May 15, 1923. 1,455,224

A. PAOLI

HYDRAULIC JACK

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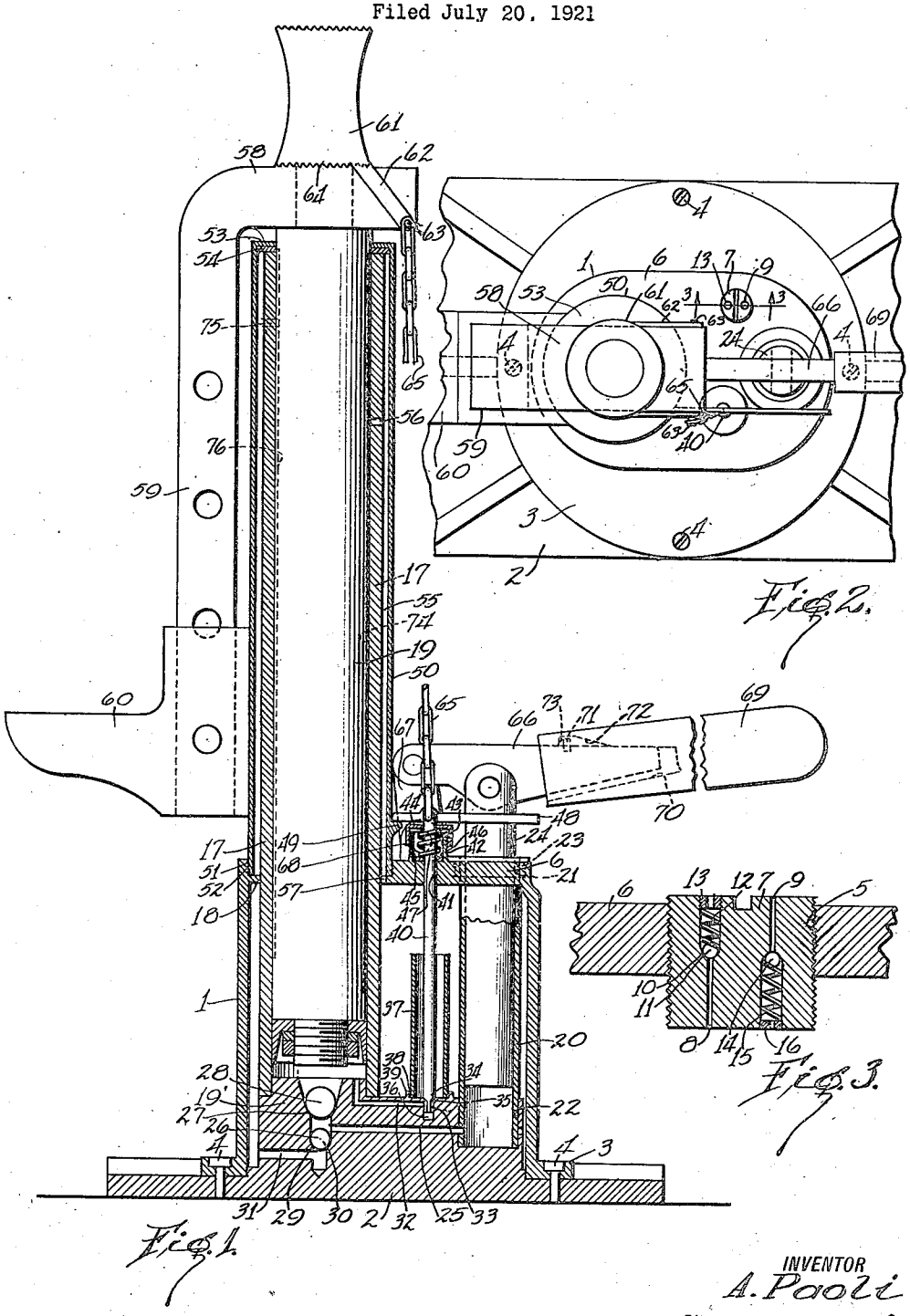


Fig. 1.

Fig. 2.

Fig. 3.

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HYDRAULIC JACK.

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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 an improvement over the hydraulic jack disclosed in my prior application for patent, Serial No. 473,764, filed May 31, 1921, said improvement consisting in the provision of a novel means for controlling the passage of a liquid used in the device from the working cylinder thereof to the liquid-holding receptacle.

A further object of my invention is to provide a device of the character described having an auxiliary work-engaging member arranged to be moved into operative position at will, whereby work may be raised to a height greater than is usual when a jack of a given size is used.

A further object of my invention is to provide a hydraulic jack having means for maintaining the air pressures on the inner and outer walls of a liquid-holding receptacle balanced.

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 a fragmentary portion of the device, and

Figure 3 is an enlarged section along the line 3—3 of Figure 2.

In carrying out my invention, I provide a casing 1 carried by a base 2 and provided with a flange 3 secured to the base by screws 4, or like fastening means, so as to provide a liquid-tight connection with the latter. The casing 1, together with the base 2, constitute a receptacle adapted to receive a liquid which may be introduced thereinto through a threaded filler opening 5 in the upper wall 6 of the casing. The filler opening 5 is normally closed by plugs 7. The latter is formed with passages 8 and 9 extending the entire length thereof. The passage 8 is enlarged at 10 adjacent to the outer end of the plug 7 to provide a seat for an outwardly opening ball valve 11. An expansion spring 12 is disposed in the enlarged portion 12 of the passage 8 between the ball valve 11 and a perforated plug 13 having a threaded engagement with the passage 12 and tends to hold the valve 11 on its seat. The passage 9 is enlarged at 13 adjacent to the inner end of the plug 7 to provide a seat for an inwardly opening ball valve 14. The latter is normally held on its seat by the action of an expansion spring 15 which is maintained within the enlarged portion 13 of the passage 9 by a perforated plug 16, as best seen in Figure 3. The passages 8 and 9 are equal in diameter and the perforations in the plugs 13 and 16 are likewise of the same diameter, whereby the air pressures on the inner and outer walls of the liquid-holding receptacle will be balanced.

As in the device disclosed in my aforesaid prior application for patent, a vertical cylinder 17 is projected through an opening 18 in the upper wall 6 into engagement with a portion 19 of the base that protrudes within the casing 1. It will be understood that the engagement of the cylinder 17 with the portion 19 is such as to provide a liquid-tight connection beween these parts. The cylinder 17 fits the opening 18 closely so as to prevent leakage of the liquid from the receptacle at this point. A ram or plunger 19 is arranged for reciprocation within the cylinder 17. A pump casing 20 is projected through an opening 21 in the upper side of the receptacle into a socket 22 in the portion 19′ of the base 2. A packing gland 23 is placed on a pump plunger 24 to provide a liquid-tight connection at the junction of the casing 20 with the upper wall 6. A transverse bore 25 in the portion 19′ of the base 2 communicates with the pump cylinder 20 and leads to an inlet passage 26. The latter is enlarged at 27 above its connection with the bore 25 to provide a seat for a ball valve 28 which prevents the return of a liquid from the cylinder 17 to the inlet passage 26. The latter is reduced at its lower end as at 29 to provide a seat for a ball valve 30.

The latter prevents the passage of a liquid from the inlet 26 through an intake port 31.

An exhaust passage 32 leads from the cylinder 17 through the upper portion 19 of the base 2 to a vertical valve bore or chamber 33 in the upper portion 19. It is to be observed that the exhaust passage 32 communicates with the chamber or bore 33 intermediately of the length of the latter and that a valve 34 normally closes the chamber 33 at its upper end. The valve 34 has a relatively reduced depending portion 35 enlarged at its lower end to provide a plunger 36 reciprocatively disposed in the chamber 33 below the junction of the latter with the exhaust passage 32. A tubular member 37 is vertically disposed within the receptacle and has a screw-threaded connection as at 38 with an annular flange or boss 39 surrounding the orifice of the chamber 33.

The valve 34 has a stem 40 extending vertically through the tubular member 37 and through an opening 41 in the upper wall 6 to project exteriorly of the latter. The upper wall 6 is formed with an outwardly extending boss 42 threaded exteriorly at 43 for engagement with a cap 44 having a central opening through which the stem 40 projects. The boss 42 is provided with a relatively large central opening 45 surrounding the stem 40, in which a spring 46 is disposed. The latter reacts at its ends against the cap and a disk 47 mounted on the stem 40, whereby the valve 34 is normally held against its seat. A lever 48 is pivotally attached intermediately to the upper end of the stem 40 and is fulcrumed at one end on an extension 49 to the outer wall of a casing 50 that has a screw-threaded connection at 51 with a socket 52 in the upper wall 6 and concentric with the opening 18. The casing 50 has an inner diameter greater than the outer diameter of the cylinder 17 and is of a length to extend slightly above the upper end of the latter. The casing 50 has an inwardly extending flange 53 adapted to receive the plunger 19 and to overlie a packing member 54 that rests upon the upper end of the cylinder 17. The arrangement of the casing 50 with respect to the cylinder 17 provides an annular passage 55 which has an inlet 56 leading thereinto from the cylinder 17 and an outlet 57 through the upper wall 6 into the liquid-holding receptacle.

A work-engaging member 58 is carried by the plunger 19 and has a depending arm 59 adapted to support a work-supporting foot 60. The latter is slidably mounted as shown. An auxiliary work-engaging member 61 has arms 62 arranged to straddle a laterally projecting portion of the work-engaging member 58 and attached to the latter by means of a pintle 63. The auxiliary work-engaging member 61 may be moved into the position illustrated in Figure 1, whereby work may be raised to a height greater than is usual when a jack of a given size is employed. When desired, the auxiliary work-engaging member 61 may be swung downwardly about the axis of the pintle 63 to hang against the casing 50 and out of operative position. The work-engaging member 58 is preferably serrated as at 64 and the auxiliary work-engaging member 61 is likewise serrated or formed in any other suitable known manner at its ends to engage with the work. The valve stem 40 is connected with the work-engaging member 58 by a cable 65 which may be a chain, as illustrated. The pump plunger 24 is provided with an operating lever 66 connected by a link 67 with a lug 68 on the upper wall 6. A handle 69 is provided with a socket 70 adapted to receive the outer end portion of the lever 66. A pin 71 protruding from the lever 66 is arranged to enter a recess 72 in the wall of the socket 70 and to engage with a shoulder 73 defined by the recess, whereby the handle 69 is normally prevented from disengaging the lever 66. It will be observed that the socket 70 is of a size sufficient to permit the lever 66 to be loosely received therein and the handle 69 may be detached from the lever 66 when grasped and raised relatively to the latter.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. An operating fluid is forced into the cylinder 17 when the pump plunger 24 is operated in the manner described in my aforesaid application for patent, whereby the ram 19 will be raised to a desired height. The ram 19 has a vertical slot 74 extending to a determined distance from the lower end thereof. The ram 19 is held against rotation by the engagement of a pin 75 projecting from the inner wall of the cylinder 17 into a vertical guide slot 76 in the outer wall thereof. When the lower end of the ram 19 has been raised above the level of the inlet opening 56, the operating fluid will pass through the latter into the annular passage 55 and thence through the outlet 57 to the receptacle. Consequently, the ram 19 cannot be moved out of engagement with the cylinder 17. Since the passage 50 is annular in form, the possibility that the same may be obstructed in service, on account of the presence of sediment in the operating fluid, or on account of any other reason, is reduced to a minimum. The provision of the inwardly extending flange 53 overlying the packing member 54 prevents the passage of dust into the passage 50 and into the cylinder 17, thereby obviating the necessity of providing a dust cap that must ordinarily be provided in devices of a like character, of which I am aware. I also provide auxiliary means to insure a return flow of the operating fluid from the cylinder 17 to the receptacle when

the plunger or ram 19 has been raised to a predetermined height. Such means include the cable 65 which connects the work-engaging member 58 with the valve stem 40. This cable may be of any length desired. When the plunger 19 has been raised to a desired height, the valve stem 41 will be moved axially against the tension of the spring 47, thereby permitting the operating fluid to pass through the exhaust passage 32 and the socket 33 into the tubular member 37. The valve 34 will be lifted from its seat when the outer end of the lever 48 is lifted. It is important to note that the operating fluid passing into the receptacle from the cylinder 17 must first entirely fill the vertically disposed tubular member 37 before flowing into the receptacle proper. In practice, it has been found with an ordinary device that a considerable amount of air is pumped into the cylinder with the operating fluid and that this air is compressed during the operation of the device. In consequence, when the valve controlling the flow of the operating fluid from the cylinder to the receptacle is moved into open position, the rush of the compressed air into the receptacle will thoroughly agitate the fluid in the receptacle and even vaporize part of the latter, whereby the operating fluid is forced through any outlet provided for the escape of air from the receptacle. If no outlet is provided for that purpose, the further operation of the device is seriously affected. I have found that the provision of the tubular member 37 obviates this difficulty as the operating fluid passes into the latter, the air is permitted to pass from the upper end of the tubular member and thence directly through the passage 8 without acting on the liquid within the receptacle. Since the valve 34 has a depending extension provided with the plunger 36, the pressures on the valve 34 and on the plunger 36 will be balanced and consequently the pressure of the operating fluid within the cylinder 17 and filling the exhaust passage 32 does not tend to move the valve 34 from its seat, as in the case of similar devices of which I am aware. The base 2 may be provided with reenforcing ribs 77, as shown.

I claim:

1. A device of the character described comprising a cylinder closed at one end, a movable ram projecting from the other end of the cylinder, a work-engaging member carried by the ram at its outer end, and an auxiliary work-engaging member attached to the first named work-engaging member and movable at will into alinement with the ram or laterally of the latter.

2. A device of the character described comprising a working cylinder closed at one end, a ram operatively mounted in the cylinder and arranged to project from the other end of the latter, means for supplying an operating fluid to the cylinder at its closed end, an exhaust conduit communicating with the cylinder at its closed end, means for controlling the passage of a liquid from the cylinder through the exhaust conduit, and means connecting the said controlling means and the ram to occasion an operative movement of the controlling means when the ram is moved outwardly in the cylinder a predetermined distance.

3. A device of the character described comprising a working cylinder closed at one end, a ram operatively mounted in the cylinder and arranged to project from the other end of the latter, a work-engaging member carried by the ram at its outer end, means for supplying an operating fluid to the cylinder at its closed end, an exhaust conduit communicating with the cylinder at its closed end, normally closed manually operable means for controlling the discharge of a liquid from the exhaust conduit, and a cable connecting the controlling means with the work-engaging member for moving the controlling means into open position when the ram has been moved outwardly a predetermined distance.

4. A device of the character described comprising a casing provided with a base, said casing and said base being arranged to coact to provide a liquid-holding receptacle, a vertical cylinder arranged to depend within the casing and to have a liquid-tight connection at its lower end with said base, a ram operatively mounted in the cylinder, means operable at will for supplying an operating liquid from the receptacle to the cylinder at the lower end of the latter, said base being provided with an exhaust passage communicating at one end with the cylinder at the lower end of the latter and with a valve chamber communicating intermediately with the outer end of the exhaust passage, said valve chamber being arranged to communicate at its outer end with the liquid-holding receptacle, and a manually operable valve normally seated at the outer end of the valve chamber and provided with a stem projecting exteriorly of the casing, said valve being provided with a relatively reduced portion depending into the valve chamber and enlarged at its end below the junction of the exhaust passage with the valve chamber.

5. A device of the character described comprising a casing provided with a base, said casing and said base being arranged to co-act to provide a liquid-holding receptacle, a vertical cylinder arranged to depend within the casing and to have a liquid-tight connection at its lower end with said base, a ram operatively mounted in the cylinder, means operable at will for supplying an operating liquid from the receptacle to the

cylinder at the lower end of the latter, said base being provided with an exhaust passage communicating at one end with the cylinder at the lower end of the latter and with a valve chamber communicating intermediately with the lower end of the exhaust passage, said valve chamber being arranged to communicate at its outer end with the liquid-holding receptacle, a manually operable valve normally seated at the outer end of the valve chamber and provided with a stem projecting exteriorly of the casing, said valve being provided with a relatively reduced portion depending into the valve chamber and enlarged at its ends below the junction of the exhaust passage with the valve chamber, and flexible means connecting the outer end of the valve stem with the outer end of the ram.

6. In a device of the character described, a liquid-holding receptacle provided with a filler opening, a closure for the opening, said closure being provided with similar longitudinally extending passages extending through the closure, one of said passages being enlarged adjacent to its outer end to define a seat for a ball valve and the other of said passages being similarly enlarged adjacent to its inner end, an outwardly opening normally closed spring pressed ball valve for one of said passages, an inwardly opening, normally closed spring pressed ball valve for the other of said passages, and a perforated plug for each passage, said plugs being arranged to retain said ball valves within the passages.

7. A device of the character described comprising a casing provided with a base, said casing and said base being arranged to co-act to provide a liquid-holding receptacle, a vertical cylinder arranged to depend within the casing and to have a liquid-tight connection at its lower end with said base, a ram operatively mounted in the cylinder, means operable at will for supplying an operating liquid from the receptacle to the cylinder at the lower end of the latter, said base being provided with an exhaust passage communicating at one end with the cylinder at the lower end of the latter and with a valve chamber communicating intermediately with the outer end of the exhaust passage, said valve chamber being arranged to communicate at its outer end with the liquid-holding receptacle, a manually operable valve normally seated at the outer end of the valve chamber and provided with a stem projecting exteriorly of the casing, and a vertically extending tubular member disposed within the receptacle in concentric relation to the valve chamber, said last named tubular member having a liquid-tight connection at its lower end with the base.

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