

J. SCHWISTER.
HYDRAULIC HOIST FOR DUMPING VEHICLES.
APPLICATION FILED DEC. 29, 1916.

Patented Apr. 24, 1917.
2 SHEETS—SHEET 1.

1,223,741.

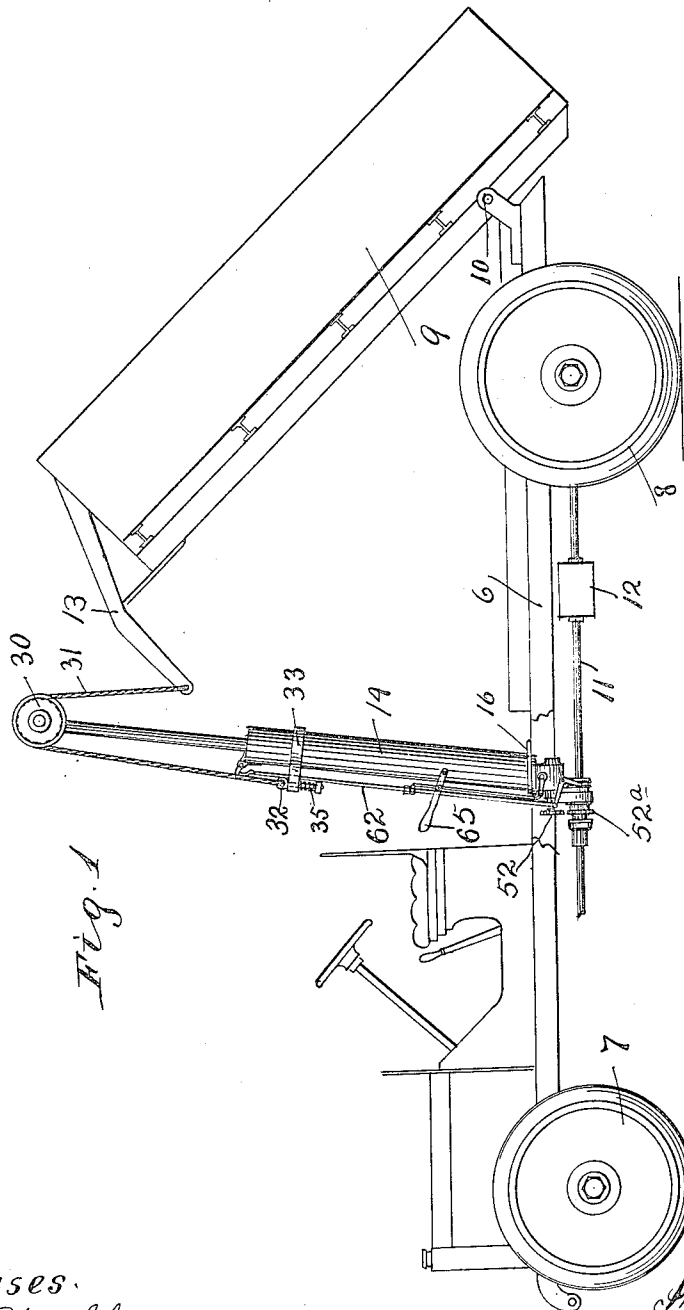


Fig. 1

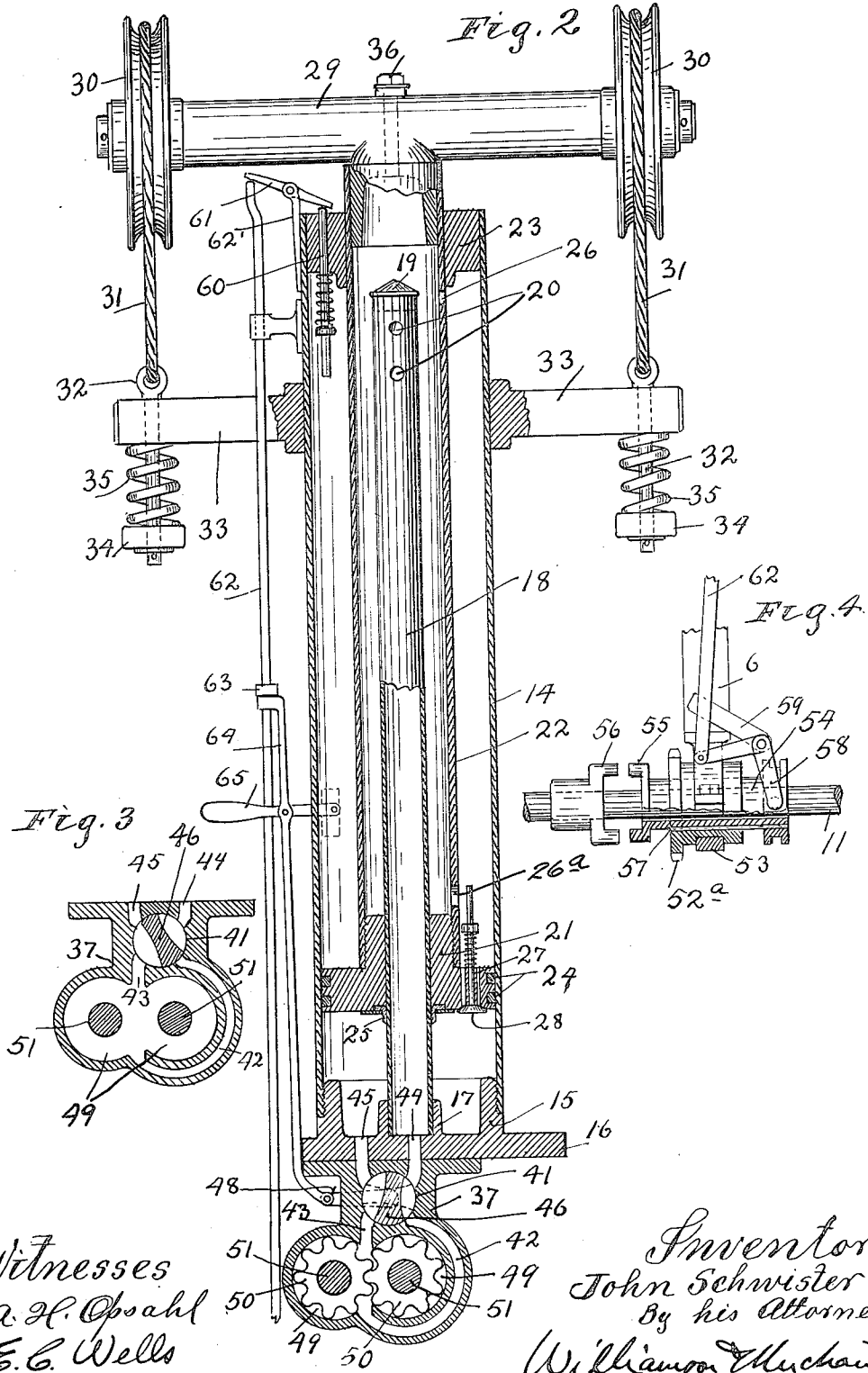
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UNITED STATES PATENT OFFICE.

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HYDRAULIC HOIST FOR DUMPING-VEHICLES.

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Specification of Letters Patent.

Patented Apr. 24, 1917.

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To all whom it may concern:

Be it known that I, JOHN SCHWISTER, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Hydraulic Hoists for Dumping-Vehicles; and I do hereby declare the following to be a full, clear, and exact description of the invention such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to provide an improved hydraulic hoist for dumping vehicles; and to such ends, generally stated, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

The invention is illustrated in the accompanying drawings wherein like characters indicate like parts throughout the several views. Referring to the drawings;

Figure 1 is a side elevation showing the improved hydraulic hoist applied to a dumping vehicle, such as a heavy truck designed to carry the dump coal, sand, gravel, etc.;

Fig. 2 is a transverse vertical section taken centrally through the hydraulic hoist proper;

Fig. 3 is a fragmentary view in section showing the controller valve of the hydraulic hoist; and

Fig. 4 is a side elevation of the clutch mechanism for driving the rotary pump;

Of the parts of the vehicle, the numeral 6 indicates the truck frame, the numeral 7 the front wheels, the numeral 8 the rear wheels and the numeral 9 the dumping body or box which is pivotally mounted at 10 on the rear portion of the truck frame 6. The numeral 11 indicates the engine driven transmission shaft which, on the truck illustrated, drives the rear traction wheels through a rear transmission mechanism of any suitable construction contained in a casing 12. At its front end, the dumping body 9 is provided with a forwardly and downwardly projecting heavy bracket 13 to which the cable of the hoist is attached.

The hydraulic hoist comprises a long upright cylinder 14 which, at its lower end, is rigidly anchored to the truck frame 6 and, as shown, has a slight rearward inclination. In the construction illustrated, the cylinder 14, at its lower end, has screw-threaded en-

gagement with an annular flange 15 of a base plate 16 that is suitably anchored to the truck frame 6 and is formed with a relatively small axially located flange 17 into which the lower end of a return tube 18 is screwed, and hence, rigidly secured in a position concentric to the axis of the cylinder 14. The upper end of this return tube 18 is preferably closed by a plug 19, but below the said plug, said tube is provided with one or more lateral ports 20.

Working within the cylinder 14 and around the return tube 18 is a piston 21 that has a tubular stem 22. This tubular stem 22 is spaced from, but concentric to both the return tube 18 and cylinder 14 and it works through an annular upper end cylinder head 23. The piston 21 has piston rings 24 for making a tight joint with the cylinder and is provided with a pressure-seated flexible packing leather washer 25 that maintains a tight joint with the tube 18. Just above the hub of the piston, the tubular stem 22 has ports 26* and in one side, said piston has a port 27 that is normally closed by a spring-pressed check valve 28, the stem of which projects upward and is adapted to strike the annular cylinder head 23 at the extreme upward movement of the piston, all as will be hereinafter more fully described.

Rigidly secured to the upper end of the tubular piston stem 22 is a cross arm or bar 29, which, as shown, has a tubular hub telescoped into the upper end of the said stem. Sheaves 30 are loosely journaled on the ends of the cross bar 29. Hoisting cables 31 of any suitable form, but, as shown, in the form of wire cables, are passed over the sheaves 30, and at their lower ends, are attached to anchor bolts 32, which, in turn, are passed through the ends of an anchor bar 33 which is rigidly secured to the cylinder 14 and projects from the opposite sides thereof. The anchor bolts 32 are provided with nuts 34, between which and the ends of the anchor bar 33, heavy cushioning springs 35 are interposed.

The hub of the cross bar 29 is preferably closed except for combined filler and breather tube 36. The rear ends of the hoisting cables 31 are attached to the laterally projecting arms of the bracket 13, which, as above noted, is secured to the front end of the dumping body or box 9. With this arrangement, as is evident, when-

ever the piston 21 is moved upward the dumping body 9 will be raised into an inclined or dumping position, and, conversely, when the piston lowers, the dumping body 5 will be lowered back to its normal or carrying position. Furthermore, it will be noted that the movement of the front end of the dumping body will be twice as fast as that of the piston.

10 The pump, which is of the rotary type, comprises a pump casing 37 and two intermeshing toothed rotary pump pistons 50 working in intersecting cylindrical seats within said casing. In fact, this pump may be of an improved rotary type. The gears 15 or rotary pistons 50 have shafts 51, one of which projects from the casing and is provided with a driving sprocket 52, which is driven from the transmission shaft 11 through clutch mechanism presently to be described.

The pump casing 37 is preferably, and as shown, directly bolted, or otherwise, rigidly secured to the base plate 16. Said casing is 25 formed with a cylindrical valve seat 41. Below the valve seat 41, said casing is provided with oil circulating conduits 42 and 43. Above the valve seat 41, the valve casing and base plate 16 are formed with oil 30 circulating conduits 44 and 45. Working within the valve seat 41 is a controller valve 46 that is provided with a projecting shaft 47, to one outer end of which an arm 48 is rigidly attached.

35 The conduits 42 and 43 lead, respectively, to the receiving and discharging sides of intersecting piston seats 49, formed in the valve casing 37, and working in these seats are intermeshing gear-like rotary pump pistons 50 having shafts 51 journaled in the 40 sides of the casing. One of the shafts 51 projects, and is provided with a sprocket 52 that is alined with a similar sprocket 52^a on the engine driven transmission shaft 11. An ordinary sprocket chain, not shown will run 45 over the sprockets 52 and 52^a. The sprocket 52^a (see particularly Fig. 4) is not primarily driven from the transmission shaft 11 but has a hub journaled in a bearing 53 rigid 50 on the truck frame 6, and between said sleeve and said shaft 11, is interposed a long sleeve 54. This sleeve 54 is loose on the shaft 11, is free for sliding movements and is provided at one end with a half clutch 55 that 55 is engageable, at will, with the half clutch 56 secured to the transmission shaft 11. A spline and key connection 57 causes the sprocket 52^a to rotate with the sleeve 54, but permits the latter to slide through the same. 60 At its outer end, the sleeve 54 has a grooved head that is engaged by one arm of a bell crank shipper lever 58 pivoted to a bracket 59 on the frame 6.

Working through the annular cylinder 65 head 23 is a downwardly spring-pressed

plunger 60 that is engageable with the inner end of a small lever 61 intermediately pivoted to a bracket 62' on the upper end of the cylinder 14. The outer end of this lever 61 overlies and is engageable with the upper 70 end of a long push rod 62 guided by suitable bearings on the cylinder 14 in the frame 6 of the machine, and pivotally connected at its lower end to the upper arm of the bell crank shipper lever 58. On its intermediate portion, this push rod 62 has a 75 shoulder or collar 63 that is engageable with the upper end of a secondary push rod 64, the lower end of which is pivoted to the arm 48 of the controller valve 46. A hand 80 lever 65 is pivoted to the exterior of the cylinder 14 and to the upper end portion of the secondary push rod 64.

Operation.

When the handle lever 65 and other parts 85 are in the position shown in Fig. 2, the half clutch 55 will be engaged with the half clutch 56 and the intermeshing rotary pistons will be in action, and furthermore, the 90 controller valve 46, being then in the position shown in Fig. 2, will connect the conduit 44 to conduit 42, and conduit 43 to conduit 45, so that oil will be pumped from the return tube 18 down through conduits 44, 42 95 and up through conduits 43 and 45, into the lower end of the cylinder, thereby forcing the piston 21 and its tubular stem 22 upward. This upward movement of the piston and its stem, of course, carries a cross 100 bar 29 and sheaves 30 therewith, and tilts the dumping body 9 into the position shown in Fig. 1.

It is, of course understood that the cylinder 14, tubular stem 22 and return tube 18 105 will all be filled with a liquid, preferably oil. The port 26 permits the cylinder 14 to be nearly filled with oil when the piston is lowered and the lower port 26^a, affords communication between the cylinder and interior of tubular piston stem 22, when the 110 piston is raised. There is always, therefore, a chance for the oil to be drawn from the cylinder 14 into the tubular stem 22 and from thence through the ports 20 into the return tube 18. 115

When the piston closely approaches the limit of its upward movement, two actions take place approximately simultaneously, to-wit, the upper end of the stem of valve 120 28 is forced against the annular head 23, thereby opening the port 27, and the lower end of plunger 60 is engaged by the piston, thereby raising said plunger and depressing the push rod 62. Opening of the valve 28 instantly 125 relieves the piston from oil pressure, by permitting the oil to escape through port 27 from the lower to the upper side of the piston, and this insures stopping of piston without moving the pliable washer 25 above 130

either of the ports 20. If this pliable washer 25 should be moved above one of the said ports 20, while subject to oil pressure, it would be forced into and cut by the said perforations.

The depression of the push rod 62, by engagement of the piston with the plunger 60, simultaneously equalizes two actions, to-wit; it disengages half clutch 55 from half clutch 56 and stops the actions of the pump, and it moves controller valve 46 from the position shown in Fig. 2 into the position shown in Fig. 3, thereby cutting off conduit 42 from supply conduit 44, but leaving port 43 in communication with port 45, so as to permit oil to remain in the pump to be delivered therefrom into the cylinder, in case the pump should be run by momentum, or otherwise, slightly after the supply port is cut off. This avoids shocks in the pump.

When the valve 46 is in the position shown in Fig. 3, hand lever 65 will be forced slightly lower than shown in Fig. 2 and the piston will then be located in its uppermost position.

When it is desired to lower the piston, and hence, the dumping body, the hand lever 65 must be thrown still farther downward than just stated, to-wit, far enough to move the valve 46 from the position shown in Fig. 3 into the position indicated by dotted lines in Fig. 2; and when the said valve is in this dotted line position, the conduits 44 and 45 will be connected so that under the weight of the load, the oil will be forced from the lower end of the cylinder up into the so-called return tube 18, from thence into tubular piston stem 22 and from thence into the upper portion of the cylinder 14. Of course, check valve 28 automatically closes under initial downward movement of the piston, and plunger 60 returns to its normal lowered position without, however, moving the push rods 62 and 64 and parts actuated thereby. It will be noted that the downward movement of the lever 65 and suspension push rod 64 required to move controller valve 46 from the position shown by full lines in Fig. 3, into the position shown by dotted lines in Fig. 2, does not move main push rod 62, nor further actuate or move the clutch members.

To stop the piston, and hence the dumping body when in an intermediately raised position, it is only necessary to raise the lever 65 far enough to move the controller valve back from the position indicated by dotted lines in Fig. 2 into the position shown in Fig. 3, and this manipulation, either under upward movement of the piston, or downward movement of the piston, may be accomplished, at will, by the above noted hand manipulation.

When the piston, and hence the dumping body, is to be raised, the lever 65 must be

raised far enough to move valve 46 into the full line position, Fig. 2, and the push rod 62 back to the position also indicated in Fig. 2. It will, of course, be understood that when the push rod 62 is in its extreme raised position shown in Fig. 2, the half clutch 55 will be engaged with half clutch 56 and the rotary pump will again be thrown into action, operating as already described.

Aside from the extreme simplicity and highly efficient action of the hydraulic hoist described, it has other structural advantages. For instance, there are no outside oil circulating pipes or conduits but the circulation of oil, except through the pump casing, is entirely within parts contained in the cylinder. There is, therefore, only one joint which must be packed or constructed against leakage of oil, and that is between the top of the pump casing and the base plate of the cylinder.

It will be further noted that both the cylinder and the tubular piston are constructed to contain oil to a level above the uppermost port 20 and above the limit of the uppermost position of the piston. This provides a surplus of oil so that the piston will always reach its maximum elevation, regardless of slight waste or evaporation of the oil.

What I claim is:

1. In a hydraulic hoist, the combination with a cylinder and piston working therein, of a pump with connections for delivering oil from one side to the other of said piston, a driving shaft, a clutch for connecting said shaft to said pump, and connections for automatically throwing said clutch out of action, to stop said pump, when the piston approaches the one limit of its movement in said cylinder.

2. In a hydraulic hoist, the combination with a cylinder and piston working therein, of a pump with connections for delivering oil from one side to the other of said piston, a driving shaft, a clutch for connecting said shaft to said pump, connections for automatically throwing said clutch out of action, to stop said pump, when the piston approaches the one limit of its movement in said cylinder, and a normally closed check valve in said piston arranged to be opened at the above noted extreme position of said piston.

3. In a hydraulic hoist, the combination with a cylinder and return tube therein, of a piston working within said cylinder and around said return tube and having a tubular stem surrounding said return tube and working through the upper head of the cylinder, said cylinder, return tube, and tubular stem having circulating ports, a pump having a supply conduit leading from said return tube and a delivery conduit leading to the lower end of said cylinder, and a con-

troller valve arranged to open and close said supply and delivery conduits to control the movements of said piston.

4. In a hydraulic hoist, the combination with a cylinder and return tube therein, of a piston working within said cylinder and around said return tube and having a tubular stem surrounding said return tube and working through the upper head of the cylinder, said cylinder, return tube, and tubular stem having circulating ports, a rotary pump having a supply conduit leading from said return tube and a delivery conduit leading to the lower end of said cylinder, a controller valve arranged to open and close said supply and delivery conduits to control the movements of said piston, and a normally closed check valve in said piston arranged to be opened at the limit of the upward movement of said piston.

5. In a hydraulic hoist, the combination with a cylinder and return tube therein, of a piston working within said cylinder and around said return tube and having a tubular stem surrounding said return tube and working through the upper head of the cylinder, said cylinder, return tube, and tubular stem having circulating ports, a rotary pump having a supply conduit leading from said return tube and a delivery conduit leading to the lower end of said cylinder, a controller valve arranged to open and close said supply and delivery conduits to control the movements of said piston, a driving shaft, a clutch for connecting said driving shaft to said pump, and a clutch releasing connection arranged to be automatically actuated at the limit of its upward movement of said piston and to thereby open the clutch and stop the pump.

6. In a hydraulic hoist, the combination with a cylinder and return tube therein, of a piston working within said cylinder and around said return tube and having a tubular stem surrounding said return tube and working through the upper head of the cylinder, said cylinder, return tube, and tubular stem having circulating ports, a pump having a supply conduit leading from said return tube and a delivery conduit leading to the lower end of said cylinder, a controller valve arranged to open and close said supply and delivery conduits to control the movements of said piston, the said controller valve having three positions, in one of which it connects said return tube and cylinder only through the pump, in the second of which it cuts off communication between the return tube and pump, but leaves the pump in communication with said cylinder, and in the third of which it connects said return tube and cylinder directly and without passing through the pump.

7. In a hydraulic hoist, the combination with a cylinder and return tube therein, of a piston working within said cylinder and around said return tube and having a tubular stem surrounding said return tube and working through the upper head of the cylinder, said cylinder, return tube, and tubular stem having circulating ports, a pump having a supply conduit leading from said return tube and a delivery conduit leading to the lower end of said cylinder, a controller valve arranged to open and close said supply and delivery conduits to control the movements of said piston, the said controller valve having three positions, in one of which it connects said return tube and cylinder only through the pump, in the second of which it cuts off communication between the return tube and pump, but leaves the pump in communication with said cylinder, and in the third of which it connects said return tube and cylinder directly and without passing through the pump, a driving shaft, a clutch for connecting said driving shaft to said pump, and a piston actuated connection for releasing said clutch to stop said pump at a predetermined position of said piston.

8. In a hydraulic hoist, the combination with a cylinder and return tube therein, of a piston working within said cylinder and around said return tube and having a tubular stem surrounding said return tube and working through the upper head of the cylinder, said cylinder, return tube, and tubular stem having circulating ports, a pump having a supply conduit leading from said return tube and a delivery conduit leading to the lower end of said cylinder, a controller valve arranged to open and close said supply and delivery conduits to control the movements of said piston, the said controller valve having three positions, in one of which it connects said return tube and cylinder only through the pump, in the second of which it cuts off communication between the return tube and pump, but leaves the pump in communication with said cylinder, and in the third of which it connects said return tube and cylinder directly and without passing through the pump, a driving shaft, a clutch for connecting said driving shaft to said pump, a piston actuated connection for releasing said clutch to stop said pump at a predetermined position of said piston, and a normally closed check valve in said piston arranged to be opened at a predetermined position of said piston.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN SCHWISTER.

Witnesses:

CLARA DEMAREST,
B. G. WHEELER.