April 28, 1936. R. W. WERNER 2,038,974

HYDRAULIC JACK

Filed July 28, 1932

Fig. 1.

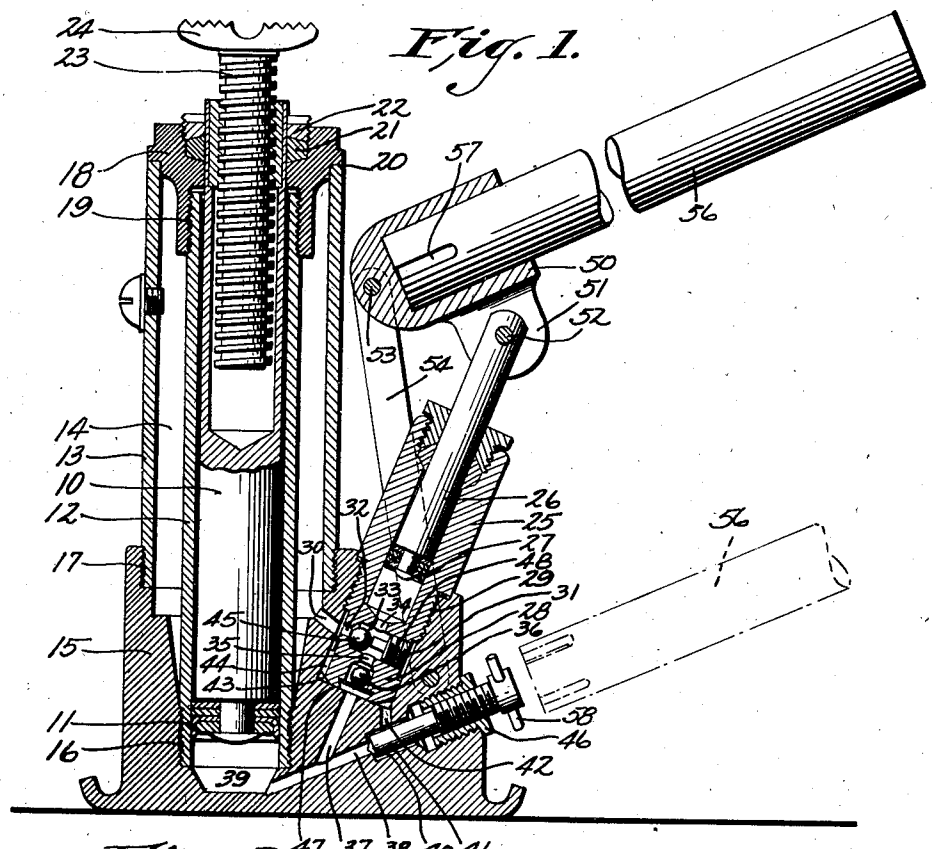


Fig. 2.

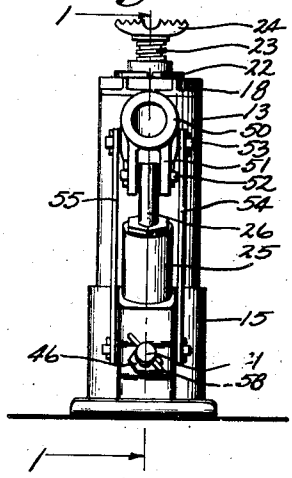
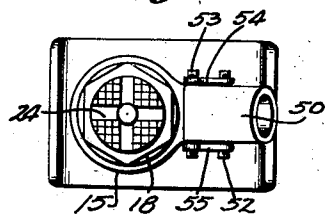


Fig. 3.



Inventor

Richard W. Werner

By

Wheeler, Wheeler and Wheeler

Attorneys

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HYDRAULIC JACK

Richard W. Werner, Milwaukee, Wis.

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6 Claims. (Cl. 60—52)

My invention relates to an improvement in hydraulic jacks.

Many types of hydraulic jacks have heretofore been provided wherein the essential parts comprise a hydraulically operated ram for direct application against an object to be lifted, a cylinder in which the ram is mounted, a pumping device for forcing fluid into the cylinder, a reservoir for fluid, various conduits and check valves therein for controlling passage of fluid to and from the reservoir and cylinder, and a relief valve for permitting discharge of fluid from the cylinder when pressure upon the ram is to be released. My improved jack incorporates all of these features but avoids serious difficulties which have been heretofore encountered because of construction requiring that the ducts leading to and from the reservoir and cylinder and pumping device be formed with a drilling device which leaves apertures in the external walls to be plugged with resultant danger of leakage.

I have avoided danger of leakage in my improved hydraulic jack by installing my pumping device with such relation to the cylinder and reservoir that drilling operations necessary to the forming of the ducts in my jack are performed at such angles and with such relationship to the exterior walls of the base of the jack which houses the parts that no high pressure ducts are directly accessible to the exterior walls of the jack in the completely assembled structure, and low pressure ducts are so disposed as to minimize the possibility of leakage.

The object, therefore, of my invention is to provide a hydraulic jack wherein all portions of the jack subjected to high pressure fluid are isolated in protective relation by zones of low pressure, whereby leakage from the high pressure zones is only possible into the low pressure zones or into the reservoir.

Other features of novelty will be apparent upon examination of the description of my improved jack as hereinafter set forth.

In the drawing:

Fig. 1 is a vertical section upon line 1—1 in Fig. 2.

Fig. 2 is an elevation of a complete jack taken upon the pump side of the complete structure.

Fig. 3 is a plan view of the completed structure.

Like parts are identified by the same reference characters throughout the several views.

As indicated above, my hydraulic jack includes certain features which may be considered conventional in hydraulic jack construction. These features include a ram 10 provided with the usual leather cups and packing at 11 and mounted in a cylinder 12 which is jacketed by means of a cylindrical jacket sleeve 13 to form a jacket reservoir 14, in which fluid is stored.

The cylinder and jacket are respectively mounted in threaded engagement with the base 15 in a bore and counterbore as shown at 16 and 17 respectively. A reservoir cap 18 is in threaded engagement with the cylinder 12 at 19 and is so shaped as to provide a flange at 20 receivable upon the end of the cylindrical jacket 13 to provide a closure for the top of the reservoir 14. The cap 18 is likewise bored and counter-bored to receive the ram 10 and packing 21 respectively, the packing 21 being retained by a packing nut 22 in threaded engagement with the cap 18.

In the ram 10 and in threaded engagement therewith is an adjustable extension 23 for the ram and provided with a head 24 to receive the load which may be lifted by the jack.

Most hydraulic jacks are provided with a pumping device and I have provided structure for that purpose involving certain novel features which will now be described.

The pump includes a pump cylinder 25 with a plunger 26 to reciprocate therein. The piston 26 is provided with cup and packing leathers 27 somewhat similar to those at 11 upon the ram 10.

Integral with the cylinder 25 I provide a check valve structure in an extension 28 of the cylinder unit below threaded portion 29 of the cylinder 25. In this extension various ducts and check valves are incorporated so that when activated by the piston 26 in cylinder 25 fluid in reservoir 14 is moved into the cylinder 12 below the ram 10 under such pressure as may be induced by the piston 26.

The base 15 of the jack is ported and provided with conduits intercommunicating with the conduits and check valves of the extension 28 as follows:

A conduit 30 between reservoir 14 and the extension 28 extends into an annular channel 31 which is provided by reason of the undercutting of the extension 28 and indicated clearly in Fig. 1. The annular channel forms means for communication between the conduit 30 and a port 32 comprising an opening between the annular channel 31 and an interior chamber 33 in the extension 28.

From the chamber 33 conduits 34 and 35 extend in either direction co-axially with the cylinder 25 and comprise respectively passages for fluid to and from cylinder 25 and chamber 33, and a passage from the chamber 33 through a

ball check 36 into a conduit 37 communicates with conduit 38 for passing fluid into chamber 39 below the ram 10. The ball check 36 as shown in the drawing is in accord with usual practice in the art whereby to close conduit 35 to prevent passage of fluid upwardly from the conduit 37, but to leave the passages adequately free for passage of fluid from the pump through conduit 35 and into conduit 37. Conduit 38 is plugged at 40 by means of a needle valve 41 comprising a bleed which, when open, may pass fluid through conduit 42 into an annular space 43 at the end of the extension 28. This space 43 is preferably formed by chamfering the end of the extension 28. A milled channel 44 communicates between the annular space 43 and annular channel 31 so that fluid released by the needle valve at 40 may pass through conduit 42, annular space 43, milled channel 44, annular channel 31, into conduit 30 and back into reservoir 14.

Tracing fluid through my hydraulic jack it will be seen that fluid is withdrawn from reservoir 14 through conduit 30, channel 31, port 32, a ball check 45 into chamber 33 and thence through conduit 34 into cylinder 25, to which it is drawn by the partial withdrawal of the piston 26 from the cylinder 25. Reverse motion of the piston 26 will cause the closure of ball check 45 and the opening of ball check 36 for passage of fluid out of the cylinder 25 through conduit 34 and chamber 33, conduit 35, ball check 36, conduits 37 and 38 and the chamber 39 below ram 10 which, by reason of the pressure induced by the piston 26, will be elevated. Repeated motion of the piston 26 will cause repeated movements upwardly of the ram 10 as will be clear to those skilled in the art. When the ram is to be lowered under the pressure of the load which it sustains the fluid will be passed from the chamber 39 through the conduit 38 back to the reservoir, as heretofore described. It will be noted that the ball of ball check 45 is positioned by plug 48 in operative relation to the port 32 which it controls.

It will be noted that my cylinder 25 is disposed axially at an angle to the axis of cylinder 12 and that by reason of this axial disposition of the cylinder 25, all of the conduits with the exception of conduit 38 and the co-axial bores formed for the reception of needle valve 41 may be made without breaking any of the exterior walls of the base 15 and it will be noted that as to the bores for reception of the needle valve 41 and conduit 38, the disposition of the needle valve against its seat at 40 is such that any leakage at the needle valve seat 40 is passed into conduit 42, which is under fluid pressure induced only by the head of fluid in the reservoir 14. Therefore, plug 46 through which needle valve 41 extends in threaded engagement is only subjected to reservoir pressure of fluid.

High pressure of fluid is only subjected to joints between cylinder 12 and the base 15; between conduit 38 and conduit 42 controlled by needle valve 41; at joint 47 between the extension 28 and base 15; between chamber 33 and port 32 during the pressure stroke of the piston 26 and between plug 48 in the extension 28 and the annular channel 31. In all of these places leakage of fluid at these joints or valves may only pass into ports, conduits or chambers which will receive the escaping fluid and return the fluid to the main reservoir 14.

Attention is likewise called to the lever of the second class embodied in the piston actuating mechanism shown in the drawing and which includes a lever socket member 50 provided with ears 51 to embrace the piston 26, and provided with pivot pins 52 and 53. Pivot pin 52 passes between the ears 51 and through an aperture near the end of the piston 26. Pivot pin 53 extends through the handle socket member 50 and receives upon the ends of such pivot 53 side fulcrum members 54 and 55 respectively. Hollow handle 56 extends into the socket member 50 and is provided with slots 57 to receive a pin 58, comprising a part of needle valve 41.

I have found that this arrangement of parts particularly facilitates the manual control and reception of piston 26 when the jack is disposed under an automobile axle, since the angular disposition of the handle 56 over the end of the piston 26, which in turn is angularly disposed with reference to the base 15 of the jack itself, is conducive to easy manipulation.

I claim:

1. The combination with a base bored and counterbored for the reception of a ram cylinder and reservoir cylinder respectively and provided with a laterally disposed bore axially and angularly disposed with reference to the axis of the first bore, of a pressure conduit comprising an extension of and co-axial with the laterally disposed bore, a relief conduit extending from the margin of the laterally disposed bore to the base of the first bore and intersecting the pressure conduit, a supply conduit connecting the counterbore and the laterally disposed bore and a pump unit with a chamfered extension receivable in the laterally disposed bore and provided with an undercut side wall portion to register with the supply conduit, the pump unit being also provided with check valves and conduits to receive fluid from the supply conduit through the undercut portion and pass said fluid to the pressure conduit, and a bleed valve in the relief conduit to release fluid from the ram and permit its passage past the chamfered pump unit through the undercut portion to the reservoir.

2. The combination with a hydraulic jack provided with a base, a ram cylinder, a ram therein, and a reservoir, of a conduit comprising a substantially straight hole extending from the exterior of the base into the lower portion of the ram cylinder and provided at a point intermediate the exterior wall of the base and the ram cylinder with an enlargement of the conduit, a shunt conduit extending from the enlargement of the first-mentioned conduit to the reservoir, a pump to receive fluid through the shunt conduit from the reservoir, a high pressure conduit extending from the pump to the first mentioned conduit and forming a junction therewith intermediate the shunt conduit and the ram cylinder, and a bleed valve between the first-mentioned conduit and the shunt conduit, so positioned as to block the opening in the exterior wall of the base, said bleed valve extending into said enlargement.

3. A hydraulic jack comprising the combination with a jack base and a cylinder extending vertically therefrom, of a lifting plunger in said cylinder, a reservoir carried by said base, a pump chamber provided with a duct communicating with said cylinder, a bypass duct in said base leading from said pump chamber to said last mentioned duct and provided with a valve seat, a duct in said base leading from the reservoir to said chamber, a valve member threadedly adjustable in said base to and from said seat, a pump casing in screw threaded connection wtih said base to

close said chamber and provided with valved internal passages in a terminal portion seated against said chamber about the point of communication therewith of the duct leading from the chamber to the jack cylinder, one of said passages registering with the last-mentioned duct and the other passage registering with the duct leading from the reservoir, a pump piston operable in said casing and means supported on said base for the actuation of said piston to receive liquid from said reservoir and to expel such liquid under pressure through the duct leading from the chamber to the jack cylinder.

4. In a hydraulic jack, the combination with a base provided with a pump chamber and ducts, of a jack cylinder projecting upright from said base, a reservoir having a portion within said base and directly communicating with said chamber by one of said ducts, another of the ducts of said base comprising a high pressure duct leading from said chamber to said cylinder and another of the ducts in said base comprising a bypass having angularly related portions whereof the first leads directly from said high pressure duct to the exterior of the base and is provided with a valve seat shoulder and the second leads from the first externally of said shoulder to said chamber, a valve adjustable in said base axially of the first portion of said bypass duct into and from engagement with the shoulder thereof to close and open the bypass, a pump casing having a terminal portion seated against the end of said chamber about the point of communication of the high pressure duct therewith and provided internally with a valved passage controlling communication with said duct, said chamber providing communication outside of said pump casing between said reservoir duct and the second portion of said bypass duct, a valve controlling the admission of liquid from said chamber to the pump casing and a pump piston reciprocable in said pump casing to draw liquid from said reservoir through said last mentioned valve and to expel said liquid through the high pressure duct to said cylinder.

5. A hydraulic jack comprising the combination with an upright cylinder and a concentric reservoir, of a base with which said cylinder and reservoir are in liquid tight connection, a jack plunger operative in said cylinder, a duct in said base leading directly from the bottom of said cylinder in an upward direction to the external surface of said base, and provided at an intermediate point with a valve seat shoulder, a valve screw threaded in the end of said duct for axial adjustment therein to and from said shoulder, a chamber formed in said base with a screw threaded outer portion opening therefrom along an axis inclined with reference to said cylinder and intermediate said cylinder and said duct, a bypass duct leading from said first mentioned duct externally of said shoulder to said chamber and thence to said reservoir, a pump casing provided with means connecting it in screw threaded engagement with the outer end of the chamber and provided with a reduced terminal portion affording clearance from the wall of said chamber for the flow of liquid through said bypass duct from said first mentioned duct to said reservoir, said terminal portion being seated against the bottom of said chamber, and having a passage opening to said bottom and another passage opening into said casing from said chamber, a high pressure duct communicating with said first mentioned passage and said cylinder, check valves in the respective passages of said pump casing and a displacement piston operable in said casing to draw liquid from said reservoir and chamber into said casing and to expel such liquid through said high pressure duct to said cylinder.

6. A hydraulic jack comprising the combination with an upright cylinder and a concentric reservoir, of a base with which said cylinder and reservoir are in liquid tight relation, a ram operative in said cylinder, a duct in said base leading directly from the bottom of said cylinder to an exterior side surface of the base and provided at an intermediate point with a valve seat shoulder, a bleed valve threaded in said duct for axial adjustment therein to and from said shoulder, a pump chamber formed in said base and opening therefrom along an axis inclined with reference to said cylinder and intermediate said cylinder and said duct, a bypass duct leading from said first mentioned duct externally of said shoulder to said reservoir, a pump plunger operative in said chamber, a high pressure duct extending from the chamber to the first mentioned duct, and a supply duct in communication with the reservoir and leading to the high pressure duct, and check valves at the junction of the supply duct with the high pressure duct whereby to control liquid urged by the plunger from said reservoir to the cylinder.

RICHARD W. WERNER.