Oct. 12, 1937. H. J. RIACH 2,095,286

HOIST

Filed Nov. 30, 1931 3 Sheets-Sheet 1

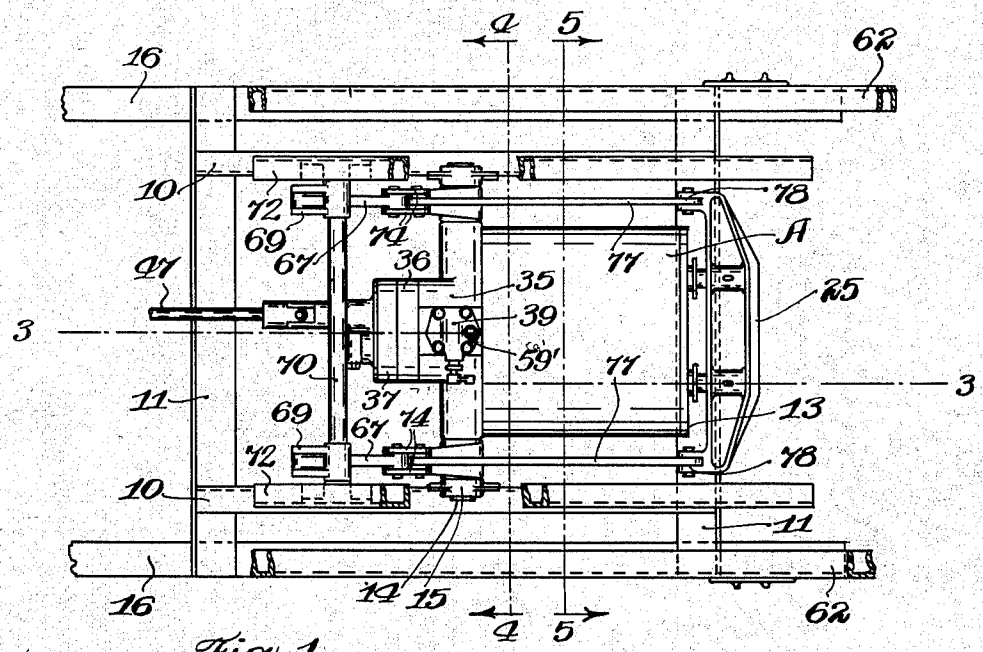


Fig. 1

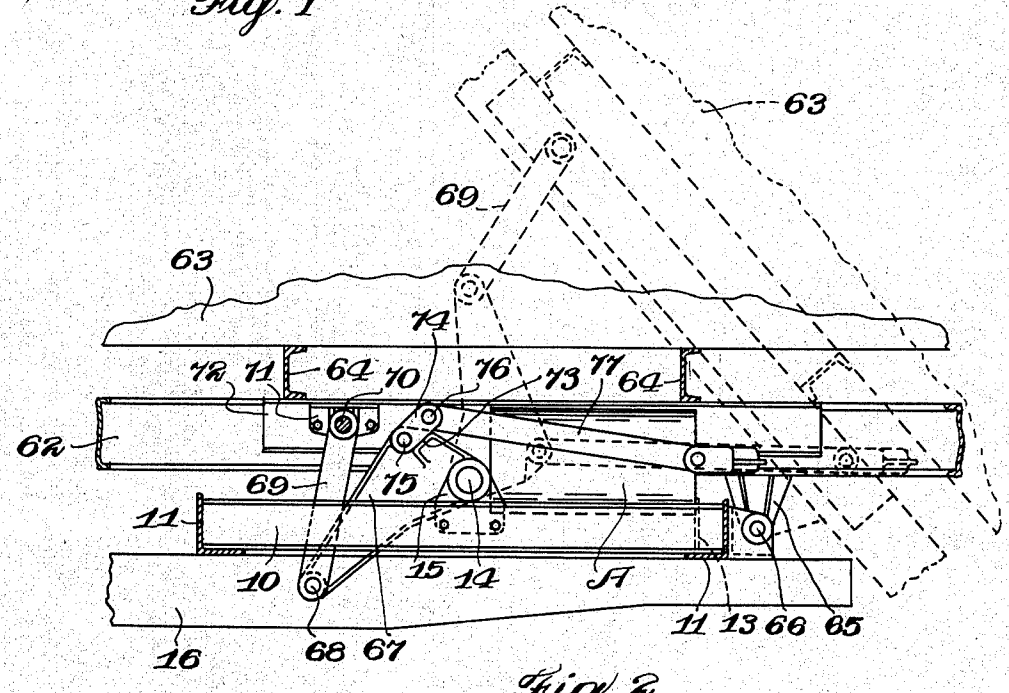


Fig. 2

Inventor

Henry J. Riach

By Howard Riach

Attorney

Oct. 12, 1937. H. J. RIACH 2,095,286

HOIST

Filed Nov. 30, 1931 3 Sheets-Sheet 2

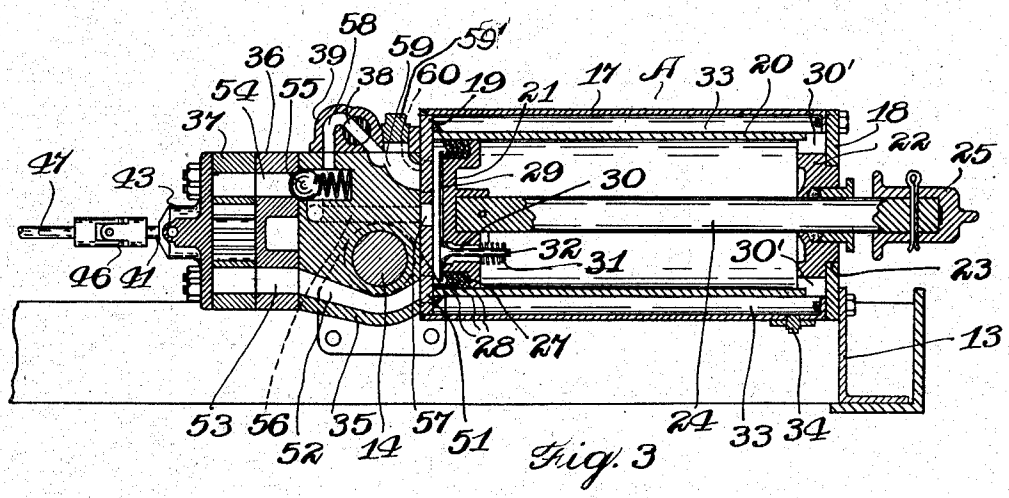


Fig. 3

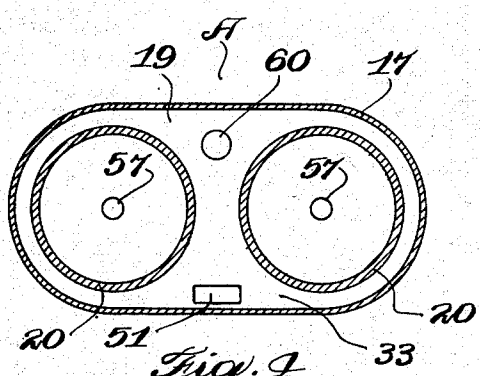


Fig. 4

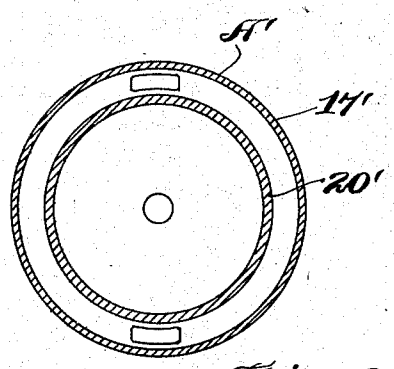


Fig. 6

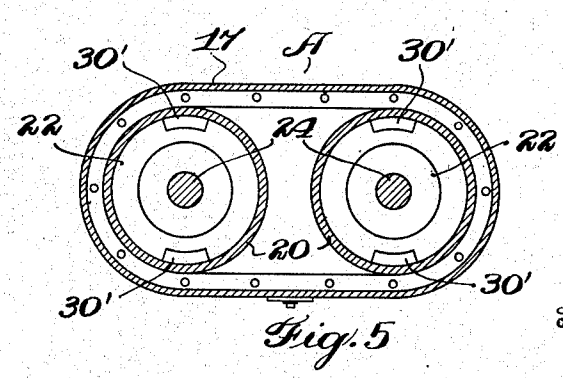


Fig. 5

Inventor

Henry J. Riach

By Amand Riach

Attorney

Oct. 12, 1937. H. J. RIACH 2,095,286

HOIST

Filed Nov. 30, 1931 3 Sheets-Sheet 3

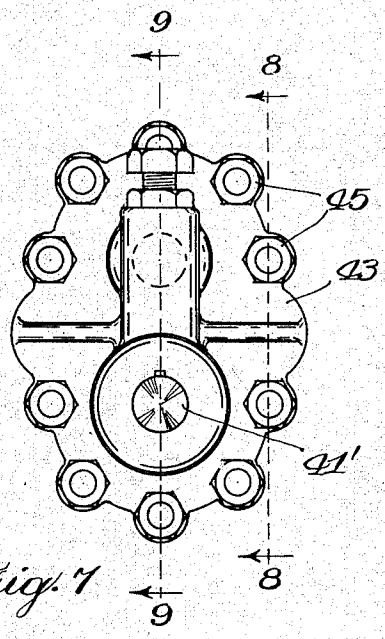


Fig. 7

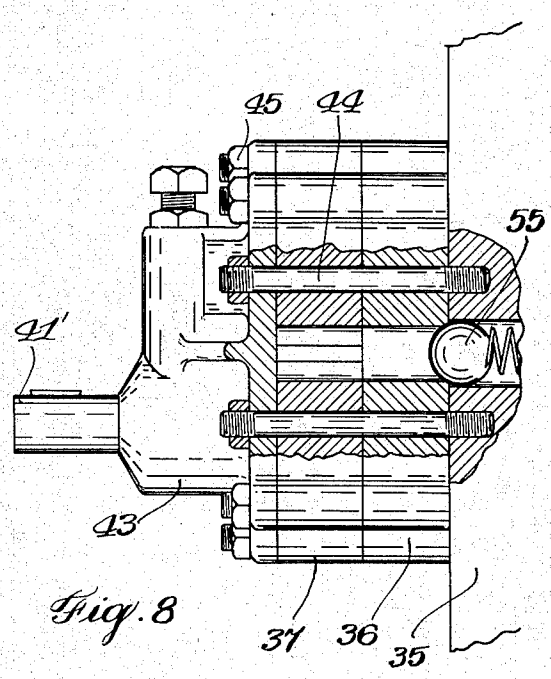


Fig. 8

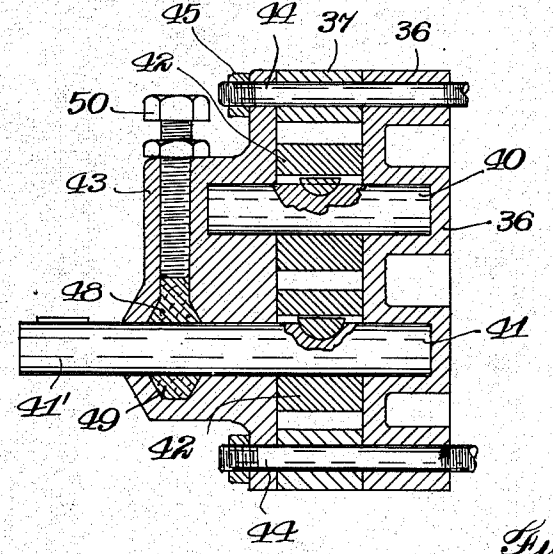


Fig. 9

Inventor

Henry J. Riach

By Howard Riach

Attorney

Patented Oct. 12, 1937 2,095,286

UNITED STATES PATENT OFFICE

2,095,286

HOIST

Henry J. Riach, St. Paul, Minn.

Application November 30, 1931, Serial No. 577,988

4 Claims. (Cl. 60—52)

This invention relates to a hoist such as is employed to raise motor truck bodies and the like, or for any other hoisting purpose where it is desired to employ a simplified mechanism having a powerful lifting capacity and with a small number of parts which are arranged together so as to operate in a manner to give more efficient service.

A feature of the invention resides in providing a pipeless hoisting mechanism so as to obviate all unnecessary joints which may cause trouble or which through vibration would become defective and leak or break. This is an important feature because hoists of this nature when used on motor trucks are subjected to heavy duty and the vibrations of the truck in traveling over the road puts a severe strain on the connecting parts of the hoists and I have designed this mechanism to overcome these defects by providing a pipeless hoisting mechanism which is compact and designed in a manner to give the best efficiency in operation.

A further feature of my invention resides in a particular construction wherein I place the operating cylinder within a casing or housing which may be termed the outside cylinder or casing. Thus the casing or outer cylinder provides a reservoir around the working cylinder, giving an increased capacity to the reservoir or low pressure compartment of the hoist unit without materially increasing the outer dimensions and overcoming the necessity of having a separate tank or compartment remotely positioned to the working cylinder. Such hoisting mechanisms as have been used heretofore where the reservoir was placed remote to the working cylinder, gave considerable trouble and have been hard to mount upon the various motor trucks used for hoisting purposes, that is, the hoisting of the bodies and the like. These constructions used heretofore, even though the reservoir was placed close to the working cylinder, were not compact and required pipe connections or long cast manifolds which have also given considerable trouble in keeping the same in operative condition and oil tight.

It is a feature to provide a hoisting mechanism which is of a unitary nature and so compact as to provide a small unit hoisting device which may be placed in close dimensions and which will fit readily under the body which is to be hoisted by this mechanism, and in fact, which may not exceed in depth dimension the cross bolsters which carry the hoisting body. With this compact unitary hoisting device it is not necessary to cut away the cross bolsters and thereby I maintain the rigidity and strength to the hoisting body and supporting means which is very desirable.

My unitary hoisting mechanism does not require rollers or tracks beneath the body to be hoisted but is connected by levers and operating cross head means so as to give a direct lifting pressure to the operating links so as to raise the body of the motor truck in an efficient manner.

This hoisting mechanism may be made with a single working cylinder or with twin working cylinders, or as many cylinders as may be desired, and by means of the peculiar unitary construction I provide a large reservoir chamber for the oil or fluid used in the operation of the working cylinders. Further, there are no external fluid connections to the operating pump for the hoisting unit and the same may be operated with a high or low pressure.

In providing a hoisting mechanism for motor truck bodies to tilt the bodies so that the contents of the same may be dumped readily, it is an important feature to provide large piston area if it is possible so as to reduce the oil pressure without unnecessarily increasing the height or depth of the hoisting unit. This I accomplish with my particular construction of hoisting mechanism, thereby maintaining a minimum height between the chassis frame and bottom of the body. My hoisting mechanism is confined within a single unit including the pump and connections from the pump to the operating or working cylinder or cylinders, and by means of a particularly constructed operating link or arm which may be drop forged I provide a leverage feature with my hoisting unit which operates to raise the dumping body without tracks, rollers, or offset cast arms. This lever may be made a drop forging, making it very strong and practical for the duty to which it is applied.

Features and details of primary importance will be fully and clearly set forth in the specification and claims.

In the drawings forming part of this specification:

Figure 1 is a plan view of my hoisting unit and the supporting frame which carries the same, showing diagrammatically the relative position of the hoisting unit and frame to the body or supporting members of a truck.

Figure 2 is a side view of my hoisting mechanism, showing a portion of the truck body and frame to which the unit is attached, also showing in dotted lines the relative hoisting position of the parts.

Figure 3 is a section on the line 3—3 of Figure 1.

Figure 4 is a section on the line 4—4 of Figure 1, in the direction of the arrows.

Figure 5 is a section on the line 5—5 of Figure 1, in the direction of the arrows.

Figure 6 is a similar section to Figure 4, showing a single working cylinder instead of twin cylinders.

Figure 7 is a front end view of the pump portion of my hoisting unit.

Figure 8 is a section on the line 8—8 of Figure 7.

Figure 9 is a section on the line 9—9 of Figure 7.

The operating cylinder A of the unitary hoisting mechanism is supported by the longitudinal channel iron members 10, the ends of which rest on the transversely extending angle iron members 11 and are secured thereto by spot welding or bolting the same rigidly together. At one end of the cylinder A the angle iron member 13 supports the same directly above the transverse angle member 11, while at the other end of the cylinder A the transversely extending shaft 14 is supported in the bracket members 15 and these brackets are secured to the longitudinal channel irons 10 on either side of the cylinder A. In this manner the cylinder A is rigidly and firmly supported on the angle frame members of the hoisting unit.

The operating hoisting cylinder A is thus carried by the frame made up of the longitudinally parallelly extending members 10 and the transverse parallelly extending members 11. This frame is adapted to rest and be secured in a suitable manner to the bed or longitudinal frame members 16, only a portion of which is shown, and which form the chassis frame of the motor truck or other device to which the hoisting mechanism is attached. With this frame the hoisting mechanism is firmly and substantially carried upon the members 16 of the truck to form a strong and substantial supporting base portion to hold the hoisting mechanism in place and to distribute the hoist force in a desirable manner to the bed or frame portion 16 of the truck which is an important feature, as will be more fully hereinafter set forth, giving advantages to the construction of my hoist and the arrangement of the parts over hoisting mechanisms that have been used heretofore in connection with motor trucks and dumping bodies.

The cylinder A is formed with an outer casing 17 which extends between the end plates 18 and 19 and may be formed of sheet material of the desired gauge with the same detachably secured with the end plate 18 as illustrated and welded, or otherwise securely attached to the end plate 19. Within the cylinder casing 17, I provide a pair of operating cylinders 20 formed of tubing of the desired gauge so as to provide working cylinders which are adapted to receive the operating pistons 21. The cylinders 20 are formed with a head portion 22 on one end, which is in the form of a collar member, said collar member 22 holding the cylinders 20 concentric with the piston rod 24. This collar 22 is adapted to extend into the opening 23 formed in the end plate 18 of the cylinder A and is secured thereto by a fluid tight joint so as to close the end of the master hoist cylinder A and to form an end portion for the cylinder 20. Each of the cylinders 20 are constructed in this manner.

The piston 21 is provided with an operating rod 24 which is secured to the piston in a suitable manner and extends through the end 22 to the operating yoke 25 which is keyed or otherwise secured to the outer end of the shaft 24 to connect the shaft rigidly to the operating yoke 25. The inner ends of the cylinders 20 are secured to the plate 19 by welding or otherwise attaching the inner ends of the cylinders 20 to the plate so as to form a fluid tight joint between the wall of the cylinder 20 and the end plate 19.

The operating pistons 21 of the working cylinders 20 are formed with a packing groove 27 in which a series of leather or flexible washer packing rings 28 are positioned and held against disengagement by means of the plate 29 on the end of the piston 21. The plate 24 is held in place by screws (not shown) or by any other suitable means. This provides a very effective packing having a very durable nature and also providing an efficient packing means for the operating piston 21. A relief valve 30 is carried by the piston 21 and is held normally closed by the spring 31, while the outer end of the valve rod 32 extends beyond the spring so that when the piston 21 reaches a point adjacent the end 22, the end 32 will strike against the cylinder end 22 and open the valve 30 to relieve pressure from beneath the piston 21 and providing circulation through the piston 21, through the ports 30' into the reservoir 33.

The master hoisting cylinder A is formed with one or more working cylinders such as 20, within the casing 17 and the compartment or space formed around the working cylinder or cylinders 20, such as 33, provides a reservoir chamber for oil or other fluid which is adapted to be used in the master hoisting cylinder in its operation. A drain plug 34 is provided in the lower side of the casing 17 to permit the draining of the fluid from the reservoir chamber 33. The master hoisting cylinder may be formed with small adjacent or twin cylinders 20 as illustrated in the section of Figure 4, where the cylinders 20 are placed parallel with each other so that the master cylinder A may be comparatively flat in its height or the depth of the same from the top to the bottom, or a master cylinder A' may be formed with the working cylinder concentric with the casing 17' as illustrated in the section in Figure 6. In this last construction one working cylinder 20' is positioned inside of the casing 17' of the master cylinder. The operations and function of this master cylinder A' is the same excepting there is only one operating cylinder such as 20' instead of two or more such cylinders.

My hoisting mechanism is provided with a manifold block 35 which is secured to the end plate 19 of the master cylinder A through which the shaft 14 extends and which is adapted to provide the manifold connection with the bearing block 36 and the gear pump 37. This manifold block 35 supports the operating or control valve 38 for the master cylinder A, the valve being positioned within the casing portion 39 which is bolted to the manifold 35. The block 36 forms a bearing for one end of the shafts 40 and 41 which support the working gears 42 of the gear pump 37. This block 36 may be made of bronze or other suitable metal to form a suitable bearing for the ends of the gears 42 and shafts 40 and 41. A cover 43 formed of bronze or other suitable metal adapted to provide a good and substantial bearing material is secured to the outer surface of the gear pump 37 by means of the bolts 44.

The bolts 44 extend through the block 36 and the body of the gear pump 37 and cover 43, the inner ends of the bolts being threaded in the

manifold 35 as illustrated in Figure 8, and the nuts 45 holding the cover 43 firmly in place against the body of the gear pump 37.

The shaft 41 extends through the cover 43 to provide a working end 41' to which a universal joint 46 may be connected and which may be operated by the driving shaft 47 so as to operate the gear pump 37 when it is desired. I provide a packing gland 48 of a peculiar nature extending around the working end 41' of the shaft 41 and the packing 49 in the gland 48 may be adjusted by means of the threaded plunger bolt 50. This provides a suitable means of forming a packing around the working end of the shaft 41 so as to permit the gear pump 37 to operate efficiently without leaking around the outer end of the shaft 41 or to take up ordinary wearing of the shaft and bearing to provide a better efficiency for the gear pump for a longer period of time.

The gears 42 are held between the block 36 and the cover 43 so that these parts, namely, the block 36 and the cover 43, form bearings for the side walls of the gears 42. This provides a working tight joint so that the gears 42 may be operated as the gear pump 37 to provide the desired fluid pressure to the pistons 21 of the cylinders 20. With a gear pump of this nature, considerable pressure may be built up by using a fluid such as oil or other suitable fluid means which provides a lubricant for the pump as well as the means of providing hydraulic pressure for operating the pistons 21. The structure of the pump 37 is of a simple nature and the parts thereof may be readily replaced as well as the bearing parts 36 and 43.

This provides a pump means for my hoisting device wherein the parts may easily be replaced as they become worn out, or for any other reason, a feature which is highly desirable in a device of this character. Hoists for dump bodies for motor trucks are subjected to considerable use and it will be apparent that in a simple construction of the manifold 35, together with the quickly and readily replaceable parts 36, 37 and 43, that I provide a very desirable structure wherein all of the parts are of a simple yet practical nature.

The driving shaft 47 for the pump 37 may be connected to any suitable source of power, such as a power take-off mounted on the truck transmission (not shown), or may be driven by any other suitable means to operate the gear pump 37 to draw oil from the reservoir chamber 33 through the passageway 51 which is formed in the end plate 19, then through the passageway 52 formed in the manifold 35 and through the passageway 53 formed in the bearing block 36 to the pump 37. As the pump 37 operates, it will force oil away from the same through the passageway 54 formed in the block 36 against the spring ball check 55 which is supported in the manifold 35 and is adapted to operate against a valve seat formed in the block 36.

In the operation of the gear pump 37 to operate the pistons 21, the valve 38 is turned into closed position. The fluid pressure coming from the pump will open the check valve 55 and permit the fluid to pass through the passageway 56 and through the openings 57 directly against the pistons 21 in the cylinders 20, operating the pistons to move the piston rods 24 outwardly and thereby operating the yoke 25. The valve 38 is illustrated in Figure 3 in open position. When it is desired to operate the pistons as just described, this valve is first turned into closed position so as to shut off the by-pass passageway 58 formed in the casing 39 which also closes the by-pass passageway 59 which connects with the passageway 58 through the valve 38. The passageway 59 is formed in the manifold 35 and connects with the passageway 60 in the plate 19 leading into the reservoir chamber 33.

The passageways 51 and 60 are formed in the plate 19 between the cylinders 20 and the passageway 51 provides an outlet to the intake end of the pump 37. The passageway 60 provides an inlet passageway for the fluid or oil when the piston 21 is operated toward the end plate 19. After the pistons 21 have been moved to a point adjacent the end 22 and it is desired to return them to the position illustrated in Figure 3, the valve 38 is placed in the position illustrated in Figure 3 and thereupon pressure on the yoke 25 will push the piston 21 toward the end 19, forcing the oil under the piston in the cylinder 20 out of the passageways 57 through the passageway 56 around the check 55 into the passageway 58 through the valve 38 and through the passageway 59, and through the opening 60 back into the reservoir chamber 33.

With this master hydraulic hoisting unit A, a very desirable construction is provided wherein a maximum reservoir is formed about the cylinders 20 and by the increased piston area permits a lower working pressure to be employed to operate the hydraulic hoisting unit. There are no outer connecting pipes, all of the passageways are contained within the unit and they are so directly connected and closely assembled as to provide a more efficient hoisting device. This compact hoisting unit provides a primary feature of importance and advantage in my hoisting device.

I provide a filler plug 59' leading into the passageway 59 which provides an easy means for filling the oil into the hoist in servicing the cylinder A and the pump 37. The location of the plug 59' prevents filling the hoist cylinder A with too much oil, allowing for displacement of oil by the piston rods 24.

My hoisting unit, owing to its compact nature and the fact that it may be mounted to lie horizontally with its frame made of the members 10 and 11 on the frame portion such as 16 of a motor truck, is particularly adapted for hoisting dump bodies such as are used on trucks. The drawings illustrate diagrammatically only a portion of the motor truck, such as the frame portions 16. The master hoist cylinder A is held by its frame upon these members 16, as set forth, and the longitudinal bolsters 62 of the dump body 63, only a portion of the body being illustrated, extend above the frame members 16 on either side of the hoist cylinder A. Cross bolsters 64 hold the dump body 63 above and secured to the longitudinal bolsters 62. The longitudinal bolsters 62 are supported by the bracket 65 which is pivotally mounted at 66 on the frame members 16 and rear transverse angle iron 11. This pivotally supports the bolsters 62 which carry the dump body 63 through the cross bolsters 64. Thus the body 63 is pivotally mounted to the frame 16 of the motor truck.

The pivotal mounting at 66 is virtually adjacent one end of the master hoisting cylinder A and on either side of the same. The compact nature of my hoisting device with its comparatively flat master hoisting cylinder A permits the same to fit in close quarters beneath the dump body 63 and without interference with any of the parts of the truck, such as the cross members of the

frame, or rear axle. This is an important feature as will be more fully set forth.

The shaft 14 carries a pair of drop forged arms 67 and these arms are free to pivot on the shaft 14. The arms 67 are of a peculiar shape and are pivotally connected at 68 to operating links 69. The links 69 are connected on one end to the shaft 70 which is supported on its ends by brackets 71. These brackets are connected to the channel members 72 which extend above the longitudinal frame members 10 and which are adapted to be secured to the cross bolsters 64 of the body 63. The arms 67 are formed with a shoulder portion 73 against which the short link 74 rests when the parts of the hoisting mechanism are in the position illustrated in Figure 2. One end of the link 74 is pivoted at 75 to the arm 67 and the other end is pivotally connected at 76 to a long link bar 77. Each arm 67 has connected to it the links 74 and 77 and the link bars 77 extend on each side of the master cylinder A and are pivotally connected at 78 to each side of the yoke 25. Thus, when the master cylinder is operated by closing the valve 38 and the gear pump 37 operates to build up a hydraulic pressure under the pistons 21, the piston rods 24 will force the yoke 25 outwardly away from the master cylinder A, thereby causing the link bars 77 to draw upon the links 74, lifting the arms 67 and elevating the links 69 so as to elevate the body 63 into dumping position as illustrated in dotted outline in Figure 2. The operating cylinders 20 of the master cylinders provide a powerful lifting force to the yoke 25 and the load in the body 63 is elevated so as to permit the same to be readily dumped from the body when it is desired.

My hoisting device operates directly against the approximate center of the body where the lifting force is most desired, and the lifting strain is distributed through the hoist supporting frame. The hoist supporting frame may be readily mounted on any motor truck chassis. The master hoisting cylinder being of a comparatively flat and compact nature, the same as a unit with the hoisting parts, fits neatly beneath the body to be hoisted. This permits my hoist to be positioned where the frame of the truck is best adapted to receive the load and lifting strain, and by means of the supporting frame for the hoisting mechanism the lifting load is distributed over a greater area on the frame of the chassis instead of being concentrated at a single point which would require wide saddles to prevent bending strain at a single point on the frame, as has been experienced heretofore. The master hoisting cylinder may be made as illustrated in Figure 6, where the casing and the operating cylinder are concentric for larger apparatus and where only one working cylinder is desired with sufficient space beneath the dumping body to receive the larger diameter of the master cylinder. The operation of the master cylinder A' illustrated in Figure 6 would be the same as that shown in the twin cylinder structure illustrated in Figure 4 and the pump 37 would operate in the same manner to build up the hydraulic pressure in this piston as in the master cylinder illustrated in Figure 4.

The master cylinder illustrated in Figure 4 with the twin working cylinders 20 is preferred for providing hoisting mechanism to operate truck bodies where minimum space is available or desired between the bottom of the body and the frame. With my hoisting structure the working cylinders are held stationary and the large reservoir about the same permits a good supply of hydraulic fluid, while the unitary construction of the parts without any outer pipe connections provides a hoisting mechanism which is adapted to give continued or uninterrupted service for a long period of time and without appreciable wear even though under heavy loads and hard use.

The pump connecting manifold with the other parts like the bearing block 36 and the pump body itself with the gears therein and the cover 43 are all easily assembled and therefore they may be readily replaced. The main wear comes on these parts under heavy strain and it is an easy matter to replace them, therefore I have provided a structure of a hoisting mechanism which I have found to be of a very desirable nature.

In my hoisting mechanism, the master cylinder A is held in operative position by the angle member 13 and the shaft 14 while the members 10 and 11 constitute a frame which supports the same between the side members 16 of the chassis of the motor truck. The fact that the hoisting cylinder A is of a compact nature, owing to the peculiar construction of providing the working cylinders within the reservoir casing, permits the whole hoisting unit to be assembled in a very compact form. The yoke 25 may be a drop forging of a simple nature as well as the arms 67, thereby providing very strong members for these working parts which carry the strain in the operation of the hoisting cylinder A, the piston rods 24 working directly against the yoke 25, while a pull is directed against the links 77 and 74, to pull the arm 67 upward around the shaft 14 in a manner to elevate or push upwardly on the link 69, thereby directing an upward force against the under cross bolsters of the body 63 to elevate the same very readily. Any suitable driving means may be connected to operate the gear pump 37 and when the shaft 47 is operated by the transmission or other moving parts of the truck which carries the hoisting mechanism, a direct drive may be provided, and owing to the fact that the pump and connecting parts with the master cylinder A remain stationary at all times considerable wear is obviated over former types of hoisting mechanisms for dump bodies of motor trucks.

A feature resides in the direct connecting of the parts on the inner end of the master cylinder which permits a more direct passageway for the flow of the liquid in providing the hydraulic hoist and the free and ready escapement for the liquid such as oil out of the by-pass passageways 30' in the outward movement of the pistons 21, together with the large and closely connected reservoir for the surplus liquid or oil used in the operation of the hoist. These are features which distinguish my hoist from those used heretofore and I have found that my hoist has considerable advantage over these prior structures.

In accordance with the patent statutes, I have described the principles of operation of my hoist and I have endeavored to set forth the best embodiment thereof, however, the illustrations are only suggestive of a means and apparatus for showing the principles and operation of my hoisting unit, and I desire to have it understood that the same may be adapted to other uses and the principles carried out by other variations within the scope of the following claims.

I claim:

1. A hoisting unit having a compact nature in-

cluding, a pair of work cylinders, a casing extending about said work cylinders adapted to provide a reservoir thereabout, passageways directly connecting said work cylinders with said reservoir, operating pistons and rods within said work cylinders, by-pass valves carried by said pistons to permit the relief of hydraulic pressure through said pistons at the limit of stroke in one direction, a manifold secured to one end of said casing, a gear pump directly connected to said manifold on one end of said casing of said working cylinders and reservoir, passageways in said manifold connecting said gear pump with said reservoir and working cylinders, and a valve for controlling the operation of said gear pump to operate said pistons within said working cylinders.

2. A master hoisting unit for hydraulic hoists including, a casing, spaced parallel working cylinder means within said casing, pistons within said cylinder means, parallel piston rods extending from said pistons to a point outside of said cylinder, a reservoir chamber formed by said casing between said casing and said work cylinder means, a pump manifold connected to one end of said master cylinder, a bearing block adjacent one end of said manifold, a gear pump block having operating gears secured to said bearing block, a cover for the other side of said gear pump, passageways through said manifold and bearing block connecting said gear pump with said work cylinder means and said reservoir in said master cylinder, and valve means in said manifold block to direct the operation of said gear pump to operate said pistons by hydraulic pressure from said gear pump.

3. A hoisting unit including, a comparatively flat master operating cylinder, working cylinders forming a part of said master cylinder, a reservoir in the remaining portion of said cylinder, pistons and rods operable within said working cylinders, an operating yoke connected to said piston rods outside of one end of said master cylinder, a manifold secured at one end of said master cylinder, and a gear pump unit secured to said manifold at one end of said master cylinder, and valve means for controlling the operation of the pistons within said work cylinders during the operation of said gear pump by by-passing the operating fluid through said manifold in said hydraulic master cylinder and gear pump past said pump and from one side of the pistons in said work cylinders back to the other side and into the reservoir of said master cylinder.

4. A master hoisting unit for hydraulic hoists including, a casing, a plurality of parallel spaced working cylinders in said casing, pistons within said cylinders, parallel piston rods extending from said pistons to a point outside of said cylinder, a reservoir within said casing between said work cylinders, a manifold connected to one end of said master cylinder, a hydraulic pump in said manifold, passageways connecting said pump and said working cylinders, and means to direct the operation of said gear pump to operate said pistons by hydraulic pressure from said gear pump.

HENRY J. RIACH.