Feb. 21, 1950 F. BISZANTZ 2,497,844

HOIST MECHANISM FOR DUMP TRUCKS

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FIG. 1

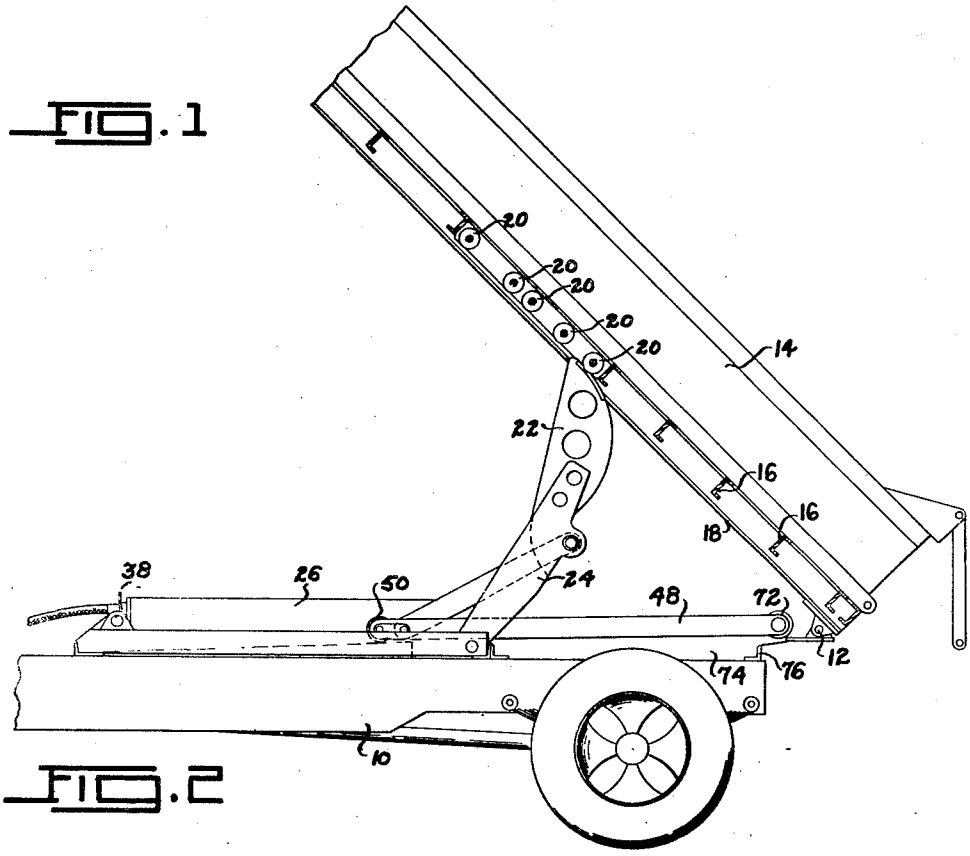

FIG. 2

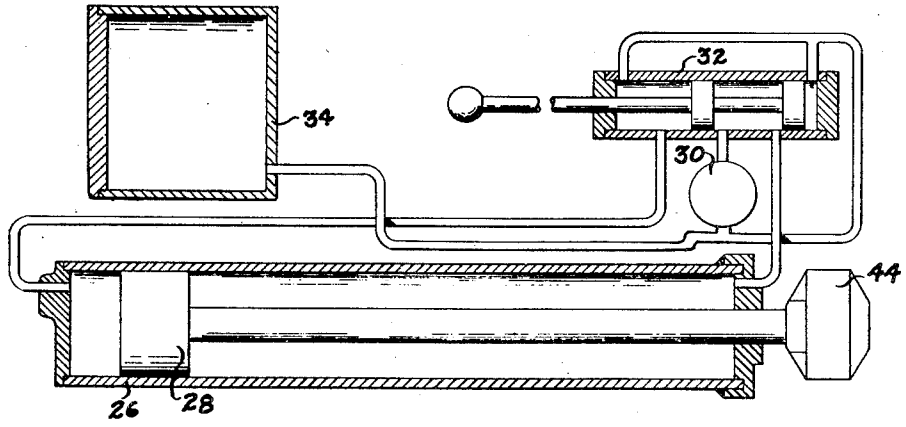

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FIG. 3

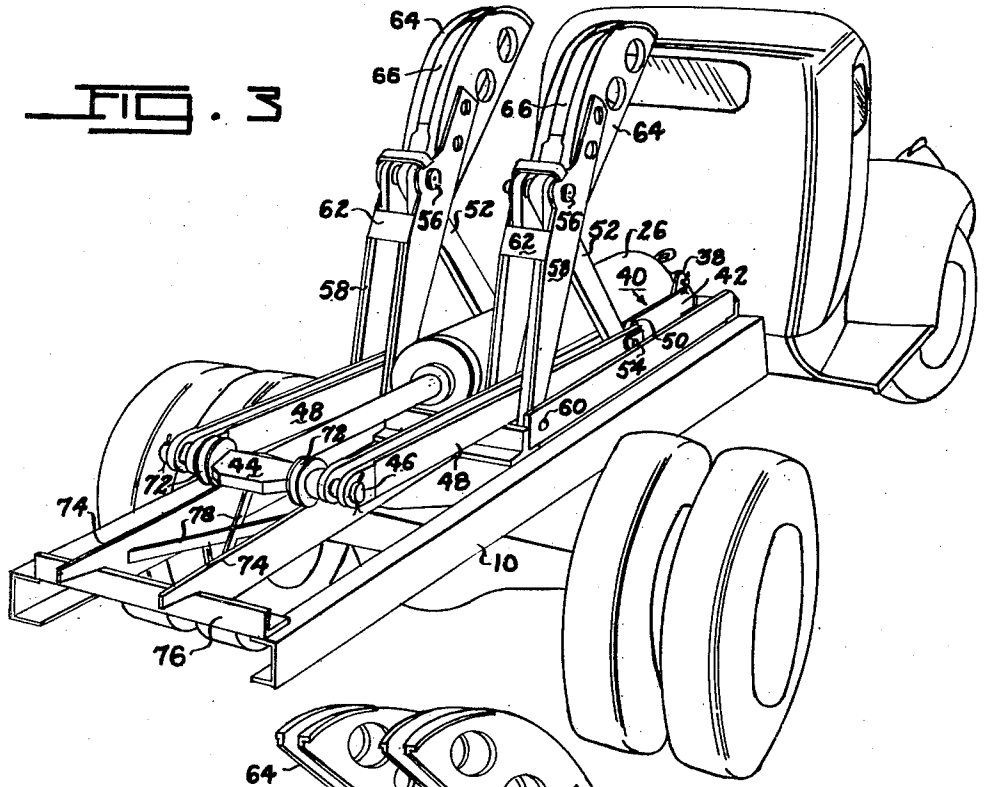
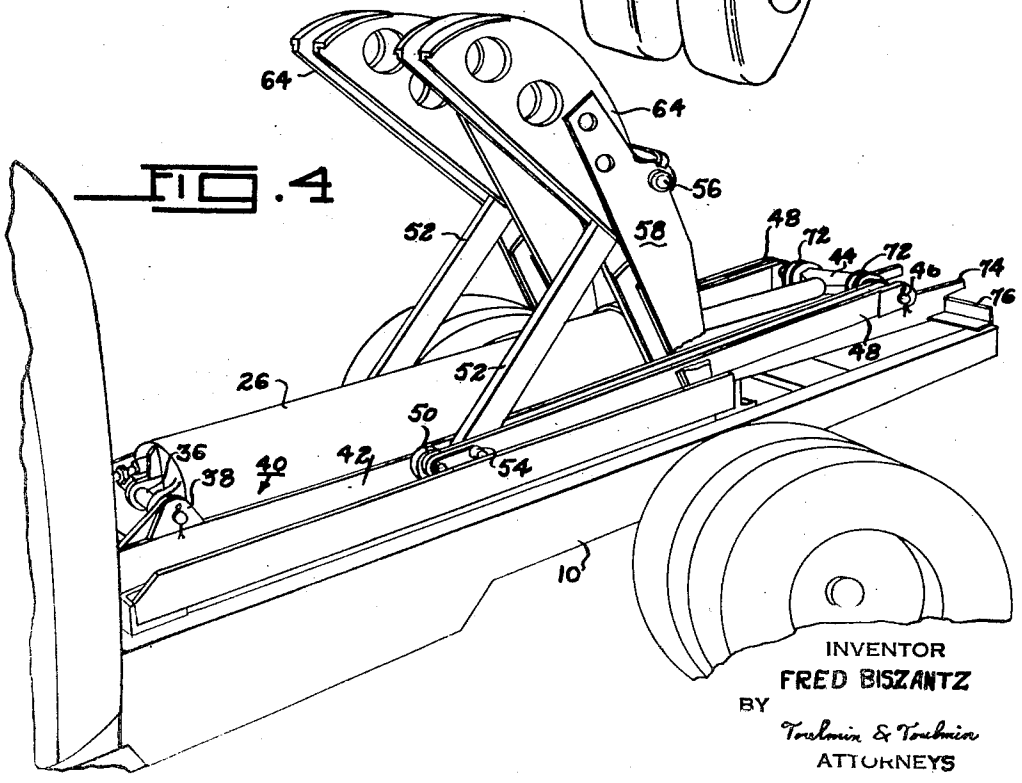


FIG. 4



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HOIST MECHANISM FOR DUMP TRUCKS

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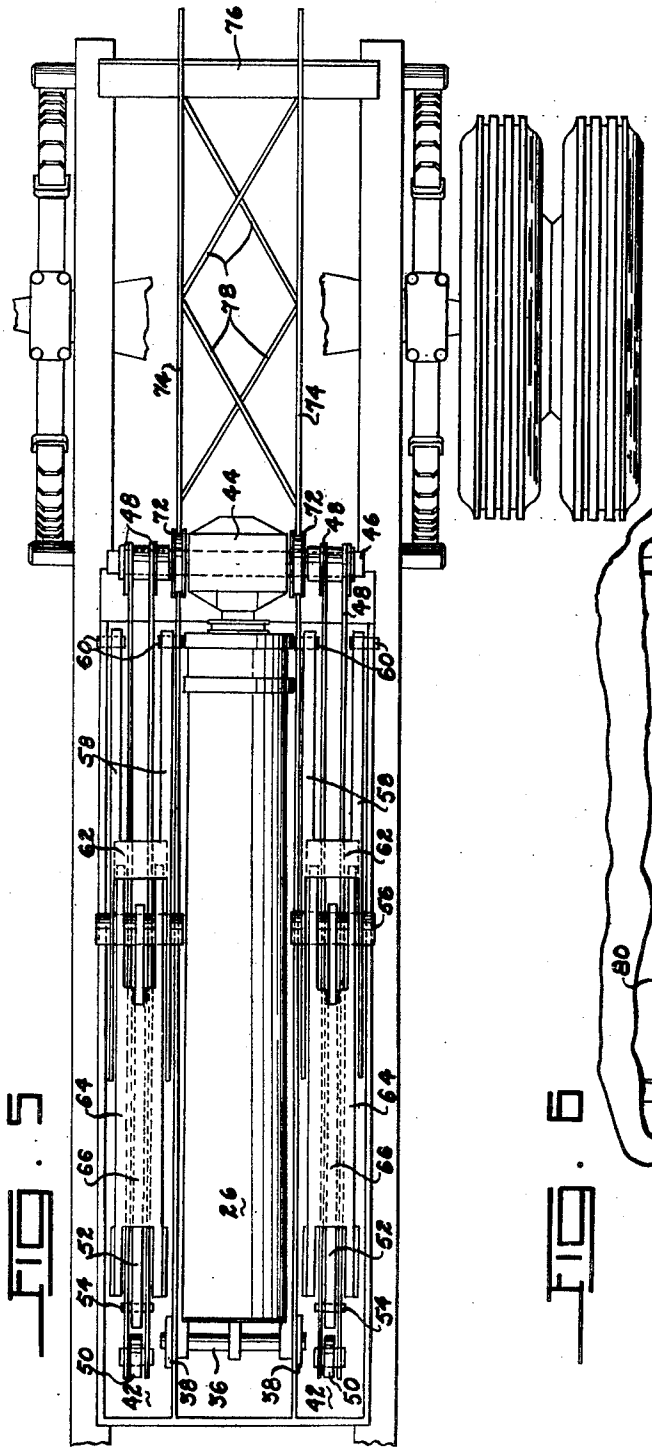

FIG. 5

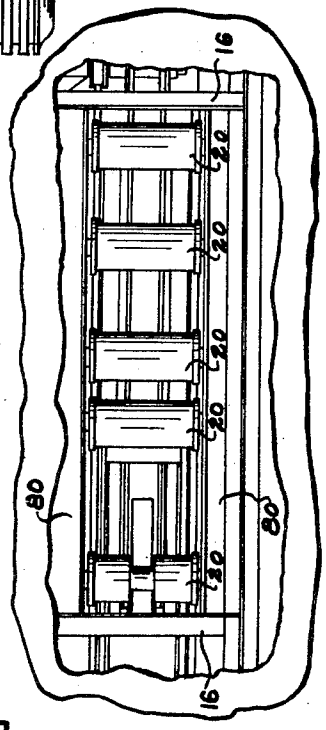

FIG. 6

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HOIST MECHANISM FOR DUMP TRUCKS

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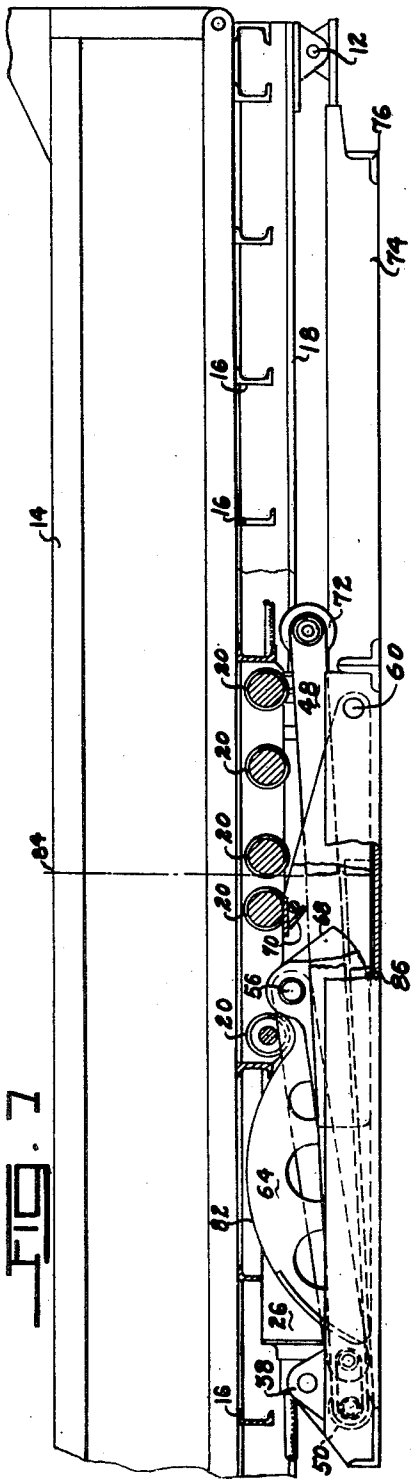

FIG. 7

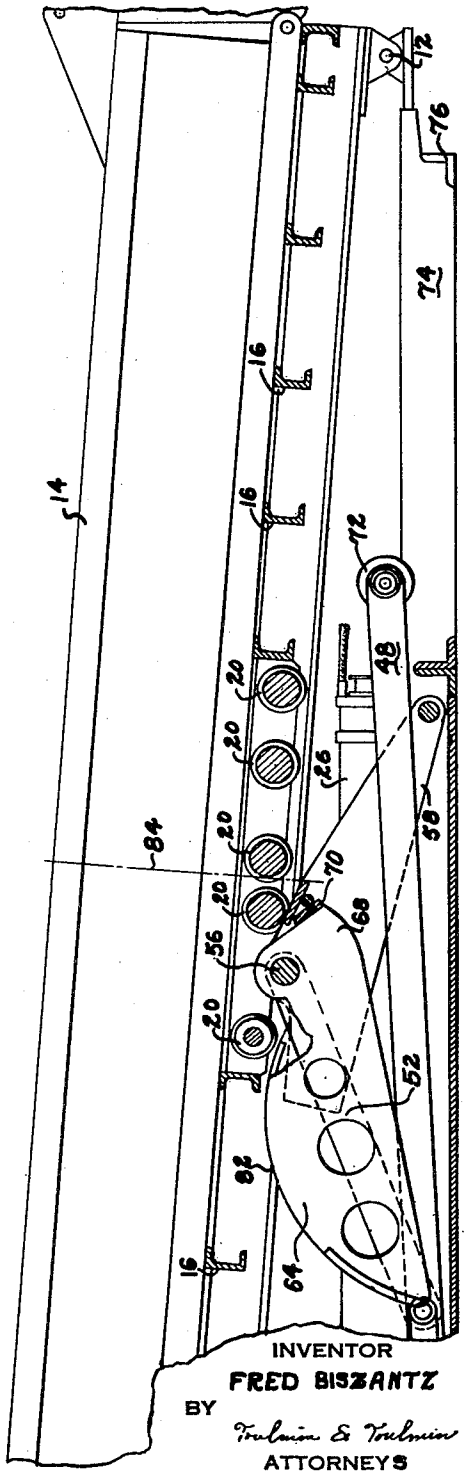

FIG. 8

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UNITED STATES PATENT OFFICE

2,497,844

HOIST MECHANISM FOR DUMP TRUCKS

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Application October 9, 1947, Serial No. 778,900

9 Claims. (Cl. 298—22)

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This invention relates to hoist mechanisms, and particularly to hoist mechanisms for use in connection with dump trucks for tilting the bodies thereof.

The usual type hoist for a dump truck body is a hydraulically actuated under body arrangement employing a direct acting hydraulic ram which works in a cylinder and one end of the said ram and cylinder is connected with the body to be tilted and the other is connected with a fixed point. In some instances, linkages and levers have been employed for transmitting the motion of a hydraulic motor to the body but these arrangements ordinarily are complex and bulky and are therefore inconvenient to manufacture and employ.

It is particularly difficult to devise a satisfactory hoist mechanism for large dump bodies which are adapted for carrying several tons of load because of the severe power requirements. In connection with bodies of this size, it is customary to employ a hoist consisting of two cylinder-piston arrangements, one under each side of the body. This arrangement provides for motors which are not excessively large and distribute the lifting force over the body being tilted.

It will be apparent that an arrangement of this type has the inherent fault of permitting the body to tilt laterally if the load therein is not uniform or shifts as it is being dumped, or if the surface on which the truck or trailer is setting is not level.

The particular object of the present invention is to provide an improved hoist mechanism for dump trucks which is especially adapted for tilting very large and heavy loaded bodies.

Another object of this invention is the provision of a hoist mechanism especially adapted for use on large and heavily loaded bodies which is relatively simple in construction.

It is also an object of this invention to provide a hoist mechanism for dump truck bodies which will occupy a minimum of space when the body is in its down position.

It is also an object of this invention to provide a hoist mechanism for the body of a dump truck which includes a hydraulic motor and which operates at relatively low pressure.

A still further object of this invention is to provide a hoist mechanism for a dump truck body which will give the body stability during its dumping movements and while it is supported at its dumping angle.

These and other objects and advantages will become more apparent upon reference to the

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following description taken in connection with the accompanying drawings in which:

Figure 1 is a side elevation showing the rear end of a dump truck having therein a lift mechanism according to this invention and showing the body in its elevated position;

Figure 2 illustrates a simple hydraulic circuit which can be employed for actuating the fluid motor used with the hoist in Figure 1;

Figures 3 and 4 are perspective views showing the hoist mechanism of this invention mounted on a truck chassis, but with the body of the truck removed;

Figure 5 is a plan view looking down on the truck chassis and showing the arrangement of the hoist mechanism of this invention;

Figure 6 is a plan view looking down on the body with a portion thereof broken away to show the rollers carried by the body which are engaged by the lifting arms of the hoisting mechanism;

Figure 7 is a side view showing the hoist mechanism of the truck body with the truck body down and the hoist mechanism folded into its idle position; and

Figure 8 is a view similar to Figure 7 showing the hoist mechanism at the beginning of its body lifting movement.

Referring to the drawings, Figure 1 shows a portion of a truck chassis 10 which has pivoted to the rear end thereof as at 12 a dumping body 14. The body 14 is constructed in the usual manner with the transverse sills 16 and longitudinal sills 18 which are adapted for bearing on suitable supporting sills carried on the truck chassis when the body is in its down position.

Supported underneath the body 14 are a plurality of rollers 20 which are adapted for being engaged by the arms 22 and 24 of an underbody hoist mechanism mounted on the truck chassis beneath the body.

The hoist mechanism, to be described more fully hereinafter, includes a hydraulic motor having a cylinder 26 and a double acting ram 28 which is employed for actuating the hoist mechanism. Fluid is supplied to the cylinder 26 in any conventional manner as by a pump 30 driven by a power take-off shaft of the truck and a reversing valve 32 connected between the pump 30 and the cylinder 26. Suitable reservoir means as indicated at 34 in Figure 2 may be provided.

The arrangement of the hoist mechanism will be seen on reference to Figures 3 through 8 where it will be seen that the cylinder 26 has

its closed end pivoted as at 36 to the upstanding lugs 38 which form a part of the frame 40 of the hoist mechanism. The frame 40 is adapted for mounting on the chassis 10 of the truck and includes trough or channel means 42 extending longitudinally along either side of the cylinder 26.

At the rearmost end of the cylinder 26, the double acting plunger 28 has connected thereto a crosshead 44 which includes a shaft 46 extending out either way therefrom. Secured to each end of the cross shaft 46 is an elongated link 48 which extends toward the rear of the cylinder 26 and which has pivoted thereto a roller 50 rolling in the associated trough 42. Preferably each of the links 48 is composed of a pair of spaced bars in order to provide access therebetween for another link 52 pivoted to the said link 48 adjacent the roller 50 as by the pivot pin 54.

The links 52, which are compression members and which are therefore substantially heavier in cross section than the tension members 48, extend in a direction rearwardly of the truck from their pivot pins 54 and into engagement with the pivot pins 56. Mounted on the pivot pins 56 are the levers or links 58 which extend toward the rear of the truck and which are pivoted on the frame 40 of the hoist mechanism by the pivot pins 60. Preferably the levers 58 are bifurcated in order to span the links 48 and have the legs thereof joined by a plate or other member suitably made integral with the said legs as indicated at 62.

Also pivoted to the pins 56 and extending in the opposite direction therefrom from the links 58 are the arms 64 which are preferably closed on top as by the plate member 66 and which have wings or side parts extending downwardly therefrom which are sufficiently far apart to telescope with the links 48.

The arms 64 also extend beyond the pivot links toward the rear of the truck and have the end parts 68 which extend to beneath the portions 62 of the links 58.

As will be seen in Figures 7 and 8, the extending portions 68 are adapted for abutting the plate member 70 which is rigidly carried by the link 58.

For guiding the crosshead in its reciprocating movements the shaft 46 carries a pair of rollers 72 which ride on the tracks 74 which may be extensions of the walls of the troughs or channels 42 on the side adjacent to the cylinder 26. These tracks extend to the rear end of the truck chassis and may be supported thereon by the transverse angle member 76. Suitable cross bracing as at 78 can be supplied for supporting the tracks 74 between the rear of the frame 40 of the hoist mechanism and the angle member 76.

The support for the rollers 20 is shown in Figure 6 when it will be seen that they are journaled between a pair of longitudinally extending structural members 80 which are secured to the bottom of the truck body and which extend between a pair of the sills 16. The rollers 20 are mounted at each side of the truck body and are directly over the hoist mechanism as will best be seen in Figures 7 and 8.

Reference to Figure 7 will reveal that the hoist mechanism will fold into a substantially flat assembly beneath the body when the plunger 28 is retracted into the cylinder 26. Because of this the hoist mechanism is adapted for use in connection with large truck bodies and with

dumping trailers without modifying the body or the chassis and without having any parts which extend beneath the truck or trailer chassis.

In operation, the plunger 28 is energized by supplying pressure fluid to the left end of the cylinder 26. This drives the plunger 28 toward the right and carries the crosshead 44 secured thereto toward the rear end of the truck body. This will also move the links 48 toward the rear end of the truck body and apply compressive force to the links 52 through the pins 54. Due to the fact that the compressive force thus exerted on the links 52 acts in a line which has a moment arm around the pivot pins 60, the levers 58 will rotate in a clockwise direction around the said pivots. This will bring the portions 62 of the levers 58 against one of the rollers 20 at each side of the truck body. The upward thrust thus exerted on the truck body will cause it to tilt from its down position into the position shown in Figure 8.

During the movement of the truck body from its Figure 7 to its Figure 8 position, the arm parts 64 pivot downwardly about the pivot pins 56 until the end parts 68 thereof engage the abutments 70 on the links 58. Thereafter, further pivoting movement of the links 58 brought about by continued energization of the plunger 28 will bring the arms 64 into engagement with the rearmost of the rollers 20. It will be noted that the upper parts of the arms 64 are curved as at 82 and that further movement of the links 58 and arms 64 beyond the Figure 8 position will bring about further tilting movements of the truck body with the arms 64 remaining in engagement with one or more of the rollers 20. The tilting movement of the body and the pivoting movement of the link 58 and arm 64 thus continue until the truck body reaches its Figure 1 position. At this time the body is tilted sufficiently to discharge the entire load therefrom and the piston 28 may bottom in the right end of the cylinder 26.

It will be noted that the links 58 and arms 64 move as an integral unit once the ends of the said arms have contacted the abutments 70. However, when the hoist mechanism is in its down position, the said links and arms will pivot relatively in order to lie flat beneath the truck body so as to occupy the least possible space. Also the parallel plate arrangement of the arms permits them to telescope into the space required for the widest thereof.

The arrangement of this invention is of advantage because it makes possible the engagement of a truck body forwardly of its center of gravity and thereby reduces the operating pressure required for energizing the hydraulic hoist motor.

This will be seen in Figures 7 and 8 wherein the center line of the body is indicated by the dot-dash line marked 84. As the tilting of the body proceeds, the point of contact of the lifting arm of the hoist will move rearwardly until it passes the center of gravity of the truck body and load but at that time the body will be elevated sufficiently that the load will either be shifted toward the rear thereof or partially discharged.

For slightly increasing the angular movement of the lifting arm of the hoist, each of the troughs 42 may have built therein an inclined cam track 86 on which the rollers 50 ride. In this manner the lift of the hoist is somewhat increased, but without increasing any of the dimensions of the parts thereof either in length or width.

Due to the fact that both of the lifting arms for the hoist mechanism are mechanically interconnected by inextensible links and the relatively rigid crosshead 44 and shaft 46, the body being lifted is given great stability against tilting transversely and the ease and safety of operation of large dump trucks is thereby greatly increased. Since the tendency for the body to tilt laterally is reduced the truck on which it is mounted may be employed with safety even in conditions where the truck is somewhat tilted before the body is lifted and under which circumstances it would be hazardous to employ other types of hoisting mechanisms.

It will be understood that this invention is susceptible to modification in order to adopt it to different usages and conditions and, accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

I claim:

1. In an under body hoist mechanism for a dump body pivoted at the rear edge thereof; roller means carried beneath said body at each side thereof and intermediate the ends of said body, a pair of arms pivoted beneath said body and lying forwardly underneath each said group of rollers, each of said arms being jointed to break convex upwardly when moved toward said rollers and to lie flat beneath said body when retracted from said rollers, a compression member acting on each of the joints of said arms for actuating the same in pivoting movements for tilting said body, and means for supplying power to said compression members.

2. In a hoist mechanism for a dump body; a group of rollers mounted on the underneath side of said body at each side of the center thereof and between the ends of said body, an arm pivoted beneath said body at each side of the center thereof and extending forwardly underneath said rollers, a joint in each arm between the ends thereof for permitting said arms to break convex upwardly when actuated toward said rollers, a compression member secured to each of said arms at the joint thereof and extending forwardly underneath said body, and means comprising a hydraulically actuated ram for driving said compression members rearwardly of said body for moving said arms upwardly to tilt said body, said arms and compression members interleaving when retracted from said body to lie flat therebeneath.

3. In a hoist mechanism for a dump body pivoted on a transverse axis adjacent the rear end thereof; a group of rollers supported underneath side of said body at each side of the center thereof, said rollers being spaced along the length of said body and rotatable on axes parallel with the pivot axis of said body, an arm at each side of said body pivoted therebeneath and extending forwardly beneath said rollers, each said arm having a joint intermediate its ends for permitting said arm to break convex upwardly when moved toward said rollers and to lie flat beneath said body when retracted from said rollers, a compression member engaging each arm at the joint thereof and extending forwardly therefrom, roller means at the forward ends of said compression members, track means supporting said roller means for substantially horizontal movement thereof, and means comprising a hydraulically actuated ram connected with said forward ends of said compression members for actuating said members and said arms for tilting said body, said arms and compression members comprising laterally offset elements which interleave when in their retracted position thereby to lie flat beneath said truck body.

4. In an under body hoist mechanism for a dump body; jointed arm means pivoted beneath said body and extending forwardly, said arms being jointed to break convex upwardly when actuated toward said body and to lie flat when retracted beneath said body, compression members secured to the joints of said arms and extending forwardly therefrom, tension members connected with the forward end of said compression members and extending rearwardly therefrom, means interconnecting the rear ends of said tension members, and a hydraulically actuated ram in engagement with said connecting means and energizable for actuating said members and arms to move the said arms upwardly about their pivots.

5. In an under body hoist mechanism; a frame, a pair of arms pivoted on said frame and extending forwardly, each of said arms being jointed intermediate its ends to break convex upwardly when lifted, abutment means on said arms for limiting the breaking thereof, compression members secured to the joints of said arms and extending forwardly therefrom, tension members secured to the forward end of said compression members and extending rearwardly therefrom, roller and track means at each end of said tension members for supporting and guiding the same in horizontal movements, a cross head interconnecting the rear end of said tension members, and hydraulic motor means connected with said cross head and mounted in said frame between said arms energizable for actuating said members and arms.

6. In an under body hoist mechanism; a frame, a pair of arms pivoted on said frame and extending forwardly, each of said arms being jointed intermediate its ends to break convex upwardly when lifted, abutment means on said arms for limiting the breaking thereof, compression members secured to the joints of said arms and extending forwardly therefrom, tension members secured to the forward end of said compression members and extending rearwardly therefrom, roller and track means at each end of said tension members for supporting and guiding the same in horizontal movements, a cross head interconnecting the rear end of said tension members, and hydraulic motor means connected with said cross head and mounted in said frame between said arms energizable for actuating said members and arms, said members and arms being constructed of elements laterally offset from each other whereby they interleave in their retracted position so as to lie flat beneath said body.

7. In an under body hoist for a dump body pivoted on an axis at the rear end thereof; an arm pivoted at its rear end beneath each side of said body and extending forwardly therebeneath; roller means mounted on the underneath side of said body and over each said arm, said arms being jointed to lie flat beneath the body when retracted and breaking convex upwardly at the joints therein when moved toward the body, said arms also including abutment means for limiting the amount of angular movement at the joint; and means for actuating said arms into engagement with said roller means for tilting said body.

8. In an under body hoist for a dump body

pivoted on an axis at the rear end thereof; an arm pivoted at its rear end beneath each side of said body and extending forwardly therebeneath; roller means mounted on the underneath side of said body and over each said arm, said arms being jointed intermediate their ends to lie flat beneath the body when retracted and breaking convex upwardly when moved toward the body, said arms also including abutments operable to limit the angular movement of each arm at the joint; and means for actuating said arms into engagement with said roller means for tilting said body, at least the first engagement of said arm means and roller means occurring forwardly of the center of gravity of said body.

9. In a hoist mechanism for a dump body pivoted at its rear edge; arm means having pivot means at the rear end and extending forwardly from the said pivot means beneath the body, said arm means being jointed intermediate the ends thereof for breaking convex upwardly when moved toward said body; abutment means on said arm means for limiting the amount of angular movement at the joint and thus predetermining the amount of breaking of the arm means; roller means mounted on the underneath side of said body and positioned over said arm means to be engaged by the arm means during movement of the arm means toward the body; and acuating means for said arm means engaging the said arm means at the joint thereof.

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