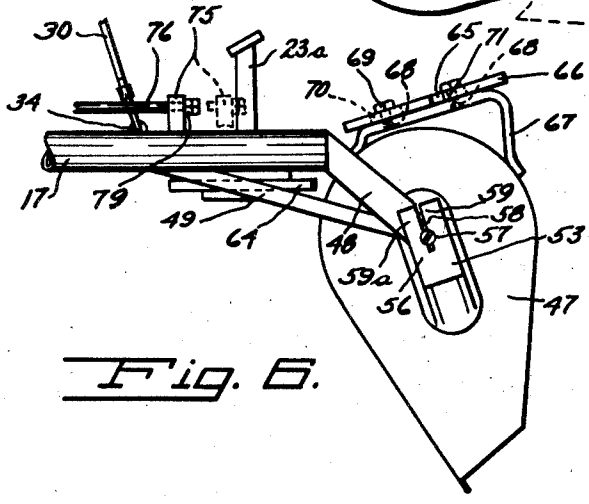


Fig. 6.

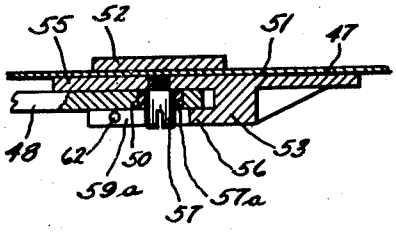


Fig. 7.

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UNITED STATES PATENT OFFICE

2,463,803

LOADING DEVICE FOR TRACTORS

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Application March 14, 1946, Serial No. 654,372

6 Claims. (Cl. 214—140)

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For many years there have been devices on the market for the purpose of handling material such as earth, gravel, snow and similar substances commonly known as steam shovels or power shovels. With the advent of tractors for farm work and other purposes there have been developed devices in the nature of attachments to be used with such tractors. Inasmuch as such attachments, in many instances, are used only a part of the time and the rest of the time the tractor is used without the attachment there are many problems of construction that are due to this dual use of the tractor, sometimes with and sometimes without the attachment. In many cases neither the tractor nor the attachment is provided with means for transporting the material handled to any great distance so that a vehicle of some type such as a dump cart or an automobile truck is used for the actual transportation of the material, and for that reason the word loader is used to describe the attachment.

The present invention relates to improvements in such loaders and has for one of its objects a construction which is compact in its space requirements and in which the strains and stresses are minimized resulting in less material in the parts and less total weight for the loader as a whole.

Another object of the invention is to provide improved means for dumping the bucket or scoop which shall be readily operable from the seat of the operator of the tractor.

It is a still further object of the invention to provide latching means which can be released to permit movement of the scoop from the loaded position into the dumping position but which latching means, during the reverse movement of the scoop will automatically limit the movement of the scoop to its loading position at which position the scoop will automatically latch itself in place until again released by the operator.

It is also an object of the invention to proportion the dimensions of the scoop and its weight distribution so that the sum total of the forces acting on the scoop when it is in its loaded position will tend to turn it into the dumping position and then, after the scoop has been released and the load has been dumped, the weight distribution of the scoop alone is such that it will tend to turn back into its loading position where it becomes automatically latched in position.

It is still another object of the invention to provide resilient means for moving the latch into and holding it in the latching position and also

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to provide manually operable mechanism for releasing the latch which mechanism is nevertheless free from connection with and does not operate with the latching mechanism during the relatching operation and also to provide the operating mechanism with resilient stop means to limit its travel in the opposite direction from that in which it is manually moved when operated to unlatch the scoop.

Another object of the invention is to provide means whereby the position or angle of the scoop can be readily adjusted for different conditions of work such as scraping up material from the surface of the road or excavating or digging down into soft material.

It is a still further object of the invention to provide pivotal means for supporting the scoop which pivot can be readily locked in place but which shall nevertheless be so arranged that the dirt and mud of the road or of the material being handled will not readily clog up the parts and render them difficult of adjustment or replacement.

It is also a general object of the invention to provide clear visibility for the operator so that he can keep in close touch with the work which he is handling and thereby increase both the accuracy and the speed with which the work is performed.

The foregoing and other objects of the invention will readily appear to those skilled in the art to which it appertains by a consideration of the following description of one embodiment thereof taken in connection with the accompanying drawings in which

Fig. 1 is a side elevation of a loader, the tractor with which it is being used being shown in dotted lines, the loader itself being shown in its upper position in full lines, in a middle position in dotted lines, and in its lower position by another set of dotted lines;

Fig. 2 is a front elevation of the loader taken on the line 2—2 of Fig. 1;

Fig. 3 is a top plan view of the scoop showing the pivotal supporting structure and also the release mechanism (approximately only half of the scoop being shown);

Fig. 4 is a side elevation of the same parts as those shown in Fig. 3;

Fig. 5 is a front elevation of the latch and release mechanism taken on the line 5—5 of Fig. 3;

Fig. 6 is a side elevation similar to Fig. 4 but shows the scoop in the dumping position instead of in the loaded position; and

Fig. 7 is a detail sectional view showing the

construction of the pivotal support for the scoop and is taken on the line 7—7 of Fig. 4.

Referring to the drawings more in detail the frame of a tractor is indicated generally by the reference character 11. The tractor is shown as having a pair of large rear supporting wheels 12 and a similar pair of small forward supporting wheels 13. The operator's position is at the rear, the operator's seat being indicated at 14 within convenient reach of the steering wheel shown at 15 and also near other controls as will be more fully explained hereinafter. Means for raising and lowering a scoop or bucket is shown in the form of a swinging framework or jib comprising a pair of longitudinal members 16 and 17 pivotally supported at 18 and 19 respectively on the frame 11 of the tractor and toward the rear thereof. It will also be noted that these pivotal supports are positioned on the tractor well above the level of the ground. Near the other ends of the members 16 and 17, which are preferably tubular in section, there is provided a transverse member 20, which is also preferably tubular, which may be welded or otherwise suitably secured to the longitudinal members 16 and 17 and serves to provide a strong and rigid framework which is capable of swinging around the pivotal supports 18 and 19 and thereby raising and lowering the far end of the jib which carries a scoop as will be presently described.

Hydraulic means are provided for raising and lowering the outer end of the framework or jib and comprises a cylinder 21 for the longitudinal member 16 which cylinder is pivotally supported on the frame 11 of the tractor at 22, and a similar cylinder 23 for the longitudinal member 17 which cylinder is pivotally supported on the frame 11 of the tractor at 24. It will be observed that the position of the pivotal supports 22 and 24 is lower down on the frame 11 than the pivotal supports 18 and 19 and also somewhat farther forward toward the front of the tractor.

The cylinders 21 and 23 are provided with piston rods 25 and 26 respectively which at their upper ends are provided with a forked or bifurcated construction in which are mounted grooved pulleys 27 and 28 respectively. Cables 29 and 30 pass over these pulleys and are attached at their rear ends to the frame 11 of the tractor at 31 and 32 and at their forward ends are attached at 33 and 34 respectively to the longitudinal members 16 and 17 near the ends thereof farthest away from their pivotal supports. It will be observed that the points of attachment of the cables to the frame 11, that is 31 and 32, are somewhat higher than the pivotal supports of the cylinders which are indicated at 22 and 24 and also farther toward the rear of the tractor. By this construction the cables 29 and 30 will always lie on the same side of the jib during the movement of the jib as it swings from its highest position to its lowest position (see Fig. 1). There is a rest 21*a* secured to the transverse member 20 upon which the piston rod 25 is supported when the jib is in its lowest position and a similar rest 23*a* is also secured to the transverse member 20 upon which the piston rod 26 is supported when the jib is in its lowest position.

The hydraulic means employed for raising and lowering the jib may comprise a pump 35 having its intake side connected through a suitable pipe or hose 36 to a reservoir 37 for holding the hydraulic fluid such as oil. A similar pipe or hose 38 connects the discharge side of the pump 35 to a control valve 39 having a control rod 40

operated by a control handle 41 within easy reach of the operator seated at 14. A suitable hose 42 connects the discharge side of the control valve 39 to the lower end of the cylinder 23 and there is also a hose 43 provided for connecting the lower end of the cylinder 23 to the lower end of the cylinder 21 (as best seen in Fig. 2) whereby the pistons in the two cylinders are operated simultaneously and they also both have the same forces existing therein at all times.

Means are provided for taking care of the hydraulic medium such as oil which leaks past the pistons into the upper ends of the cylinders 21 and 23. For this purpose a suitable hose 44 extends between the upper ends of the two cylinders 21 and 23 (see Fig. 2) and is provided with a T 45 to which is connected a hose 46 which at its other end is connected to the reservoir 37. It will be noted that the control valve 39 is positioned on top of the reservoir 37 and while not shown in the drawings there is a fluid passage connecting the valve with the reservoir. The detail construction of the control valve 39 is no part of the invention covered by this application but it is sufficient, in order to understand the operation of the device as a whole, to state that the valve is capable of admitting fluid under pressure through the hose 42 to the lower ends of the cylinders 21 and 23; is capable of connecting the hose 42 to the reservoir 37 for the purpose of releasing the pressure in the lower ends of the cylinders and for discharging the fluid therein into the reservoir; and is also capable of releasing any excess pressure received from the pump 35 which can not be used by the cylinders for the time being thus permitting this excess pressure to discharge whatever fluid may be necessary, for the purpose of releasing the pressure, into the reservoir.

At each side of the jib the respective longitudinal tubular members are provided with means for pivotally supporting a bucket or scoop 47 but inasmuch as the drawings only show the construction at one side, that of the member 17, it will be that construction only that will be described, it being understood that substantially identical structure exists at the other side but is not shown in the drawings. The member 17 is provided with a flat extension or bar 48 which may be either formed integrally with the member 17 or secured thereto by any suitable means as by welding. This extension may be reinforced by a strut 49 between the member 17 and the extension 48. Near the end of the longitudinally extending member 17, or more properly speaking near the end of the extension 48 thereof, there is provided an aperture 50 therein which serves as a bearing.

The scoop is fabricated from sheet metal of a thickness suitable for the work for which the scoop is intended to be used. This is best seen at 51 in Fig. 7. This relatively thin sheet metal is reinforced by an inner plate 52 where the scoop is to be pivotally supported and also by a similar somewhat thicker outer plate 53 both of which may be secured to the sheet metal 51 by welding. The outer plate 53 may be provided with a slot 54 extending parallel to the sheet metal of the scoop near it and also parallel to the flat extension 48 of the longitudinal member 17 of the jib. The bifurcated member 53 or fork has one of its arms 55 secured to the sheet metal 51 of the scoop and the other arm 56 is spaced therefrom a distance slightly greater than the thickness of the extension 48 of the member 17 so that

the extension is capable of movement with respect to the scoop in a direction that is parallel to their flat surfaces. A bearing pin 57 extends through an aperture in the outer arm 46 of the plate 53, through the aperture 50 of the extension 48, into which aperture there is pressed a hardened steel bushing, and is screwed into the inner arm 55. To prevent the bearing pin 57 from working loose a second slot 58 is provided which divides the outer fork or arm 56 into an upper portion 59 and a lower portion 59a. A counterbored aperture 60 extends upwardly through the lower portion 59a of the arm 56 and in the upper portion 59 of the arm 56 there is provided a threaded aperture 61 which is in alinement with and is substantially a continuation of the aperture 60. A machine screw 62 passes upward through the aperture 60 and is screwed into the threaded aperture 61 so that the upper portion 59 of the arm 56 is drawn toward the lower portion 59a of the arm 56 and squeezes the bearing pin 57 tightly in place and prevents its accidental loosening. It will be noted that the machine screw 62 is screwed into the parts from underneath and is therefore relatively free from being clogged up with dirt and can be readily removed if necessary.

From the foregoing it has been seen that the scoop 47 is supported by the jib so as to be raised and lowered therewith and at the same time it is capable of swinging or rotative movement around the bearing pins 47, one at each side of the scoop. It is also a part of the construction to provide a latch or latching arm 64 which cooperates with a latching slot 65 provided in a plate 66 which may be appropriately called a latching slot plate. For purposes of adjustment this latching slot plate is secured to a mounting plate 67 the mid portion of which extends in a substantially vertical direction when the scoop is latched and the jib is about half-way raised (see the middle position of Fig. 1 and Figs. 3, 4, and 5). The upper and lower ends of the mounting plate are curved or bent so as to be secured to the rear of the scoop 47. The mounting plate 67 is provided with a pair of threaded apertures 68 for the reception of machine screws 69 used for holding the latching slot plate against the mounting plate.

The latching slot plate 66 is formed from heavy or thick sheet metal and (as seen in Fig. 4) is disposed in a vertical plane extending transversely of the tractor, that is, parallel to the axis of the scoop. A pair of vertically extending slots 70 are provided in the plate 66 so that the machine screws 69 may pass therethrough and clamp the latching slot plate 66 tightly against the mount-plate 67 when the screws are drawn up firmly but will permit a certain amount of adjustment in the position of the latching slot plate with respect to the mounting plate (and with respect to the position of the scoop) when the screws are loosened for the purpose of making such adjustment.

It will be noted that the latching slot 65 has an upper projecting lip 71 and a lower projecting lip 72 and that the upper lip 71 projects outwardly somewhat farther than the lower lip 72. It will also be noted that the edge of the plate 66 near the slot does not follow a vertical direction but slants away from the slot. The reason for these details of construction will be presently set forth.

The latch 64 constitutes one arm of a bell crank lever which is pivotally supported about a vertical axis or pivot 73 carried by a supporting member 74 which is in turn carried by the transverse member 20. The bell crank lever has a long arm 75 which is provided with an aperture in which there is positioned one end of an operating rod 76 of a slightly less diameter than the aperture so that the rod is capable of longitudinal sliding movement with respect to the arm 75. The operating rod 76 extends along the top of the member 17 and is provided with an operating handle 77 within reach of the operator. A plurality of guides 78 are welded or otherwise suitably secured to the member 17 and have apertures therein through which the rod 76 slides and by which it is constrained to longitudinal movement only. On the end of the rod 76 which protrudes beyond the arm 75 there is provided a pair of nuts so that when the rod 76 is pulled toward the operator the nuts will engage the long arm 75 and operate the latching arm 64 to release the scoop. It will be observed that the action of the rod 76 in moving the long arm 75 and the latch 64 is not a reciprocal action; the movement of the arm 64, in order to relatch, which is through the same distance as is required for the unlatching operation, will move the arm 75 (toward the left in Fig. 1) but will not move the rod 76 inasmuch as the arm 75 is free to slide on the rod 76 and move away from the nuts 79. By thus relieving the scoop of the work required to move the rod 76 during the relatching operation the functioning of the scoop during the relatching operation is made to that extent easier and more certain in its operation.

A shoe 80 may be secured to the rod 76 and has a curved under side to fit the curvature of the member 17 so that the shoe may slide along the member 17 but neither the shoe nor the rod is able to turn or rotate around the axis of the rod 76. This is to prevent the handle 77 from being moved into different positions by the jar and vibration of the apparatus. Between the shoe 80 and one of the guides 78 there is positioned a spring which constitutes a resilient stop for the movement of the rod 76 toward the right (as seen in Fig. 1).

The bell crank lever is provided with a third arm 82 to which there is fastened one end of a tension spring 83. The other end of the spring is fastened to a cross brace or strut 84 which extends between the longitudinal member 17 and the transverse member 20.

In discussing the operation of the loader the operation of the latching mechanism will first be described. Let it be assumed that the position of the scoop with respect to the jib is the loading position (which may also be called the loaded position) as shown in all three positions of Fig. 1 and also in Figs. 3, 4 and 5. In this position, the latching arm 64 engages the slot 65 and prevents any swinging movement of the scoop 47 about its pivotal support 57. It is resiliently held in this position by the action of the spring 83 on the arm 82 of the bell crank lever of which the latching arm 64 is another part. When the scoop has been raised to a sufficient height and is over the position where it is to be dumped (as for example the upper, full-line position of Fig. 1) the operator pulls the handle 77 toward him (to the left as seen in Fig. 1). This moves the rod 76 toward the left and the nuts 79 on the end of the rod press against the arm 75 and turn the bell crank lever clockwise, about the pivot 73, thus withdrawing the latching arm 64 from the slot 65 against the action of the spring 83. The latch-

ing arm 64 is shown in its latching position in Fig. 3 in full lines and in its unlatching position in dotted lines. The supporting member 74 is so formed as to provide stops for the bell crank lever which prevent it from movement beyond its normal operating position in either direction.

The scoop is so designed, as has already been stated, that when loaded it will tip and swing, because of the weight of the load, into the position shown in Fig. 6. As soon as the load has been discharged, again because of the design of the scoop, the weight of the scoop will return it to its loading position. As the latching slot plate 66 moves downward along the latching arm 64 the lip 72, because of its inclined or slanting edge, pushes the latching arm 64 into the same position as it was in during the unlatching operation. At that moment the upper lip 71 strikes against the latching arm 64 and is thereby prevented from any further downward movement while the spring 83 pulls the bell crank lever counter-clockwise about the pivotal support 73 and thereby pushes the latching arm into the slot 65 and the parts are again in their latching position.

It should be particularly noted that the direction of movement of the latching arm 64 is parallel to the axis of the pivotal support of the scoop. As contrasted with a latch having a direction of movement in a radial direction with respect to the axis of the pivotal support of the scoop there are very marked advantages in the arrangement as shown. A radially movable latch is far more responsive to jars and vibrations, which exist to a considerable degree in apparatus of the type under consideration, and the strength of the spring 83 necessary to prevent accidental unlatching is much greater than the strength of the spring required for a latch that is movable in a direction parallel to the axis of the pivotal support.

It will also be noted that in the relatching operation there is a quick movement of the latching arm 64 and the bell crank lever, first clockwise against the action of the spring 83 and then, under the action of the spring, back into the latching position. It will be particularly noted that the temporary movement of the arm 75, to the left as shown in dotted lines in Fig. 3, does not move the rod 76 and to that extent the load on the scoop in performing the relatching operation is reduced and the parts are rendered more certain in their functioning. In the final step of the relatching operation the arm 75 moves very quickly from the dotted line position of Fig. 3 to the full line position and in so doing it is very apt to hit the nuts 79 so suddenly as to amount to a blow as though struck with a hammer. Any rigid stop used for limiting the movement of the rod in a direction to the right is very likely to be broken by such treatment and it is for this reason that the spring 81 is employed to cushion the blow between the shoe 80 and the stop 78.

The loader is then ready for the loading part of the cycle of operations. The scoop is lowered, after the tractor has been manipulated to bring the scoop to the place where it is to be loaded, the parts being in substantially the position shown in the lower dotted line position of Fig. 1, the latch being in position to hold the scoop in its fixed position with respect to the jib. The tractor as a whole is then driven forward so that the scoop is pushed into the pile of material to be loaded. When the scoop has been pushed forward sufficiently to load the scoop the operator by means of the handle 41 operates the control

valve 39 to admit the hydraulic fluid or oil into the lower ends of the cylinders 21 and 23. This moves the piston rods 25 and 26 outwardly and upwardly so as to tighten the cables 29 and 30. This lifts the ends of the longitudinal members 16 and 17, that is, it swings the jib as a whole around the pivotal supports 18 and 19 and raises the scoop 47 through the intermediate position shown in Fig. 1 up to the upper position of Fig. 1. It should be particularly pointed out that, due to the high pivotal mounting of the jib at the rear of the tractor, the path of movement of the loading end of the jib is in the form of an arc which results in a type of operation on the material being loaded that is in the nature of a cutting into the material which would not be true except for this arcuate path of the scoop. During this hoisting operation the cylinders 21 and 23 are free to swing or swivel around their pivotal supports 22 and 24. Because of this freedom to swing about their pivotal supports there can be no side strains or stresses on the pistons and their cylinders, any such force immediately swings the cylinders and pistons to one side or the other. Another advantage of the construction set forth is that the distance which the cables move the ends of the longitudinal members 16 and 17 is about twice the distance through which the pistons move. This is not precisely true because of the angles involved but nevertheless the multiply-effect makes it possible to employ much shorter pistons and cylinders than would otherwise be the case.

There are several advantages which flow from the general arrangement of the jib on the tractor and the relationship of the pistons and the supports of their cylinders together with the arrangement of the cables. The points 33 and 34 on the jib where the cables exert their lifting forces are well toward the end of the jib where the scoop is pivotally supported with the result that the greater part of the force exerted through the cables is applied directly to the lifting and there is a minimum portion of the forces exerted to produce bending moments which consequently require parts in the jib that are excessively large and heavy. It should also be noted that the direction in which the cables exert their forces, when the scoop is in the middle or upper position (see Fig. 1), is in such a direction as to lift the scoop and to swing the jib about its pivotal support. On the other hand, in the lower position of the scoop the cables lie more nearly parallel to the jib. Since there are large forces and substantial shocks encountered when the scoop is being driven into certain compact materials this more nearly parallel disposition of the cables enables the piston cylinders to relieve the jib of a great deal of the forces that it would otherwise have to sustain alone.

In the foregoing description it was stated that the scoop was pushed into the material until loaded and then the raising or hoisting mechanism was put into operation. It is to be understood that this sequence of operations does not necessarily have to be adhered to. Not only may the tractor as a whole remain stationary while the hoist is operated but it can be operated at the same time, that is, the tractor can continue to be pushed forward while the hoist is operating or it may be moved backward.

After the load has been dumped the jib may be lowered by operating the control valve 39 to connect the lower ends of the cylinders 21 and 24 to the reservoir 37 and the combined weight of the

scoop, the longitudinal members 16 and 17, and the piston rods 25 and 26 together with associated parts forces the hydraulic fluid out of the lower ends of the cylinders into the reservoir thus permitting the jib and scoop to move downward at a speed that may be suitably controlled by the operation of the control valve 39.

It is to be understood that the foregoing embodiment of the invention has been selected for purposes of illustration only and various changes may be made therein without departing from the spirit and scope of the invention as defined in the subjoined claims.

I claim:

1. In a loader for a tractor, a jib adapted to be pivotally supported at one end thereof on the frame of the tractor, a scoop pivotally supported at the other end of said jib, a latching plate secured to the rear of said scoop with its plane parallel to the pivoting axis of the scoop, said plate having a slot in one edge thereof, a latching arm operable to move into and out of said slot to lock said scoop against and to release it for swinging movement around its pivotal support, the sides of the slot being determined by an upper projecting lip and a lower projecting lip which project different distances at the edge of the plate whereby the movement of the latching arm will operate to release the scoop for swinging movement in one direction while the other lip still prevents swinging movement of the scoop in the opposite direction.

2. In a loader for a tractor, a jib adapted to be pivotally supported at one end thereof on the frame of the tractor to swing about a horizontal axis extending transversely of the tractor, a scoop pivotally supported at the other end of said jib to swing about a horizontal axis parallel to said first-named axis, a latching plate secured to the rear of said scoop with its plane parallel to the axis of said scoop, said plate having a slot in one edge thereof, a bell crank lever mounted to swing about a vertical axis with one of its arms operating as a latching arm to engage said slot and movable in a horizontal direction transversely of said tractor, said bell crank lever having a second arm movable in a direction at right angles to said first-named arm and having an aperture near its end, an operating rod slidably positioned in said aperture, a pair of nuts on the outer end of said rod, a plurality of members mounted on said jib for slidably supporting said rod, resilient means holding said latching arm in said slot, a guide member secured to said rod and slidable on said jib for preventing rotative movement of said rod, and resilient means positioned on said rod between said guide member and one of said members for slidably supporting said rod for absorbing the shock of the movement of the bell crank lever into the slot.

3. In a device of the character described an arm having a bearing aperture therein near its end for pivotally supporting a scoop, a bifurcated member secured to said scoop and having one of its forks positioned on one side of said arm and the other of its forks positioned on the other side of said arm, a bearing pin engaging said aperture near its middle portion, said bearing pin being threaded into one of said forks and having a close but loose fit in the other of said forks, the fork having the loose fit being split, and a screw for drawing the two sides of the split fork together and squeezing the bearing pin tightly in place.

4. A loading device for use with a tractor comprising a jib pivotally mounted on said tractor, a scoop mounted at the end of said jib, a cable having one end attached to said jib adjacent said scoop and the other end attached to said tractor at a point spaced rearwardly of the first mentioned end of said cable when said jib is in its lowermost position, said cable being longer than the distance between the ends thereof when said jib is in said position, extensible hydraulic means pivotally mounted on said tractor at a point between the ends of said cable when said jib is in said position, below a straight line connecting said ends, and near the end of said cable connected to said tractor, and means at the end of said extensible means for engaging said cable and permitting said cable to move freely thereover, said extensible means being of such length that the slack of the cable is taken up when said jib is in said position.

5. A loading device, as defined in claim 4, in which the means engaging the cable is a pulley rotatably mounted on said extensible means.

6. A loading device as defined in claim 5, in which the hydraulic extensible means comprises a cylinder member and a piston member, one of which is pivoted to the tractor and the other of which carries the pulley.

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