

April 16, 1929.

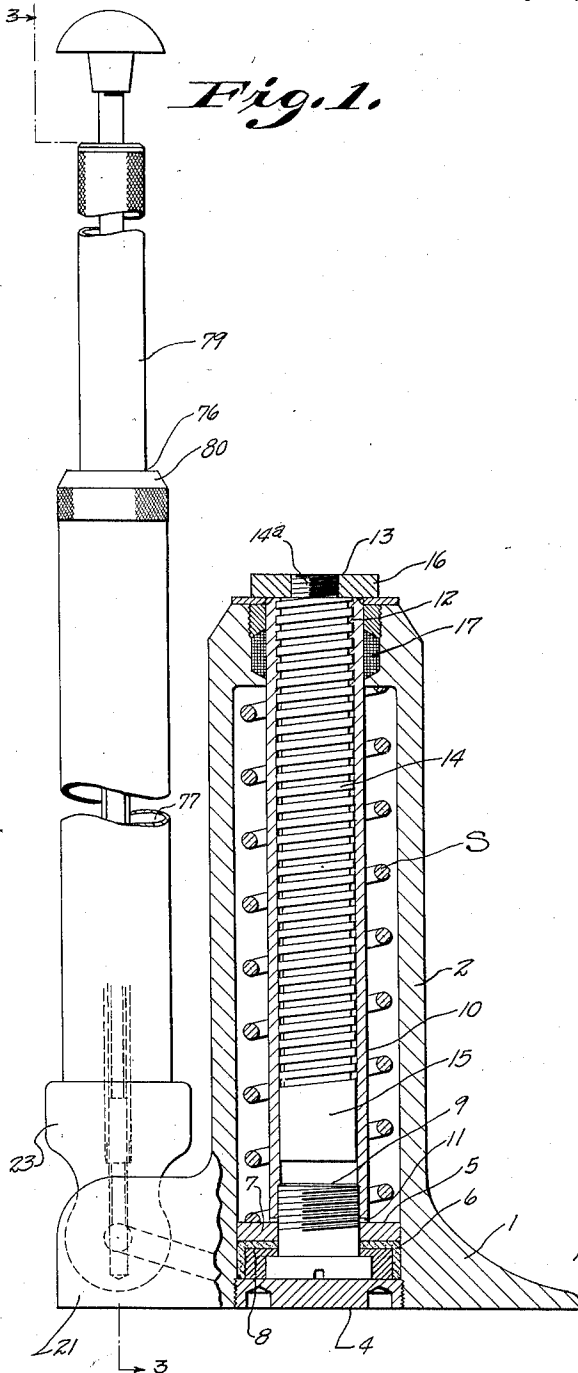
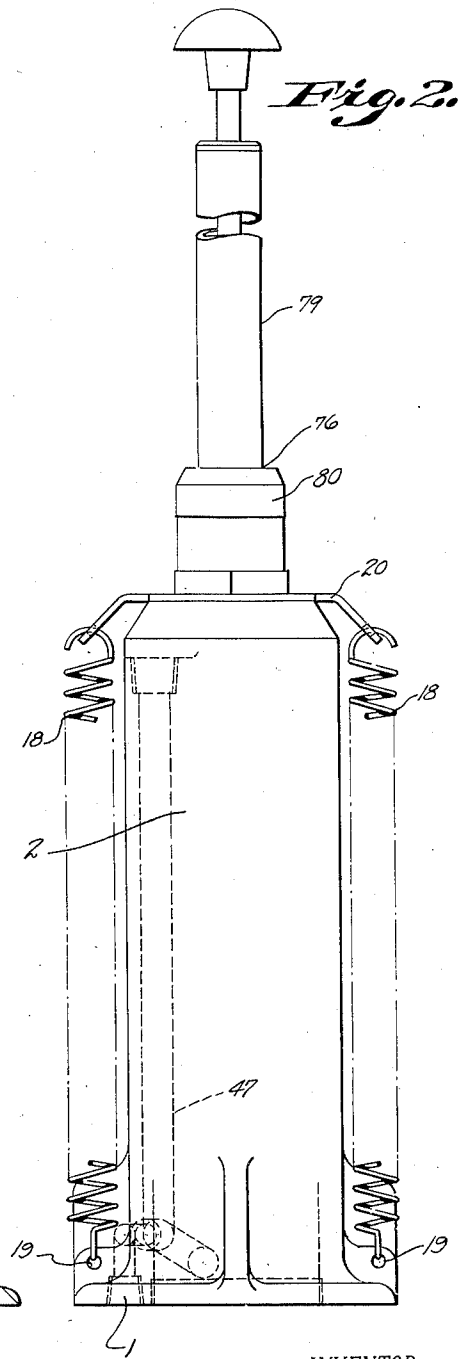
H. W. BOLENS

1,709,000

HYDRAULIC JACK

Filed July 20, 1927

2 Sheets-Sheet 1



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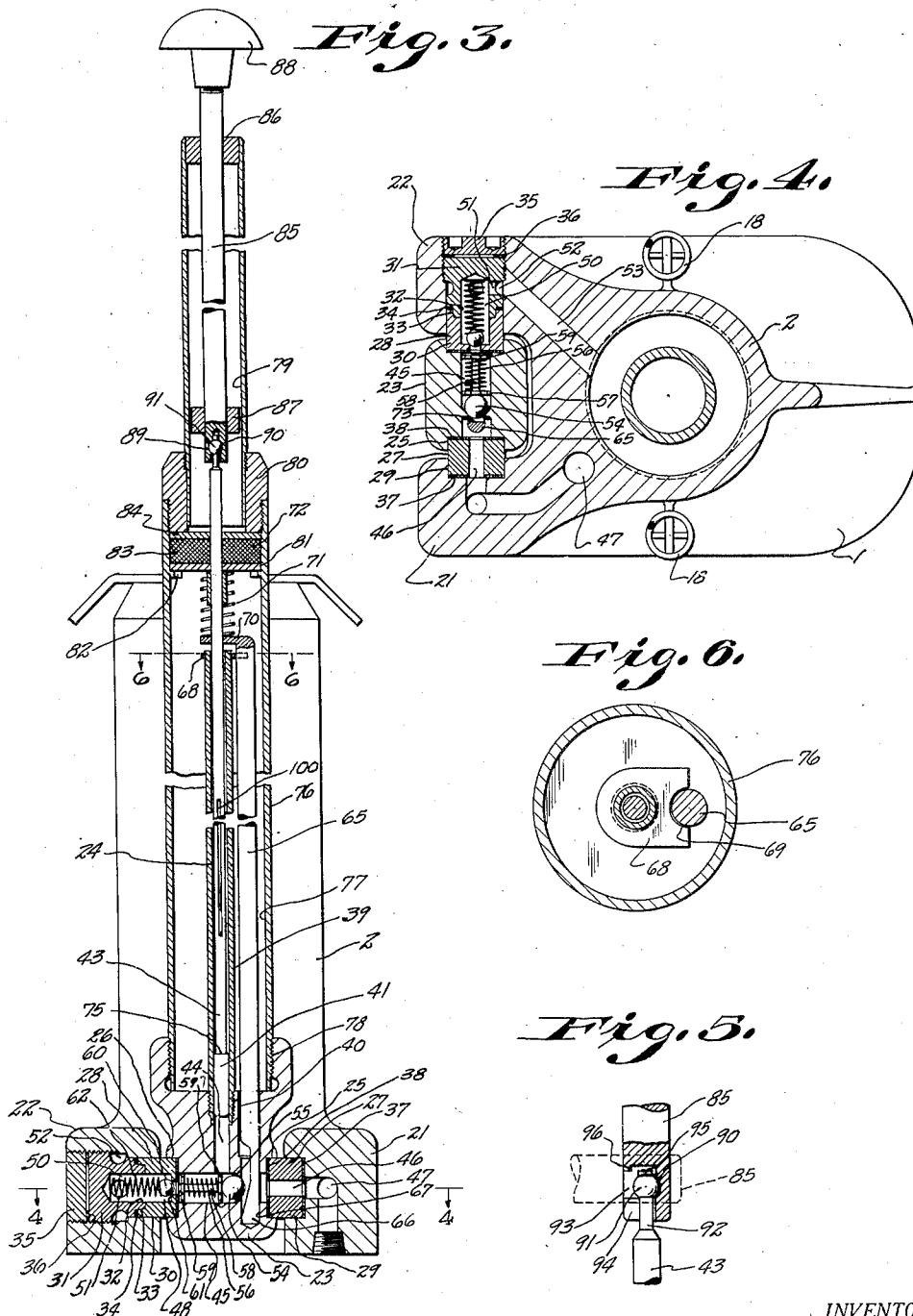
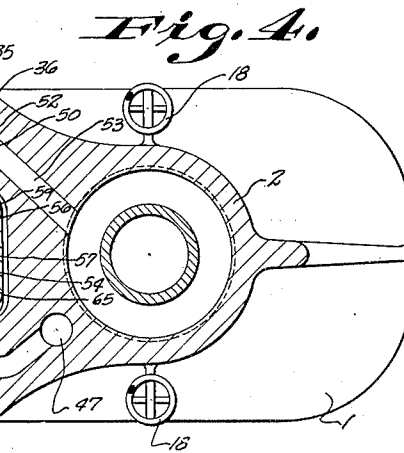
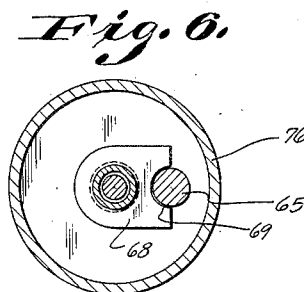
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HYDRAULIC JACK

Filed July 20, 1927

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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HYDRAULIC JACK.

Application filed July 20, 1927. Serial No. 207,129.

This invention relates to an improvement in hydraulic jacks especially designed for use with automobiles, although also having many other uses.

One object of the invention is to provide a hydraulic jack of this character which may be operated with ease and convenience and with a minimum of effort to lift or jack up automobiles or other heavy bodies. The jack is adapted to apply this lifting force in crowded and inaccessible quarters and yet may be operated and controlled without the necessity of the person using the jack closely approaching the point where the jack applies its lifting force. Thus, with an automobile, the person using the jack may place the body of the jack under the car and cause it to engage the axle to jack up the car and may control the jack from a standing position and outside the limits of the car of its equipment.

Another object of the invention is to provide a jack of this character wherein the release and lowering of the lifting member of the jack is controlled and effected by the same member used for the pump and yet the possibility of accidental release and lowering of the jack during the operation of the pump is precluded.

Another object is to provide a hydraulic jack of the type having hydraulically operable lifting mechanism and a pump operatively associated therewith and swingable relative thereto and wherein novel means is provided for effecting the swingable mounting of the pump on the hydraulically operable lifting mechanism.

A further object resides in the provision of a novel form of lift member which is adjustable as to length over a wide range while having rigidity and strength in all phases of its adjustment and presenting a compact and completely housed construction when in operative position.

A still further object is to provide a hydraulic jack having these advantages and capacities and which may be knocked down and stored in a compact space.

Other objects and advantages reside in certain novel features of the construction, arrangement and combination of parts which will be hereinafter more fully described and particularly pointed out in the

appended claims, reference being had to the accompanying drawings forming a part of this specification and in which:

Figure 1 is a view of the hydraulic jack embodying the present invention showing the same partly in central vertical longitudinal section and partly in side elevation;

Figure 2 is a fragmentary view in front elevation;

Figure 3 is a view in vertical section on line 3—3 of Figure 2, parts being shown in elevation for the sake of simplicity in illustration;

Figure 4 is a view in horizontal section on line 4—4 of Figure 3;

Figure 5 is a detail view partly in section and partly in elevation illustrating the releasable coupling between the plunger rod of the pump and the operating element therefor; and

Figure 6 is a detail sectional view on line 6—6 of Figure 3.

Referring to the drawings it will be seen that the jack embodying the present invention comprises a base 1 with which a vertical cylinder 2 is integrally formed or otherwise suitably connected. The cylinder 2 opens out through the bottom of the base and the lower end of the cylinder is closed by a removable closure 4 threadedly connected with the base and provided to permit of assembly of a piston designated generally at 5 and fitted in the cylinder 2, as shown in Figure 1.

This piston 5 includes a cup-shaped leather washer 6 confined between plates 7 and 8 and together with these plates 7 and 8 mounted on a stud 9. The plate 8 is flanged or otherwise suitably shaped to provide a filler which backs up and sustains the washer 6 at all times. This is an important feature as the buckling of the washer 6 which would occur in the absence of such a filler structure would defeat the operation of the jack. The stud 9 is threaded into the lower end of a piston rod 10. Considerable difficulty has been experienced in constructions of this kind by reason of the confined fluid escaping past the piston, the fluid escaping not around the outer periphery of the cup-shaped washer 6 but in between the cup-shaped washer, its plates and the mounting, stud

or the like, on which it is carried. In the present instance this difficulty is overcome by compressing a washer 11, preferably one of soft metal such as lead, between the upper metal plate 7 and the lower end of the piston rod 10.

The piston rod 10 is of novel construction and preferably comprises a cylindrical tube or sleeve of uniform internal diameter from its lower end to a point adjacent to but spaced from its upper end, the upper end of the piston rod being internally enlarged or thickened and provided with screw threads 12. A lifting member designated generally at 13 is provided and has a threaded portion or screw 14 threadedly engaged with the internal screw threads 12 of the piston rod 10. The screw 14 terminates short of the lower end of the lifting member and leaves a smooth and plain guiding portion 15 which snugly fits in the hollow piston rod and provides a guide in all adjustments of the lifting member and also serves to limit the extent to which the lifting member may be projected beyond the piston rod. The lifting member is completed by a head 16 threaded on or otherwise suitably fixed to a reduced extension 14^a of the lifting member. In assembling these parts the lifting member is inserted up into the lower end of the piston rod 10 prior to the mounting of the piston on the piston rod and after having its screw threaded through the screw threads or threaded bar 12 on the piston rod, the piston is assembled with the piston rod and these assembled parts fitted in the cylinder. The head 16 is then fixed to the upper end of the lifting member. With this novel construction the lifting member may be completely housed in the piston rod to impart to the jack the small vertical dimension desirable in lifting objects which are positioned close to the ground or floor and yet the jack may also be used to lift relatively high objects when the lifting member is rotated to cause it to extend or project about the piston rod.

A further and important advantage of this construction resides in the fact that the lifting member, even when fully projected, has a substantial bearing and a rigid connection with the piston rod due to the combined action of the screw 14 and threaded bearing 12 and the guide 15. The piston rod 10 slides through a packing gland 17 provided at the upper end of the cylinder 2, but even when this piston rod is in its lowermost position its upper end projects just slightly above the packing gland 17 and above the cylinder 2.

The base 1, cylinder 2, piston 5, and piston rod 10 with its lifting member 13, constitute the hydraulically operable lifting mechanism of the jack. The normal position of this mechanism is that shown in Fig-

ures 1 and 2, the piston and piston rod being biased to this position by suitable spring means shown in the present instance as retractile coil springs 18 having their lower ends connected as at 19 to the base 1 and having their upper ends suitably connected to a mounting plate 20 supported on the upper end of the piston rod 10. When the piston is elevated these springs 18 are placed under tension and as soon as the hydraulic pressure elevating the piston is relieved then the springs effect the return or downward movement of the piston. The lifting member must be manually adjusted relative to its piston rod.

The base 1 has a pair of lugs 21 and 22 projecting from one side thereof and integral therewith or otherwise suitably fixed thereto. On these lugs 21 and 22 a swingable mounting member designated generally at 23 is supported, the mounting member 23 serving to carry a pump designated generally at 24 and also the operating and control mechanism for the pump as will be hereinafter more fully described.

As shown to advantage in Figures 3 and 4, recesses or seats 25 and 26 are provided in the opposite sides of the mounting member 23 adjacent its lower end and receive the adjacent end portions of mounting trunnions 27 and 28, respectively, the trunnion 27 being relatively fixed and being supported in a blind recess or seat 29 formed in the lug 21, while the trunnion 28 is adjustable axially in a transverse opening 30 provided in the lug 22. The trunnion 28 is forced into and against its seat 26 in the mounting member 23 by means of a follower 31 threadedly engaged with the outer portion of the wall of the opening 30 and having a reduced forward end 32 engaging in a flanged seat 33 provided in the trunnion 28 whereby the follower 31 will impart axial movement to the trunnion 28 but will not positively rotate the same. A lead washer 34 is compressed between the follower 31 and the trunnion 28. The follower may have suitable slots or holes to facilitate its adjustment by means of a suitable tool and its adjustment is maintained by a lock disc 35 threaded into the opening 30 behind the follower, a gasket 36 of hard fiber or other suitable material being interposed between the lock disc and the follower. It is obvious that when the follower forces the trunnion 28 into its seat 26 it also secures and maintains the proper engagement of the trunnion 27 with its seat 25 and with the mounting member 23. Hard fiber washers or gaskets 37 and 38 are interposed between the trunnion 27 and its seats 29 and 25. A similar gasket 38' is interposed between the trunnion 28 and its seat 26.

With this construction the mounting member 23 is supported on the lugs 21 and 22 in

such manner as to permit angular adjustment thereof and yet it is held in any annular position to which it may be swung.

The pump 24 comprises a barrel 39 having its lower end threaded into the mounting member 23, as indicated at 40, the upper end of the barrel 39 being open. A plunger 41 is fitted in the barrel for reciprocatory movement and is operated by means of a plunger rod 43 which extends up through the barrel and projects well above the upper end thereof.

The lower end of the barrel 39 communicates through a port 44 with an intermediate portion of a passage 45 extending transversely through the mounting member 23 and communicating at one end with a port 46 provided in the mounting trunnion 27, this port 46 in turn communicating with the passage 47 leading through the lug 21 and the wall of the cylinder 2 to the upper end of the cylinder at which point it communicates with the interior of the cylinder 2 above the piston 5. The passage 45 also communicates with a port 48 provided in the mounting trunnion 28 and extending axially there-through, this port 48 being in open communication with an axial port 50 in the follower 31. The follower 31 is also formed with a transverse or radial port 51 leading from the axial port 50 to an annular recess 52 provided in the outer periphery of the follower, the annular recess 52 serving to provide for communication between the radial port 51 and a passage 53 in any angular adjustment of the follower. This annular recess 52 and the passage 53 are wide enough to maintain this communication between the radial port 51 and the passage 53 in all axial adjustments of the follower. The passage 53 leads into the interior of the lower end of the cylinder 2 below the piston 5, as illustrated in Figure 4.

The passage of the inelastic fluid, such as oil, from the upper end of the cylinder 2, that is, from above the piston 5, to the pump 24 is controlled by means of an inlet ball valve 54 coacting with a valve seat 55 provided therefor in the passage 45 and normally held against its seat by virtue of the engagement therewith of a spider 57 which has a free slidable mounting in the passage 45 and which engages the ball valve 54 under the influence of a compression coil spring 56 encircling a pin 58 fixed to and extending axially from the spider 57 and slidably supported in a fixed spider 59, also positioned in the passage 45. The spring 56 being compressed between the spiders 57 and 59 and being placed under suitable tension in this manner, operates to constantly urge the ball valve 54 against its seat. As will be understood from Figure 3, the upstroke of the plunger 41 exerts a suction on the valve 54 which opens it against the action

of the spring 56 and permits the suction induced by this upward stroke of the plunger 41 to pull the oil from the upper side of the piston 5 into the barrel 39 of the pump. When the plunger moves downwardly the valve 54 closes under the action of its spring 56 and also under the action of the pressure so that the fluid or liquid in the pump barrel can only escape through the ports 48, 50 and 51 to the passage 53 leading into the cylinder 2 below the piston 5. In passing from the passage 45 into the port 48 the fluid unseats a ball valve or outlet valve 60 which coacts with a valve seat 61 provided around the port 48, the ball valve 60 being normally held against this valve seat 61 by a compression coil spring 62. The function of this valve 60 is to prevent the plunger 41 on its up stroke from withdrawing oil or fluid from below the piston. In other words, when the plunger of the pump is reciprocated it can only serve to exhaust the oil from above the piston of the pump and force it into the cylinder of the pump below the piston thereof. In this way the piston with its lifting member will be smoothly but powerfully elevated.

For the purpose of releasing the piston and its lifting member and permitting these parts to lower or descend under the influence of the weight carried by the lifting member and also under the influence of the springs 18, a release bar 65 is provided and extends along the barrel of the pump in substantially parallel relation thereto. The lower end portion 66 of this release bar is of circular cross section and is a sliding fit in a cylindrical passage 67 provided therefor in the mounting member 23 and so located in the mounting member as to intersect the passage 45. This release bar 65 is further guided by means of a guide plate 68 (see Figs. 3 and 6), the guide plate 68 being apertured to pass over the upper end of the barrel 39 of the pump, this upper end of the barrel of the pump being slightly reduced to receive the guide plate 68 and having its extreme upper edge swaged or displaced around the guide plate 68 to hold the plate in position. As shown in Figure 6, one projecting portion of the plate 68 has a semi-circular guide recess 69 in which the release bar 65 is a sliding fit. The upper end of the release bar 65 has a laterally projecting extremity 70 which is apertured to slidably receive the plunger rod 43 of the pump. Normally the release bar 65 is maintained depressed, that is, it is held down in the position wherein its lower end 66 is at the bottom of the passage 67 and this depression of the release bar is effected by a compression coil spring 71 interposed between the upper end of the lateral extension 70 of the release bar and packing means 72 to be hereinafter more fully described. In this posi-

tion of the release bar the inlet valve 54 and outlet valve 60 are influenced solely by their respective springs and the operation of the pump because at such time the inclined camming surface 73 of the release bar is spaced from the inlet ball valve 54. This camming surface 73 is formed by cutting away and shaping the release bar above its lower end as indicated in Figure 3. However, when the release bar 65 is elevated its camming portion 73 engages the inlet ball valve 54 to displace the same axially away from its seat. Such displacement of the ball valve 54 causes simultaneous displacement of the slidable spider 57 and its pin 58 thereby advancing the pin through the fixed spider 59 and into engagement with the ball valve 60 to cause displacement of the ball valve 60 from its seat. Thus, both the valves 54 and 60 are positively maintained unseated as long as the release bar 65 is elevated. Unseating of both of these valves 54 and 60 permits of the free passage of oil or other fluid from below the piston 5 through the passage 53, annular recesses 52, ports 51, 50 and 48, into the passage 45, and from the passage 45 across the passage 67 and through the ports 46 into the passage 47 from whence it flows to the upper side of the piston 5. With such a passage open to the oil the piston and lifting member descend under the action of the springs 18 and also under the influence of any weight carried by the lifting member.

The release bar 65 may be elevated by an extreme elevation or outward movement of the plunger rod 43. Such movement of the plunger rod 43 brings a shoulder 75, presented at the juncture of the plunger rod 43 with the plunger 41, into engagement with the lateral extension 70 of the release bar whereby the outward movement of the plunger rod and plunger may be imparted to the release bar and the release bar elevated against the action of its spring 71.

The pump 24, the release bar 65, and the associated parts are housed in a rigid tubular handle designated generally at 76 and made up of a lower section 77 threadedly connected with the mounting member 23 as indicated at 78, and an upper section 79 detachably connected to the lower section 77 by a reducing coupling 80. The coupling 80 is threadedly connected with both of the sections 77 and 79 as clearly shown in Figure 3, and in the assembly maintains these sections rigid and in axial alinement. This same coupling 80 also serves to compress the packing means 72 which is positioned just below the same. As shown, this packing means 72 may comprise a lower metallic plate 81 seated on indentations 82 pressed or punched into the lower section 77, the lower plate 81 providing a support for fibrous packing 83. An upper or pressure plate 84 is forced down against this fibrous

packing 83 by the coupling 80. Centrally the plates 81 and 84 and the packing 83 have alined openings in which the plunger rod 43 is operatively fitted.

An operating element 85 is provided for the plunger rod 43, this operating element 85 preferably being in the form of a rod constrained to reciprocatory movement of the section 79 of the housing by means of a guide 86 fixed to the housing and slidably receiving the rod 85 and a guide 87 fixed to the rod 85 and slidable in the housing. The upper end of the rod 85 has a knob 88 to facilitate manipulation thereof, and at its lower end this rod 85 is detachably connected to the plunger rod 43 by a releasable or detachable coupling designated generally at 89.

This releasable or detachable connection or coupling 89 is designed to be capable of release or detachment only when the coupling 80 has been backed off to disconnect the sections of the housing and when the operating rod 85 is swung angularly or laterally with respect to the plunger rod. In other words, it is impossible to disconnect the operating element 85 from the plunger rod in an accidental manner or otherwise when the housing sections are assembled or connected by the coupling 80. In carrying out this purpose the coupling 89 comprises a socket 90 formed in the lower end of the operating element 85 and designed to receive a ball 91 formed on a reduced extension 92 of the plunger rod 43 (see Fig. 5). The lower end of the operating element 85 is not only formed with the socket 90 but also has a lateral entering slot 93 large enough to permit of passage of the ball 91 therethrough and a constricted or narrowed slot 94 below the entering slot 93 to accommodate the reduced extension 92 of the plunger rod. The ball 91 has a tenon 95 projecting from the top thereof, the tenon being received in a recess 96 provided above the socket 90 in the operating element 85. The recess 96 is larger than the tenon so as to permit the operating element 85 to be swung over to the horizontal position shown in dotted lines in Figure 5 whereby to align both the tenon and the ball 91 with the entering slot 93 to permit of disassembly. However, when the parts are positioned as shown in full lines in Figure 5 the narrowed slot 94 prevents the ball 91 from passing downwardly out of its socket and the tenon 95 is engageable with the wall of its recess to prevent lateral displacement of the ball 91 through the entrance slot 93. As long as the housing sections are coupled the operating element and the plunger rod are mounted in the position shown in Figure 5 and consequently the coupling 89 cannot be released. A quick and easy release of this coupling 80 may be effected as soon as the housing sections 77 and 79 are disconnected

by backing off the coupling 80. This arrangement provides a knockdown pump assembly which may be very compactly stored in a tool box or in a compartment such as is ordinarily provided for tools beneath an automobile seat and yet when assembled there is no danger of the parts becoming accidentally disengaged no matter how manipulated.

The plunger rod 43 may be provided with a shallow and elongated venting groove 100 which bridges this packing 72 to vent the lower section 77 of the housing when the plunger rod is elevated and reciprocated to operate the pump.

This venting slot while long enough to bridge the packing during the pumping operation will be located below the packing when the plunger rod is pushed fully in as it is when the pump is stored.

In lieu of or in addition to the springs 18 a compression coil spring S may be provided in the cylinder 2 (see Fig. 1). The spring S has one end engaging the piston 5 and its other the upper end of the cylinder. Its strength is varied depending on whether it is used along with the springs 18 or by itself alone.

The invention claimed is:

1. A hydraulic jack comprising a body provided with hydraulically operable lift mechanism, a pump swingably connected to the body and operatively associated with the hydraulically operable lift mechanism, a tubular handle member connected with the pump and made up of sections, means for detachably connecting said sections, an operating member of the pump movable through the handle member, and a detachable connection between the operating member and the pump releasable only when the sections of the handle members are disconnected.

2. A hydraulic jack comprising a body provided with hydraulically operable lift mechanism, a pump swingably connected to the body and operatively associated with the hydraulically operable lift mechanism, a tubular handle member connected with the pump for swinging the same, said tubular handle member being made up of sections, means for detachably connecting said sections, said pump having a plunger rod reciprocable in the tubular handle member, and an operating element extending through the tubular handle member and constrained to reciprocatory movement when the sections of the handle member are connected, and coupling means between the operating element and plunger rod engageable and releasable upon relative lateral movement of the operating element with respect to the plunger rod.

3. A knockdown operating mechanism for use in swinging a swingably mounted pump

of a hydraulic jack and reciprocating the plunger rod thereof and comprising a tubular handle member connected to the pump in axial alinement with the plunger rod and made up of detachably connected sections, an operating element constrained to axial movement through the tubular handle member when the sections thereof are connected, and a coupling between the operating element and the plunger rod and including a socket on one and a ball connected with the other, said socket having a lateral entering slot designed to permit of the passage of the ball therethrough only when the operating element has been swung over to an angular position and out of axial alinement with the plunger rod.

4. A knockdown operating mechanism for use in swinging a swingable mounted pump of a hydraulic jack and reciprocating the plunger rod thereof and comprising a tubular handle connected to the pump and made of detachably connected sections, an operating element for the pump movable through the handle, and a coupling between the operating element and the tubular handle releasable only when the sections of the tubular handle are disconnected.

5. A knockdown operating mechanism for use in swinging a swingably mounted pump of a hydraulic jack and reciprocating the plunger rod thereof and comprising a tubular handle member connected to the pump in axial alinement with the plunger rod and made up of detachably connected sections, an operating element constrained to axial movement through the tubular handle member when the sections thereof are connected, and a coupling between the operating element and the plunger rod and including a socket on one and a ball cooperable with said socket and connected with the other, said socket having a lateral entering slot designed to permit of the passage of the ball therethrough when the operating element has been swung over to an angular position out of axial alinement with the plunger rod, said socket and said ball also having a cooperating tenon and recess preventing displacement of the ball from the socket when the operating element and the plunger rod are in alinement.

6. A hydraulic jack comprising a body portion provided with hydraulically operable lift mechanism, a pair of spaced lugs on said body, a fixed mounting trunnion on one lug, an adjustable mounting trunnion carried by the other lug, a mounting member having a pair of seats receiving and engaged by said trunnions, and a pump mounted on said mounting member, and having valve controlled passages extending through the mounting member, lugs and body to operatively connect the pump and the hydraulically operable lift mechanism.

7. A hydraulic jack comprising a body provided with hydraulically operable lift mechanism, a pair of spaced lugs on said body, one of said lugs being substantially solid and carrying a fixed mounting trunnion, the other of said lugs having an opening, an adjustable trunnion mounted in said opening, a follower threadedly connected with the wall of said opening and cooperable with the adjustable trunnion for effecting adjustment thereof, means for locking the follower in adjusted position, a mounting member located between said lugs and having seats receiving and coacting with said trunnions and a pump carried by said mounting member, there being valve controlled passages extending through the mounting member, lugs and body to operatively connect the pump with the hydraulically operable lift mechanism.
8. A hydraulic jack comprising a body provided with hydraulically operable lift mechanism, a pair of spaced lugs on said body, one of said lugs being substantially solid and having a seat carrying a fixed mounting trunnion, the other lug having an opening, an adjustable trunnion mounted in said opening, a follower threadedly connected with the wall of said opening and cooperable with the adjustable trunnion for effecting adjustment thereof, means for locking the follower in adjusted position, a mounting member located between said lugs and having seats receiving said trunnions, and a pump carried on said mounting member, there being valve controlled passages extending through the mounting member, lugs and body, to operatively connect the pump with the hydraulically operable lift mechanism.
- In witness whereof, I hereto affix my signature.
- HARRY W. BOLENS.

CERTIFICATE OF CORRECTION.

Patent No. 1,709,000.

Granted April 16, 1929, to

HARRY W. BOLENS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, line 84, claim 4, for the word "swingable" read "swingably", and line 91, for "tubular handle" read "plunger rod"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of May, A. D. 1929.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.

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