Apr. 24, 1923. 1,453,043

J. ERHARDT

HYDRAULIC LIFTING JACK

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Fig. 1.

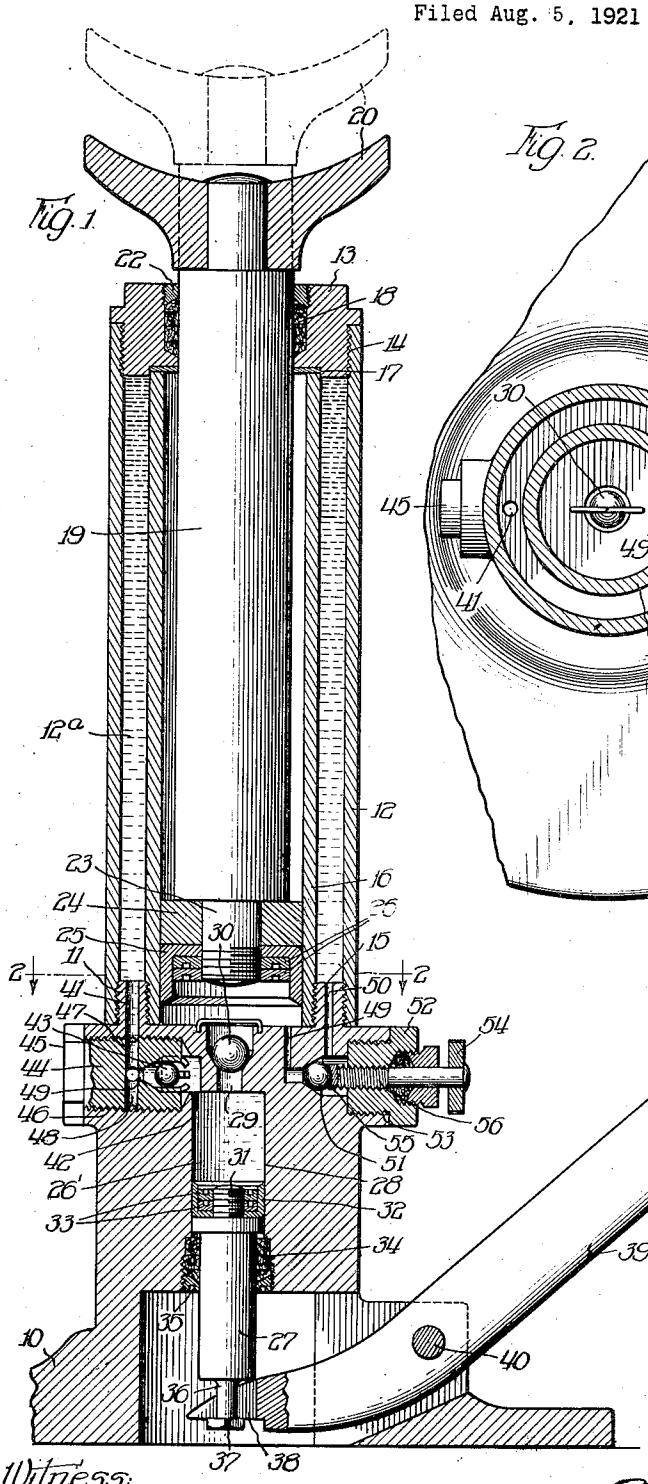
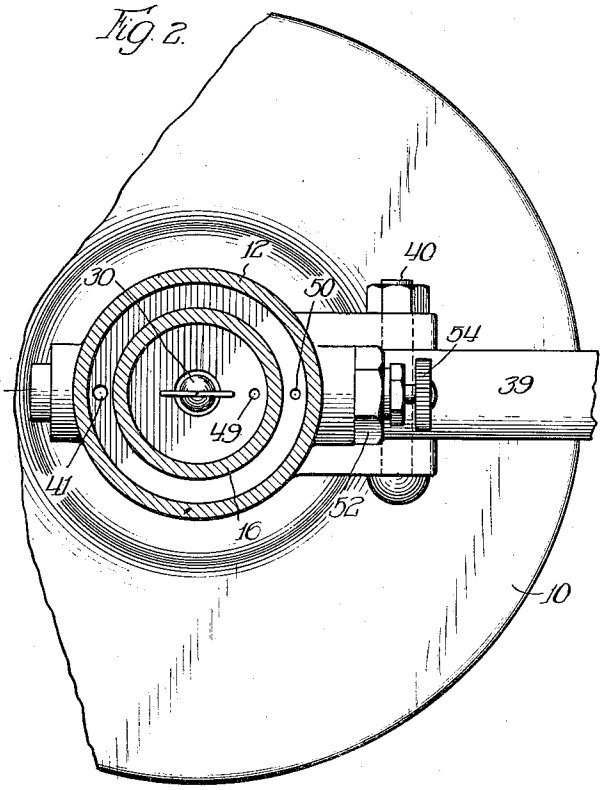


Fig. 2.



Witness:
R. Burkhardt

Inventor
Joseph Erhardt,
By Otto M. Wernicke
Attys.

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UNITED STATES PATENT OFFICE.

JOSEPH ERHARDT, OF CHICAGO, ILLINOIS.

HYDRAULIC LIFTING JACK.

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To all whom it may concern:

Be it known that I, JOSEPH ERHARDT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Hydraulic Lifting Jacks, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

The invention relates to lifting jacks and primarily to those of the fluid actuated type.

The invention has among its various objects the provision of a device of this character which is relatively small in size and capable of use as an automobile accessory, and which is simple in construction, efficient in operation and relatively light in weight so that it may be readily transported or handled when its use is found necessary.

The invention has an additional object, the provision of an arrangement in which the lifting element may be actuated to lift an object and maintain it in an elevated position.

It is a further object of the invention to provide a structure such as above described with a means for releasing the pressure from the lifting element so that it may be lowered, this means being capable of adjustment so as to regulate the speed at which the lifting element receeds from its elevated position.

It is also an object to provide a construction in which the pressure applying element may be manually actuated and the pressure created maintained until released without being transmitted to the pressure creating mechanism. This assists in permitting the manually operated pressure device to be readily actuated and eliminates back pressure, which adds to the case of the operation of the pressure creating device.

The particular arrangement herein shown for accomplishing the desired result includes the use of a fluid reservoir, a fluid pressure cylinder, a lifting element which is arranged for movement in the pressure cylinder and a fluid pressure creating device which acts upon the lifting device. This pressure creating device is arranged below the pressure cylinder and communicates therewith. The passage forming the communication between the pressure cylinder and the pressure creating device is controlled by a valve which permits the fluid to pass from the pressure creating device to the pressure cylinder, but prevents the flow of said fluid from the pressure cylinder back into or toward the pressure creating device.

The pressure creating device and the fluid reservoir communicate with each other, the fluid being permitted to flow from the reservoir towards the pressure creating device but is prevented from flowing in the reverse direction.

By this arrangement just described the fluid may flow into the pressure creating device and be forced thereby into the pressure chamber against the lifting element causing it to raise, it being held in this raised position by virtue of the fact that the fluid is prevented from flowing back into the pressure creating apparatus or from the pressure cylinder.

A bypass is provided which leads from the pressure cylinder back to the fluid reservoir. This by pass is controlled by a valve which is closed during the lifting operation of the lifting element. This valve prevents the flow or escape of the pressure from the fluid pressure chamber to the fluid reservoir, but is operable to allow the pressure to gradually escape from the pressure cylinder back into the fluid chamber or reservoir. The valve which controls the flow of the fluid is capable of adjustment to vary the speed at which the lifting element is lowered and is also operable to permit the lifting device to be partially lowered and held in this last named position, from which position it may be fully lowered.

The lifting device is also capable of being manually raised to any desired elevated position and its elevation increased from this manually set position by the actuation of the pressure creating device.

The invention will be explained and more readily understood when read in conjunction with the accompanying drawings which show one embodiment which the invention is susceptible, it being obvious that other arrangements may be resorted to without departing from the spirit of the appended claims forming a part hereof—

In the drawing Fig. 1 is a central longitudinal section of a jack constructed according to one embodiment of the invention.

Fig. 2 is a section taken on line 2—2 of Fig. 1.

In the particular embodiment of the invention illustrated in the drawings, the use of a base 10 is contemplated. The upper-

most end of this base is provided with an annular projected portion 11, the outermost face of which is provided with screw threads which cooperate with screw threads provided on the tubular element 12 which produces one wall of a fluid chamber 12a. The uppermost end of this member 12 is closed by an annular plug 13, it being provided with the threads 14 which cooperate with the threads on the tubular member to secure these two portions together.

The inner annular face of the projection 11 is also provided with threads as shown at 15 and these threads cooperate with the threaded end of the tubular member 16. This member 16 together with the tubular member 12 produces the fluid chamber 12a. This tubular member provides a pressure cylinder. This last mentioned tubular member 16 extends upwardly into engagement with the member 13, the end being held within the recess 17 of this member 13. A suitable packing 18 is interposed between the uppermost end of this tubular member 16 and the member 13. This prevents leakage of the fluid from the reservoir or fluid chamber provided by the tubular members 12 and 16.

A plunger or lifting element 19 is arranged for reciprocation within the tubular member 16. This lifting element 19 projects through the plug 13 and has its uppermost end provided with a head 20 which is placed against the article to be lifted. This lifting element 19 is packed against leakage by the packing 18, the latter being arranged within the plug 13 and is held by the collar 22. The lowermost end of this member 19 is provided with the reduced portion 23 upon which is arranged the ring 24 and the cup shaped portion 25, both of which are held with respect to the lifting element 19 by means of the nuts 26. These parts 24 and 25 provide a tight connection with the tubular member 16 but permit the lifting element 19 to be raised when the pressure is applied thereto.

This structure provided by the elements 24 and 25 simulates a piston head as will be evident from the following.

A pressure creating device generally designated 26' is utilized. This pressure creating device includes the plunger 27 and the cylindrical bore 28, this bore being provided in the base 10. A valve controlled passage 29 communicates with the pressure cylinder produced by the tubular member 16. This passage 29 is arranged so that the fluid which is pumped or put under pressure by the plunger 27 is permitted to pass from the cylindrical bore 28 through the passage into the pressure cylinder below the lifting element, thus when the fluid, which in the present instance is oil, is pumped by the plunger 27 through the passage 29 this pressure will be exerted upon the lowermost end of the lifting element 19 which will cause it to be raised.

A pressure actuated valve 30 is arranged in the passage 29 between the cylindrical bore 28 and the pressure cylinder formed by the tubular member 16. The plunger 27 is provided with a reduced portion 31 and the leather or other cup shaped portion 32 which is placed over the reduced portion 31 and clamped to the plunger 27 by means of the nuts 33.

This plunger 27 is packed against leakage as shown at 34 and this packing is held by means of the collar 35. The lowermost end of the plunger 27 is provided with an extension 36 having a head 37. This last mentioned portion is designed to be engaged by the forked or bifurcated end 38 of a lever 39 which is pivoted to the base 10 at 40. Thus by actuating the handle or lever 39 the plunger 27 will be caused to reciprocate within the cylindrical bore 28 causing the fluid therein to be forced therefrom into the pressure chamber produced by the tubular member 16. This will cause the plunger 19 to be elevated.

The fluid within the pressure chamber is prevented from passing back into the cylindrical bore of the pressure creating device by means of the check valve 30, thus this lifting element 19 will be raised and maintained in its elevated position.

A fluid passage 41 is produced which extends through the collar or extension 11 and communicates with the cylindrical bore 28 through the passage 42. The passage of the fluid from the reservoir 12a to this cylindrical bore is controlled by a ball check valve 43 which is operable to permit the fluid to be introduced into the cylindrical bore upon the suction stroke of the plunger 27 but prevents the fluid from passing back into the fluid reservoir upon the compression stroke of the plunger. This ball check is caged within the end of a removable plug 44 which is provided with a head 45 and the screw threaded portion 46 so that it may be readily removed and inserted for operation with respect to the fluid passages above enumerated. This plug 44 is provided with the annular grooved portion 47 and the radial passages 48 which communicate with the passage 49, the latter terminating in a seat for the ball check valve.

The last mentioned arrangement permits the plug to be inserted and the fluid to pass from the fluid chamber into the cylindrical bore of the pressure creating device. A valve controlled bypass is utilized to permit the regulation of the lowering of the lifting element 19. This bypass connects the pressure cylinder and the reservoir together and is controlled by an adjustable ball check valve which may be regulated to allow the

lifting element to recede or lower rapidly and may be regulated so that this lifting element 19 may recede slowly.

The bypass above referred to includes the fluid passage 49 and the fluid passage 50, the former leading from the pressure cylinder to the ball check valve back into the reservoir 12a. These passages 49 and 50 are provided in the base 10 and the ball check valve is interposed between them so the passage of the fluid from one to the other may be regulated. This ball check regulating mechanism includes the member 52 which is threaded into a suitable threaded opening 53. This member 52 carries the set screw 54 which is adjustably arranged within the member 52 and has the end 55 thereof provided to engage and release the ball of the ball check valve 51. This set screw 54 is secured to the member 52 by means of the threaded portion 56.

By referring to the drawings it will be evident that by manipulating this set screw 54 that this ball of the check valve 51 may be securely held against its seat to prevent the passage of the fluid from the pressure cylinder into the reservoir and may be also adjusted so that various openings are produced between the ball of the ball check valve and its seat, which therefore regulates the amount of fluid which may pass from the pressure cylinder into the reservoir 12a.

From the foregoing description it is evident that the lifting element 19 may be manually lifted or moved with respect to the remaining structure and elevated by the operation of the plunger 27 from this manually set position or this plunger may be caused to travel from its lowermost position as shown in the drawings to any one of its intermediate positions by the actuation of the plunger 27 through the medium of the lever 39.

The operation of the device is substantially as follows:

By operating the lever 39 the plunger 27 will be actuated or reciprocated in the cylindrical bore 28. Upon its downward or suction stroke the ball check 43 permits the fluid to pass from the reservoir 12a through the passages 41, 42, 47, 48 and 49 into the cylindrical bore 28. At this time the ball check 30 rests against its seat which prevents any fluid in the pressure chamber from entering this cylindrical bore 28. Upon the upward or compressed stroke of the plunger 27 the fluid in the cylindrical bore 28 will be forced through the passage 29 into the pressure chamber below the lifting element 19. Upon this stroke of the plunger the ball check valve 30 is unseated and the ball check 43 is brought against its seat which prevents the fluid from passing back into the reservoir 12a. This operation is continued until the lifting element 19 is raised to the desired position. During this operation the ball of the ball check valve 51 rests against its seat which prevents the fluid in the pressure chamber from passing therefrom through the passage 49.

When it is desired to permit the raising element 19 to lower this ball check 51 will be released from its contact with the valve seat by the manipulation of the set screw 54. This allows the fluid in the pressure cylinder to pass through the passages 49 and 50 back into the reservoir 12. The pin 40 of the valve handle 39 may be separated from the base 10 which permits the separation of the handle or lever and the base so that the arrangement will not consume any great amount of space when not in use.

Having thus described the invention what I claim and desire to cover by Letters Patent is:

I claim:

1. In a portable lifting device the combination of a member providing a base for the lifting device, said base having a fluid chamber and a pressure chamber secured thereto, a lifting element arranged in the pressure chamber, said base being provided with a chamber which communicates directly with the pressure chamber, a pump arranged in the chamber, a wall of the pump chamber providing a wall for the pressure chamber, a valve arranged in said wall, a passage leading from the fluid chamber to said pump chamber and a passage leading from the pressure chamber to the fluid chamber.

2. In a portable lifting device the combination of a member providing a base for the lifting device, said base having a fluid chamber and a pressure chamber secured thereto, a lifting element arranged in the pressure chamber, said base being provided with a chamber which communicates directly with the pressure chamber, a pump arranged in the chamber, a wall of the pump chamber providing a wall for the pressure chamber, a valve arranged in said wall, a a passage leading from the fluid chamber to said pump chamber, a passage leading from the pressure chamber to the fluid chamber, a valve arranged in both of said last named passages, said last mentioned valve being closed during the lifting operation and opened to permit the lifting element to be lowered.

3. In a portable lifting device the combination of a member providing a base for the lifting device, said base having a fluid chamber and a pressure chamber secured thereto, said lifting element arranged in the pressure chamber, said base being provided with a chamber which communicates directly with the pressure chamber, a pump arranged in the chamber, a wall of the pump

chamber providing a wall for the pressure chamber, a valve arranged in said wall a passage leading from the fluid chamber to said pump chamber, a passage leading from the pressure chamber to the fluid chamber, said passage which leads from the pressure chamber being provided in said wall.

4. In a portable lifting device, the combination of a member providing a base for the lifting device, said base having a fluid chamber and a pressure chamber secured thereto, said lifting element arranged in the pressure chamber, said base being provided with a chamber which communicates directly with the pressure chamber, a pump arranged in the chamber, a wall of the pump chamber providing a wall for the pressure chamber, a valve arranged in said wall, a passage leading from the fluid chamber to said pump chamber, a passage leading from the pressure chamber to the fluid chamber, said pump chamber and pressure chamber being arranged in substantial axial alignment with each other.

5. In a portable lifting device, the combination of a member providing a base for the lifting device, said base having a fluid chamber and a pressure chamber secured thereto, a lifting element arranged in the pressure chamber, said base being provided with a chamber which communicates directly with the pressure chamber, a pump arranged in the chamber, a wall of the pump chamber providing a wall for the pressure chamber, a valve arranged in said wall, a passage leading from the fluid chamber to the pump chamber, a passage leading from the pressure chamber to the fluid chamber, said pump chamber, pressure chamber, and fluid chamber being arranged in substantial axial alignment with each other.

6. In a hydraulic jack, the combination of a base, a member forming a chamber secured to said base, a lifting element arranged in said chamber, a pump chamber provided in said base, said pump chamber being in communication with said first mentioned chamber, a plunger provided in said pump chamber, the lowermost end of the pump chamber being arranged in spaced relation to the lowermost part of the base to provide a space in which the plunger may operate, said plunger having means whereby an element for actuating said plunger may be removably secured thereto.

7. In a hydraulic jack, the combination of a base, a pressure chamber and a fluid chamber secured to said base, a lifting element arranged in the pressure chamber, a pump chamber provided in said base, a valve controlling the flow of fluid from the fluid chamber to said pump chamber, and a valve controlling the flow of fluid from the pressure chamber to the fluid chamber, said pump chamber being arranged in spaced relation to the lowermost part of the base to provide a space in which the plunger may operate and said plunger being provided with means whereby an element for actuating said plunger may be removably secured thereto.

8. In a hydraulic jack, the combination of a base, a member forming a chamber secured to said base, a lifting element arranged in said chamber, a pump chamber provided in said base, said pump chamber being in substantial axial alignment with the first mentioned chamber and being in communication with said first mentioned chamber, a plunger provided in said pump chamber, the lowermost end of the pump chamber being arranged in spaced relation to the lowermost part of the base to provide a space in which the plunger may operate, said plunger having means whereby an element for actuating said plunger may be removably secured thereto.

9. In a hydraulic jack, the combination of a pressure chamber, a lifting element arranged in said chamber, a pump chamber provided in said base, a plunger arranged in said pump chamber, and said plunger being arranged for vertical reciprocation below said pump chamber.

10. In a hydraulic jack, the combination of a pressure chamber, a lifting element arranged in said chamber, said base being bored to provide a pump chamber, a pump arranged in said pump chamber, means for actuating said pump and said base being provided with a space for the reception of said means for actuating said pump.

In witness whereof, I hereunto subscribe my name this 8th day of July, A. D., 1921.

JOSEPH ERHARDT.