May 15, 1923. 1,455,223

A. PAOLI

HYDRAULIC JACK

Filed May 31, 1921

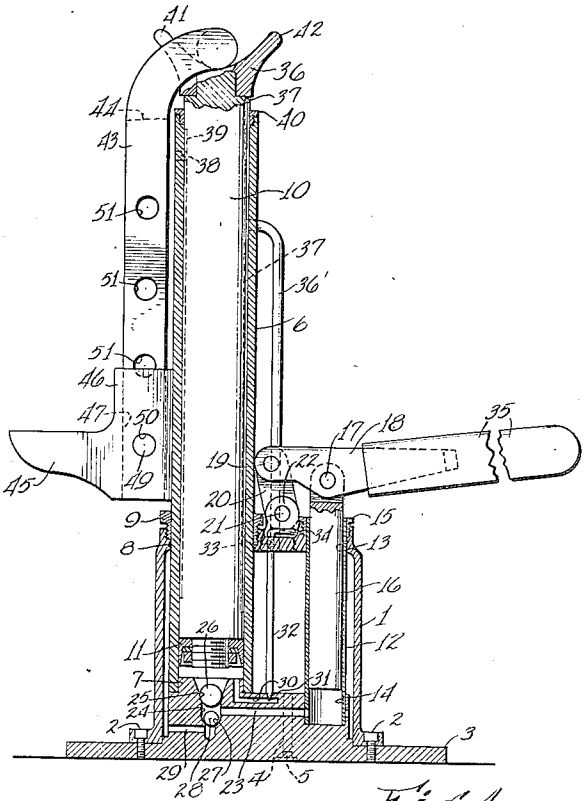


Fig. 1.

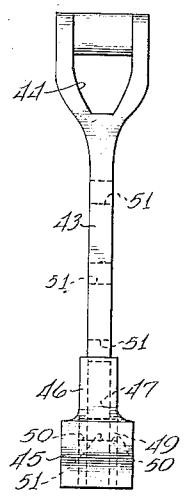


Fig. 3.

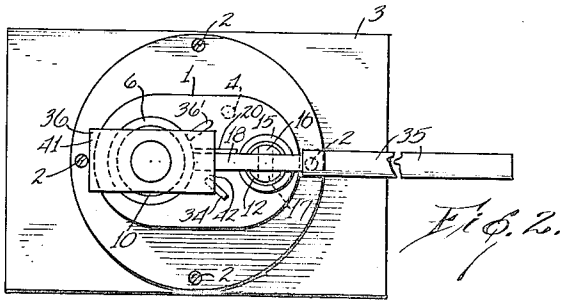


Fig. 2.

INVENTOR
A. Paoli
BY Munn & Co.
ATTORNEYS

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UNITED STATES PATENT OFFICE.

ARTHUR PAOLI, OF HANCOCK, MICHIGAN.

HYDRAULIC JACK.

Application filed May 31, 1921. Serial No. 473,764.

To all whom it may concern:

Be it known that I, ARTHUR PAOLI, a citizen of the United States, and a resident of Hancock, in the county of Houghton and State of Michigan, have invented a new and useful Improvement in Hydraulic Jacks, of which the following is a full, clear, and exact description.

My invention relates to hydraulic jacks, and it consists in the combinations, constructions and arrangements herein described and claimed.

An object of my invention is to provide a hydraulic jack that is relatively simple in construction and operation and is therefore capable of being operated readily.

A further object of my invention is to provide a device having a liquid-holding receptacle and means for returning the power liquid to the receptacle when the work-engaging member of the device has been raised to a predetermined height, whereby the work-engaging member of the device cannot be moved out of operative position when the operation of the device is continued.

A further object of my invention is to provide a device of the character described having means for permitting the escape of air from the liquid used in the device without permitting any of the fluid to pass therefrom.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, forming part of this application, in which—

Figure 1 is a vertical central section through the device, portions being shown in elevation,

Figure 2 is a top plan view of the same, and

Figure 3 is an elevation of auxiliary work supporting elements embodied in the device.

In carrying out my invention, I provide a casing 1 that is firmly secured at its lower end by bolts 2, or like fastening means, to a base 3 in such a manner as to provide a liquid-tight connection between the casing and the base. The casing 1, together with the base, constitutes a receptacle adapted to hold a liquid that is placed therein through a filler opening 4 in the bottom of the base 3. The filler opening 4 is normally closed by a plug 5 and the casing 1 is inverted when the liquid is introduced thereinto.

A portion of the base 3 protrudes within the casing 1. A vertical cylinder 6 is arranged with its lower end disposed within the casing 1 and closed by an integral cylindrical boss 7 that extends upwardly from the base 3. The cylinder 6 has a threaded connection at 8 with the walls of the opening in the casing through which it is projected into the latter, whereby the cylinder 6 can be adjusted to clamp the lower end thereof against the upper wall of the base to effect a liquid-tight connection. A packing gland 9 is provided to prevent leakage of the liquid from the receptacle at the point of connection of the cylinder 6 with the wall of the opening at 8. The cylinder 6 has a ram or plunger 10 arranged therein and provided with a packing member 11 at its lower end to prevent leakage of the actuating liquid between the ram 10 and the inner wall of the cylinder 6. A pump cylinder or casing 12 is projected into the casing 1 through an opening 13 and arranged with its lower end disposed within a socket 14 in the base 3. A packing gland 15 is provided at the junction of the pump casing 12 and the casing 1. A pump plunger 16 arranged for reciprocation in the pump cylinder 12 is connected at its upper end, as by means of a pivot pin 17, to a lever 18. The latter is pivoted at 19 to a link 20 that is in turn pivoted at 21 to a lug 22. The latter is integral with the casing 1.

A transverse bore 23 in the base 1 communicates with the pump cylinder 12 at its lower end and leads to an inlet passage 24 in the base that is enlarged at 25 to provide a seat for a ball valve 26. The enlarged portion of the inlet passage opens into the cylinder 6, through its bottom wall at the approximate center of the latter. The inlet passage 24 is reduced at 27 at a point below its junction with the bore 23

to provide a connection with a ball valve 28. An intake passage 29 communicates with the reduced portion 27 and opens through the portion of the base protruding within the casing 1. An exhaust passage 30 leads from the cylinder 6 through the upper portion of the base 3 to communicate with the interior of the receptacle, as shown. A needle valve 31 seated in the outlet orifice of the exhaust passage 30 can be operated by means of a stem 32 to prevent or permit the flow of liquid from the cylinder 6 into the receptacle. The stem 32 has a threaded connection at 33 with the wall of the casing and extends exteriorly thereof, being bent laterally adjacent to its upper end to provide a handle 34 for convenience in manipulating the valve stem 31.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. The lever 18 may be adapted for connection with a detachable handle 35 and is operated to reciprocate the pump plunger 16. When the latter is moved upwardly in the pump casing 12, a partial vacuum is created in the passages 23, 24, 27 and 29 and the ball valve 28 will be moved from its seat, thereby permitting a flow of liquid from the receptacle into the pump casing. At the down-stroke of the pump plunger 16, the liquid drawn into the pump cylinder and filling passages 23 and 24 will be forced into the cylinder 6, thereby forcing the ram 10 upwardly and raising work that rests upon a work-engaging member 36 carried at the upper end of the ram. It is to be observed that the ball valve 28 will be moved from its seat when the pump plunger 16 is moved upwardly and that the ball member 26 will be moved from its seat when the pump plunger is moved downwardly. When the work engaged has been raised to the height desired or it is desired to occasion the retraction of the ram 10 for any other reason, the handle 34 is moved to open the valve 31 and to thereby permit the return of the liquid from the working cylinder 6 to the receptacle. A by-pass conduit 36′ communicates with the working cylinder 6 at a spaced distance from the upper end thereof and leads to the receptacle 1. A longitudinally extending groove 37 in the outer wall of the ram 10 extends from the upper or outer end of the latter to a spaced distance from the lower end thereof. The ram 10 is guided in its reciprocation by a pin 38 protruding from the inner wall of the cylinder 10 into a longitudinally extending guide slot 39 in the ram 10 so that the groove 37 is in registry with the opening of the by-pass conduit 36′ into the cylinder 6. Consequently, when the ram has been raised to the upper end of the by-pass 36′ in the manner described, it can be raised no higher and further operation of the lever 18 will occasion the circulation of the operating fluid from the receptacle into the cylinder 6 and thence through the by-pass conduit 36′ to the receptacle again. An important feature of the construction just described is the provision of a means for permitting the escape of air from the receptacle without permitting the passage of the operating fluid therefrom. It will be understood that considerable air is forced into the cylinder 6 together with the operating fluid and that this air is compressed. When the liquid passes from the cylinder 6 to the receptacle again, the air passes upwardly through the by-pass conduit 36′ and along the air groove 37 from the cylinder 6 at the upper end of the latter. A packing gland 40 may be provided at the upper end of the cylinder 6 to prevent the leakage of the liquid from the latter.

The work-engaging member 36 is conventional in form and has oppositely extending ears 41 and 42. An auxiliary work supporting arm 43 is curved adjacent to its upper end to rest upon the work supporting member 36 when the ear 41 is disposed in a slot 44 in the arm 43. A foot 45 has a body portion 46 provided with a bore 47 adapted to the arm 43 and is slidable along the latter. It may be secured in adjusted position by a pin 49 projected through registering openings 50 in the walls of the body portion and a selected one of the spaced apart openings 51 through the arm 43. The body portion 46 has its wall contiguous to the cylinder 6 curved to conform with the latter and to thereby prevent lateral movement of the foot 45 relative to the cylinder.

The device comprises relatively few parts and being liquid-tight, can be readily transported from place to place, as in the tool box of an automobile.

I claim:

1. In a device of the character described, a working cylinder closed at one end and provided with an inlet and outlet at its closed end, a ram slidable in the cylinder and protruding from the open end of the latter, said ram being arranged at its inner end to engage the cylinder with a liquid-tight fit, means for introducing a liquid into the cylinder through the inlet, means for controlling the passage of the fluid through the outlet, whereby the ram will be moved along the cylinder away from the closed end when the outlet is closed, a by-pass conduit for conducting liquid from the cylinder when the ram has been moved a certain distance, said ram being formed with a longitudinally extending groove in its outer wall extending from a point spaced from its inner end to the end protruding from the cylinder, and means for guiding the ram in its

movement in the cylinder to occasion the communication of the groove with the by-pass conduit.

2. In a hydraulic jack of the character described, a liquid holding receptacle, a cylinder, a ram slidably mounted in said cylinder, a by-pass communicating at one end with said cylinder and at its lower end with said receptacle, said ram being fashioned with a longitudinally extending groove on its side wall and means for guiding said ram in said cylinder, whereby the groove in said ram may be in registration with said by-pass when said ram is retracted in said cylinder,

ARTHUR PAOLI.