Dec. 10, 1946. M. L. CONRAD 2,412,323

TRACTOR SHOVEL

Filed July 19, 1944 3 Sheets-Sheet 1

Fig. 1.

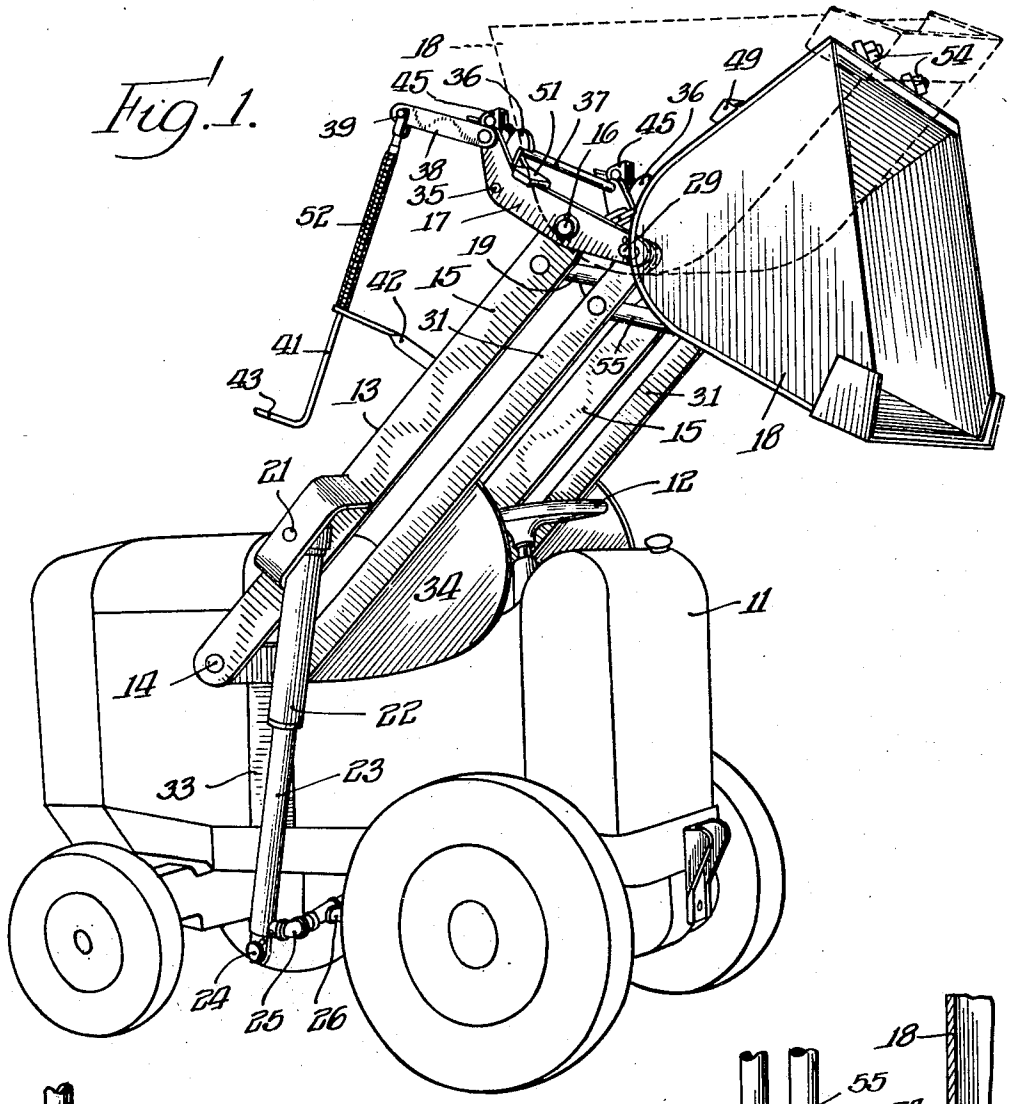
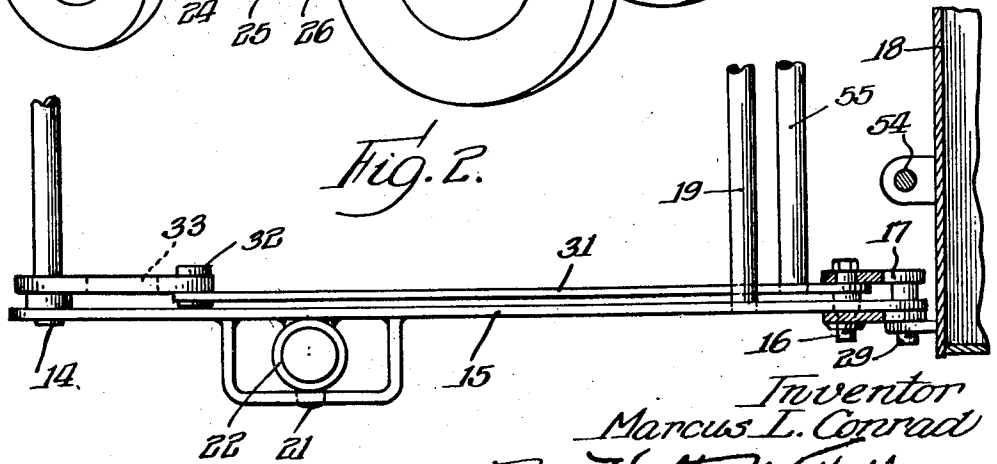


Fig. 2.



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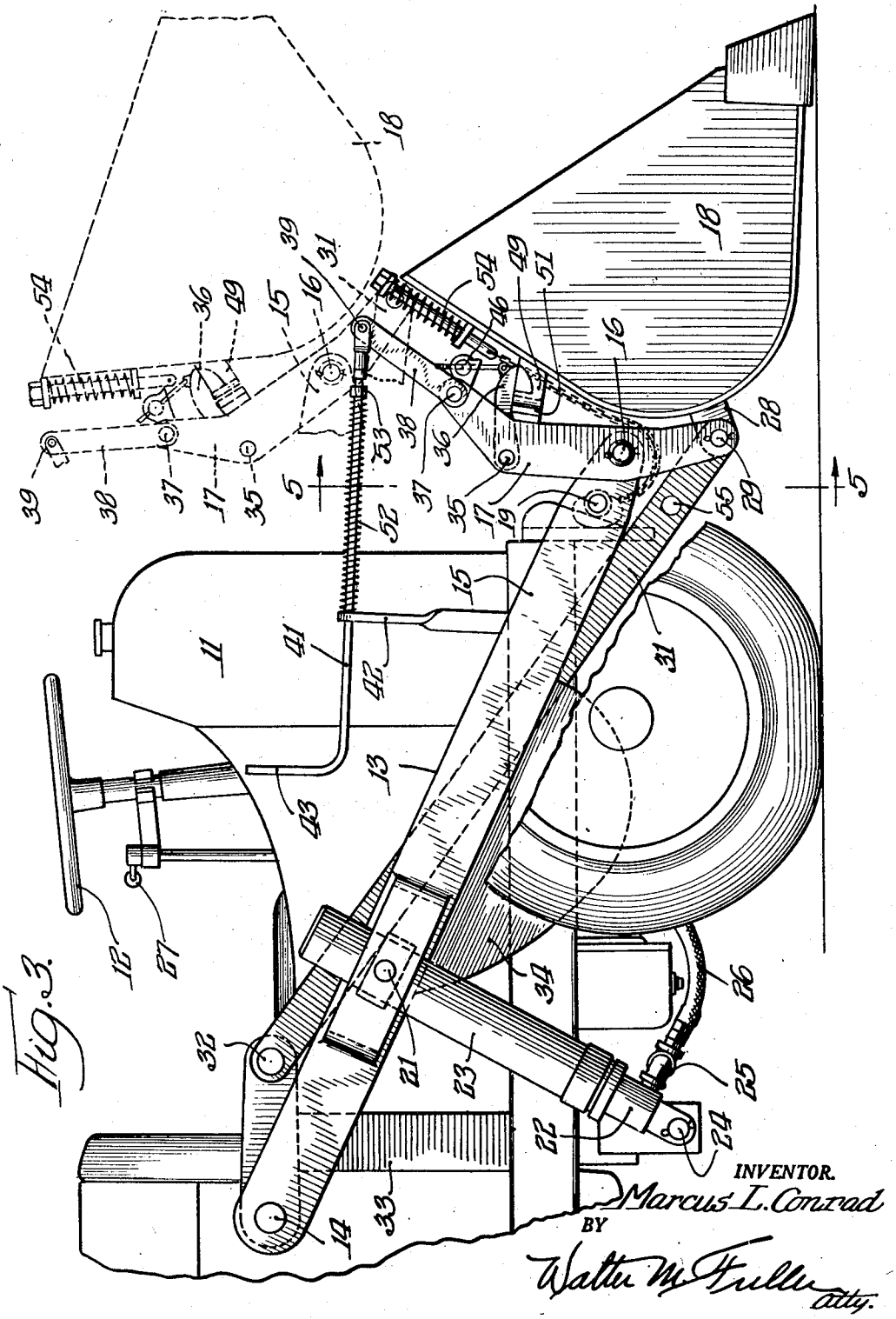


Fig. 3.

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Fig. 4.

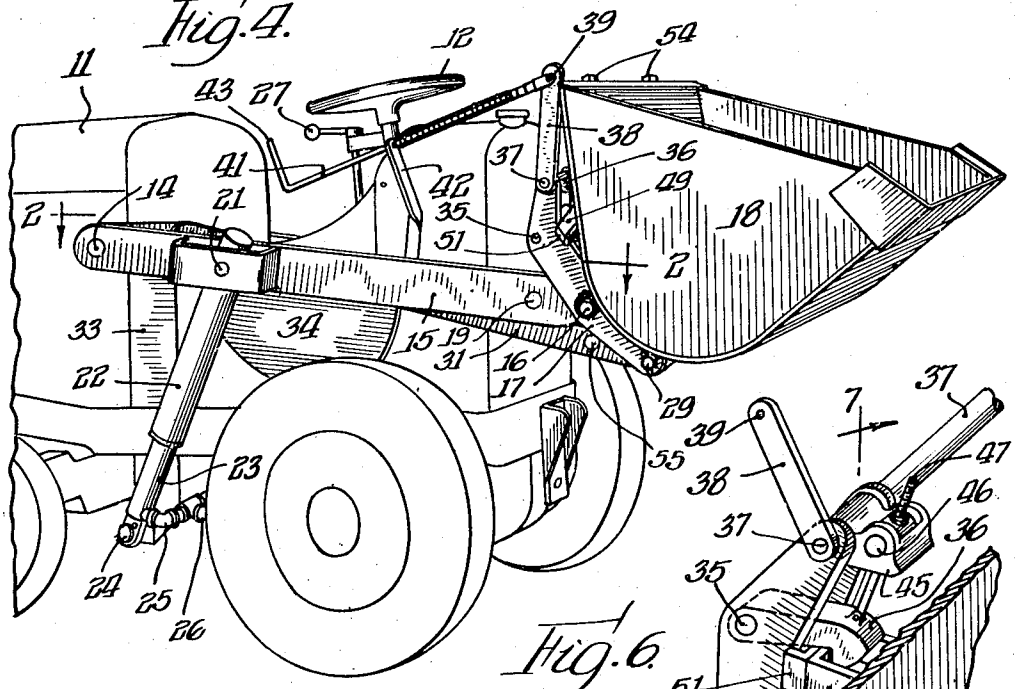


Fig. 6.

Fig. 5.

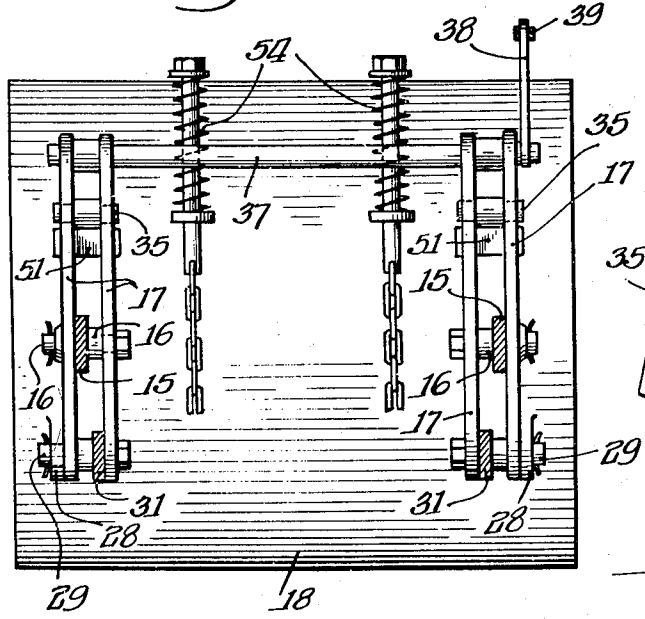
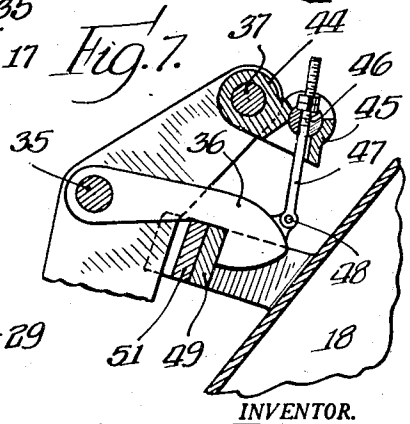


Fig. 7.



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UNITED STATES PATENT OFFICE

2,412,323

TRACTOR SHOVEL

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Application July 19, 1944, Serial No. 545,640

9 Claims. (Cl. 214—140)

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The current invention relates to certain novel and advantageous structural features and their attendant functional benefits in vehicle-mounted power-operated shovels, frequently known as tractor-shovels, one aim of the invention being to supply materially improved means for controlling the shovel or bucket while digging its load and while lifting it for subsequent disposal or discharge.

One of the main and leading objects of the invention is the production of a shovel of the specified type, which is simple in structure, which is efficient in operation, which is relatively inexpensive to manufacture, which is unlikely to become damaged or injured in ordinary service, which is readily and easily controlled, and which does not obstruct the view of the operator while the tractor is travelling with its load.

Another important feature of the invention resides in the fact that such innovatory shovel governing means permits the shovel to carry the load effectively at a relatively low level or center-of-gravity when conveying it, whereby, during the travel of the tractor, the view of the operator is not obstructed or restricted thus rendering the operation of the appliance a matter of ease, facility and safety.

Such comparatively low center-of-gravity of the vehicle as a whole when transporting the loaded shovel to its delivery location has a direct effect on the safety of operation of the appliance and the unencumbered steering of the same.

To enable those skilled in this art to understand the structural and operating features or characteristics of an embodiment of the invention, a present preferred incorporation thereof in physical form has been illustrated in detail in the accompanying drawings, forming a part of this specification, and to which reference should be had in connection with the following description thereof, like mechanical elements in the several views of the drawings having been supplied with the same reference numerals for the sake of simplicity.

In these drawings:

Figure 1 is a perspective view of the tractor-shovel showing the shovel in full lines in its elevated load-discharging position and in dotted lines in its load-retaining relation;

Figure 2 is an enlarged, horizontal, detailed, sectional view taken on line 2—2 of Figure 4;

Figure 3 is a fragmentary, side elevation of the structure on a larger scale depicting in full lines the elements of the machine with the shovel in its lowermost load-receiving position;

Figure 4 is a partial perspective presentation of the construction with the shovel in its intermediate position occupied during the travel of the tractor;

Figure 5 is a vertical section on line 5—5 of Figure 3;

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Figure 6 is an incomplete perspective view of the shovel or bucket showing one of its pair of manually releasable locking means; and

Figure 7 is a section on line 7—7 of Figure 6.

As is clearly portrayed in these views of the drawings, the vehicle on which the power-actuated shovel is mounted is an internal-combustion engine operated tractor, characterized as a whole 11, having four carrying-wheels, an operator's seat, a steering-wheel 12, and a gear-shift lever, all of ordinary or usual known types.

Exept for details of construction hereinafter designated, the parts of the structure at the two sides of the vehicle are alike so that a complete description of one will suffice for both.

The boom or vertically-rockable elevating and lowering support, designated as a whole 13, for the shovel comprises a horizontal cross-shaft 14 extended through, and having appropriate bearing in, the tractor, each of its two protruding ends at opposite sides of the vehicle having the rear end of a forwardly projecting arm 15, fixed thereon, the front end of each such arm being suitably hinged at 16 between a pair of spaced-apart, parallel bars 17, 17 at the rear of the shovel 18.

As is clearly indicated in Figures 1 and 3, the forward portions of the pair of bars 15, 15 are cross connected together by a transverse tubular-member 19 welded or otherwise fastened at its ends against the inner faces of the two bars.

At 21 each such rock arm or bar 15 has an upper, closed end of a cylinder 22 hinged thereto, the hollow, downwardly extended piston 23 of the cylinder being hinged or fulcrumed at 24 to the frame of the tractor 11, the lower portions of the interiors of such pair of pistons being cross connected together by a pipe 25 having a flexible conduit 26 extended up into the tractor, the oil under pressure for simultaneously actuating the two pistons and cylinders being controlled by a handle 27 within easy reach of the seated operator of the vehicle.

Obviously, when the oil enters the pistons, the boom rocks upwardly around the axis of shaft 14 and, when such liquid is allowed to escape from the pistons, the boom swings downwardly, its uppermost position being shown in Figure 1 and its lowermost relation being presented in Figure 3.

As portrayed in Figures 3 and 5 the back of the shovel has two cross-aligned, rearwardly-extended ears or lugs 28, 28 rigid therewith, and a pivot or hinge bolt 29 occupies registered apertures in each such lug 28 and its corresponding pair of shovel-supporting bars 17, 17, each such bolt 29 having rockingly mounted thereon the front end of a shovel-control bar or link 31 whose rear end is hinged at 32 on its side of the tractor on an upward extension 33 from the frame of the tractor, it being noted that the axes of the

two hinge or rocking connections 14 and 32 are in substantially the same horizontal plane, with the axis of part 32 ahead of the axis of part 14.

Inasmuch as each link 31 is inwardly beyond its corresponding boom arm or bar 15, the former, for safety of the operator of the tractor, has a downwardly-extended, protective flat wing or shield 34.

Appropriately pivoted at 35 between each pair of bars 17, 17 is a forwardly-projecting hook or latch 36, the two hooks, near opposite sides of the shovel, being capable of simultaneous actuation by means of an upper cross-shaft 37 oscillatory in bearings in all four bars 17, 17, as shown in Figures 5, 6 and 7, one end of such shaft having an upstanding operating-arm 38 fixed thereon and pivotally connected at 39 to an actuating rod 41 extending rearwardly through an aperture in an upright support 42, the rear end of such rod having a handle 43 within easy reach of the operator seated in the machine.

Fixed on and turnable with the shaft 37 between each pair of bars 17, 17 is the hub 44 of a skeleton arm 45 rockingly accommodating a short oscillatory shaft 46 to which is affixed a depending rod hinged at 48 to the corresponding hook 36.

Each hook 36 coacts with its own individual catch 49 welded to the back of the shovel and against which a block 51 affixed to the two correlative parts 17, 17 is adapted to bear.

To assure that each hook is normally down in its operative position, rod 41 is surrounded by a coiled spring 52 bearing at its rear end against the member 41 and at its front end against a collar 53 fixed to the rod.

To absorb the shock of the unhooked or unlocked shovel when it tips to discharge its load, any convenient or expedient means such as the spring and chain mechanism 54, 54, may be used, these forming no part of the present invention.

The novel appliance functions substantially as follows:

When the locked or hooked shovel is in its lowermost position, as shown in Figure 3, and the tractor is advanced to cause the shovel to receive its load, the guide-bars or control-links 31, 31 assist the boom-structure 13 in maintaining the shovel in correct relation, which involves an upward as well as a rotative movement of the shovel.

The shovel having scooped up its load, it is elevated by its supported boom to its carrying position, shown in dotted lines in Figure 3, and during such lifting thereof, by reason of the rocking of the shovel rearwardly around the axis of the aligned short shafts or pins 16 by the control-links 31, 31, the shovel is quickly turned to its load-retaining relation, the angle of repose of its contents preventing any spilling thereof.

Such rapid swing of the shovel brings it to such intermediate load-conveying position at which it is retained during the travel of the tractor, so that the seated operator of the tractor has full view ahead over the loaded shovel.

When such power-operated vehicle reaches its load dumping location, the shovel is ordinarily lifted to its full height with but slight if any change in its own rotation, except that forwardly to compensate for the rearward swing of the boom, and then the operator pulls rearwardly on the handle 43 thereby releasing both hooks 36 simultaneously, permitting the load in the shovel to rock it in well known manner to discharge such load, this released dumping position of the shovel being depicted in full lines in Figure 1.

If it is to be desired to unload the shovel at a lower level this is accomplished in an analogous manner.

When during the descent of the unloading shovel, it first engages the ground and then continues its downward travel, it rocks and again becomes automatically locked to its support as presented in Figure 1.

It is to be particularly noted that, while the shovel remains in its partially elevated position as illustrated in Figure 4, the tractor carries the shovel and its contents to the place where the latter is to be delivered or dumped, and the performance of this act while the shovel and its lading are at such relatively low level has two outstanding advantages, in that, in the first place, the view ahead of the driver of the tractor is unobstructed so that danger incident to the absence of such a condition is avoided, and, in the second place, the comparatively low center-of-gravity of the loaded tractor is a distinct benefit in the travelling and guiding of such vehicle.

An outstanding and important feature of the invention resides in the actuality that by reason of the function of the shovel-controlling links 31, 31 and its relation to the operation of the boom 13, the shovel during its elevation from the ground is quickly rocked to full-load holding relation which is thereafter preserved during the later further lifting thereof to its final uppermost dumping position.

Those acquainted with this art will readily understand that the invention, as defined in the appended claims, is not necessarily limited and restricted to the precise and exact details of construction shown and described and that reasonable modifications may be resorted to without departure from the heart and essence of the invention and without the loss or sacrifice of any of its substantial benefits and advantages.

Although not always essential, the front end portions of the parallel links 31, 31 may be connected together crosswise by a rod or tube 55 fixed to them in any approved manner.

It may also be mentioned in passing that by reason of the low overall height of the machine its uses are extensive, in that the vehicle is capable of maneuvering through low openings, such as doorways and passages associated with bins, etc.

In addition, the center-of-gravity of the appliance is advantageously closer to its rear end than in the conventional type of structure, thus creating better balance.

I claim:

1. In a power-operated tractor-shovel of the type having power-actuated elevating and lowering means, a shovel-support rockingly mounted thereon, a shovel rockingly mounted on said support, said support and shovel being located ahead of the tractor, a releasable lock when active preventing rocking of the shovel on said support and when released allowing the shovel to turn on said support and discharge its load, and means to rock said shovel-support during the elevation thereof, the novel improvement being that the axes of rocking of said shovel-support on said elevating-and-lowering means and of rocking of said shovel on said support are out of register, and that said shovel-support rocking-means turns the support and shovel locked thereto to bring the latter to full-load retaining position before reaching one-half the height of its complete

upward travel from its lowermost position, the shovel when unlocked discharging its load out of its forward end at the front of the tractor.

2. In a power-operated tractor-shovel of the type having power-actuated elevating and lowering means, a shovel-support rockingly mounted thereon, a shovel rockingly mounted on said support, said support and shovel being located ahead of the tractor, a releasable lock when active preventing rocking of the shovel on said support and when released allowing the shovel to turn on said support and discharge its load, and means to rock said shovel-support during the elevation thereof, the novel improvement being that the axes of rocking of said shovel-support on said elevating-and-lowering means and of rocking of said shovel on said support are out of register, and that said shovel-support rocking-means turns the support and the shovel locked thereto to bring the latter to full-load retaining position before reaching an elevation to obstruct the forward view of the seated operator of the tractor, the shovel when unlocked discharging its load out of its forward end at the front of the tractor.

3. In a power-operated tractor-shovel of the type having a power-actuated forwardly-extended boom hinged at its rear portion on the tractor, a shovel-support hinged on the front portion of said boom, a shovel rockingly mounted on said support, a releasable lock when active preventing rocking of the shovel on said support and when released allowing the shovel to turn on said support and discharge its load, and link-means hinged at its rear portion on the tractor and hinged at its forward portion to said shovel-support to rock such support and the shovel locked thereto during the elevation of the shovel, the novel improvement being that the locations of the hinge connections of said link-means cause the support and the shovel locked thereto to turn the latter to full-load retaining position before reaching one-half the height of its complete upward travel from its lowermost position.

4. The novel improvement presented in claim 3 in which the hinge-connection of said link-means on said tractor is further forward than the corresponding hinge-connection of said boom on said tractor, and in which the hinge-connection of said link-means with said shovel-support, in the lowermost position of the shovel, is at a lower level than the corresponding hinge-connection of the boom with said shovel-support.

5. The novel improvement presented in claim 3, in which the hinge-connections of said boom and said link-means on said tractor are in substantially the same horizontal plane with the latter connection ahead of the former, and in which the hinge-connections of said boom and said link-means with said shovel-support, in the lowermost position of the shovel, are in substantially the same vertical plane with such link-means connection below that of said boom connection.

6. In a power-operated tractor-shovel of the type having a power-actuated forwardly-extended boom hinged at its rear portion on the tractor, a shovel-support hinged on the front portion of said boom, a shovel rockingly mounted on said support, a releasable lock when active preventing rocking of the shovel on said support and when released allowing the shovel to turn on said support and discharge its load, and link-means hinged at its rear portion on the tractor and hinged at its forward portion to said shovel-support to rock such support and the shovel locked thereto during the elevation of the shovel, the novel improvement being that the locations of said hinge connections of said boom and of said link-means with the tractor and with the shovel-support cause the shovel to rock rearwardly relative to the boom during the initial upward travel of the shovel to full-load retaining height and to rock forwardly thereafter relative to the boom during further upward travel of the shovel to dumping elevation.

7. In a power-operated tractor-shovel of the type having a power-actuated forwardly-extended boom hinged at its rear portion on the tractor, a shovel-support hinged on the front portion of said boom, a shovel rockingly mounted on said support, a releasable lock when active preventing rocking of the shovel on said support and when released allowing the shovel to turn on said support and discharge its load, and link-means hinged at its rear portion on the tractor and hinged at its forward portion to said shovel-support to rock such support and the shovel locked thereto during the elevation of the shovel, the novel improvement being that the planes of said link-means and boom through the axes of their hinge connections with the tractor and with the shovel-support cross one another during the first portion only of the upward travel of the shovel, the shovel when unlocked discharging its load out of its forward end at the front of the tractor.

8. In a power-operated tractor-shovel of the type having a power-actuated forwardly-extended boom hinged at its rear portion on the tractor, a shovel-support hinged on the front portion of said boom, a shovel rockingly mounted on said support, a releasable lock when active preventing rocking of the shovel on said support and when released allowing the shovel to turn on said support and discharge its load, and link-means hinged at its rear portion on the tractor and hinged at its forward portion to said shovel-support to rock such support and the shovel locked thereto during the elevation of the shovel, the novel improvement being that the planes of said link-means and boom through the axes of their hinge connections with the tractor and with the shovel-support cross one another between the two hinge connections of the boom during the first portion only of the upward travel of the shovel, the shovel when unlocked discharging its load out of its forward end at the front of the tractor.

9. In a power-operated tractor-shovel of the type having a power-actuated forwardly extended boom, means hinging said boom at its rear portion on the tractor, a forwardly facing shovel and means rockingly mounting said shovel on the front portion of said boom to elevate and to lower the shovel with the upward and downward swinging of said boom, the novel combination of link-means, means hingedly connecting said link-means at its back portion on said tractor and at its front portion to said shovel, respectively, at points to rock the shovel automatically rearwardly during its initial elevation to full-load retention position before obstructing the forward vision of the tractor-operator and thereafter during the further elevation of the shovel to its maximum lift position automatically rocking the shovel forwardly sufficiently to compensate approximately for the tendency of the boom during such further ascent to rock the shovel rearwardly.

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