

Nov. 12, 1957

O. S. PERKINS ET AL

2,812,872

PULL SHOVEL EXCAVATOR.

Filed Oct. 5, 1954

4 Sheets-Sheet 1

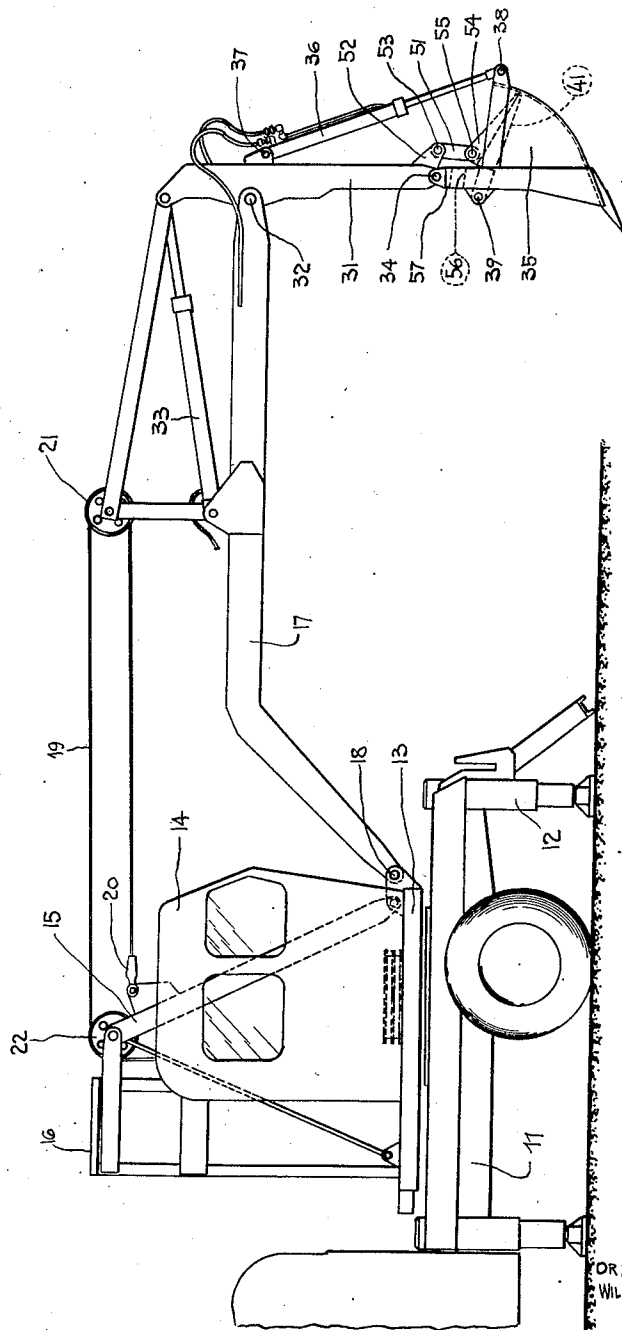


Fig. 1.

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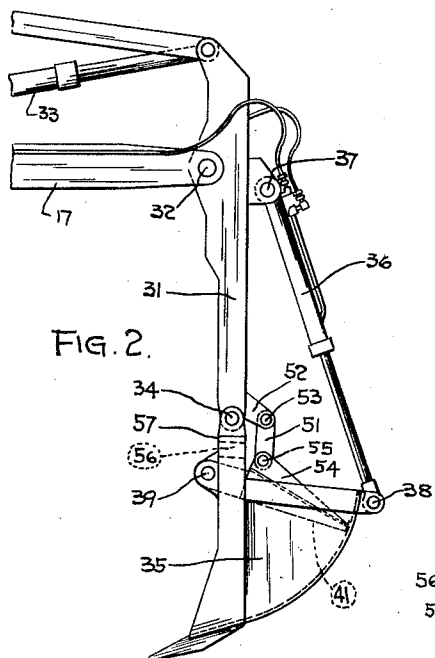


FIG. 2.

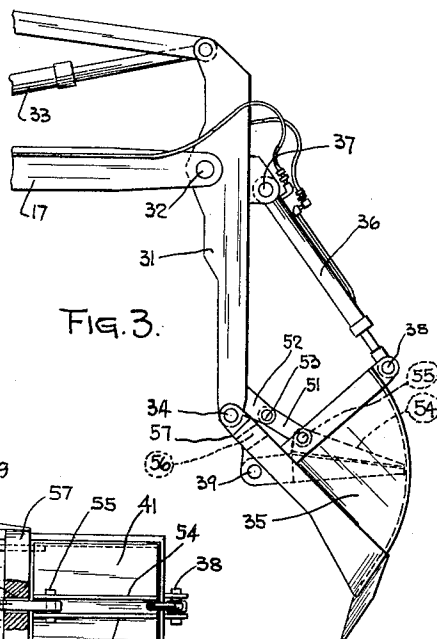


FIG. 3.

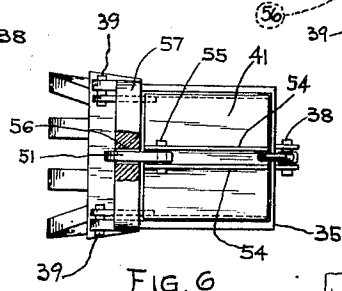


FIG. 6

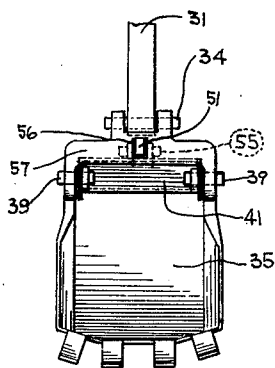


FIG. 5.

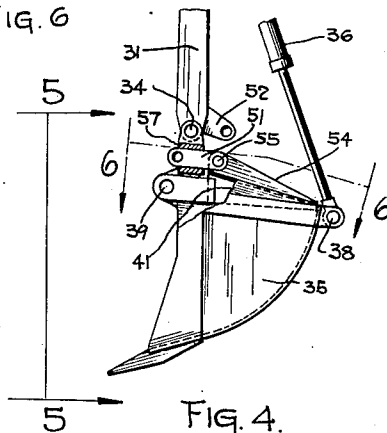


FIG. 4.

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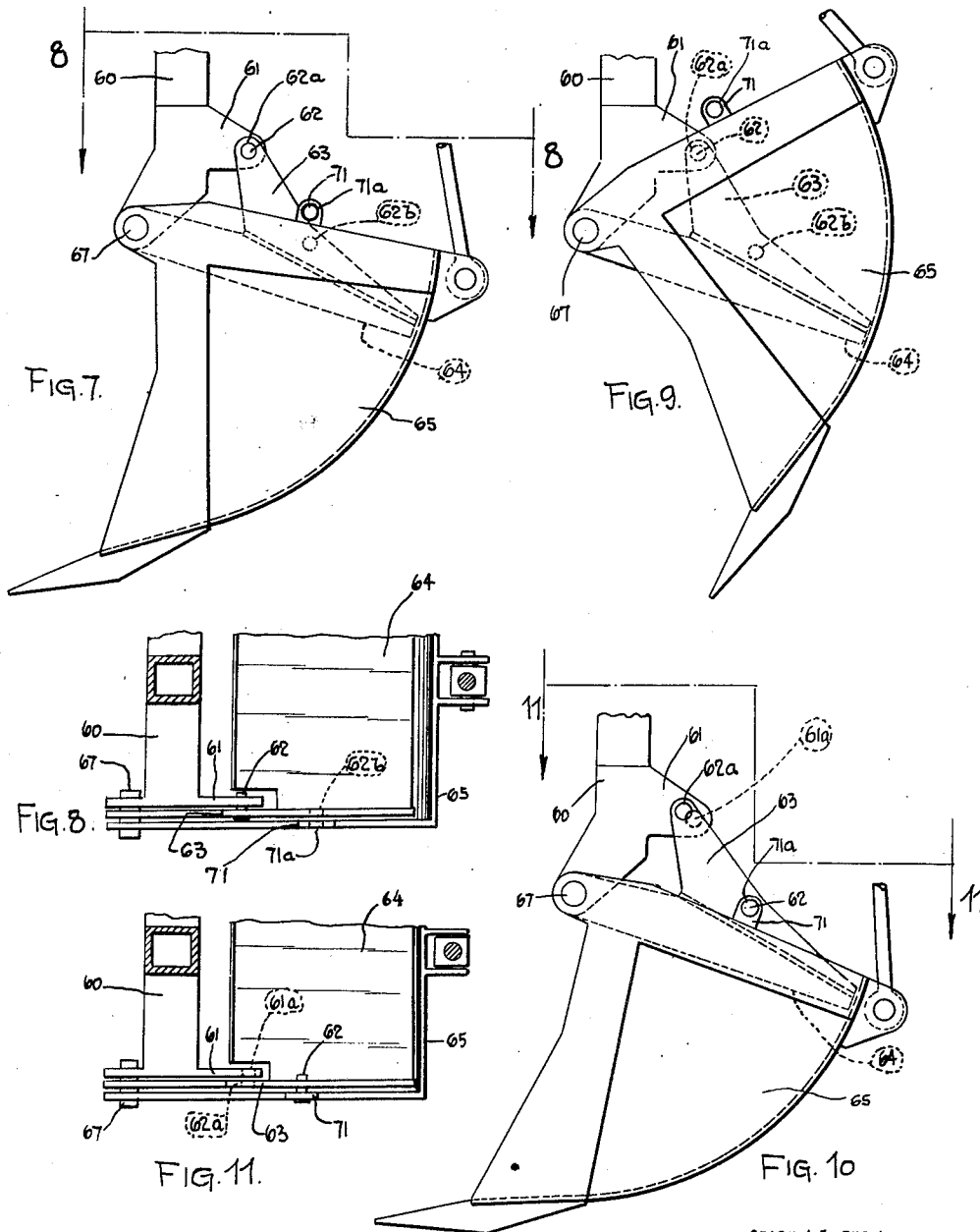
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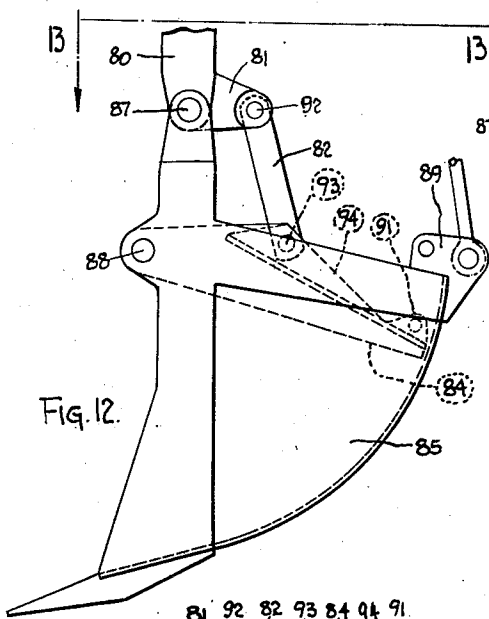
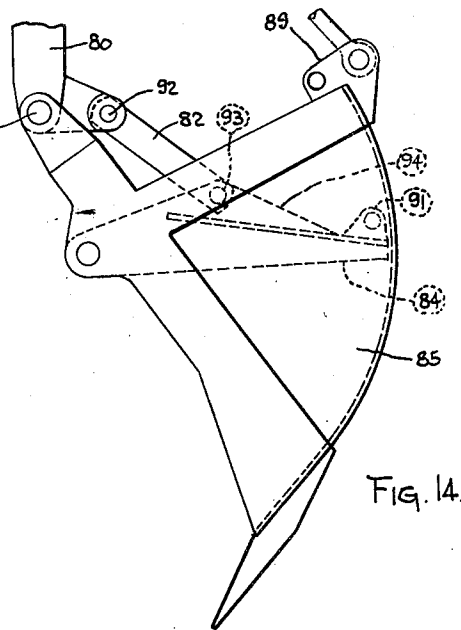
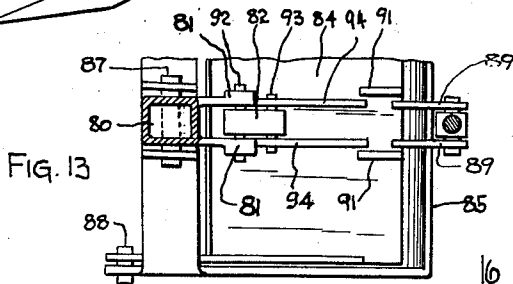
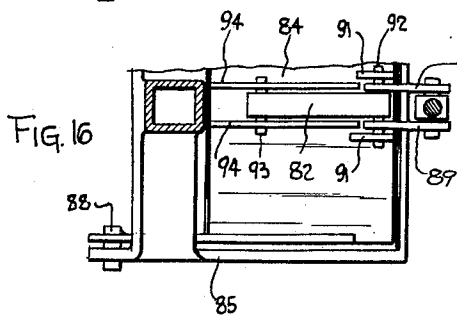
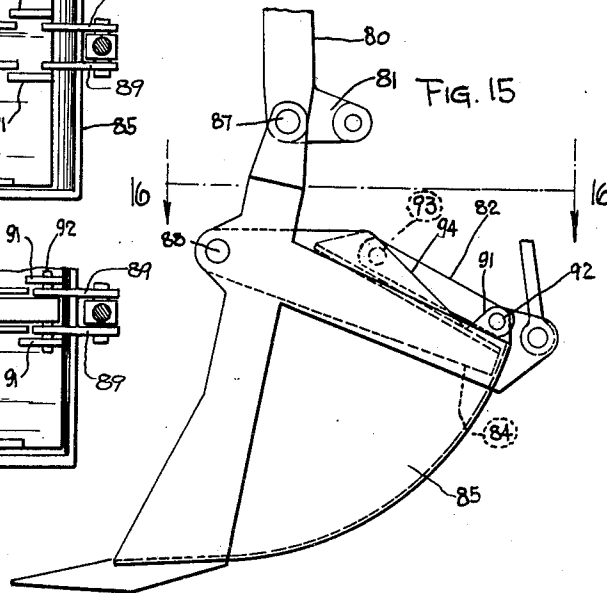
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PULL SHOVEL EXCAVATOR

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4 Sheets-Sheet 4



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PULL SHOVEL EXCAVATOR

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Application October 5, 1954, Serial No. 460,302

16 Claims. (Cl. 214—510)

This invention relates to dipper dumping mechanisms for pull shovel excavators.

Conventional pull shovel excavators consists of a means of locomotion; a rotating base mounting a boom, a dipper handle and a dipper; means for activating these elements to produce a digging action toward the excavator and to allow elevation and swing of the loaded dipper to remove the loaded dirt from the excavation; and means for dumping the dipper at a desired location.

To facilitate the removal of the dirt from the dipper an ejector is often used which is actuated either by independent control means or by means of a link or cam connection between the dipper handle and the dipper whereby ejection occurs automatically with dumping action of the dipper.

Such ejectors serve two important functions in pull shovel excavators. The eject sticky material from the interior of the dipper and they serve as a back for the dipper, preventing material from spilling out through the rear, thus increasing dipper capacity. Both of these functions are important to successful excavator action.

The separate manually-controlled ejector device produces ejection when it is desired, but increases the cost and functional complexity, and decreases efficiency. The fixed link or cam device produces the ejector action during a large part of the operating time of the excavator when no such action is needed.

For digging loose dirt or other non-sticky material only a fixed back wall for the dipper is needed, forcible ejection being actually needed less than 10% of the usual operating time. Ejection action during the remainder of the operating time merely results in unnecessary wear on the ejector and in ejector interference with filling the dipper.

Accordingly it is the principal object of this invention to provide a dipper adapted to function at will either with or without an ejector, the ejector functioning in the latter case as the rigid back wall of the dipper.

A further object is to provide a simple means for eliminating the ejector action on the dipper so that the excavator will be quickly and inexpensively adaptable to varied digging conditions.

A still further object is to reduce frictional wear in the ejector by providing a means for at will operating the ejector only when digging sticky dirt.

In addition to the principal objects above stated, there are a number of novel and useful details, which will be readily evident as the description progresses.

The invention consists in the novel parts and in the combination and arrangement thereof, which are defined in the appended claims, and of which three embodiments are exemplified in the accompanying drawings, which are hereinafter particularly described and explained. Throughout the description the same reference number is applied to the same member as to similar members.

Figure 1 is a general side elevation of the pull shovel excavator with dipper in a digging position and showing the first embodiment of the invention.

Figure 2 is an enlarged side elevation of a portion of

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Figure 1, showing the dipper-arm and dipper with dipper in a digging position and ejector actively connected to the dipper arm.

Figure 3 is an enlarged side elevation of the first embodiment, showing the dipper-arm and dipper with dipper in a dumping position and ejector actively connected to the dipper-arm.

Figure 4 is an enlarged side elevation of the first embodiment, showing the dipper in digging position with ejector inactively connected to the dipper.

Figure 5 is a front elevation of the dipper and dipper bail taken along the lines 5—5 of Figure 4.

Figure 6 is a plan view taken along the lines 6—6 of Figure 4.

Figure 7 is an enlarged side elevation of the second embodiment of the invention with dipper in a digging position and the dipper ejector actively connected to the dipper handle.

Figure 8 is a plan view taken along the lines 8—8 of Figure 7.

Figure 9 is an enlarged side elevation of the second embodiment of the invention showing the dipper in a dumping position and the ejector actively connected to the dipper arm.

Figure 10 is a side elevation of the second embodiment of the invention showing the dipper in a dumping position and the ejector actively connected to the dipper arm.

Figure 10 is a side elevation of the second embodiment showing the dipper ejector inactively connected to the sides of the dipper.

Figure 11 is a plan view taken along the lines 11—11 of Figure 10.

Figure 12 is a side elevation of the third embodiment of the invention with dipper in a digging position and the ejector actively connected to the dipper arm.

Figure 13 is a plan view taken along the lines 13—13 of Figure 12, showing the ejector actively connected to the dipper handle.

Figure 14 is a side elevation of the third embodiment of the invention showing the dipper in a dumping position and the ejector actively connected to the dipper-arm.

Figure 15 is a side elevation of the third embodiment of the invention showing the ejector inactively pinned to the dipper.

Figure 16 is a plan view taken along the lines 16—16 of Figure 15 showing the ejector inactively pinned to the dipper.

Referring now to Figure 1, we see that a typical excavator to which the invention may be applied consists of a truck 11, having an extendable outrigger mechanism 12, a flat revolving platform 13, upon which is revolvably mounted a control cab 14, an A-frame 15, a power-assembly 16, and a boom 17 extending from a pivot 18 on the revolving platform 13.

Boom 17 is supported by cable 19 which is dead-ended to the A-frame 15 at 20, passes around sheave 21 on boom 17 and over sheave 22 at the top of A-frame 15 and thence into a conventional hoist assembly (not shown) capable of raising and lowering boom 17.

A dipper handle 31 is pivotally mounted at 32 on the outer end of boom 17. The upper end of dipper-handle 31 is pivotally connected to power means, such as cylinder-piston assembly 33, which is preferably mounted on the boom and retracts and extends to cause the dipper handle 31 to rotate in a vertical plane about pivot 32. This illustrates one of a number of conventional means for producing a jackknife swinging action in the dipper arm of a pull shovel, this invention being equally applicable to pull shovels having any of such means.

Pivotally suspended from the lower end of dipper handle 31 by means of pivot 34 is dipper 35. An extensible and retractable dipper actuating mechanism is

operatively connected, preferably but not necessarily directly, at one end to the dipper handle or other suitable structure relative to which the dipper is adapted to move, and at the other end to the dipper, one form of which mechanism is illustrated by cylinder-piston assembly 36 pivotally connected to dipper handle 31 at 37 and to dipper 35 at 38. Hinged inside dipper 35 by means of ejector hinge pin 39 is an ejector 41, preferably but not necessarily in the form of a plate.

All of the foregoing is conventional, and for the purposes of the invention is merely illustrative of the apparatus to which any embodiment of the invention could be applied.

Referring now to Figures 1-6, which illustrate the first embodiment of the invention, it is seen that motion of ejector plate 41 relative to dipper 35 is constrained by a constraining means which includes a link 51 which is pivotally connected at one end to lugs 52 on dipper handle 31 by link pin 53 and at the other end to lugs 54 on the back of ejector plate 41 by pin 55.

When the ejector link 51 is thus connected at 53 and 55, and the dipper 35 is pivoted into digging position (Figures 1 and 2) by extension of dipper actuating cylinder-piston assembly 36, the ejector plate 41 is held by the ejector link 51 adjacent the back of dipper 35.

Then, when the dipper 35 is pivoted into a dumping position (Figure 3) by the retraction of dipper actuating cylinder-piston assembly 36, the dipper 35 pivots anticlockwise relative to the ejector plate 41 which is held approximately fixed relative to the dipper arm 31, so that it forcefully ejects the dirt from the dipper 35. This provides a simple automatically functioning means co-acting with cylinder-piston assembly 36 for ejecting sticky material from the dipper.

Dipper ejector link pins 53 and 55 are readily disconnectable, so that, when it is desired to connect the ejector plate 41 rigidly to dipper 35, to form a fixed back plate at the back of the dipper, ejector link 51 can be removed, and inserted through slot 56 in the bail 57 on dipper 35 as shown in Figures 4 to 6, and pinned to the ejector plate 41 by dipper ejector link pin 55. In this position, ejector link 51 serves as a key to lock the ejector plate 41 in a fixed relation to the dipper 35.

The second embodiment of this invention is shown in Figures 7 to 11. The pull shovel assembly is essentially the same as shown in Figures 1 to 6 except that the invention is now applied to a pull shovel in which the ejector is hinged on the pivot axis of the dipper and accordingly the constraining means for the ejector can be simplified as will now be described.

Referring to Figures 7 to 11, dipper 65 is pivotally suspended from dipper arm 60 by pivot pins 67, and ejector plate 64 is suspended inside dipper 65 by the same pivot pins 67 so that both dipper 65 and its ejector plate 64 pivot about a common axis.

Lugs 61 on dipper arm 60 have transverse holes 61a which are adapted to register with similar holes 62a in lugs 63 on ejector plate 64 to allow insertion of ejector plate pins 62 as shown in Figure 8. When ejector plate pins 62 are thus inserted, ejector plate 64 is rigidly secured in a fixed position relative to dipper-arm 60. Accordingly, as dipper 65 is pivoted anticlockwise about pivot pins 67 (Figure 9) ejector plate 64 ejects sticky materials from inside dipper 65.

Ejector plate pins 62 are readily disconnectable, and when ejector action is not desired these pins can be removed and inserted through holes 62b in ejector plate lugs 63 and aligned holes 71a in dipper lugs 71, with the ejector plate in position at the back of the dipper, to form a rigid pin connection between dipper-ejector plate 64 and dipper 65, as shown in Figure 11.

Thus the removable pin connection between lugs 61 and lugs 63 constitutes, in the second embodiment, constraining means operatively connected to the ejector plate

at a point spaced from the pivotal support of said ejector plate, and having a disconnectable operative connection to the dipper handle at a point spaced from the pivotal connection of the dipper to the dipper handle, and the alternative pin connection between lugs 63 and lugs 71 constitutes means for alternatively securing said ejector plate rigidly to said dipper.

A third embodiment of this invention is shown in Figures 12 to 16. The pull-shovel assembly is essentially the same as shown in Figures 1 to 6 except that the slot 56 in the dipper bail has been eliminated, the function of this means being otherwise performed as shown by the following description.

Referring to Figures 12 to 16, dipper 85 is pivotally suspended from dipper-arm 80 by pivot pin 87 in a manner similar to the dipper suspension in the first embodiment. Hinged inside dipper 85 by means of ejector pivot pins 88 is ejector plate 84. Ejector link 82 is pivotally connected at one end to lugs 81 on the dipper handle 80 by means of dipper ejector link pin 92, and at the other end to lugs 94 on the back of ejector plate 84 by means of ejector link pin 93. When the ejector link pin is thus connected, and dipper 85 is pivoted into digging position (Figure 12), the ejector plate 84 is held by ejector link 82 adjacent the back of dipper 85.

When dipper 85 is pivoted into a dumping position (Figure 14) the dipper is pivoted anticlockwise relative to the ejector plate by ejector link 82, so that the ejector plate forcefully ejects dirt from the dipper.

Dipper-ejector link pin 92 is readily disconnectable, so that, when it is desired to connect the ejector plate 84 rigidly to the dipper 85 to form a fixed back plate at the back of the dipper, ejector plate link 82 can be disconnected from dipper handle lugs 81, ejector plate 84 pivoted about its hinge pins 88 into position at the back of dipper 85 for connection with lugs 89 on the back of dipper 85 by pin 92 as shown in Figure 16, and link 82 pivoted about pin 93 into position for connection likewise with lugs 89 by insertion of pin 92. In this position connecting pin 92 holds ejector link 82 securely in an inactive position on the top of ejector plate 84, and by connecting lugs 89 with lugs 91, holds ejector plate 84 rigidly to dipper 85. This construction has the advantage, as a means for alternatively securing the ejector plate to the dipper, that it obviates removal of link 82 and hence reduces time required to change from an active to an inactive ejector plate connection.

It can be seen that the above-described three embodiments produce a simple means for at will alternatively connecting the ejector plate either (1) actively to the dipper handle, or (2) inactively to the dipper to form a fixed back for the dipper.

Having now described and illustrated three forms of the invention, it is to be understood that the invention is not to be limited to the specific forms or arrangement of parts herein described and shown, or specifically covered by the claims.

What is claimed is:

1. In a pull shovel having a main frame and a boom supported thereby, the combination of: a dipper handle connected to said boom for jackknife swinging movement; a dipper pivotally connected to the lower portion of said dipper handle; extensible and retractable means operatively connected to the dipper and to the dipper handle for rotating said dipper in a vertical plane about the pivotal connection of said dipper to said dipper handle; an ejector plate for said dipper pivotally connected to the dipper adjacent the forepart of said dipper; constraining means operatively connected to the ejector plate at a point spaced from the pivotal support of said ejector plate, and having a disconnectable operative connection to the dipper handle at a point spaced from the pivotal connection of the dipper to the dipper handle; and means for alternatively securing said ejector plate rigidly to said dipper.

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2. A pull shovel according to claim 1, further characterized by the fact that the ejector plate and the dipper pivot on a common axis, and that the constraining means at will rigidly connects said ejector plate to said dipper handle.

3. A pull shovel according to claim 2, further characterized by the fact that the constraining means includes a removable pin connection between rigid elements on the dipper handle and the ejector plate.

4. A pull shovel according to claim 3, further characterized by the fact that the means for alternatively securing the ejector plate to the dipper includes a removable pin connection between rigid elements on the dipper and the ejector plate at a point spaced from the pivotal support of the ejector plate.

5. A pull shovel according to claim 1, further characterized by the fact that the means for alternatively securing the ejector plate to the dipper includes a removable pin connection between rigid elements on the dipper and the ejector plate at a point spaced from the pivotal support of the ejector plate.

6. A pull shovel according to claim 1, further characterized by the fact that when the ejector-plate is operatively connected to the dipper-handle the constraining means fixes the ejector plate adjacent the back of the dipper when the dipper is in digging position and substantially forwardly thereof with respect to said dipper when the dipper is in dumping position.

7. A pull shovel according to claim 1, further characterized by the fact that the ejector plate is pivotally connected to the dipper to pivot about an axis adjacent the forepart of the dipper and adjacent the pivot axis of the dipper on the dipper handle, and that the constraining means includes a link pivotally connected to the ejector plate and to the dipper handle.

8. A pull shovel according to claim 7, further characterized by the fact that the pivotal connection of the link to the dipper handle is disconnectable, so that the link can be alternatively secured to the dipper.

9. A pull shovel according to claim 1, further characterized by the fact that the constraining means includes a link pivotally connected to the ejector plate and to the dipper handle, and that the means for alternatively securing the ejector plate rigidly to the dipper includes a pin connection between said link and a rigid element on the dipper.

10. A pull shovel according to claim 1, further characterized by the fact that the constraining means includes a link pivotally connected to the ejector plate and to the dipper handle, and that the means for alternatively securing the ejector plate rigidly to the dipper includes a slot in the bail of the dipper adapted to engage said link when the link is inserted therein as a latch to secure the ejector plate to the dipper.

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11. In a pull shovel the combination of: a main frame and power assembly thereon; a boom supported by the main frame; a dipper handle pivotally mounted on the boom; a dipper pivotally suspended adjacent the lower end of the dipper handle; power-actuated means operatively connected to the dipper for pivoting the dipper in an arc about its pivotal connection with the dipper handle; a transverse ejector member associated with said dipper; disconnectable means operatively connecting the ejector member to the dipper handle and operable by pivoting of the dipper to automatically position the ejector member adjacent the back of the dipper when the dipper is pivoted from dumping into digging position and forwardly thereof when the dipper is pivoted from digging into dumping position; and means for alternatively connecting the ejector member to the dipper to rigidly secure the ejector member to the dipper in a position adjacent the back thereof when said disconnectable means is disconnected.

12. A pull shovel according to claim 11, further characterized by the fact that the ejector member is pivotally connected to the dipper to pivot about an axis spaced from the pivot axis of the dipper on the dipper handle, and that the disconnectable means includes a link operatively connected to the ejector member and to the dipper handle, the connection of the link to the dipper handle being disconnectable, so that the link can be alternatively secured to the dipper.

13. A pull shovel according to claim 12, further characterized by the fact that the means for alternatively securing the ejector member to the dipper comprises a pin connection between said link and a rigid element on the dipper.

14. A pull shovel according to claim 11, further characterized by the fact that the ejector member and the dipper handle pivot on a common axis and that the disconnectable means when connected rigidly connects the ejector member to the dipper handle.

15. A pull shovel according to claim 14, further characterized by the fact that the disconnectable means includes a removable pin connection between rigid elements on the dipper handle and the ejector member.

16. A pull shovel according to claim 11, further characterized by the fact that the means for alternatively securing the ejector member to the dipper includes a removable pin connection between rigid elements on the dipper and the ejector member.

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