Aug. 18, 1931. L. D. NILSON 1,819,378

CURB HYDRAULIC AND GENERAL GARAGE SERVICE JACK

Filed Aug. 19, 1929 3 Sheets-Sheet 1

Fig. 1.

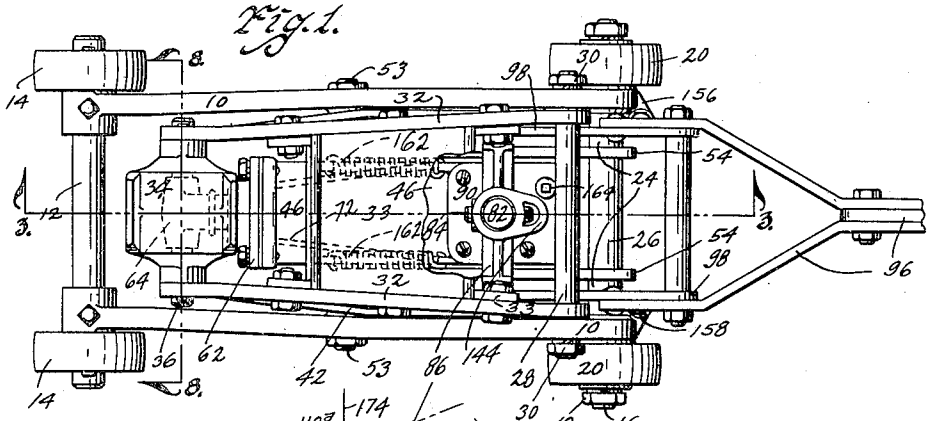


Fig. 9.

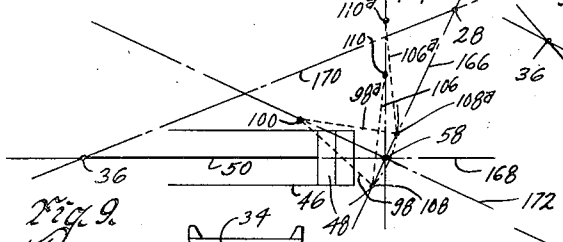


Fig. 10.

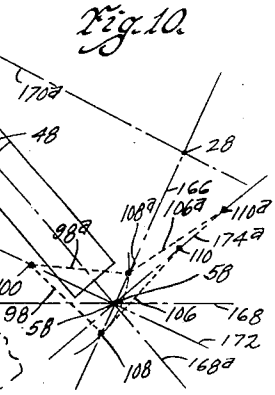


Fig. 2.

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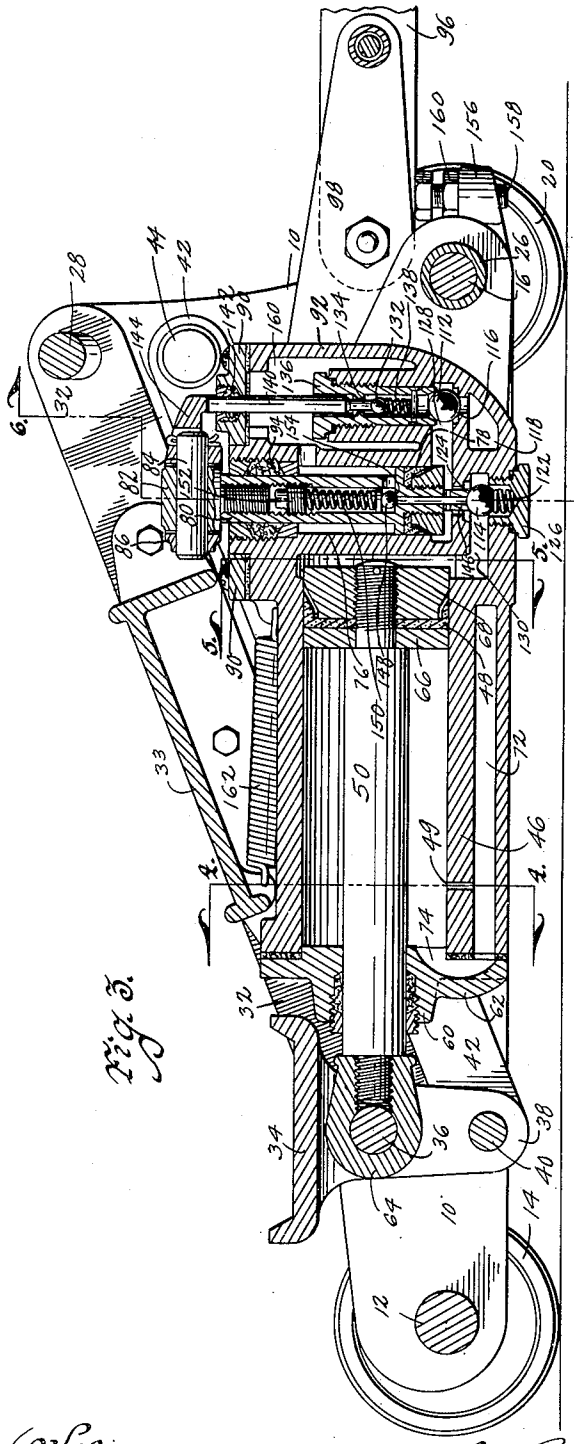


Fig. 3.

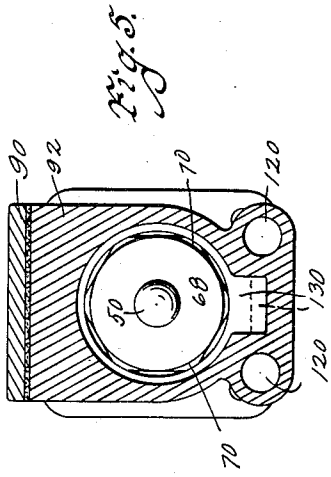


Fig. 5.

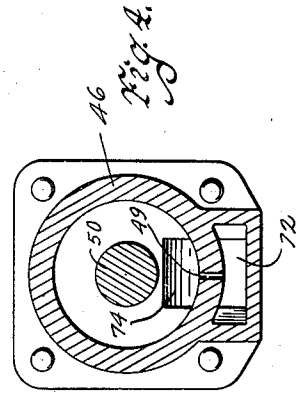


Fig. 4.

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Fig. 6.

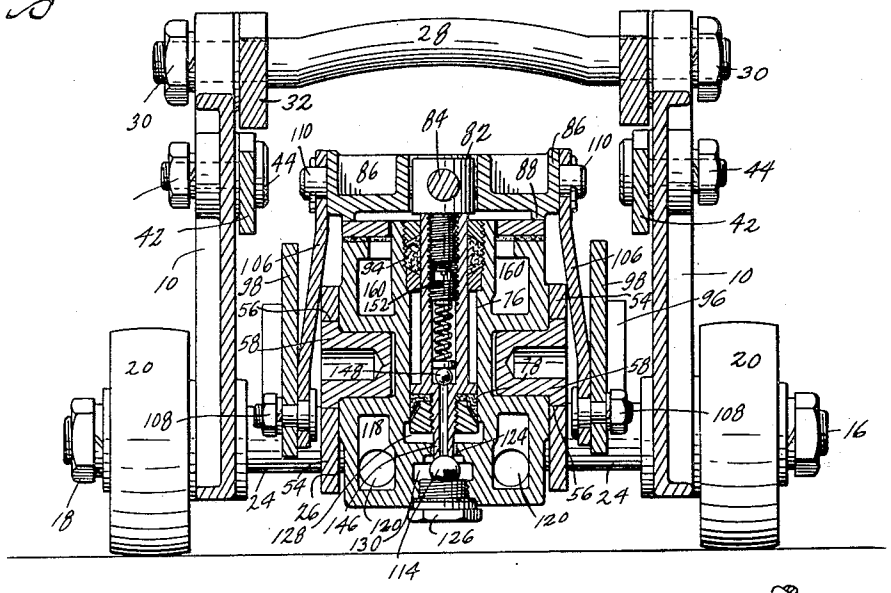


Fig. 7.

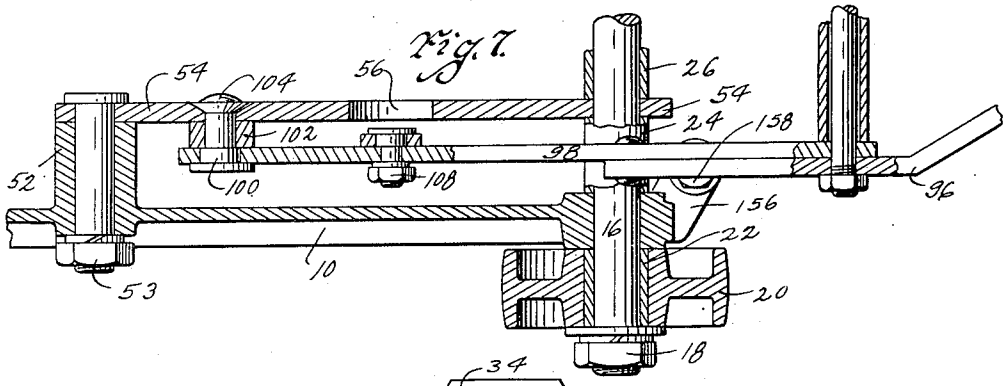
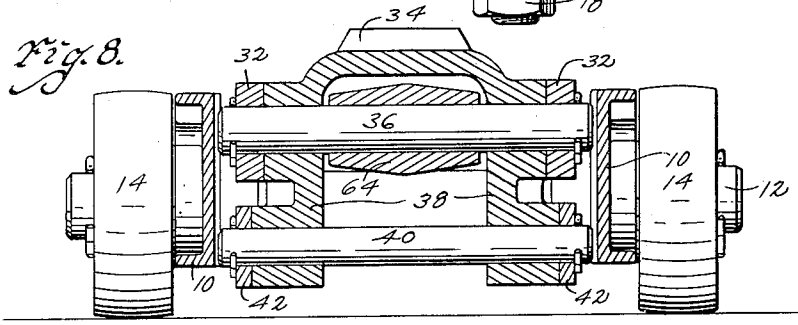


Fig. 8.



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UNITED STATES PATENT OFFICE

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CURB HYDRAULIC AND GENERAL GARAGE SERVICE JACK

Application filed August 19, 1929. Serial No. 386,964.

The object of my invention is to provide a curb hydraulic jack of simple, durable and comparatively inexpensive construction.

A further object of my invention is to provide a comparatively short hydraulic jack adaptable for "curb service" in which the parts are so arranged that even though short, the lifting head of the jack can be raised to a relatively high position, the same details of hydraulic mechanism, however, can be used in connection with a long frame.

More particularly, it is my object to provide a jack equally as well adapted for use as a universal shop jack and consisting of a wheeled frame with a lifting arm pivoted thereto and normally extending downwardly at an angle from such pivot point, a hydraulic extensible mechanism being provided for raising a lifting head mounted on the free end of the lifting arm.

A further object is to provide a hydraulic extensible mechanism designed so that a small extension movement thereof will cause a considerably greater movement of the lifting head so that the lifting head can move from a very low position where it is possible to get the lifting head in position beneath the axles of vehicles having deflated balloon tires and thereafter the jack can be operated to raise such axle to a substantially high position.

Still a further object is to provide a jack construction in which a lifting arm pivot, a hydraulic mechanism pivot and a lifting head pivot form a triangle, the side of which extending from the lifting arm pivot to the hydraulic mechanism pivot is at such an angle that a plane at right angles thereto and extending through the hydraulic mechanism pivot will lie in a plane substantially half way between the lifting head pivot when it is in its lowered and raised positions.

Still a further object is to provide a pump structure carried by the hydraulic mechanism, a plane through the center line of which travels from a position on one side of a plane extending through the lifting arm and hydraulic mechanism pivots to a position on the other side of such plane, such positions being substantially equi-distant from such last mentioned plane.

Still a further object is to provide an operating handle pivoted at a point lying in the plane extending at right angles from the line through the lifting arm pivot and the hydraulic mechanism pivot and crossing the hydraulic mechanism pivot point whereby the central plane of the hydraulic mechanism when in lowered and raised positions assumes a position on opposite sides of the pivot for the operating handle.

The last three objects set forth a structure provided for a specific purpose, such purpose being the equalization of forces in the various parts of the jack (which move through various positions and operate at varying angles) whereby with a given load, the force exerted on the operating handle to raise the load is equal throughout the entire range of movement of the lifting head and the operating handle. Such equalization of forces in the jack also cause proper operation of a safety release valve mounted in the hydraulic extensible mechanism, the object of such release valve being to prevent overloading of the jack. The release valve is adapted to be set at a predetermined tension to prevent operation of the jack when a predetermined load is imposed thereon and the equalization just referred to prevents the release valve from opening when the jack assumes certain positions where the load, though always the same would cause a difference in the hydraulic pressure acting upon the release valve. The features of design relative to the positions of the various pivot points etc., all contribute to the accomplishment of this result.

With these and other objects in view my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Figure 1 is a plan view of my improved curb hydraulic jack structure, the operating handle thereof being broken off although in

the actual jack being of a substantial length for easy operation of the jack.

Figure 2 is a side elevation of the same showing the lifting head in raised position and the operating handle in dotted line position at its upper limit of movement.

Figure 3 is an enlarged sectional view on the line 3—3 of Figure 1.

Figures 4 and 5 are detail sectional views on the lines 4—4 and 5—5 of Figure 3.

Figure 6 is a sectional view on the line 6—6 of Figure 3.

Figure 7 is a sectional view on the line 7—7 of Figure 2.

Figure 8 is a sectional view on the line 8—8 of Figure 1.

Figure 9 is a diagrammatic view showing the jack in lowered position; and

Figure 10 is a similar view showing it in raised position.

On the accompanying drawings I have used the reference numeral 10 to indicate a side frame, two of the frame members 10 are provided in spaced relation. An axle 12 is secured to the frames 10 at their forward ends. Front wheels 14 are rotatably mounted on the ends of the axle 12.

A rear axle 16 is provided for the frame 10 and has threaded ends provided with nuts 18. Rear wheels 20 are mounted on the sleeves 22 on the axle 16 and sleeves 24 and 26 are provided on the axle 16 between the frames 10.

A lifting arm pivot 28 is provided consisting of a rod having shouldered and threaded ends to receive nuts 30. A lifting arm is provided consisting of lifting arm members 32 each having one end pivoted on the shouldered parts of the lifting arm pivot 28 in such a way that they do not bind thereon. The lifting arm members 32 are securely fastened together by a cross brace 33 to form a rigid lifting arm and prevent twisting of one arm member 32 relative to the other. The lifting head 34 is pivoted on a lifting head pivot 36. The lifting head 34 is carried by the lifting arms 32 as clearly shown in Figure 8. The lifting head 34 may be of the construction shown or may include a pivotal connection so that the lifting head can revolve on a vertical axis if desirable.

It will be noted that the lifting head 34 is a yoke construction having downwardly extending arms 38. A stabilizer pivot pin 40 is carried by the arms 38 and extends through openings formed in stabilizer arms 42. The opposite ends of the arms 42 are pivoted to pivot bolts 44 secured to the side frames 10.

For raising the lifting head 34 I provide a hydraulic extensible mechanism consisting of a cylinder 46, piston 48, piston rod 50 and associated parts. The cylinder 46 is pivotally mounted relative to the frame 10 in the following described manner.

Extending inwardly from each frame 10 is a boss 52 to which is connected one end of a triangular shaped supporting plate 54 (see Figure 7). The other end of each plate 54 is securely connected with the rear axle 16 by means of an opening through which the axle extends and the sleeves 24 and 26 engage opposite sides of this plate. Each supporting plate 54 is provided with a pivot opening 56 adapted to receive a pivot stud 58 pressed into the side of the head of the cylinder 46 (see Figure 6). The stud 58 is used rather than forming a stud on the cylinder itself since the stud should be of hardened metal, while the cylinder may be of cast iron or the like.

Thus it will be seen that the two supporting plates 54 are a part of the supporting frame of the jack and are spaced inwardly from the sides 10 thereof so as to be adjacent the sides of the cylinder and to provide space for the operating handle and links extending therefrom to the pump structure between the supporting plates and the frames 10 as will hereinafter be described.

The piston rod 50 extends outwardly through a packing means 60 in a head 62 on the forward end of the cylinder 46 and is connected with a fitting 64. The fitting 64 is pivoted on the lifting head pivot pin 36. The piston 48 consists of a cup leather against one side of which a washer 66 is positioned and against the other side of which a nut 68 is positioned. The nut 68 is angular-shaped, as clearly shown in Figure 5 and has a plurality of corners 70 adapted to snugly fit the interior of the cylinder 46. The purpose of this construction is so that the nut 68 forms a bearing against the interior surface of the cylinder so that even in extended position such bearing is substantially spaced from the bearing formed adjacent the packing 60 to prevent side strain on the piston rod 50 and yet keep the over-all length of the hydraulic cylinder down to a minimum so that a short jack can be had. The cutaway portions of the nut 68 allow oil to pass by the nut and act upon the cup leather piston 50 to expand it.

The space in the cylinder 46 ahead of the piston 48 provides a reservoir which is in connection with an external reservoir 72 formed below the cylinder 46. A passageway 74 is formed in the cylinder head 62 to afford communication between these reservoirs.

The center line of the cylinder 46 and piston rod 50 passes through the pivotal connection 58 of the hydraulic mechanism. A pump structure is located within the hydraulic mechanism and includes a cylinder 76 also passing through such center and bisecting the plane of the cylinder 46 at substantially right angles. Mounted within the pump cylinder 76 is a pump piston 78 of construction similar to the piston 48. The piston 78 is secured to a tubular piston rod 80 having a head 82 screwed into the upper end thereof. The head 82 is connected by means of a pivot

pin 84 with a cross arm 86. The cross arm 86 is provided with an enlarged opening adapted to surround the head 82 and of slightly larger diameter than said head to allow for slight pivotal movement of the cross arm 86 relative to the head 82. The cross arm 86 is provided with a pair of stops 88 adapted to engage a cover plate 90 on an enlargement 92 of the cylinder casting 46 when certain parts hereinafter to be described are in predetermined positions.

A packing means 94 is provided for the pump piston rod 80. An operating handle 96 is provided for reciprocating the pump piston 78. The operating handle 96 is secured to a pair of pump arms 98 pivoted at 100 to supporting plates 54. The pump pivots 100 extend through vertical brace bars 102 the lower ends of which are riveted as indicated at 104 to the supporting plates 54 so that the bars 102 act as reenforcing bosses on the plates 54 which are otherwise flat.

Links 106 extend from pivot bolts 108 in the pump arms 98 to studs 110 formed on the ends of the cross arm 86. Thus, an operative connection is provided between the oscillatible operating handle 96 and the reciprocable pump piston 78.

The inlet and outlet valves for the pump structure are indicated at 112 and 114. The inlet valve 112 is normally seated by gravity against a seat 116 and receives oil or other fluid used in the jack from a cavity 118. The cavity 118 connects by means of passageways 120 with the reservoir 72 as clearly shown in Figure 6 of the drawings. The outlet valve 114 is normally seated by means of a spring 122 against a valve seat 124. A plug 126 receives the spring 122 and partially receives the valve 114 with clearance when in depressed position.

A passageway 128 leads from the inlet valve 112 to the pump cylinder 76 and the outlet valve seat 124. Thus it will be seen that reciprocation of the pump piston 78 draws oil through the passageway 128 from the inlet valve 112 and forces it past the valve seat 124 during alternate raising and lowering movements of the piston 78 by an ordinary pumping operation. The oil after passing the outlet valve 114 flows through a passageway 130 into the cylinder 46 and back of the piston 48.

A release valve structure is included in my jack and consists of a release valve 132 normally seated against a release valve seat 134 formed in a removable sleeve 136. A spring 138 normally keeps the release valve 132 closed or in seated position against the release valve seat 134. The release valve 132 is adapted to be forced downwardly against the action of the spring 138 by means of a plunger 140 extending through a packing gland 142 in the cover plate 90. An extension 144 on the cross arm 86 is adapted to engage the upper end of the stem 140 when the cross arm is adjacent its lowermost position. The outlet valve 114 must also be opened for release purposes and the pump piston rod 80 is accordingly provided with an extension 146 adapted to engage the valve 114 when the piston is in lowered position as shown in Figure 3.

Within the pump structure I provide a safety release valve 148 normally seated by means of a spring 150, the tension of which is adjusted at the factory by a screw plug 152. The safety release valve 148 normally seats against a seat 154 within the pump piston 80.

Each side frame 10 is provided with a lug 156 in which an adjustable stop screw 158 is mounted. A lock nut 160 is provided on each stop screw 158.

Practical operation

In the operation of my curb hydraulic jack the operating handle 96 is oscillated from the dotted line position shown in Figure 2 to a position adjacent the full line position shown therein (the full line position being a release or lowering position). Such oscillation of the handle 96 will cause reciprocation of the pump piston 78 to alternately open and close the valves 112 and 114 and force oil from the reservoir of the jack to the cylinder 46 back of the piston 48 therein. Such operation of the handle 96 will cause a step by step raising movement to be imparted to the lifting head 34. When it is desired to release or lower the lifting head it is merely necessary to swing the handle 96 to its lowermost position against the stop screw 158 whereupon the outlet valve 114 and the release valve 132 will be opened as shown in Figures 3 and 6. The oil can then flow from behind the piston 48 through the passageway 130, past the valve seat 124, through the passageway 128 and then past the valve seat 134 from which it flows through the opening in the sleeve 136 around the stem 140 and into a cavity 160 above the sleeve 136. This cavity is connected to the cavity 118 so that the oil flows back into the reservoir 72 and the reservoir portion of the cylinder 46. The stop screws 158 may be adjusted to limit the opening movement of the valves 114 and 132 and accordingly adjust the speed at which the jack will be lowered since such adjustment will effect the size of the release openings through which the oil returns to the reservoir. Springs 162 are provided to cause lowering of the lifting head 34 when there is no load on the head or after the head has left the axle of a vehicle whereupon weight of the vehicle could not cause further lowering of the head.

Several advantages arise from the construction of the jack as herein disclosed one of which lies in opening the outlet valve 114

when lowering the lifting head. Thus, only the one valve 114 is in communication with the pressure in the cylinder 46 as caused by a load thereon so that this valve only will have to be taken care of for preventing such leakage as would allow the jack to lower after it has been brought to raised position with a load on it. The inlet valve 112 being located in the position shown will be at the lowermost point of the hydraulic mechanism as clearly shown in section in Figure 2 when the piston is in raised position. Thus it will receive the last of the oil in the jack in the event that the oil supply has become low. The oil supply can be replenished by removing a filler plug 164 in the cover plate 90 when desired. The filler plug 164 is provided with a vent opening which will compensate for displacement of air in reservoir when the jack is operating either up or down.

The spaces 118 and 160 which have been referred to as cavities are actually a portion of the reservoir for holding the oil used in the hydraulic mechanism and supplement the reservoir 12. When oil is placed in the jack its level extends only slightly above the piston rod 50 when the jack is in lowered position so that the spaces left take care of splash and rush of oil when the jack is lowered caused by the rapid flow of oil through the release valve. These cavities or portion of the reservoir keep the oil from rushing up out of the air vent in the plug 164.

It has been my purpose to provide a very short hydraulic mechanism so that the jack itself can be comparatively short, hence the reason for mounting the pump at an angle to the lifting cylinder and piston rod rather than parallel thereto. This also provides perfect operating of the pump through the links and the handle without changing the relation of the handle to the pump when the jack is being raised.

Explanation of diagrammatic Figures 9 and 10

Referring to Figure 9, center lines 166, 168 and 170 are illustrated. These center lines pass through the lifting arm pivot 28, hydraulic mechanism pivot 58 and lifting head pivot 36. A center line 172 is drawn at right angles to the center line 166 and passes through the hydraulic mechanism pivot point 58. The operating handle pivot 100 is located on this center line and the pump operating bar 98 being secured to the operating handle 96 swings from this center. The pump link pivot 108 carried by the pump operating bar 98 swings from a position on the center line 166 below the pivot 58 to a position 108*a* on such center line above the hydraulic mechanism pivot 58.

It will be noted that the points 108 and 108*a* are substantially equi-distant on each side of the pivot point 58.

The pump center line 174 is at right angles to the center line 168 and in Figure 9 is shown to the left side of the pivot 28. The pivot connection between the pump and the pump link 106 shown at 110, is of course, on the center center line 174 and moves from the point 110 to the point 110*a* during a complete oscillation of the pump operating handle.

Referring to Figure 10 it will be noted that the center line 174 has swung past the pivot 28 to a position 174*a* and hydraulic mechanism center line 168 has swung to a position 168*a* on the opposite side of the center line 172 (compared to its position in Figure 9). The pump operating bar 98 will still swing between such position and the position 98*a* which still causes the same movement in the pump structure as when the device was in the position shown in Figure 9.

This particular arrangement of elements in the jack is of importance to the smooth and unvarying operation of the operating handle. It is also helpful when the jack is loaded to a point adjacent its load limit as fixed by the adjusting plug 152. It will be remembered that this plug adjusts the tension of the spring 150 bearing against the safety release valve 148. The particular arrangement of the elements of the jack as disclosed in the diagrammatic views, Figures 9 and 10, makes it necessary to mount the hydraulic extensible mechanism and the pump structure carried thereby so that the mechanism can be pivoted and yet oscillating movement can be transmitted to the pump structure in such a way that the leverages of the lifting arm in its various positions relative to the units of movement of the piston 48 do not vary in such a way as to render the setting of the safety release valve inaccurate in certain positions of the lifting arm relative to the frames 10. Accordingly in some of my claims I have brought out the particular features enumerated in connection with Figures 9 and 10 to cover the ideas which make the accuracy of the safety release valve structure obtainable with my construction.

In regard to the position of the pump with respect to the lifting cylinder, the pump can be arranged at any angle relative to the cylinder as long as the pump is operated by or through a connecting link arranged adjacent the pivotal axis of the lifting cylinder. The pivot points of the operating handle, lifting cylinder and pump connections are so arranged as to maintain uniform handle operation without changing the sweep of the handle. It is possible to maintain this operation of uniformity even if the link pivot center only starts on the center of the cylinder pivot and moves up or starts at the center and moves down to complete the cycle instead of moving to positions on each side of

the cylinder pivot as illustrated in my drawings. By arranging the pump link to pass equally distant on each side of the lifting cylinder pivot, side strain on the pump plunger may be avoided but it is not necessary in order to obtain an even operation of the jack handle.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. In a hydraulic jack, a frame, a lifting arm having one end pivoted thereto and normally slanting downwardly from the pivotal connection of said lifting arm to said frame, a lifting head on the other end of said lifting arm, a hydraulic extensible mechanism having one end pivoted to said frame and its other end connected with said lifting arm, said lifting arm, slanting upwardly at an angle from said lifting arm pivot when the hydraulic mechanism is extended, a pump structure carried by said hydraulic extensible mechanism and including a pump plunger at right angles to the longitudinal axis of said hydraulic extensible mechanism, a handle pivoted to said frame and link connections extending upwardly from said handle to said plunger and arranged to assume a position substantially parallel with said plunger throughout the pivotal movement of said hydraulic extensible mechanism with respect to said frame.

2. In a hydraulic jack, a frame, a lifting arm having one end pivoted thereto and normally slanting downwardly from the pivotal connection of said lifting arm to said frame, a lifting head on the other end of said lifting arm, a hydraulic extensible mechanism having one end pivoted to said frame and its other end connected with said lifting arm, said lifting arm slanting upwardly at an angle from said lifting arm pivot when the hydraulic mechanism is extended, a pump structure carried by said hydraulic extensible mechanism, and a handle pivoted to said frame, a predetermined point on said handle being adapted to swing from a position on a center line passing through the lifting arm pivot and the hydraulic mechanism pivot and a second position on such center line, such positions being on opposite sides of the hydraulic mechanism pivot and a link connection between said point on said handle and said pump structure.

3. In a hydraulic jack, a frame, a lifting arm having one end pivoted thereto and normally slanting downwardly from the pivotal connection of said lifting arm to said frame, a lifting head on the other end of said lifting arm, a hydraulic extensible mechanism having one end pivoted to said frame and its other end connected with said lifting arm, said lifting arm slanting upwardly at an angle from said lifting arm pivot when the hydraulic mechanism is extended, a pump structure carried by said hydraulic extensible mechanism, and a handle pivoted to said frame, said handle being connected with said pump structure, the extended center line of said pump being adapted to swing from a position of one side of the lifting arm pivot to a position on the other side of such pivot.

4. In a hydraulic jack, a frame, a lifting arm having one end pivoted thereto and normally slanting downwardly from the pivotal connection of said lifting arm to said frame, a lifting head on the other end of said lifting arm, a hydraulic extensible mechanism having one end pivoted to said frame and its other end connected with said lifting arm, said lifting arm slanting upwardly at an angle from said lifting arm pivot when the hydraulic mechanism is extended, a pump structure carried by said hydraulic extensible mechanism, a handle pivoted to said frame, a predetermined point on said handle being adapted to swing from a position on a center line passing through the lifting arm pivot and the hydraulic mechanism pivot and a second position on said center line, such positions being on opposite sides of the hydraulic mechanism pivot and a link connection between said point on said handle and said pump structure, the extended center line of said pump being adapted to swing from a position on one side of the lifting arm pivot to a position on the other side of such pivot.

5. In a jack of the character disclosed, a frame, a lifting arm pivot thereon, a hydraulic extensible mechanism having one end pivoted on the frame by a hydraulic mechanism pivot, the other end of said mechanism being pivoted to said arm, a pump carried by said mechanism and a handle pivoted to said frame at a point on a line extending at right angles to a line passing through said lifting arm and hydraulic mechanism pivots and passing through the hydraulic mechanism pivot said handle being operatively connected with said pump.

Des Moines, Iowa, June 15, 1929.

LEONARD D. NILSON.