Jan. 8, 1924. 1,480,508

L. A. COLLIS

CONSTRUCTION OF HYDRAULIC LIFTING JACKS

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Fig. 5.

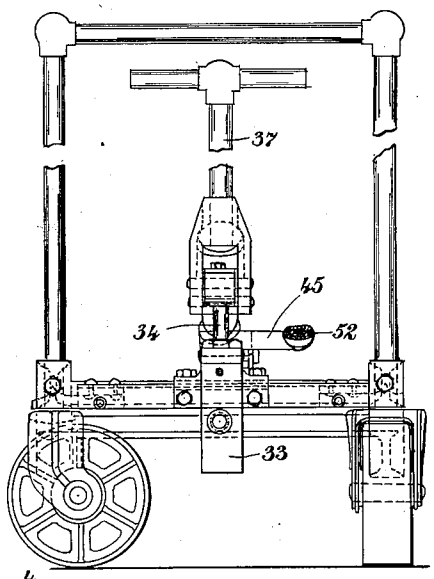
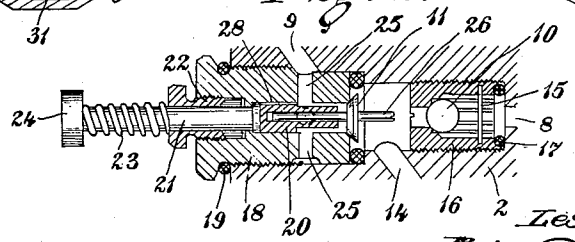



Fig. 1.




Fig. 2.




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Fig. 4.

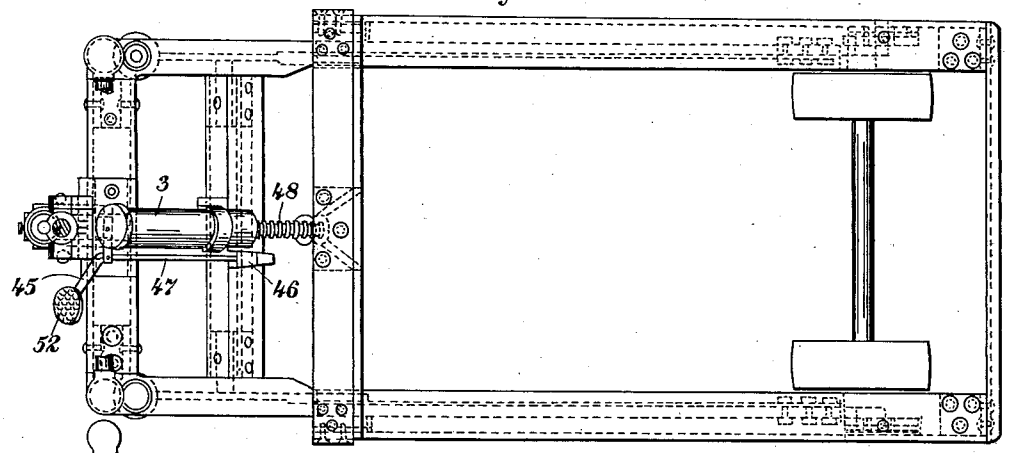



Fig. 3.

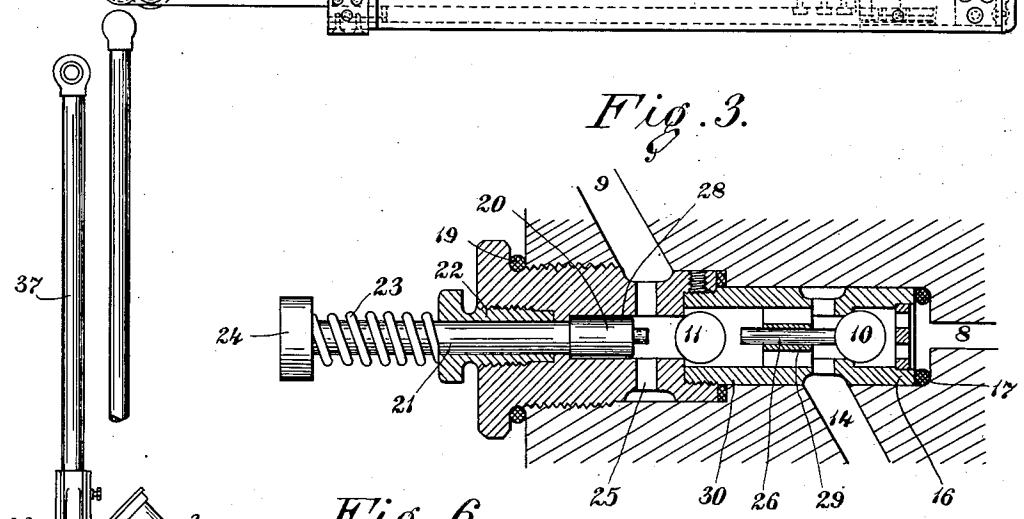
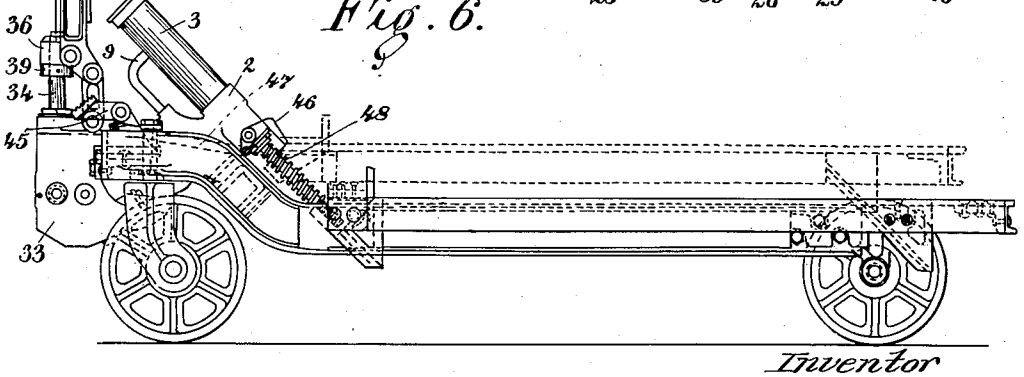



Fig. 6.




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Fig. 7.

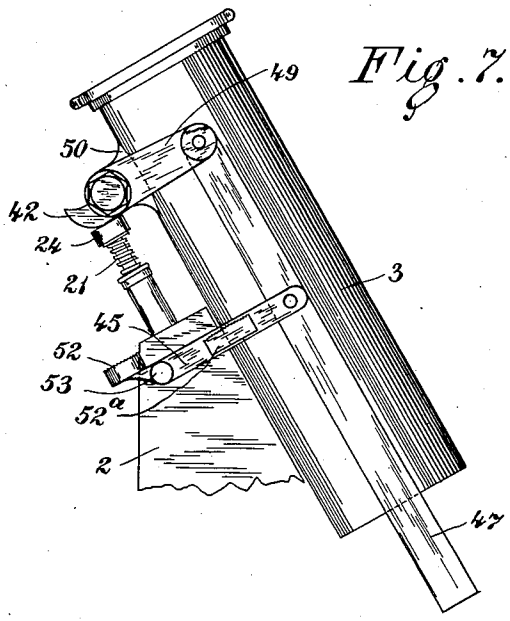



Fig. 8.

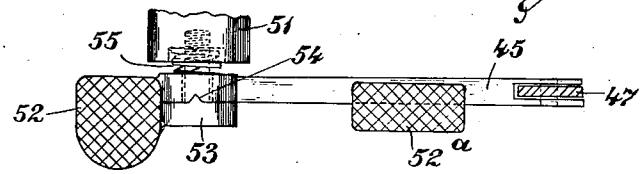
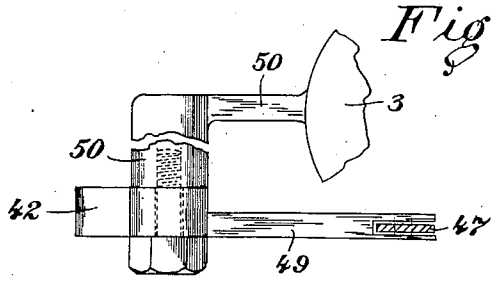



Fig. 9.




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# UNITED STATES PATENT OFFICE.

LESLIE ALFRED COLLIS, OF PUTNEY, LONDON, ENGLAND.

## CONSTRUCTION OF HYDRAULIC LIFTING JACKS.

Application filed April 16, 1921. Serial No. 461,993.

*To all whom it may concern:*

Be it known that LESLIE ALFRED COLLIS, a subject of the King of Great Britain, residing at Putney, London, England, has invented certain new and useful Improvements in the Construction of Hydraulic Lifting Jacks, of which the following is a specification.

The object of this invention is to construct a hydraulic lifting or operating jack or like appliance in such a manner that the ram can be easily and readily operated by hand or power and the liquid released slowly so as to ensure an efficient lowering or return movement of the ram and thus avoid all shocks, and I also provide means whereby when the ram has reached the greatest movement desired any further movement is prevented thereby preventing strain on the apparatus.

For the purpose of my invention I construct the ram cylinder of a greater length than is necessary for the movement of the ram and the cylinder on the working side of the cylinder is connected with the cylinder on the other side of the ram head by a passage way controlled by two valves and a piston or plunger and connected with such passage way preferably between the two valves is a cylinder carrying a pump plunger actuated by any suitable mechanism.

The valves and piston are constructed and positioned as follows, next to the ram cylinder and in the passage way is a ball or other suitable valve (which may be spring controlled) capable of being pressed upon its seating by the pressure on the working side of the ram head such valve being positioned on one side of the connecting passage between the pump plunger cylinder and the other valve which is preferably a disc valve capable of being pressed upon its seating by the pressure in the pump cylinder. This disc valve is provided with a stem on both sides, one stem on the side opposite to that of the ball valve riding in a hole of the piston which rides in a tubular seating and controlling at some part of its movement the passageway from the non-working end of the ram cylinder. This piston is provided with a groove or grooves along its outer periphery and also a stem passing through a gland and projecting from the valves casing and spring controlled such piston being operable to actuate the valves for a slow return movement of the ram and its rod, or instead of this particular construction of valves I may construct the disc valve as a ball valve and employ a loose stem positioned between the two valves the piston acting upon one ball valve which in turn acts upon the other ball valve and instead of the piston being grooved it may be made of slightly smaller diameter.

My invention will be clearly understood from the following description aided by the annexed drawings in which

Figure 1 is a sectional elevation of the appliances.

Figure 2 is a sectional elevation of the valve appliance on an enlarged scale.

Figure 3 is a sectional elevation of a modified form of valve appliances.

Figures 4, 5 and 6 are plan, front and side elevation of a hydraulic truck embodying my invention.

Figures 7, 8 and 9 are fragmentary views in side elevation and plan of modified mechanism employed for preventing overworking of the plunger.

According to this invention I form with or affix to the front of the non-lifting frame 1 of a hydraulic truck a casting or frame 2 to which is secured a ram cylinder 3 of greater length than is necessary for the movement of the ram and inside the ram cylinder 3 is positioned the ram head 4 connected by a rod 5 through a suitable stuffing box or gland 6 with the front of the lifting platform 7 of the truck.

The ram cylinder 3 on the working side of the ram 4 is connected with the cylinder on the other side by a passage way 8, 9 controlled by two valves 10, 11 and a piston or plunger 12 working in a cylinder 13 connected with the passage ways 8, 9 and between the two valves 10, 11 by a passage way 14 the pump plunger 12 being actuated by any suitable mechanism.

According to Figures 1 and 2 the valves

are constructed and positioned next to the ram cylinder and in the passage ways 8, 9 formed in the casting 2.

The ball valve 10 fits on a seating and is capable of being held thereto by the pressure in the passage 8 from the working side of the ram head 4 and such valve may be spring controlled or be held in its passage by the bar 15.

The valve seating and passage way are formed in a plug 16 screwed into a hole in the casting 2 in which a smaller hole is formed leading to the cylinder 3 and a packing 17 is employed to ensure a tight joint.

In an enlarged part of the hole in the casting 2 is screwed another plug 18 a packing 19 here being employed to ensure a tight joint.

The end of this plug 18 is positioned some little distance from the plug 16 so as to provide a space or opening from the passage way 14 connecting the pump cylinder 13.

This plug is formed with a hole through its centre, of two diameters, the larger containing a piston 20 carried by a rod 21 passing through a gland 22 and controlled by a spring 23 engaging the head 24 and the gland 22.

The plug has a series of holes 25 connecting the passage way 9 and the piston 20 is of two diameters, the smaller diameter being positioned next the passage way 9 in normal condition.

The piston 20 is provided with a central bore in which is positioned a stem 26 which carries a disc valve 11 finding a seating on the end of the plug 18 such valve 11 being positioned between the passage ways 8, 9 and 14. The piston 20 is provided with grooves 28 longitudinally thereof.

Instead of forming the valve mechanism as shown in Figures 1 and 2, I may construct the whole mechanism affixable in the casting 2 as one unit this being specially useful to enable the valves to be got at for repairs at any time and this construction I show at Figure 3 and in effect the construction is the same as at Figure 2 with slight alteration for instead of employing a stem 26 to the disc valve 11 I employ a loose stem 26 fitting in a skeleton bracket 29 and instead of employing a disc valve 11 I employ a ball valve and the piston 20 instead of being formed with grooves it may be made of slightly smaller diameter than the diameter of the hole so as to allow of slow passage of liquid.

The plug 16 is formed with a collar 30 which is screwed to the plug 18 so that all form one unit.

To operate the pump plunger 12 any mechanism can be employed and in the drawings I show one way that is to say the pump plunger 12 is provided on its end with teeth 31 which mesh with a toothed quadrant 32 pivoted to a box casing 33 attached to the casting 2 and to which is pivotally connected a reciprocating toothed rod 34 moving in a gland 35 and which meshes with the toothed quadrant 32 the rod 34 being connected by a collar 36 to the operating handle 37 this having a bent end 38 connected by a link 39 to a lug 40 on a ring 41 surrounding the gland 35 the rings 36 and 41 freely revolving so that the handle can be actuated to reciprocate the rod 34 at any position of the handle this being further assisted by the link 39.

The piston head 24 rides against a wiper or cam 42 screwed to the axle 43 riding in bearings 44 on the box casting 33 the other end of the axle 43 having a foot lever 45 for the purpose hereafter described.

In normal condition the ram head 4 is at the nonworking end of its stroke and the pump plunger 12 is at the end of its pressure stroke all the ram cylinder 3 and the passage ways 8, 9, 14 being filled with the hydraulic medium, the spring controlled piston 20 is at one end of its movement and free of the passage way 9 whilst the valve 11 is normal the ball valve 10 being retained upon its seat by the hydraulic medium left in the end of the ram cylinder 3.

Now on a movement of the pump plunger 12 by actuating the handle 37 the hydraulic medium will be drawn from the non-working end of the ram cylinder 3 past the valve 11 into the pump cylinder 13 and on a return movement of the pump plunger 12 the valve 11 will be closed and the hydraulic medium forced past the ball valve 10 into the working end of the ram cylinder 3 and acting upon the ram head 4 will move it and its rod 5 which passes through a gland 6 along its cylinder lifting the platform 7. On a return movement of the pump plunger 12 the ball valve will close and hold the hydraulic medium in the working end of the ram cylinder 3 whilst a fresh quantity of hydraulic medium will be drawn into the pump cylinder 13 and this operation is repeated until the ram 4 and its load is lifted or moved to the required height or distance, the rams rod 5 being connected to or provided with appliances capable of engaging or containing the load.

To release or lower the load the spring controlled piston 20 is pressed by action on the lever 45 moving the wiper 42 and this action first closes the passage way 9 from the non-working end of the ram cylinder except for the groove cut in the surface or reduced diameter and then actuates the valve 11 to open it and this through the stem 26 pushes the ball valve 10 back to open it against the pressure when the hydraulic medium under pressure in the work-

ing end of the ram cylinder passes the valves 10, 11 and by reason of the spring controlled piston 20 closing the passage way 9 to the non-working end of the ram cylinder the hydraulic medium can only pass through the grooves or reduced diameter back to the non-working end of the cylinder slowly thus allowing the ram to lower slowly.

To prevent over working of the apparatus I provide the cylinder casing or casting 3 with say a bell crank lever 46 carrying a rod 47 connected to the spring controlled piston 20 so that when the ram head 4 reaches its full working distance a connection on the ram's rod or the appliance being lifted or lifting platform 7 in the drawings Figure 6 the lifting platform 7 will actuate the bell crank 46 and this will actuate the lever 45 and through the wiper 42 will press in the spring controlled piston 20 and the valves 10, 11 and a release of the pressure in the working end of the ram cylinder will be effected as just described, but so soon as the ram has moved a certain distance backward the bell crank 46 will be released and the spring controlled piston 20 will be reversed by its spring 23 to free the ball valve and the ram 4 will stop or instead of preventing overworking of the apparatus by the means just described and especially where the spring controlled piston 20 is parallel with the cylinder 3 I may employ the devices shown in Figures 7, 8 and 9 in which the rod 47 runs parallel with the cylinder 3 and has its lower end connected to the bell crank 46 or may be left free for the lifting platform 7 to have action against. This rod is pivotally connected by an arm or lever 49 carrying the cam 42 to a lug 50 on the cylinder 3 the arm or lever 49 being pivoted to the lug 50 with the cam 42 in proximity to the head 24 of the stem 21 of the spring controlled piston 20. Pivotally connected to the rod 47 is lever 45 which is also pivoted to a lug 51 projecting from the frame 2 and such lever 45 carries two pedals 52, 52a.

The connection of the lever 45 to the lug 51 is by a bolt 53 having a V projection or projections engaging a V notch or notches 54 on the lever 45 and such lever 45 is kept in contact with the head of the bolt 53 by a coiled spring 55 to normally keep the V notches and projections in engagement as shown.

Now as the lifting platform 7 is reaching the end of its movement it pushes up the rod 47 a certain distance when the cam 42 will press in the spring controlled piston 20 sufficiently far to hold the valve 11 open and as the lever 45 is moved at the same time the V notches 54 are removed from the V projections and the spring will hold the lever 45 and the arm or lever 49 at the placed position and by reason of only the valve 11 being opened any further pumping will not affect the plunger 4 and the platform 7 will be held lifted. When it is required to lower the platform the operator presses on the pedal 52 and presses the spring controlled piston 20 fully down and opens the valve 10 and after the platform 7 has been lowered a pressure on the pedal 52a will reverse the appliances and the platform can be lifted.

Any means can be employed for actuating the pump plunger and for actuating the spring controlled piston automatically.

My invention is specially applicable for lifting trucks and the like in which case the spring controlled piston can be ordinarily actuated by a foot lever 45 and the bell crank lever 46 by the lifting platform 7 and I prefer that the pump cylinder 3 and passage ways 8, 9, 14 be in one casting with valves 10, 11 and piston 20 positioned in a plug or plugs fitted therein, the ram cylinder 3 and the gland 6 being attached to the casting with a pipe 9 connecting the non-working end of the ram cylinder 3 with the casting, the ram's rod 5 being connected to the lifting platform 7 a spring 48 surrounding the ram rod 5 being interposed between the lifting platform 7 and the gland 6 to assist in lowering the platform when there is no load on the platform.

By this invention I employ the ram cylinder 3 as the reservoir and such cylinder 3 may be positioned in the same plane as that in which the platform travels when employed with transporters or lifting trucks.

In applying the hydraulic apparatus to ordinary lifting jacks the end of the ram rod 5 is provided with a foot and the casting 2 is lifted such casting 2 carrying the lifting shoe, or the end of the ram rod 5 can be supplied with a lifting shoe the casting being secured to a stand.

What I do claim as my invention and desire to secure by Letters Patent is:—

1. Hydraulic lifting jack comprising a ram cylinder containing a ram rod and of greater length than necessary for movement of the ram, passage ways connecting the ends of the ram cylinder, two valves and a piston controlling the passage ways, the passage way from the working end of the cylinder leading to one valve, the other passage way leading to between the other valve and the piston, a pump with a passage way leading to between the two valves the pumping action taking the liquid from the nonworking end of the cylinder and passing it to the other end the piston being operable to move the valves and reduce the opening to the nonworking end of the cylinder to allow of slow movement of the ram within the ram cylinder to eject the liquid from the working side to the nonworking side of the ram.

2. Hydraulic lifting jack as claimed in claim 1 providing means to operate the piston and open the valves to release the pressure when the limit of movement is reached.

3. Hydraulic lifting jack as claimed in claim 1 providing the ram rod with a lifting member.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

LESLIE ALFRED COLLIS.

Witnesses:
LYNWOOD A. GARDNER,
HAROLD CORE GARDNER.