Sept. 1, 1936. R. M. LINDSAY 2,052,781

HYDRAULIC JACK

Original Filed Sept. 23, 1932 2 Sheets-Sheet 1

Fig. 2.

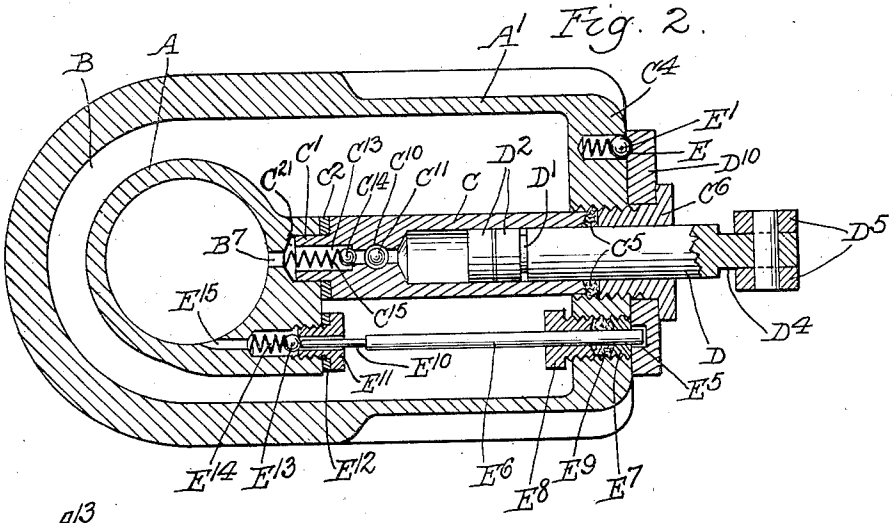
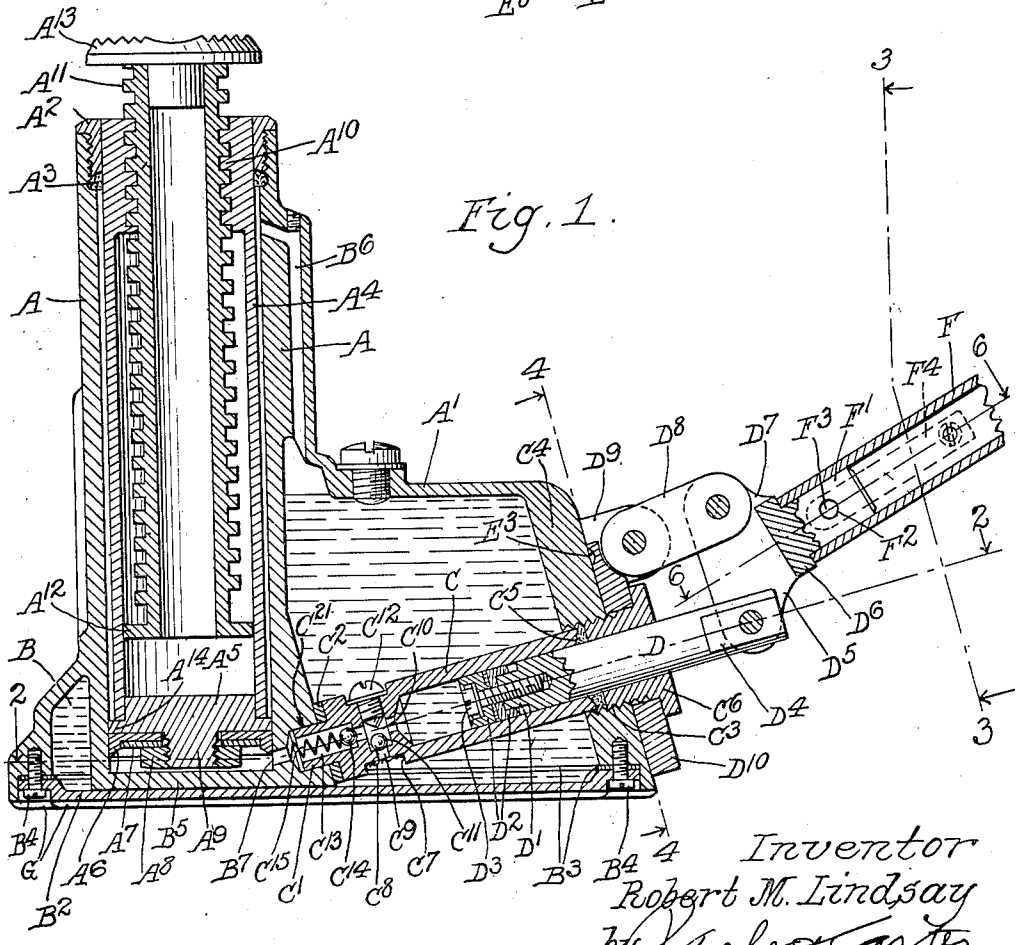


Fig. 1.



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Fig. 6.

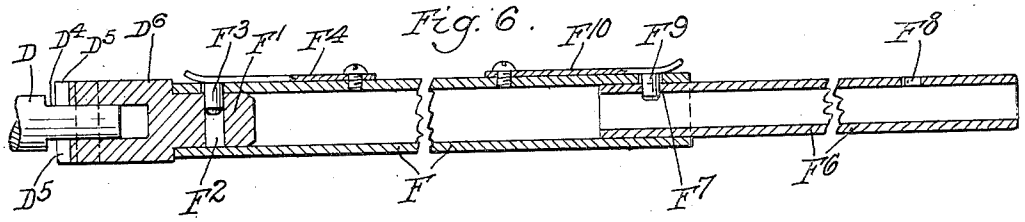


Fig. 4.

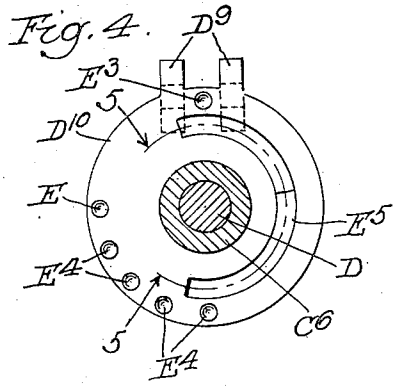


Fig. 5.

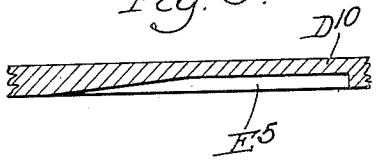
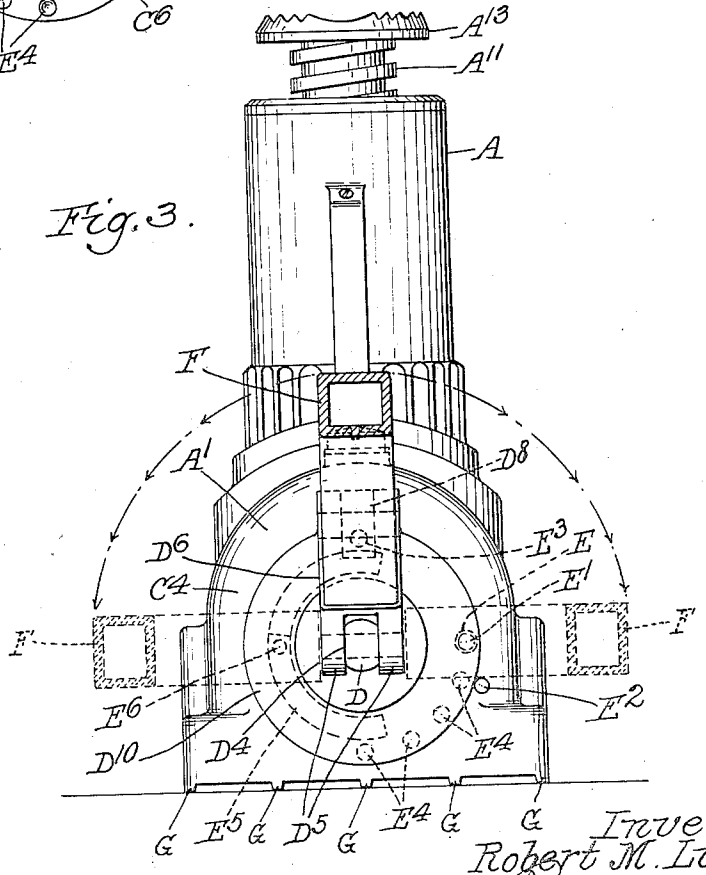


Fig. 3.



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2,052,781

UNITED STATES PATENT OFFICE

2,052,781

HYDRAULIC JACK

Robert M. Lindsay, Oak Park, Ill.

Refiled for abandoned application Serial No. 634,494, September 23, 1932. This application February 10, 1934, Serial No. 710,717

7 Claims. (Cl. 60—52)

My invention relates to improvements in hydraulic jacks and has for one object to provide a new and improved form of jack which would be cheap to manufacture, reliable in operation, which can be manipulated with a maximum amount of ease and wherein the direction of the movement of the pump operating lever may be adjusted or controlled to suit the will of the operator.

My invention is illustrated more or less diagrammatically in the accompanying drawings, wherein—

Figure 1 is a vertical section;

Figure 2 is a section along the line 2—2 of Figure 1;

Figure 3 is a section along the line 3—3 of Figure 1;

Figure 4 is a section along the line 4—4 of Figure 1;

Figure 5 is a development of cam, section along the line 5—5 of Figure 4;

Figure 6 is a section along the line 6—6 of Figure 1.

Like parts are indicated by like characters throughout the specification and drawings.

The jack comprises in general an integral one-piece casting having at one end a generally vertical cylinder A, rising from a generally horizontal oil reservoir A^1. The cylinder A is closed at the upper end by means of a gland A^2 and packing ring A^3 in engagement with and guiding the vertically moving hollow piston or plunger A^4. The lower end of the piston is closed by a cap or head A^5, which carries a packing cup washer A^6, preferably of leather, held in place by the washer A^7 and a nut A^8 on the threaded stud A^9, which projects down from the head A^5. The piston contains in its upper end a nut A^{10} in which is threaded a screw A^{11} having at its lower end a guide flange A^{12} and at its upper end a pad A^{13}, adapted to engage any object to be lifted by the jack. The sole purpose of the screw, nut, flange and pad combination is to allow the operator before the jack is used to make an initial adjustment of the height of the jack. This adjustment will be made with the piston in the lower position and will be made so as to bring the pad, if the device is being used in connection with automobiles, high enough up when the jack rests on the ground and positioned beneath the part to be raised so that a minimum movement of the piston will be needed, the operator being able to make this adjustment before the jack is put under the object.

The cap A^5 has a flange A^{14} extending in sliding engagement with the inner periphery of the cylinder so that the piston is always held in alignment with the cylinder both by the flange A^{14} and the part engaging the gland A^2.

The reservoir A^1 extends, as indicated, at right angles to the cylinder A, is tapered off as shown in Figure 1 and encircles the base of the cylinder, the pocket B being a part of the main oil reservoir A^1. The underside of the housing A is closed by the removable plate B^2, held in oil tight relation with the housing by means of a gasket B^3 and screws B^4, the lower end of the cylinder A having an integral closure B^5 which rests upon the plate B^2. B^6 is a by-pass connecting at one end with the upper inner portion of the cylinder A and at the other end with the upper portion of the reservoir A^1. This passage has two functions. It permits oil or air entrapped by the plunger A^4 to escape into the reservoir as the plunger moves up. It also provides a pressure relief going into operation when the piston has reached the upper end of its excursion because when the cup washer A^6 passes above the by-pass opening B^6 further manipulation of the pump will only cause circulation of the oil from the cylinder beneath the plunger through the by-pass back to the reservoir. But, of course, any movement of the plunger downward closes the relief by putting it out of operation and causing the plunger to remain in position at the upper end of its excursion. B^7 is an oil passage disposed in the wall of the cylinder A beneath the plunger, through which oil under pressure is introduced whenever the operator wishes to force the plunger A^4 upwardly. The passage B^7 is counterbored as at C^{21}.

C is a pump cylinder. It is reduced at its inner end as at C^1 and socketed in the counterbore C^{21} of the cylinder A, there being a packing disk C^2 encircling the reduced portion of the cylinder and compressed between the unreduced end of the pump cylinder and the cylinder A. The outer end of the pump cylinder is socketed in the threaded aperture C^3. In the outer wall C^4 of the housing is a packing ring C^5. At the end of the pump cylinder C is a gland C^6 threaded in the aperture C^3 exerting pressure on the packing ring and on the pump cylinder to compress the packing rings C^2 and C^5 to prevent oil leakage. The pump cylinder is countersunk as at C^7 to receive a screen C^8 for the purpose of screening the oil entering intake passage C^9, which intake passage communicates with the suction valve chamber C^{10}.

C^{11} is a ball check valve in said chamber associated with the pointed end of the screw C^{12}, so that the ball's movement away from its seat is limited. C^{13} is a check valve chamber in the end of the pump cylinder. It communicates with the passage B^7. It contains a ball check valve C^{14} positioned by means of a spring C^{15}.

D is a pump piston adapted to reciprocate in the hollow of the pump cylinder, the packing ring C^5 being in engagement with the outer periphery thereof. The inner end of the piston is reduced as at D^1 and engages the two leather cup plungers D^2, held together in place on the end of the piston by means of the screw D^3. These cup plungers are oppositely disposed so that the pump is tight when moving forward to exert pressure on the piston and when moving backwardly on the suction stroke. The plunger D where it projects outwardly beyond the gland C^6 is flattened as at D^4 and straddled by the fork D^5 on the stub pump lever D^6, which stub pump lever has another fork D^7 straddling the end of a pivoted link D^8, which link is also pivoted on the ears D^9 on the rotatable adjusting disc D^{10}, which disc rests against the outer face of the wall C^4 and rotatably encircles the gland C^6.

The disc on its inner face is provided with a socket E adapted to be engaged by a spring pressed ball E^1 in the face of the wall C^4 so that the disc with the jack handle is yieldingly held in upper position as shown in Figures 1 and 3. E^2 is a stop pin projecting from the wall C^4 outside the circumference of the disc and adapted to limit angular rotation of the disc in a clockwise direction, so that the disc may be rotated to overcome the force of the pressure of the ball E^1 into a position such as shown in dotted lines in Figure 3, when the ball E^1 engages the socket E^3. When in such a position the pump lever is free to rock in a horizontal plane as distinguished from its movement in a vertical plane with the parts in full line position shown in Figures 1 and 3. The inner face of the disc has a plurality of ball sockets E^4 adapted to engage the ball when the disc is moved in counterclockwise direction from the position shown in Figures 1 and 3 and yieldingly adapted to stop it and latch it in four selected positions. Also disposed on the inner face of the disc is a circular cam slot E^5, which cam slot decreases in depth as indicated in Figure 5. Associated with the cam slot is a release pin E^6, the outer end of which penetrates into the slot through the aperture guide screw E^7, gland E^8 and packing E^9. The inner end of the pin E^6 is reduced in diameter as at E^{10} and projects inwardly through a threaded plug E^{11}, associated with packing ring E^{12} to engage the release ball valve E^{13} seated on the plug E^{11} by means of a spring E^{14} in communication with the lower portion of the cylinder by means of a passage E^{15}. Counter-clockwise rotation of the disc on the outer wall from vertical position forces the pin E^6 inwardly to unseat the ball valve E^{13} and permit hydraulic fluid or oil to flow out from beneath the piston or ram in the cylinder back to the reservoir. Owing to the great range of the cam, the operator may control the rate at which the hydraulic fluid is released by rotating the disc and latching it at any one of the four positions. If he rotates the disc and latches it in the first position he gets slow outflow of oil. If he rotates it to fourth position, he gets a maximum outflow of oil. Rotation in intermediate position gives intermediate release.

The jack handle comprises a hollow tube F adapted to socket on a reduced end F^1 of the stub pump lever D^6. This plug is apertured as at F^2 to receive the pin F^3, held by means of a flat spring F^4, secured to the handle F and may be engaged in the aperture F^2 to hold the handle in position on the stub. Slidable in the hollow tube F is another tube F^6 apertured as at F^7 and F^8. A pin F^9 held by the spring F^{10} on the handle F may be put into engagement with any one of these apertures to latch the extending handle in the desired position with respect to the handle F. Either end of the tube F is alternatively engageable with the end F^1.

G are a series of longitudinal ribs on the underside of the jack projecting downwardly so as to serve as runners and to guide the jack firmly on a straight line when it is being slid along the ground into position under the object to be lifted and also to interlock with the ground or other supporting surface so as to prevent lateral displacement of the jack body as operation commences and the lever is rocked in a horizontal plane.

The use and operation of my invention are as follows:

When the operator wishes to use the jack to raise an automobile for changing a wheel or the like, he will by inspection determine how close to the ground the part to be engaged by the jack is, and he will rotate the adjusting screw to bring the pad into approximate height of the underside of the vehicle he wishes to engage. With the disc in the upright position he will latch the handle on the stub and use the handle to guide the jack and slide it under the vehicle, watching that the pad is beneath the part to be engaged. He will then give the jack handle a few perpendicular strokes, pumping enough oil out of the reservoir into the cylinder to raise the piston and put the pad into engagement with the proper part of the automobile and exert initial pressure on the jack. Because cars or automobiles are built low there is not much clearance and he would not be able to move the jack handle very far in up and down position but as soon as initial pressure has been taken up and the jack has been firmly seated on the ground, the operator will then rotate the disc clockwise by manipulating the handle through an angle of 90°, so that the handle may travel by reciprocation in a generally horizontal plane instead of a vertical plane. Therefore, the operator may take longer strokes and will not be in danger of bringing his hand or parts of his body or the jack handle into engagement with automobile parts as he manipulates the jack.

When the work is done and the operator wishes to release the jack, he will rotate the disc back to upright position in counter-clockwise direction, and beyond it, to release the relief valve more or less as he desires, and the weight of the plunger and the load carried by it will cause the oil to rush out through the relief valve back into the reservoir, the plunger settling down and the operator by pulling back on the pump lever can withdraw the jack.

This application is a refiling of abandoned application, Serial Number 634,494, filed September 23, 1932.

I claim:

1. In a hydraulic jack, including a liquid reser-

voir, a working cylinder and working piston therein, a pump cylinder and pump piston therein, and a pressure releasing valve associated with the working cylinder, a ring, rotatably mounted, concentric with the pump cylinder, a pump operating lever pivoted on the ring and associated with the pump piston to cause reciprocation thereof, the ring being adapted to be rotated by rotation of the lever, and means interposed between the ring and the pressure releasing valve for causing operation of said valve in response to the rotation of the ring.

2. In a hydraulic jack, including a liquid reservoir, a working cylinder and working piston therein, a pump cylinder and pump piston therein, and a pressure releasing valve associated with the working cylinder, a ring, rotatably mounted, concentric with the pump cylinder, a pump operating lever, pivoted on the ring and associated with the pump piston to cause reciprocation thereof, the ring being adapted to be rotated by rotation of the lever, and means interposed between the ring and the pressure releasing valve for causing operation of said valve in response to the rotation of the ring, said means comprising a cam associated with the ring, a connecting rod engaging the cam at one end and the valve at the other end.

3. In a hydraulic jack, including a liquid reservoir, a working cylinder and working piston therein, a pump cylinder and pump piston therein, and a pressure releasing valve associated with the working cylinder, a ring, rotatably mounted, concentric with the pump cylinder, a pump operating lever pivoted on the ring and associated with the pump piston to cause reciprocation thereof, the ring being adapted to be rotated by rotation of the lever, and means interposed between the ring and the pressure releasing valve for causing operation of said valve in response to the rotation of the ring, means for yieldingly locking the ring in a plurality of selected positions corresponding to a plurality of predetermined valve operations.

4. In a hydraulic jack, including a liquid reservoir, a working cylinder and working piston therein, a pump cylinder and pump piston therein, and a pressure releasing valve associated with the working cylinder, a ring, rotatably mounted, concentric with the pump cylinder, a pump operating lever, pivoted on the ring and associated with the pump piston to cause reciprocation thereof, the ring being adapted to be rotated by rotation of the lever, and means interposed between the ring and the pressure releasing valve for causing operation of said valve in response to the rotation of the ring, said means comprising a cam associated with the ring, a connecting rod engaging the cam at one end and the valve at the other end, and means for yieldingly holding the ring in a plurality of selected positions corresponding to a plurality of predetermined valve operations.

5. In a hydraulic jack, including a liquid reservoir, a working cylinder and working piston therein, a pump cylinder and pump piston therein, a ring mounted for rotation, concentric with the pump cylinder, a pump operating lever pivoted on the ring and adapted to cause reciprocation of the pump piston, yielding means for locking the ring in such a position that the pivot axis of the lever is generally horizontal, the ring when the yielding means are overcome being adapted to rotate to bring the pivot axis into a generally vertical position, a pressure release valve associated with the working cylinder and means responsive to rotation of the ring in the opposite direction for causing opening of the release valve.

6. In a hydraulic jack, including a liquid reservoir, a working cylinder and working piston therein, a pump cylinder and pump piston therein, a ring mounted for rotation, concentric with the pump cylinder, a pump operating lever pivoted on the ring and adapted to cause reciprocation of the pump piston, yielding means for holding the ring in such a position that the pivoted axis of the lever is generally horizontal, the ring when the yielding means are overcome being adapted to bring the pivot axis into a generally vertical position, and stopping means associated with the ring, for limiting its angular excursion from the starting point to approximately 90°, a pressure release valve associated with the working cylinder and means responsive to rotation of the ring in the opposite direction from the starting position for causing opening of the release valve.

7. A hydraulic jack comprising a closed liquid containing housing, a cylinder extending upwardly from the bottom floor of the housing partially enclosed in the housing and projecting thereabove, a jack piston mounted for movement in the cylinder in response to hydraulic pressure, a passage extending through the wall of the cylinder communicating at one end with that portion of the cylinder beneath the piston and at the other end with the interior of the liquid containing housing, an aperture in the outer wall of the housing in line with said passage, the wall of the cylinder about the passage being countersunk, a pump barrel socketed in the countersunk portion of the cylinder wall extending outwardly therefrom through the body of the housing and terminating beyond the housing wall, a pump piston and intake and discharge valves contained within the cylinder housing as a unit, a pump operating lever associated with the outer end of the pump piston and a support for the lever whereby the lever is free to rotate about an axis perpendicular to the axis of the pump piston for pump operation, and free to rotate about the axis of the pump, a relief valve associated with the cylinder and adapted to be operated responsive to rotation of the pump lever about the axis of the piston.

ROBERT M. LINDSAY.