Dec. 11, 1928.

1,694,909

E. R. BARRETT

HYDRAULIC DUMPING BODY HOIST

Filed July 25, 1927

3 Sheets-Sheet 1

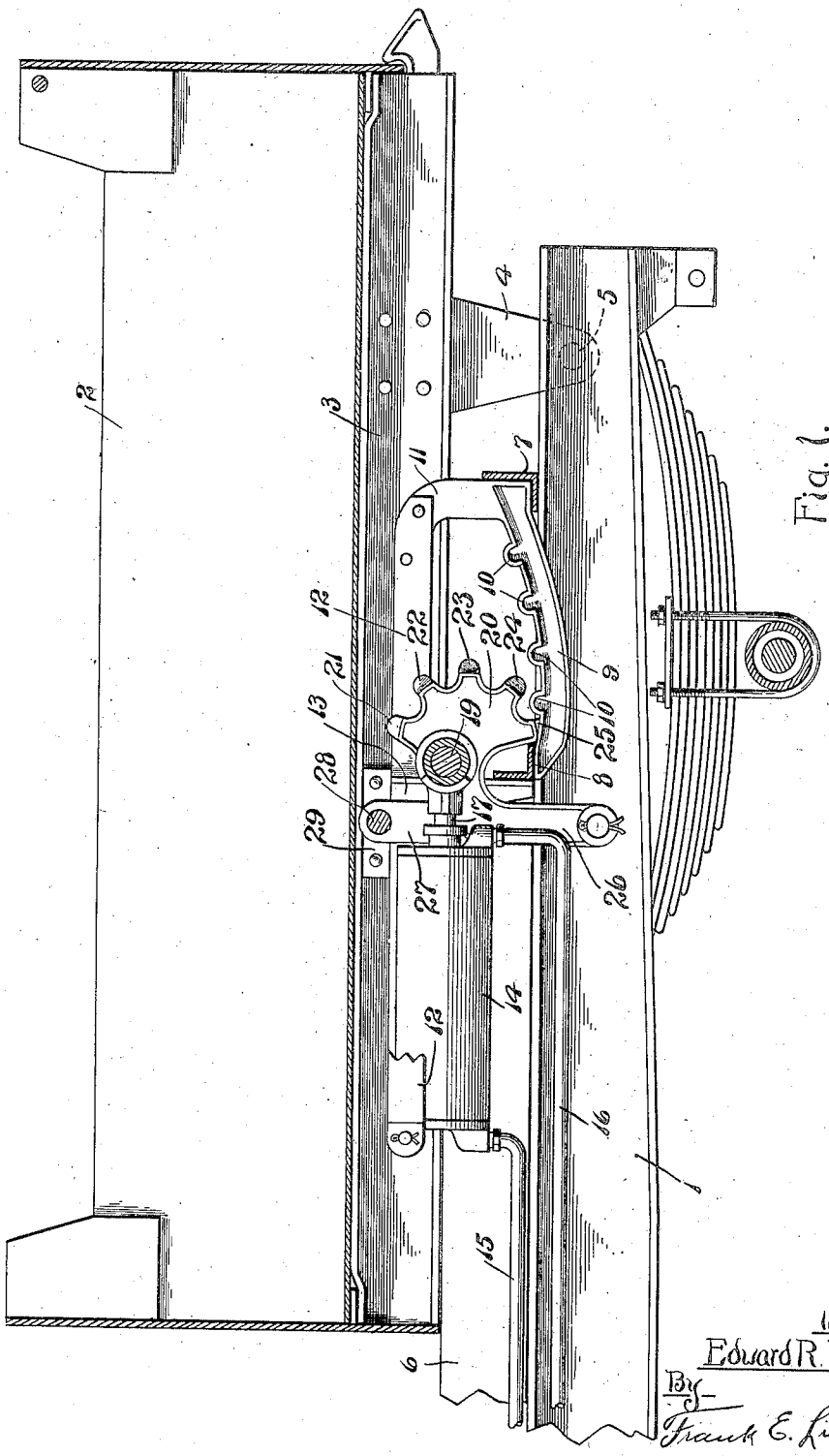


Fig. 1.

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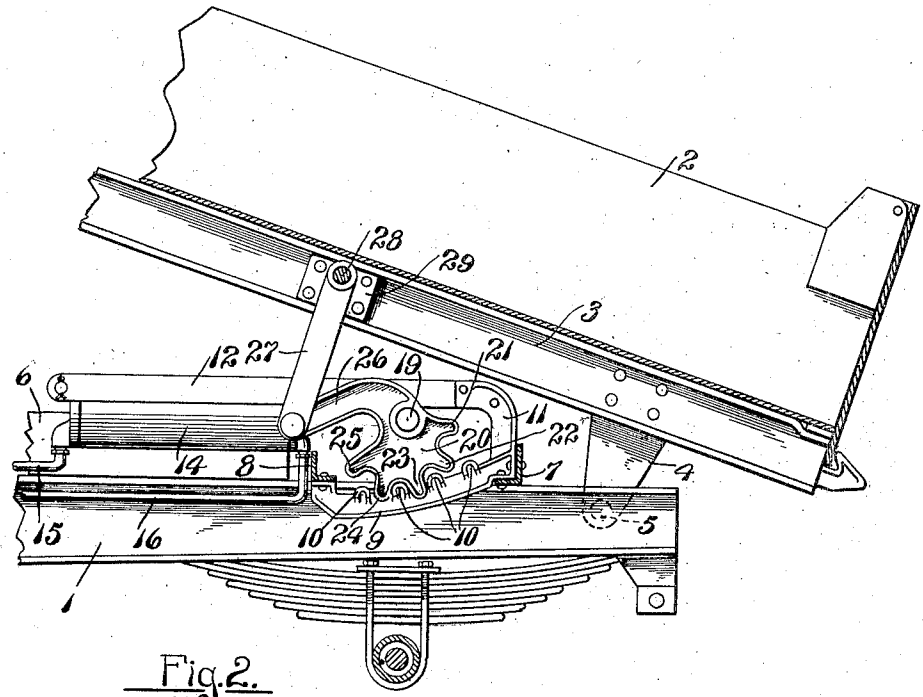


Fig. 2.

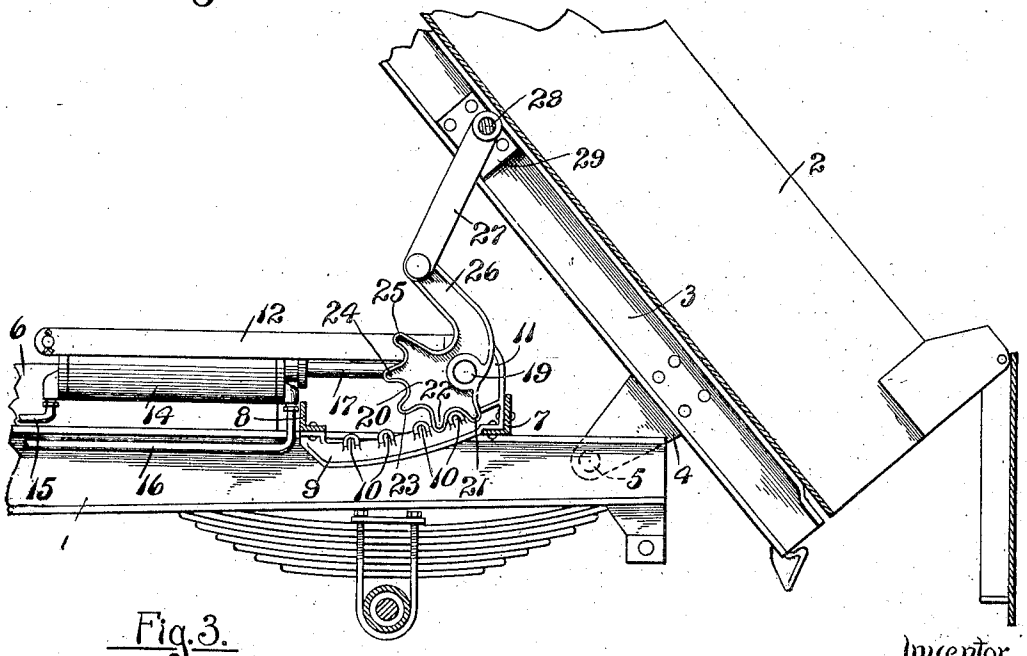


Fig. 3.

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3 Sheets-Sheet 3

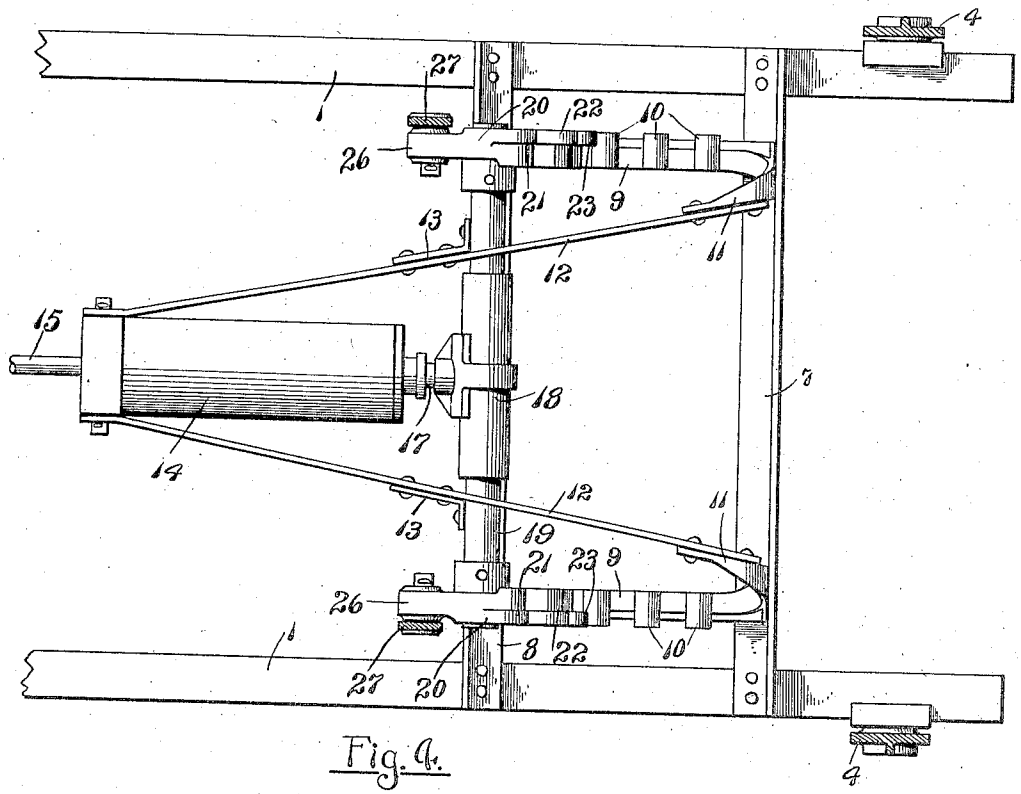


Fig. 4.

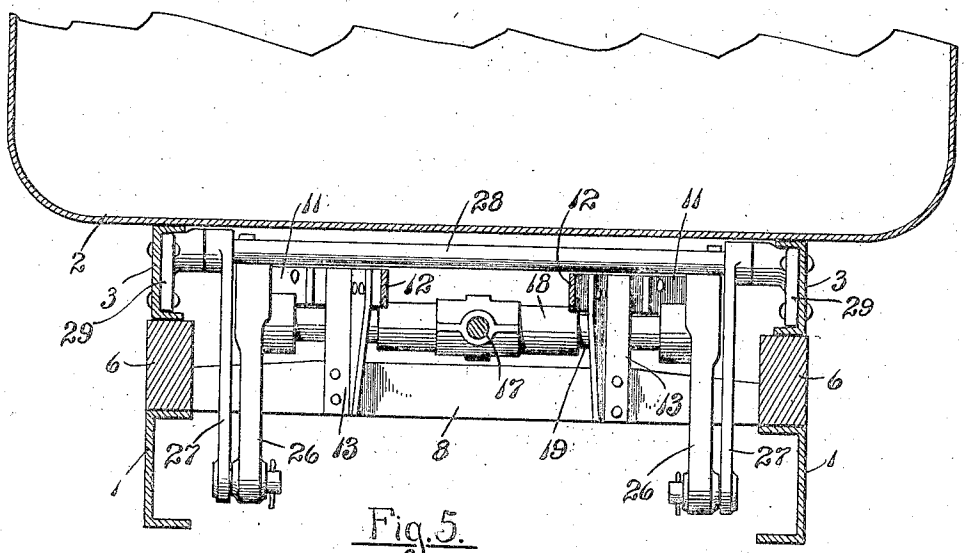


Fig. 5.

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UNITED STATES PATENT OFFICE.

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HYDRAULIC DUMPING-BODY HOIST.

Application filed July 25, 1927. Serial No. 208,074.

This invention relates to hydraulic dumping apparatus and is primarily concerned with a relatively simple, economically constructed and easily installed dumping apparatus adapted, in various sizes, to be applied to all of the different sizes of trucks and dumping bodies applied thereto. With the construction of the dumping hoist which I have invented, the design is such that when the tilting of the body is started at which time the greatest force has to be exerted to lift and tilt the body and its contents, the distance through which the load is moved is short, permitting the necessary multiplication of the power applied to the hydraulic piston in order to initiate the dumping movement. With the progress of the movement and the diminution of the lifting force required for lifting and tilting the body the movement is increased and the tilting of the body accelerated so that as the body approaches extreme tilted position its movement is very much faster than it was at the beginning. It is an object and purpose of the present invention to provide mechanism capable of effecting the results stated and in a simple and practical manner.

A further object of the invention is to construct a dumping hoist which may be built and installed as a unit and which may be installed at various positions on the truck chassis frame members, the unit hoist assembly being merely laid on said members at the proper position and the holes bored for the bolting of the same in place, there being no necessity for boring different holes at different positions and properly correlating the same for the connection of separate parts of the hoist support. This greatly aids in the installation rendering the same very simple and easy.

Many other objects and purposes than those stated will appear as understanding of the invention is had from the following description taken in connection with the accompanying drawings, in which,

Fig. 1 is a longitudinal vertical section through a dumping body and the hoisting apparatus used therewith showing the same applied to a truck frame, the body being in normal horizontal position.

Fig. 2 is a similar view showing the body in partly tilted position.

Fig. 3 is a like view showing the body tilted substantially to its extreme upper position.

Fig. 4 is a plan view of the hoisting unit and the chassis frame members on which it is mounted, the connections between the body and the frame and between the body and the hoisting unit being shown in horizontal section, and

Fig. 5 is a transverse vertical section through the truck frame body and hoisting unit, the plane of the section being taken directly back of the cylinder of the unit and the view being that shown looking to the rear.

Like reference characters refer to like parts in the different figures of the drawings.

The truck chassis frame includes the usual channels 1 comprising the side frame members over which the body 2 is mounted. The body preferably is of sheet steel carried on parallel channel sills 3 which lie above and in the same plane with the frame members 1. Plates 4 riveted or otherwise permanently secured to the sills 3 adjacent their rear ends extend downwardly along the sides of the truck frame members 1 and are pivotally connected thereto at their lower ends as indicated in dotted lines at 5. Beams 6 of wood are fastened to the upper flanges of the frame members 1 in front of where the hoist unit is mounted, the front end portions of the sills 3 resting on the beams 6 when the body is in horizontal position.

In the construction of the hoisting unit, two parallel spaced apart angle bars 7 and 8 are provided which, when installed on the truck, lie transversely above and between the truck frame members 1 and are rigidly bolted to the upper flanges thereof. The bar 8 is located in front of the bar 7 and between the same two racks 9 of the form shown are placed and permanently secured, one of said racks being located a short distance inward of each of the frame members 1. The racks 9 at their upper sides are provided with spaced apart teeth 10 which extend upwardly from the upper sides of the racks. The racks curve slightly upward from their front to their rear ends as best shown in Fig. 1.

At the rear end of each rack 9 an integral upwardly and inwardly extending post 11 curved in a forward direction at its upper

end is formed. To the inner face of the upper curved portion of each post a diagonally located brace bar 12 is riveted or otherwise permanently secured, said bars extending forward and converging toward each other at their front ends. The bars extend over the cross bar 8 and a distance in front of the same and are supported between their ends by brackets 13 which are permanently secured to said cross bar 8 as best shown in Figs. 4 and 5. The front ends of the bars 12 extend to the front end of a hydraulic cylinder 14 and are connected with said front end in any suitable manner serving as a support for the front end of the cylinder which extends to the rear lying between the diagonal supporting and brace bars 12. The cylinder has the usual valveless piston therein, and is filled with liquid, usually oil, which is pumped into the front end through the inlet pipe 15 while the oil back of the piston is returned to the pump through the outlet pipe 16 connected to the rear end of the cylinder. (See Fig. 1.)

A piston rod 17 is connected with the piston in the cylinder and passes rearwardly through the rear end of said cylinder. At the rear end of the piston rod a cross head is secured consisting of a sleeve 18 fastened to the piston rod and attached to a transverse shaft 19 which passes underneath the bars 12. The shaft 19 at its ends is rotatably mounted in two segments 20, one at each end of the shaft, each of which is formed with a plurality of spaced apart projecting teeth 21, 22, 23, 24 and 25. The number of teeth on the segments 20 and the number of teeth on the racks 9 may be varied but in every instance the distance from the center of the shaft 19 to the pitch line of the successive teeth 21 to 25 inclusive increases with each succeeding tooth. That is, the pitch radius of the tooth 21 is shorter than that of any of the others; and of the tooth 25 is longer than any of the others and there is a progressive increase in pitch radius with each tooth from the tooth 21 to the tooth 25.

From each of the segments 20 an arm 26 extends which when the body is in lower horizontal position is located vertically as shown in Fig. 1. A link 27 is pivotally connected to the end of each of the arms 26 and extends vertically therefrom so that the upper ends of the links lie closely adjacent to the bottom of the body 2. A shaft 28 passes through the upper ends of the links and is mounted at its ends in bearing plates 29 permanently secured to the inner sides of the channels 3 which form the supporting sills of the body.

When oil is pumped through the pipe 15 into the cylinder 14 the piston and the piston rod 17 connected therewith move to the rear with a consequent bodily movement of the shaft 19 to the rear. This bodily movement of the shaft 19 causes the segments 20 to turn and roll back on the racks 9. During the initial part of this movement the upward movement of the ends of the arms 26 is in ratio to the sine of the angle made by the arm 26 to the vertical. At the initiation of the movement the body and the load carried thereby are in the lower horizontal position and the force required to overcome the inertia of the body and load and lift the same is very great; and this is compensated for by the fact that the power applied to the piston in the cylinder moves through a relatively long distance compared to the vertical lift of the body when the tilting movement is started so that the pressure on the piston does not have to be unduly excessive. With the progress of movement the upward movement of the ends of the arms 26 increases, while the segments 20 roll to the rear turning about a progressively decreasing axis due to the decreasing pitch radius of the successive teeth until when the arms 26 are substantially parallel to the bottom of the body the greatest tilting movement of the body takes place. That is, during the forepart of the tilting movement the distance through which the power is applied is relatively great compared to the tilting lift of the body. But with the increasing tilting movement of the body the distance through which the power has to work progressively decreases so that the tilting of the body starts slowly and constantly accelerates until the extreme tilted position is reached, maintaining the working pressure of oil against the piston substantially constant.

With the upward tilting movement of the body it is evident that the load normally shifts to the rear and it is further evident that even if the load does not thus shift the movement of the center of gravity of the load and body vertically decreases for a given tilting movement as the body is turned away from the horizontal so that less power is required to tilt the body and its contents during the later stages of movement than at the beginning. It is evident that with this construction a substantial balance is attained whereby substantially the same pressure on the piston throughout the entire movement may be maintained, the differences in the acceleration of the body in its movements being such that the pressure applied to the piston remains substantially constant. This is a very desirable quality in hoists of this character insuring that destructive pressure and strains will be eliminated and no pressure or strain produced which will break or distort any part of the mechanism thereby insuring a long working life for the same.

It is further evident that the unit construction of the hoisting apparatus is a feature of great value in the matter of installing the same on trucks. It is necessary merely

to turn the empty body to an upper tilted position and then place the hoisting unit across and between the truck frame members 1 moving it to a desired position and then drilling holes through the flanges of the truck frame members 1 to correspond with the holes made through the angle bars 7 and 8, insert and connect the bolts used for fastening the same in place, and then bore the holes in the webs of the sills 3 at the proper place to attach the bearing plates 29. Installation is thus made very simple requiring little or no skill.

The construction of hoist described has proven very satisfactory. It may be designed in different sizes for large or small truck and body capacities. There are few parts all of which are easily produced and assembled. The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. In combination with a truck frame having spaced apart sides, a pair of racks mounted on said frame, one near each side thereof, gear segments to traverse each rack from front to rear and vice versa, each of said segments having an arm extending therefrom in a downward direction when the segments are in forward position, a shaft disposed between the segments on which the same have a rotatable mount, a dumping body tiltably mounted on the truck frame, links connecting the ends of said arms with the body and hydraulic means for moving said shaft rearwardly to thereby cause the segments to traverse the racks from front to rear.

2. In combination with a truck frame having spaced apart frame members, a pair of racks mounted on said truck frame one adjacent to each side thereof, gear segments mounted above said racks to traverse the same, each of said segments having an arm extending therefrom, a shaft disposed between the segments on which said segments are rotatably mounted, a dumping body tiltably mounted on the truck frame, links connecting the ends of said arms with the body at the under side thereof and means for moving said shaft rearwardly to cause the segments to move over the racks to the rear.

3. In combination a truck frame, a plurality of racks mounted on said truck frame in parallel relation to each other and in vertical planes parallel to the side of the frame, a gear segment mounted on and above each rack, each of said segments having a plurality of teeth of progressively increasing pitch radius from one terminal tooth to the other in each segment, a shaft disposed between the segments on which the same are rotatably mounted, means for moving said shaft to the rear, a dumping body tiltably mounted on the truck frame and connections between said body and the gear segments for tilting the body upwardly and to the rear when said shaft is moved rearwardly.

4. In combination with a truck frame, cross bars extending between the sides of the frame and spaced from each other, a plurality of racks carried by said cross bars, a gear segment mounted on and above each rack, a shaft disposed between said segments on which the same are rotatably mounted, an arm extending from each segment, a dumping body tiltably mounted on the truck frame, links connecting the ends of said arms with the body at its under side, a hydraulic cylinder enclosing a piston and a piston rod extending from the rear end of the cylinder and connected with said shaft.

5. A construction containing the elements in combination as claimed in claim 4, each of said racks curving upwardly and to the rear, and each of said segments including a plurality of teeth having a progressively increasing pitch radius from one terminal tooth to the other in a segment, the tooth having the longest pitch radius being engaged with the rack when the body is in lower horizontal position.

6. In combination with a truck frame having spaced apart side frame members, a pair of spaced apart cross bars lying between and above the side frame members of the truck frame and permanently secured thereto, a plurality of racks carried by and between said cross bars, a gear segment mounted on and above each rack, a shaft extending between the segments on which the same are rotatably mounted, each of said segments having an arm extending therefrom at a side of the axis of the shaft opposite the side to which the segment is located, said arms extending substantially vertically downward in the forward position of said segments on the racks, a body tiltably mounted adjacent its rear portion on the rear end of the truck frame to tilt about a horizontal axis, links pivotally connecting the free ends of said arms with the body at the underside thereof and hydraulic means for moving the shaft bodily to the rear.

7. A hoisting unit adapted to be applied to motor trucks comprising, spaced apart cross bars, racks extending between and connected to said cross bars, each rack member at its rear end having an upwardly extending post, a gear segment mounted to traverse each rack and formed with an arm extending therefrom, a shaft extending between said segments on which the same are rotatably mounted, a link attached to the end of each arm, brace bars connected at their rear ends to the upward ends of said posts and extending forwardly over said shaft and converging toward their front ends, brackets connecting the front cross bar and said brace bars, a hydraulic cylinder located between the front portions

of said brace bars and connected at its front end to the front ends of said brace bars, and a piston rod extending from the rear end of said cylinder and connected to said shaft.

8. In combination with a truck frame having a dumping body tiltably mounted thereon, a hoisting device comprising, a rack associated with said frame, a gear segment mounted to traverse said rack, a link eccentrically connected to said gear segment and also connected to said body, and means for traversing said gear segment on said rack.

9. In combination with a truck frame having a dumping body tiltably mounted thereon, a hoisting device comprising a rack associated with said frame, a gear segment mounted to traverse said rack, said gear segment having a progressively increased pitch radius from one terminal to the other, means connected with said gear segment eccentric with its axis and associated with said body for tilting said body by movement of said gear segment, and means for causing the gear segment to traverse the rack.

10. In combination with a truck frame having a dumping body tiltably mounted thereon, a hoisting device comprising a rack associated with said frame, a gear segment mounted to traverse said rack, said gear segment having a progressively increased pitch radius from one terminal to the other, means connected with said gear segment eccentric with its axis in proximity to its greatest pitch diameter and associated with said body for tilting said body by movement of said gear segment, and means for causing the gear segment to traverse the rack.

11. A hoisting unit comprising, cross members adapted to be mounted on a truck frame, two racks mounted on said cross members, a gear segment associated with and adapted to traverse each rack, a shaft extending between said gear segments, brace bars each fixed at one end to one of said racks and extending over and in proximity with said shaft, and means for exerting a thrust upon said shaft, said means being connected to and supported by said brace bars at their ends opposite their connections with said racks, and means associated with said gear segments and adapted to be attached to the tilting body of a truck for hoisting the same.

12. A hoisting unit comprising, cross members adapted to be mounted upon the frame of a truck, racks mounted on said cross members, a gear segment associated with and adapted to traverse each rack, a shaft extending between said gear segments, a brace bar attached to each rack and extending over and in proximity with said shaft, a hydraulic cylinder supported by said brace bars, a piston in said cylinder having a piston rod connected to said shaft, and means associated with said gear segments and adapted to be attached to the tilting body of a truck for hoisting the same.

In testimony whereof I affix my signature.

EDWARD R. BARRETT.