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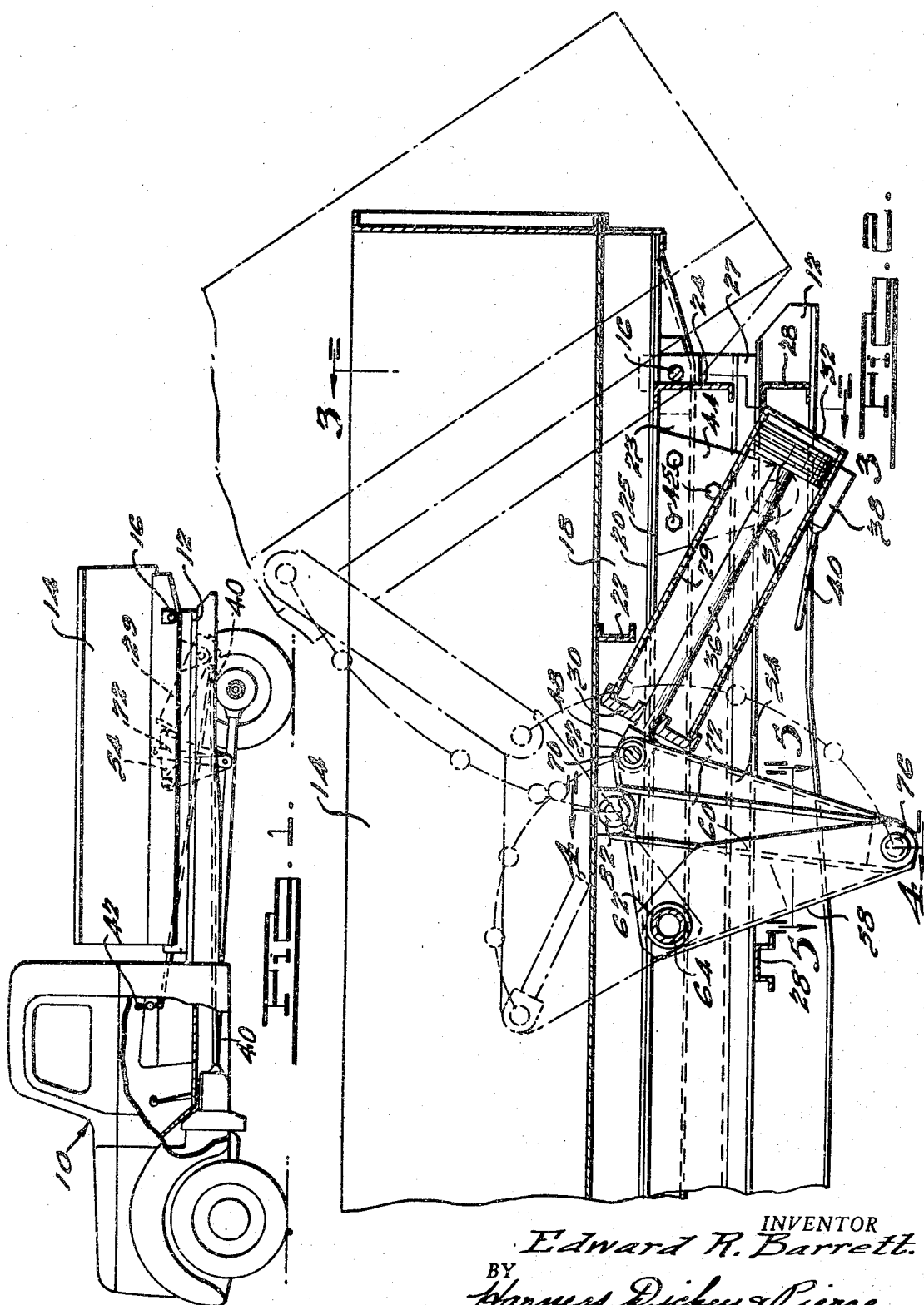
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HYDRAULIC HOISTING MECHANISM

Filed April 22, 1940

3 Sheets-Sheet 1



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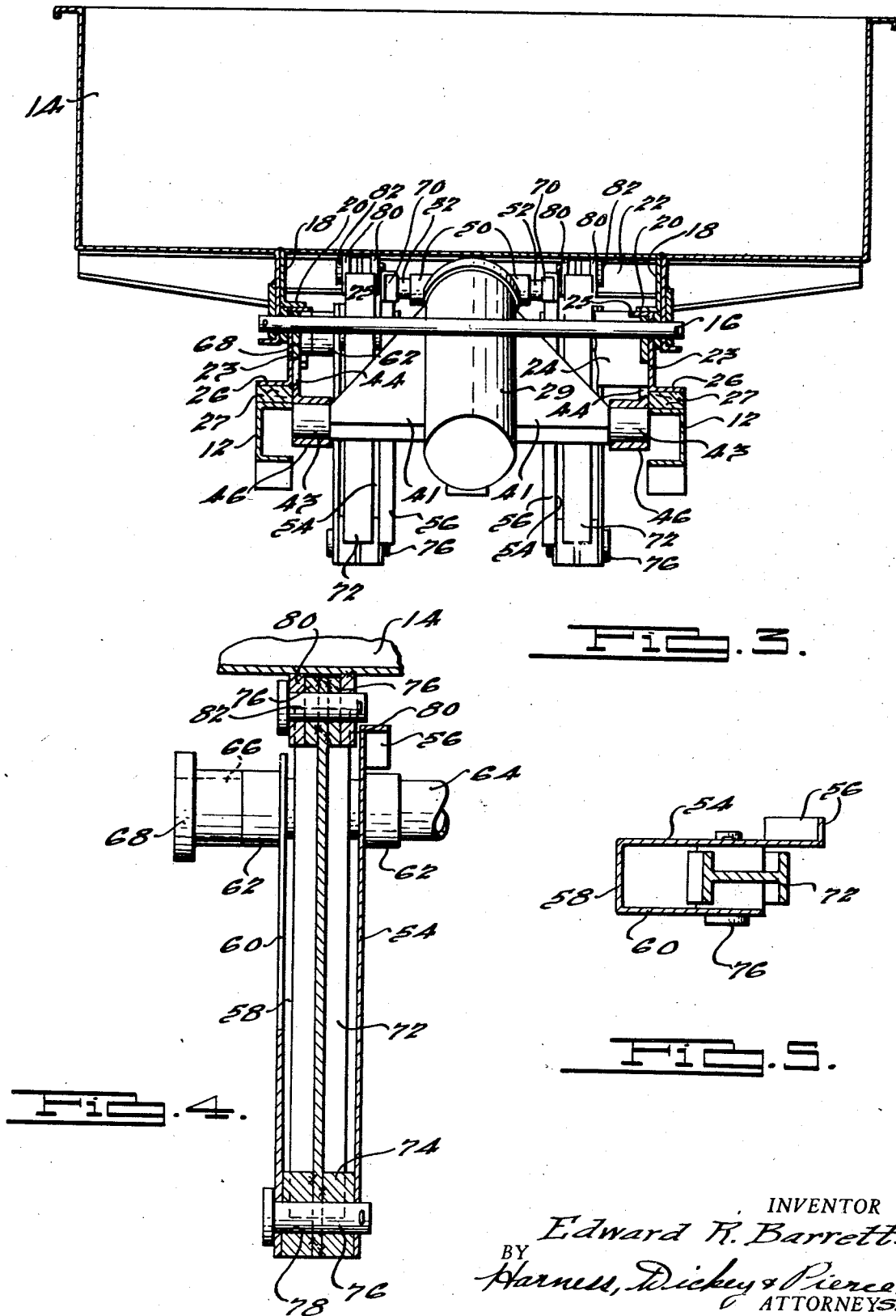
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HYDRAULIC HOISTING MECHANISM

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3 Sheets-Sheet 2



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HYDRAULIC HOISTING MECHANISM

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3 Sheets-Sheet 3

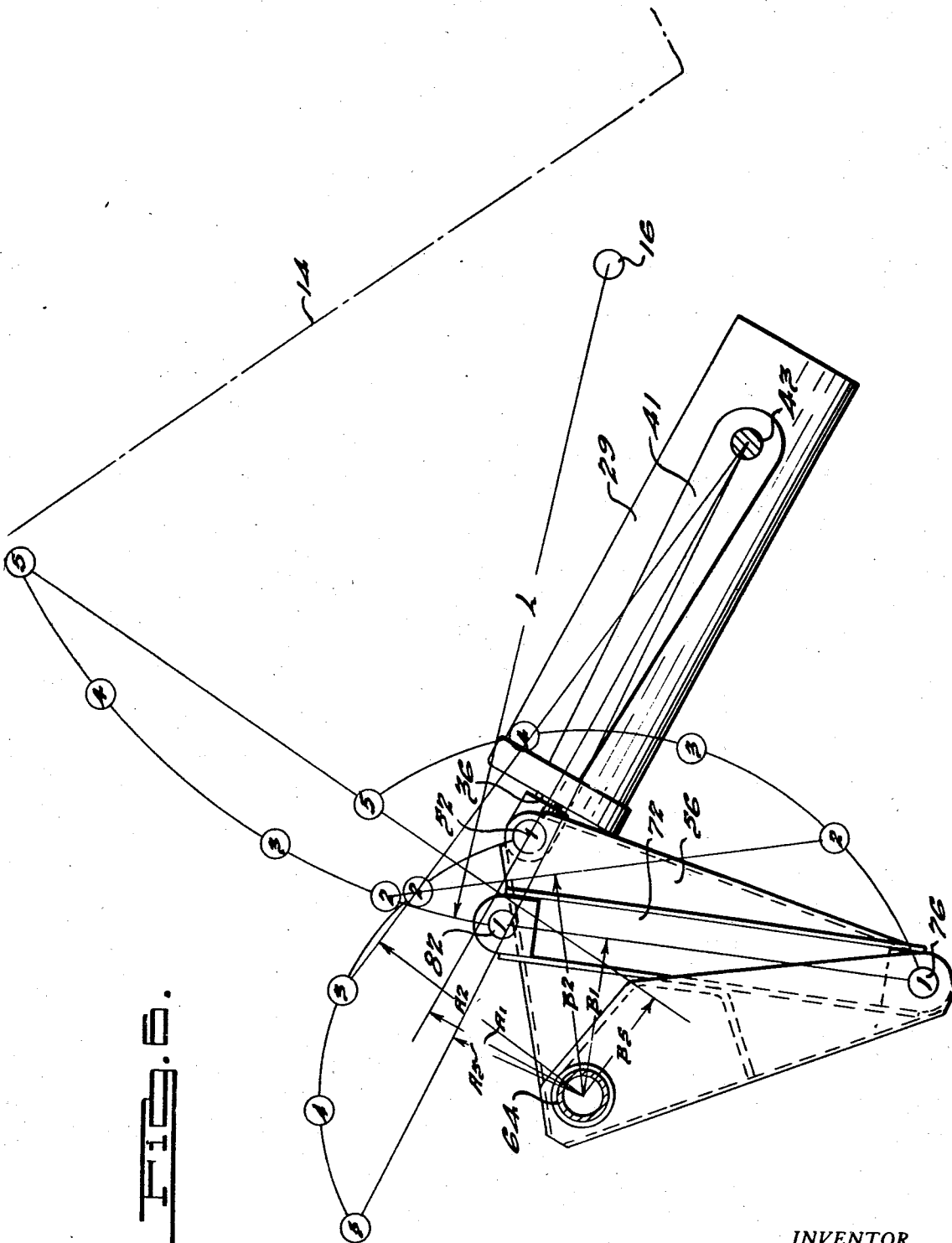


FIG. 6.

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HYDRAULIC HOISTING MECHANISM

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Application April 22, 1940, Serial No. 330,916

9 Claims. (Cl. 298—22)

The present invention relates to motor vehicles and particularly relates to hoisting mechanisms for tilting a tiltable truck body about the chassis of a truck.

5 One of the primary objects of the present invention is to provide a simplified and improved hoisting mechanism which is adapted for use on the various makes of trucks, for various length bodies, and for variant loads carried by such trucks.

10 Another object of the invention is to provide improved hoisting mechanisms which are adapted for commercial use over a wide range of loads, both as to weight and the density of the material making up the load.

15 Another object of the invention is to provide an improved hoisting mechanism which is simple in construction in that few parts are required and yet which will produce a long lever arm and multiplied leverage in order to readily perform the difficult tasks required of such constructions.

20 A further object of the invention is to provide an improved, heavy duty, hydraulic hoisting mechanism with the thrust point of the plunger on a leverage member connected to the body by an arm, in which the thrust point goes up over the top of the pivot of the leverage member, clearance for the swing of the thrust point on a longer lever, than in prior constructions, being made possible because of the arrangement of the hoist cylinder so that the thrust point follows the body upwardly.

25 Another object of the invention is to provide an improved mechanism of the type mentioned in which an improved angular relationship of the lever members of the mechanism is provided when in the starting position so that the depending arm of a bell-crank arrangement is downwardly and rearwardly so that its movement up to tilt the body does not have the arm and link so far toward the hinge point of the body, thereby improving the lever arm about the hinge point.

30 Another object of the invention is to provide an improved, hydraulic hoisting mechanism in which uniform applied pressures may be utilized for the various positions of the hoisting elements as the body is raised from horizontal to dump position.

35 Other objects of the invention will become apparent from the following specification, the drawings relating thereto, and from the claims hereinafter set forth.

40 In the drawings in which like numerals are used to designate like parts in the several views throughout:

Figure 1 is a side elevational view of a dump truck having hoisting means in accordance with the present invention associated therewith;

Fig. 2 is an enlarged, fragmentary, vertical cross-sectional view of the chassis, dump body, 5 and hoisting mechanism, illustrated in Fig. 1;

Fig. 3 is a cross-sectional view taken substantially along the line 3—3 of Fig. 2;

Fig. 4 is an enlarged cross-sectional view taken substantially along the line 4—4 of Fig. 2; 10

Fig. 5 is an enlarged cross-sectional view taken substantially along the line 5—5 of Fig. 2; and

Fig. 6 is a diagrammatic view illustrating the action of the hoisting mechanism according to the present invention. 15

Referring to the drawings, a dump truck is generally indicated at 10 having a chassis 12 and a body 14 pivotally mounted with respect to the chassis about transversely aligned pivot pins 16, located adjacent the rear end of the chassis. 20

The body 14 is formed with longitudinally extending frame members 18, which are provided with inwardly directed, substantially horizontal flanges 20 along the lower edges thereof. Transversely extending channel-shaped members 22 are 25 secured to the body and form part of the body frame at longitudinally spaced points.

The chassis 12 has a unit hoisting frame of generally rectangular shape fixed thereto which includes longitudinally extending sill members 23 30 of Z-cross-section which are connected by transversely extending channel-shaped members 24 thus providing a unitary rectangular frame. The members 23 are provided with inwardly disposed top flanges 25 which are adapted to underlie the 35 flanges 20, so that such flanges 20 rest on the flanges 25 when the body is in its lowermost or horizontal position.

The unit hoisting frame is disposed on and fixed to the chassis 12 and the lower flanges 26 40 of members 23 rest upon and are secured to longitudinally extending sill members 27 which are secured to the chassis 12 in the relationship as illustrated in Fig. 3.

The chassis 12 also includes transversely extending frame members, such as those indicated at 28 in Fig. 2. The various makes of conventional trucks include these frame members, above described, in substantially the positions indicated in the drawings. 50

Hoisting mechanisms for tilting the body with respect to the chassis are disposed under the body and it will be evident that very little room is present for the accommodation of such hoisting mechanism. According to the present invention, 55

an hydraulic hoisting mechanism is provided which is readily accommodated to the space permitted, the operation of which will not be interfered with by the conventional frame elements on the various makes of trucks. The hoisting mechanism of the present invention may, therefore, be applied to all of the various makes of trucks without the necessity of making any alterations in the truck structure, or any special modifications in the hoisting mechanism. At the same time the hoisting mechanism is adapted for handling various types of loads. The dumping of coal, which has a relatively low density, is a different matter from the dumping of gravel, which has a relatively high density. When a truck is carrying coal and is loaded with its weight capacity, the center of gravity of the load is relatively high, while in handling gravel under the same conditions the center of gravity of the load is relatively low. The structure of the present invention is adapted for handling these various types of loads by a single installation.

The hoisting mechanism of the present invention includes a power driven reciprocating element and linkage means connecting the reciprocating element to the body, so that upon the power stroke of such element in one direction, the body is caused to tilt upwardly about its pivots 16. The power means and the linkage means are so disposed that the power thrust of the power means is toward the front of the body or away from the pivot point 16; and the linkage means are so constructed and arranged with respect to the chassis, body and power means that long lever arms and multiplied leverage is present in order to readily perform the hoisting or lifting operations of the truck body to dump the load.

The power means includes an hydraulic cylinder 29 having a cap 30 closing one end thereof and having the opposite end closed as indicated at 32. A piston 34 is disposed within the cylinder and has a co-axial piston rod 36 which slidably extends through an opening in the cap 30 and projects therebeyond. Power for the cylinder is provided by a conventional gear pump 38, which is fixedly mounted with respect to the cylinder 29 and is connected through a flexible drive shaft 40 to a power take off of the engine. A control 42 is operatively connected to the cylinder and associated with the pump in order to operate the same.

The cylinder 29 has opposed reservoir wings 41 extending longitudinally thereof and rigidly connected thereto. Such wings 41 are generally triangular in shape with the apexes thereof extending toward the cap end of the cylinder 29 and with oppositely disposed aligned trunnions 43 fixedly connected to the outside of the wings 41 adjacent the bases thereof. The power means per se forms no part of the present invention and it will be appreciated that it may be of other forms than that illustrated but is preferably of the type here illustrated and disclosed in detail and claimed in the co-pending application of Edward R. Barrett, Serial No. 308,304, filed December 8, 1939.

The rear and lower end of the cylinder 29 is pivotally mounted to the hoist frame unit by means of the trunnions 43. Depending brackets 44 are suitably secured to the members 23 at oppositely disposed points by means of bolts, rivets or the like as indicated at 45; and such brackets are formed with integral hub portions 46 ad-

jacent the lower ends thereof which journal the trunnions 43.

The forwardly projecting end of the piston rod 36 is fixedly connected to a T-connection 48 having laterally projecting portions 50 provided with reduced end bearing members 52. The bearing portion 52 provides pivots for pivotally connecting the piston rod to a pair of similar elements of the linkage means, as will be pointed out in greater detail hereinafter.

The linkage means include a pair of transversely spaced leverage members 54, which are in effect bell-crank members, as will be appreciated from the following description, having flanges 56 formed along the top and front edges thereof for the purpose of stiffening and strengthening the same. Each of such members 54 has a portion 58 bent outwardly along the rear edge thereof, the outer edge of which is then bent parallel to the major portion of the member 54 as indicated at 60. The portions 54, 58, and 60 thus provide a U-shaped pocket of the leverage member with the portion 58 forming the base or bight of the U and the portions 54 and 60 lying substantially parallel to each other. The portion 60 is smaller than the portion 54 and has a configuration such as that shown in Fig. 2.

The portions 54 and 56 are provided with integral hub elements 62 through which a transversely extending, tubular pivot shaft 64 extends. The member 64 extends through the hub 62 and aligned openings in members 54 and 60 in the leverage members on both sides of the hoisting means and projects outwardly beyond each end thereof as indicated at 66. The projecting ends 66 are pivotally received within bearing brackets 68 which are fixedly secured to the member 23 of the hoist frame at transversely aligned points. The leverage members 54 are thus pivotally mounted with respect to the hoist frame and with respect to the chassis.

The members 54 are generally triangular in shape with the pivot 64 located adjacent the forward corner of the triangle. Bearing sleeves 70 are fixedly secured, as by welding, to the upper rearward corners of members 54 and pivotally receive therein the pivots 52 so that the piston rod 36 is thus pivotally connected to the members 54. The construction is preferably such that the pivot point 52 is located above the pivot 64 when the body is in its lowermost position.

The member 64 is preferably fixedly connected to the hub 62 so that both of the linkage means will move together during the raising and lowering of the body.

Each of the members 54 is connected to the body 14 by means of a linkage arm. Such linkage arm is indicated at 72 and is of I-section with integral hub members 74 and 76 welded to the lower and upper ends, respectively, thereof. The lower end of linkage arm 72 is connected to its corresponding leverage member 54 by means of a pivot pin 76 which passes through aligned openings in portions 54 and 60 and through a pivot opening 78 formed in the member 72 and in the hub 74. The arm 72 is thus pivotally connected to the lower corner of the member 54 between portions 54 and 60.

The body 14 has depending bearing brackets 80 welded to the under surface thereof adjacent the top of each arm 72; and the hubs 76 are adapted to be received therebetween for pivotally connecting the upper ends of the arms 72 to the body by means of a pivot pin 82 which is received through aligned openings in the bear-

ings bracket 80, the member 72 and the hub portion 76.

From the above description, it will be seen that the leverage elements 54 are mounted on the chassis at pivot points 64 and that the linkage arms 72 are pivotally mounted on the body at pivot points 82 and are pivotally connected to the members 54 at pivot points 76.

Referring to Figure 6, the essential elements of the hoisting mechanism are diagrammatically illustrated showing the relationship between the various elements as the body is raised from its horizontal to its uppermost dumping positions. Such positions are indicated by the numerals 1 through 5 in the circles for those pivot points which move during the tilting operation. L represents the lever arm between the point of thrust of the arm 72 against the body and the pivot point 16. By the present invention, it will be appreciated that a long and, therefore, advantageous leverage arm is thus provided as compared with prior constructions. The numeral 14 represents the position of the body floor when the body is in its uppermost position.

The pivot point 64 remains fixed throughout the tilting and the pivot points 52, 82, and 76 traverse the arcs illustrated.

When the body is in its lowermost or horizontal position, the elements are in the positions shown in full lines, and it will be seen that the pivot point 52 is above the pivot point 64. The pivot point 82 is also slightly above pivot point 52. This permits a relatively long arm between pivots 52 and 64 so that a mechanical advantage is obtained during the initial periods of hoist. The effective leverage arm for the thrust of piston rod 36 is illustrated at A1 and the leverage arm for the body in its resistance to raising is illustrated at B1. It will thus be seen that the leverage arm A1 is greater than the leverage arm B1 so that a mechanical advantage is thereby obtained. Corresponding leverage arms are indicated for the corresponding positions as A2, A5, B2, and B5. In moving from position 1 to position 2, the mechanical advantage is increased as will be evident by comparison of the effective leverage arms A2 and B2. While toward the later stages of dumping, the thrust does not have a mechanical advantage, it will be appreciated that at this time a portion of the load has already been dumped so that the force required to tilt the body is less.

It will also be seen that the hoisting mechanism is disposed between the cross-members 28 and above the rear axle. The cross-members are substantially equally spaced on opposite sides of the rear axle of the truck. The members 54 are fulcrumed to the frame above the front member 28 and the dump body is hinged above the rear member 28. These relationships are important in improving the lifting lever arm about the hinge point 16.

It has been found in the use of the structure of the present invention that extremely heavy loads may be readily and rapidly dumped. It will be appreciated that the structure of the present invention is extremely simple in that very few parts are required and such parts in themselves are of a simple character. An economical structure which may be applied to conventional trucks within the limited space allowed is thereby provided.

Formal changes may be made in the embodiment of the present invention without departing from the spirit and substance of the invention,

the scope of which is commensurate with the appended claims.

What is claimed is:

1. Apparatus for tilting the body of a dump truck comprising, in combination, a truck chassis, a tiltable body, means pivotally connecting said body to said chassis, a hoisting device having one end pivotally connected to said chassis and including a reciprocable power driven element, and means connecting said element with said body, said last-named means including leverage means pivotally connected to said chassis, linkage means pivotally connected to said body, means pivotally connecting said linkage means and said leverage means together, and means pivotally connecting said element to said leverage means, the arrangement of said element, said leverage means, said linkage means and their respective pivotal connections with each other and with the point of pivotal connection of said body with the chassis being such that the power stroke of said element is away from the point of pivotal connection of said body with said chassis and is above the point of pivotal connection of said leverage means with said chassis.

2. Apparatus for tilting the body of a dump truck comprising, in combination, a truck chassis, a tiltable body, means pivotally connecting said body to said chassis, a hoisting device having one end pivotally connected to said chassis and including a reciprocable power driven element, and means connecting said element with said body, said last-named means including leverage means pivotally connected to said chassis, linkage means pivotally connected to said body, means pivotally connecting said linkage means and said leverage means together, and means pivotally connecting said element to said leverage means, the arrangement of said element, said leverage means, said linkage means and their respective pivotal connections with respect to each other and to the point of said pivotal connection of said body with said chassis being such that the direction of the power stroke of said element is away from said point of pivotal connection of said body with said chassis and toward and above the point of pivotal connection of said leverage means with said chassis.

3. Apparatus for tilting the body of a dump truck comprising, in combination, a truck chassis, a tiltable body, means pivotally connecting said body to said chassis, a hoisting device having one end pivotally connected to said chassis and including a reciprocable power driven element, and means connecting said element with said body, said last-named means including leverage means pivotally connected to said chassis, linkage means pivotally connected to said body, means pivotally connecting said linkage means and said leverage means together, means pivotally connecting said element to said leverage means, the arrangement of said element, said leverage means and said linkage means and their respective pivotal connections with respect to each other and with the point of pivotal connection of said body to said chassis being such that the point of pivotal connection of said element with said leverage means is above the point of pivotal connection of said leverage means with said chassis when the body is in its initial substantially horizontal position and the power stroke of said element is away from the point of pivotal connection of said body with said chassis.

4. Apparatus for tilting the body of a dump truck comprising, in combination, a truck chassis, 75

a tiltable body, means pivotally connecting said body to said chassis, a hoisting device having one end pivotally connected to said chassis and including a reciprocable power driven element, and means connecting said element with said body, said last-named means including leverage means pivotally connected to said chassis, linkage means pivotally connected to said body, means pivotally connecting said linkage means and said leverage means together, and means pivotally connecting said element to said leverage means, the arrangement of said element, said leverage means, said linkage means and their respective pivotal connections with each other and with the point of pivotal connection of said body with the chassis being such that the power stroke of said element is away from the point of pivotal connection of said body with said chassis, and the point of pivotal connection of the element with the leverage means is above the point of pivotal connection of the leverage means with the chassis and below the point of pivotal connection of the linkage means with the body when the body is in its normal substantially horizontal position.

5. Apparatus for tilting the body of a dump truck comprising, in combination, a truck chassis, a tiltable body, means pivotally connecting said body to said chassis, a hoisting device having one end pivotally connected to said chassis and including a reciprocable power driven element, said hoisting device being so positioned that the power stroke of said element is away from the point of said pivotal connection of the body with said chassis, and linkage means connecting said element with said body, said linkage means comprising a leverage member, means pivotally connecting said element to said leverage member at a point above the point of pivotal connection of said leverage member with said chassis and between such last named point and the point of pivotal connection of the body to said chassis, and a linkage arm pivotally connected to said body and pivotally connected to said leverage member at a point below the point of pivotal connection of said leverage member with said chassis.

6. In a dump truck, a frame comprising side members, front and rear cross members, said cross members being substantially equally spaced on opposite sides of the rear axle of said truck, a dump body hinged on the frame near the said rear cross member, a bell crank fulcrumed in the frame over the said front cross member, a depending arm of said bell crank extending below the truck frame and to the rear of said front cross member, a link connecting the said depending arm of the bell crank to the body, a second rearwardly and upwardly extending arm of said bell crank pivotally connected to a prime mover, said prime mover being so arranged that its power stroke is away from the body hinge thereby causing the said leverage means including the link and the bell crank to swing with maximum body lifting effect within the confines of the said front and rear cross members and within the confines of the frame side members and the bottom of the body.

7. In a dump truck having a chassis frame and

a dump body, a bell crank lever swingably mounted in the chassis frame and having a downwardly and rearwardly extending arm, a link connected to the body and to the arm, a prime mover connected to an upwardly and rearwardly extending arm on said bell crank lever to effect a substantially vertical arcuated movement of the first mentioned arm with a corresponding vertical thrust of the said link against the body, during the early stages of its movement.

8. Apparatus for tilting the body of a dump truck comprising, in combination, a truck chassis, a tiltable body, means pivotally connecting said body to said chassis, a hoisting device having one end pivotally connected to said chassis and including a reciprocable power driven element, and means connecting said element with said body, said last-named means including leverage means pivotally connected to said chassis, linkage means pivotally connected to said body, means pivotally connecting said linkage means and said leverage means together, and means pivotally connecting said element to said leverage means, the arrangement of said element, said leverage means, said linkage means and their respective pivotal connections with each other and with the point of pivotal connection of the body with the chassis being such that the power stroke of the element is away from the point of pivotal connection of said body with said chassis and above the point of pivotal connection of said leverage means with said chassis and such that the effective leverage arm for the thrust of the element about the point of pivotal connection of said leverage means with said chassis is greater than the effective leverage arm for the body in its resistance to raising about the point of pivotal connection of said leverage means with said chassis at the initial stages of tilting.

9. Apparatus for tilting the body of a dump truck comprising, in combination, a truck chassis, a tiltable body, means pivotally connecting said body to said chassis, a hoisting device having one end pivotally connected to said chassis and including a reciprocable power driven element, and means connecting said element with said body, said last-named means including leverage means pivotally connected to said chassis, linkage means pivotally connected to said body, means pivotally connecting said linkage means and said leverage means together, and means pivotally connecting said element to said leverage means, the arrangement of said element, said leverage means, said linkage means and their respective pivotal connections with each other and with the point of pivotal connection of said body with the chassis being such that the power stroke of said element is away from the point of pivotal connection of said body with said chassis and above the point of pivotal connection of said leverage means with said chassis and the point of pivotal connection of said element with said leverage means moves upwardly and away from the point of pivotal connection of said body with said chassis when said body is tilted.

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