No. 874,699. PATENTED DEC. 24, 1907.

J. W. NELSON.

HYDRAULIC JACK.

APPLICATION FILED MAY 21, 1906.

2 SHEETS—SHEET 1.

Fig:1.

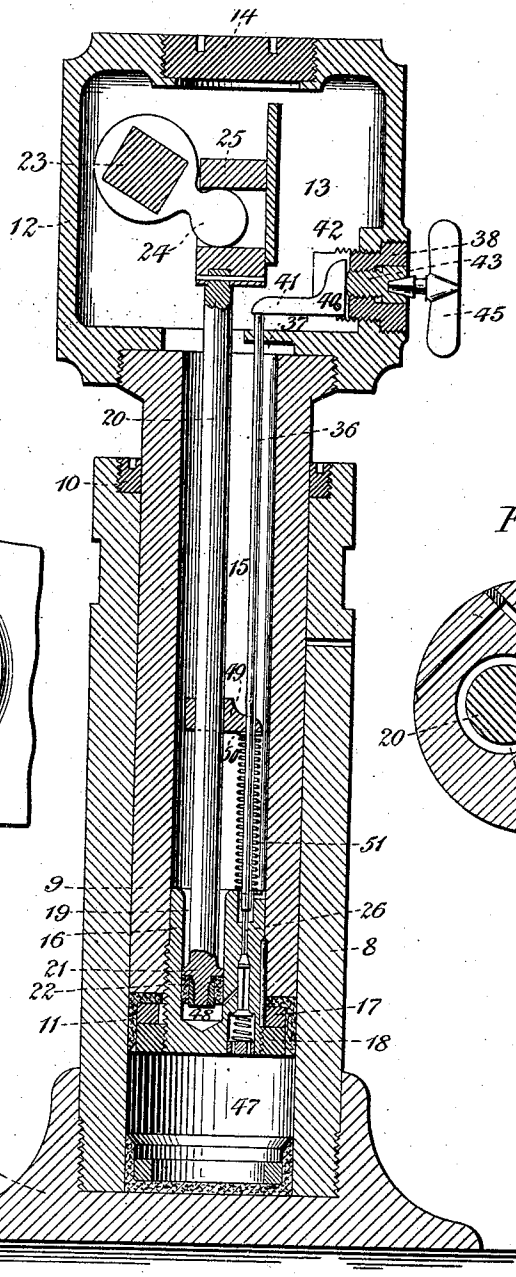



Fig:6.

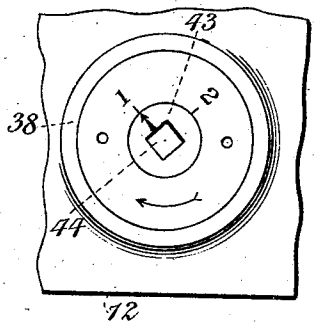
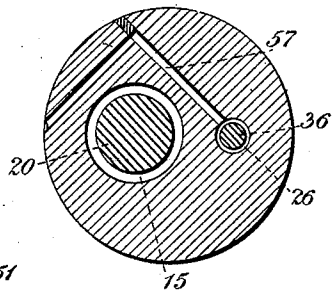



Fig:5.




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2 SHEETS—SHEET 2.

Fig: 2.

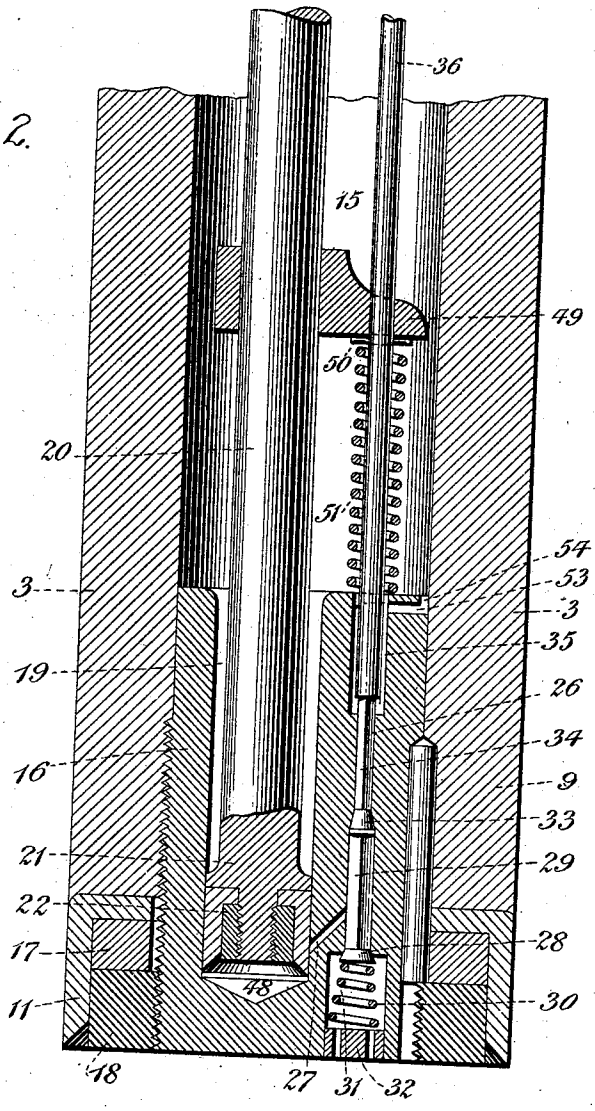
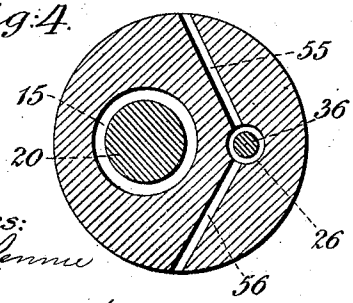
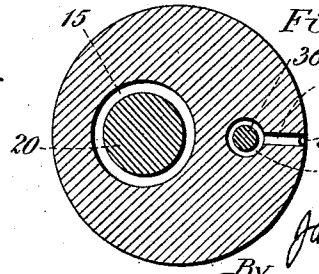



Fig: 4.




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Fig: 3.




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# UNITED STATES PATENT OFFICE.

JAMES W. NELSON, OF NEW YORK, N. Y.

## HYDRAULIC JACK.

No. 874,699. Specification of Letters Patent. Patented Dec. 24, 1907.

Application filed May 21, 1906. Serial No. 317,866.

*To all whom it may concern:*

Be it known that I, JAMES W. NELSON, a citizen of the United States, and a resident of the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Hydraulic Jacks, of which the following is a specification.

This invention relates to hydraulic jacks. As is well known, devices of this character generally comprise a storage reservoir or chamber, from which the liquid is forced by a pump into the ram chamber, and means for releasing the liquid in the ram chamber, after the work is done, in order to "lower" the jack for a subsequent or following operation. The liquid in the ram chamber may, through the employment of any suitable form of valve or cock, be discharged upon the ground, but inasmuch as these tools are frequently employed where a supply of water is not readily accessible; and, furthermore, as these tools must at times be used in very cold weather, when the temperature is sufficiently low to freeze water and render the device inoperative, thus making it necessary to employ some liquid compound which will not freeze at ordinary temperatures, and as such compounds are more or less expensive, it is desirable not only that the storage or supply chamber or reservoir be a part of the jack itself, but that the liquid which has been forced therefrom into the ram chamber be released after the "lifting" operation and its flow directed back into said storage reservoir, for use over and over again in subsequent operations. The very nature of these devices, so far as known in the art to-day, renders necessary the employment of valves to control the flow from reservoir to ram chamber and to retain the liquid under pressure in the latter. It is furthermore well known that these valves are the weakest parts of a hydraulic jack, usually the first parts to get out of order and always the most difficult to keep in dependable condition. Therefore, as a general proposition, the fewer the valves employed the less the liability of the jack to get out of order and become inoperative, and, therefore, the greater its efficiency and dependability. In providing means to permit of the back-flow of the liquid from ram-chamber to reservoir after the desired work has been done, if a separate channel or passage is provided for this purpose other than the one through which the liquid is forced into the ram chamber to do the work, it is obvious that at least one additional high-pressure valve must be employed. Furthermore, at least one additional bore must be provided and by a process which, on account of the quality of the metal which must be employed in devices of this character, is necessarily expensive and vastly increases the cost of manufacture of the tool.

This invention primarily contemplates: first, the reduction of the number of valves employed to a minimum; second, the employment of a single passage for the flow of liquid in both directions between reservoir and ram chamber; third, the provision of positive yet simple means for releasing the liquid under pressure in the ram chamber to permit of its flow back into the resevoir; and, fourth, the construction of the very simplest form of hydraulic lifting and lowering device.

My invention will be more readily understood by reference to the accompanying drawings, forming a part of this specification, and in which.

Figure 1 is a central vertical section of a hydraulic jack embodying my invention. Fig. 2 is a similar view on an enlarged scale of the lower or body portion of the same. Fig. 3 is a transverse section on the line 3—3 of Fig. 2. Figs. 4 and 5 are similar sectional views showing other modifications of the initial intake duct. Fig. 6 is a side view of a part of the head, showing a dial and indicator for the lowering device.

This jack is of what is known as the vertical type, and comprises a suitable, heavy base or standard 7 carrying the cylinder 8 which, in the construction shown, is screwed into said base 7. Within this cylinder 8 is the ram 9 which is slidable therein and which is made to fit tightly against the wall of the cylinder through the employment of suitable packing rings, one 10 screwed into the upper end of the cylinder 8 and another 11 at the lower end of the ram 9. The ram 9 has a hollow head 12, providing a chamber 13 which communicates with the interior of the ram cylinder. A screw-cap 14 permits filling of the chamber 13. The ram 9 has a cylindrical bore 15 of uniform diameter from end to end, and into the lower end of this bore the pump-cylinder 16 is screwed, the

lower portion of said pump-cylinder serving, through the rings 17 and 18, to retain the packing 11 securely in place.

The pump-cylinder 16 is provided with a pump-bore 19 extending from the top of said pump-cylinder to near the bottom thereof, the bore 19 being permanently closed at the bottom of the cylinder. The pump-piston or plunger comprises the solid rod 20 which is provided with a solid head 21 and the usual packing 22.

The piston rod 20 extends up into the head 12 and is there combined with suitable devices for reciprocating it, which, for the purpose of this application, may comprise, as shown, a rock-shaft 23 suitably mounted in the head 12 and provided at one end projecting beyond the outside of the head with suitable means for attaching a pump-handle lever (not shown). This rock-shaft 23 is provided with a knuckle 24 extending into a head 25 formed on the upper end of the piston-rod or connected therewith, so that by rocking said shaft the knuckle moves the piston up and down.

The pump-cylinder 16 has the pump-bore 19 arranged eccentrically therein in order to provide for a smaller bore 26, parallel to said pump-bore and extending entirely through said cylinder. This smaller bore 26 is connected with said pump-bore by means of a duct 27, the specific location and disposition of which will be hereinafter more fully described.

At the lower end of the bore 26 is a valve 28 provided with an upwardly projecting stem 29, which is preferably triangular in cross-section to permit of sufficient volume of flow of liquid through said bore and around said stem. This valve 28 is adapted to close the lower end of the bore 26, and is preferably pressed into its seat by means of a spring 30 contained in a chamber 31 in the bottom of the pump-cylinder and acting against the apertured plug or bonnet 32. A slight distance above the upper end of the stem 29 of the valve 28, the bore 26 is contracted to form a seat for a second valve 33, having a similar stem 34 which extends upward and into the enlarged upper end 35 of said bore 26.

A valve-rod 36 rests on the upper end of the stem 34 of the upper valve 33, when said valve is in its seat, and extends upward through an inwardly extending bracket 37 in the lower part of the head 12, so that said rod is guided to move vertically. In the side of this head 12, a plug 38 is screwed, to the inner end of which an angle or bell-crank lever 40 is pivoted in such a manner that one of its arms 41 rests on the upper end of the valve rod 36 while the other 42 is in the path of movement of a screw 43 in the plug 38, the screw being provided with the usual polygonal pocket or receptacle 44 for a rotary key 45, or like implement, by means of which said screw can be turned. Obviously, inward movement of the screw will, through the lever 40, depress the valve rod 36, depression of which will, first, through the stem 34 unseat and hold unseated the valve 33, and, second, through the depression of the valve 33 acting upon the stem 29, unseat and hold unseated the valve 28.

It will be observed that there is but a single passage extending through the pump cylinder 17—that is, from the storage or supply reservoir 46 to the ram chamber 47. All liquid taken from said reservoir 46 and forced into the pressure chamber 47 must pass through the bore 26. It will be seen that when the piston rod 19 is raised, a partial vacuum will be formed beneath the piston, in the pump chamber 48, whereupon the greater pressure upon the upper side of the valve 28 will unseat the same and the liquid will pass said valve and enter the pump chamber 48 through the duct 27, which extends from the bottom of the chamber 48 to the bore 26 at a point between the valves 28 and 33. Upon downward stroke of said piston, the greater pressure in the pump chamber 48 will force the liquid back through the duct 27, seating the valve 28 and unseating the valve 33, and be forced into the pressure chamber 47 beneath the ram, which will be raised under the well known principles of hydraulics. When it is desired to release the liquid in the ram chamber to lower the ram, the screw 43 is turned until the valve rod 36 has been forced downward to first unseat the valve 28 and subsequently the valve 33, as explained, thus opening and holding open the entire valve bore 26 and permitting the liquid to freely pass back from the ram chamber to the storage reservoir 46.

I have shown an arm or bracket 49, suitably secured to or fixed upon the piston rod 19 and provided with an aperture or opening through which the valve rod 36 loosely passes. A pin 50, or the like, is secured on or through the valve rod 36 at such a point that normally said pin will not contact with the arm or bracket 49, but when the piston rod 19 is forced down beyond the normal or effective stroke, said arm 49 will impinge against the pin and force down the rod 36 independently of the lever 40. A coil spring 51, surrounding the valve rod 36 and compressed between the top of the pump cylinder and said pin 50, retains said rod in a normally raised and inoperative position.

If it is desired to lower the ram without using the screw 43, the operator forces down the operating handle and therewith the piston rod 19 beyond the end of the normally effective stroke, whereby the bracket or arm 49 depresses the pin 50 and therewith the valve rod 36 sufficiently to unseat and hold unseated the valves 28 and 33 in the manner

set forth and permit the liquid to flow from the ram chamber back to the storage chamber 46. The spring 51, of course, automatically returns the valve rod 36 to normal position when the piston rod is again raised.

For the purpose of determining and controlling the position of said valve rod 37, said rod being entirely within the device and therefore incapable of inspection, I provide a dial 52 on the outer face of the screw plug 38, having two indicating marks, such as "1" and "2", which, in connection with an arrow or some similar mark on the screw 43 show the respective positions of the screw and the consequent positions of the valve rod 36 and the valves in the bore 26.

Jacks are not always used in a vertical position, and even with jacks of the so-called vertical type it is desirable to so construct them that they be capable of use in a horizontal position should occasion for such use arise. In such cases, the level of the liquid may not reach the upper end of the valved bore 26, and to provide for such contingency I may place a packing ring (shown by the dotted lines in Fig. 2) around the lower end of the valve rod 36 within the upper end of the enlarged portion 35 of the bore 26, and admit the liquid to said bore by means of lateral openings or ducts. As shown in Fig. 3, a duct 53 may extend laterally from the valve bore to the side of the cylinder, from the outer end of which duct a groove 54 extends to the upper end of the pump-cylinder. In this construction, when the jack is placed horizontally, the side of the ram at which the valve-rod is located must be at the bottom, and as the mechanism for adjusting and operating said valve-rod is on the corresponding side of the head, and as the pump-handle may not then be in convenient position, it is preferable to reverse the position of the jack, when placed horizontally, so that the side of the head containing the plug 38 and screw 43 is at the top. In place of the single duct 53, therefore, two lateral ducts 55 and 56, as shown in Fig. 4, may extend from the bore 26 to opposite sides of the cylinder, with a groove from the outer end of each to the top of said cylinder. A still better and preferred construction is shown in Fig. 5, in which I have shown an angle duct 57 extending from the bore 26 to the exterior of the pump-cylinder at a point diametrically opposite said valve-bore, from the outer end of which duct 57 a similar groove may afford communication with the space above said cylinder.

The opening for the plate or cap 14 in the top of the head 12 should be large enough to permit of the removal for replacement or repair of the piston and its proper adjustment without disturbing any other part or parts of the mechanism.

The angle or bell-crank lever 40, pivoted to the plug should preferably be of such dimensions that it does not project beyond the peripheral plane of said plug, whereby the lowering means may be said to be self-contained and as an entirety inserted by screwing the plug 38 into the threaded aperture or opening therefor in the side of the head.

It will be apparent that I have described a jack of exceedingly simple construction, requiring but two valves, and including the simplest form of means for unseating and holding off their seats both valves, whereby the liquid has an open passage from the pressure chamber back into the supply chamber.

Many modifications of minor details of my improved hydraulic jack will doubtless readily suggest themselves to those skilled in the art to which it appertains, and I therefore do not desire to limit my invention to the specific construction herein shown and described.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A hydraulic jack having a continuous and straight fluid-passage from reservoir to ram chamber and providing the only means of communication therebetween.

2. A hydraulic jack having a passage providing the only means of communication between reservoir and ram chamber, said passage not including the pump chamber but communicating therewith.

3. A hydraulic jack having a passage from reservoir to ram chamber and providing the only means of communication therebetween, said passage not including the pump chamber but communicating therewith and serving for the flow of liquid in both directions.

4. In a hydraulic jack having a passage which does not include the pump chamber but communicates therewith and provides the only means of communication between reservoir and ram chamber, the combination, with the pump, of valves in said passage cooperating with said pump to force liquid into said ram chamber, and means for positively unseating said valves.

5. In a hydraulic jack having a continuous and straight fluid-passage from reservoir to ram chamber, the combination, with the pump, of superposed valves in said passage coöperating with said pump to force liquid through said passage to the ram chamber, and means acting against one of said valves only to positively unseat all of said valves.

6. A hydraulic jack having a fluid-passage leading from reservoir direct to ram chamber and providing the only means of communication therebetween and a duct connecting said passage with an otherwise closed pump chamber, both said passage and said duct serving for the flow of liquid in both directions.

7. In a hydraulic jack having an individual fluid-passage leading from reservoir direct to ram chamber and providing the only means of communication therebetween and a

duct connecting said passage with an otherwise closed pump chamber, the combination, with valves in said passage, one on each side of said duct, of means for positively unseating both valves by one operation.

8. In a hydraulic jack, the combination, with a ram containing the pump and a passage providing the only means of communication between reservoir and ram chamber and communicating with an otherwise closed pump chamber, of two superposed valves in said passage to control the direction of flow therethrough, and means acting against one of said valves only to positively unseat both of said valves.

9. A hydraulic jack having a fluid-passage leading from reservoir direct to ram chamber and a duct connecting said passage with the pump chamber, said passage and said duct providing the only means of communication between reservoir and pump chamber and between pump chamber and ram chamber.

In witness whereof, I have signed my name to the foregoing specification in the presence of two subscribing witnesses.

JAMES W. NELSON.

Witnesses:
HENRY R. BAUER,
J. C. CONRADI.