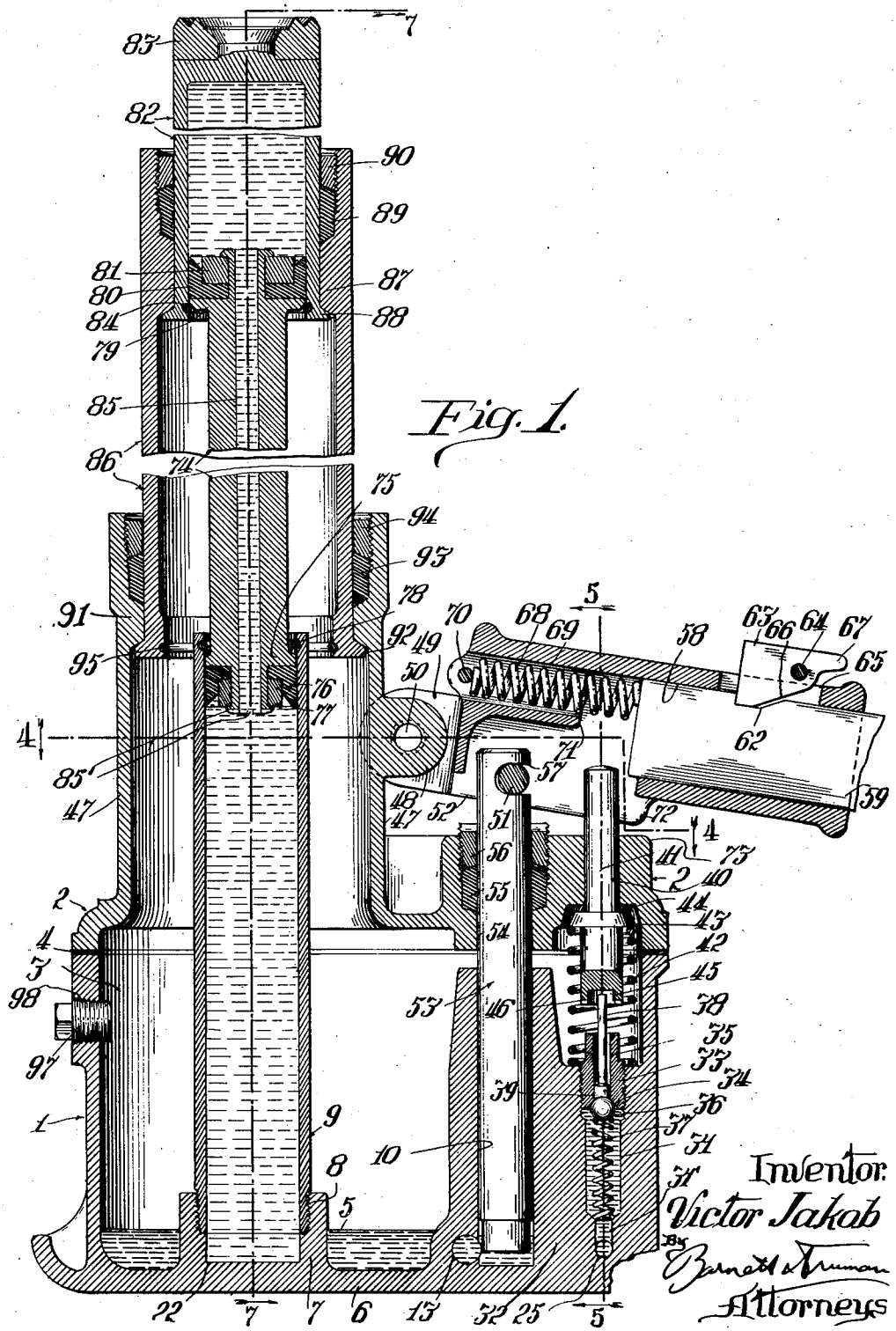
April 7, 1931. V. JAKOB 1,799,298

HYDRAULIC LIFTING JACK

Filed Jan. 25, 1929 5 Sheets-Sheet 1



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HYDRAULIC LIFTING JACK

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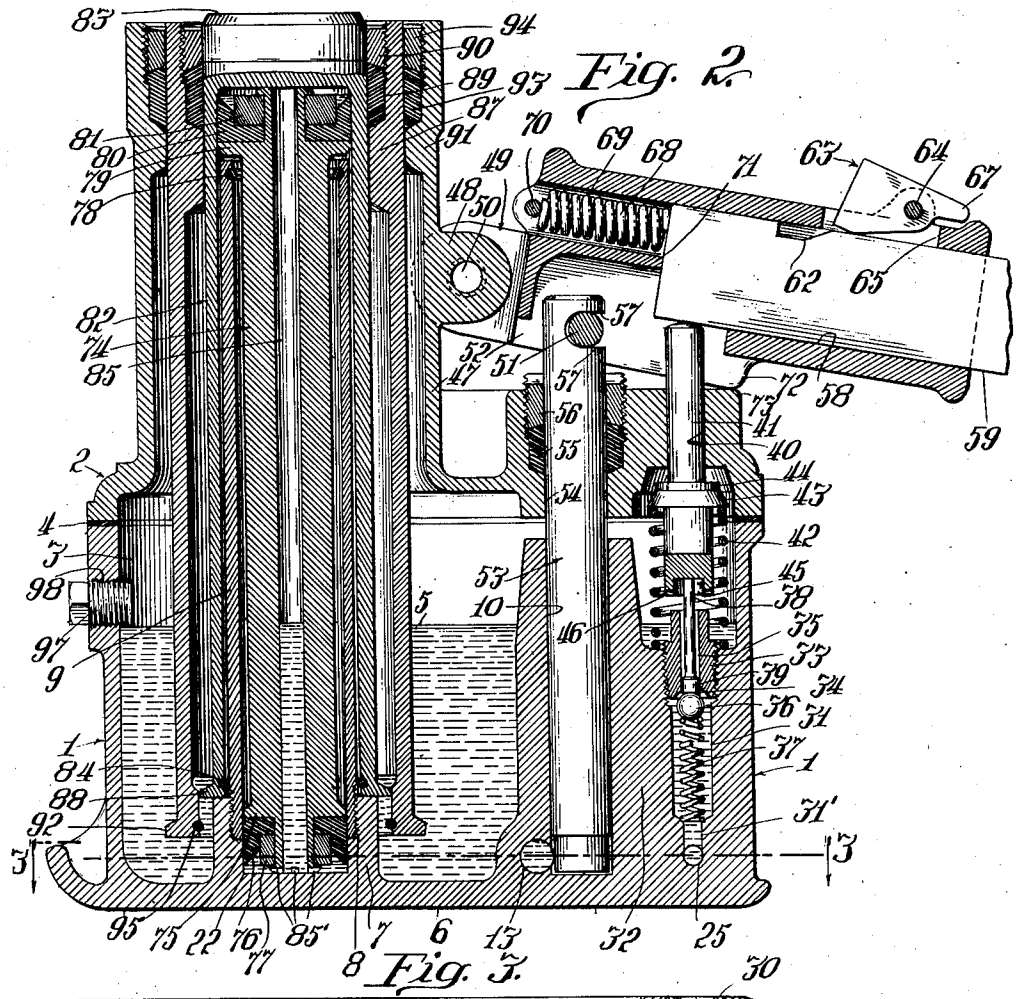

Fig. 2.

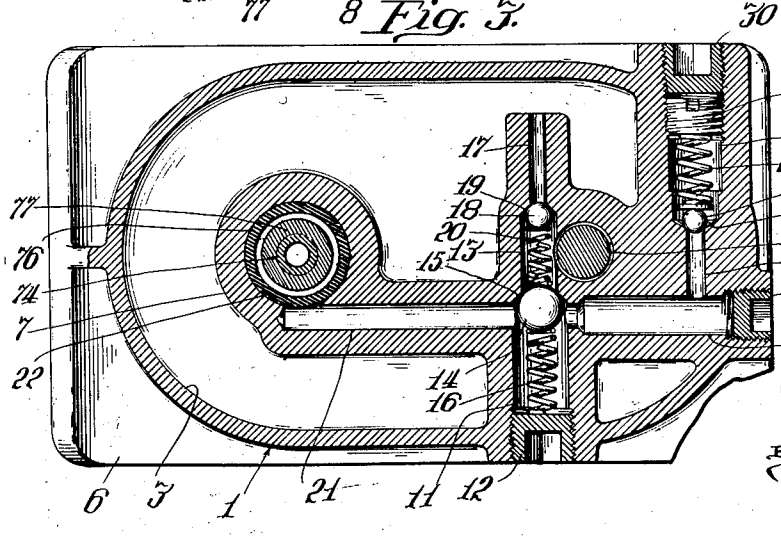

Fig. 3.

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Fig. 4.

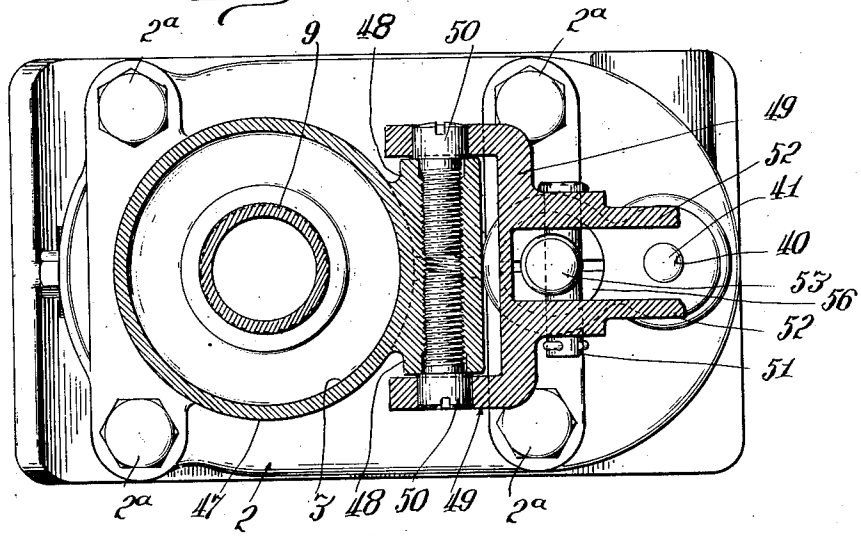

Fig. 5.

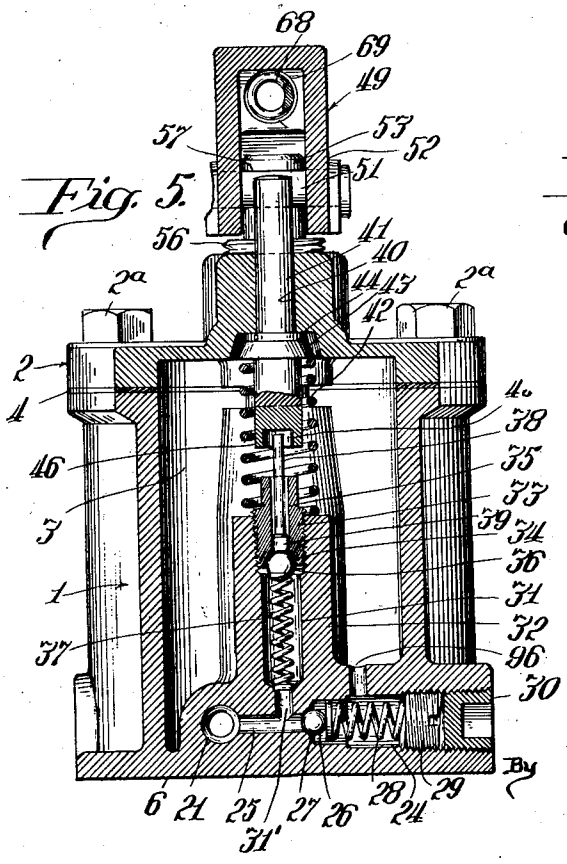

Fig. 6.

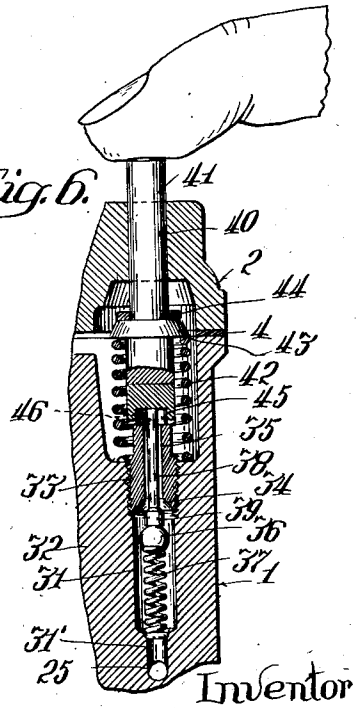

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Fig. 7.

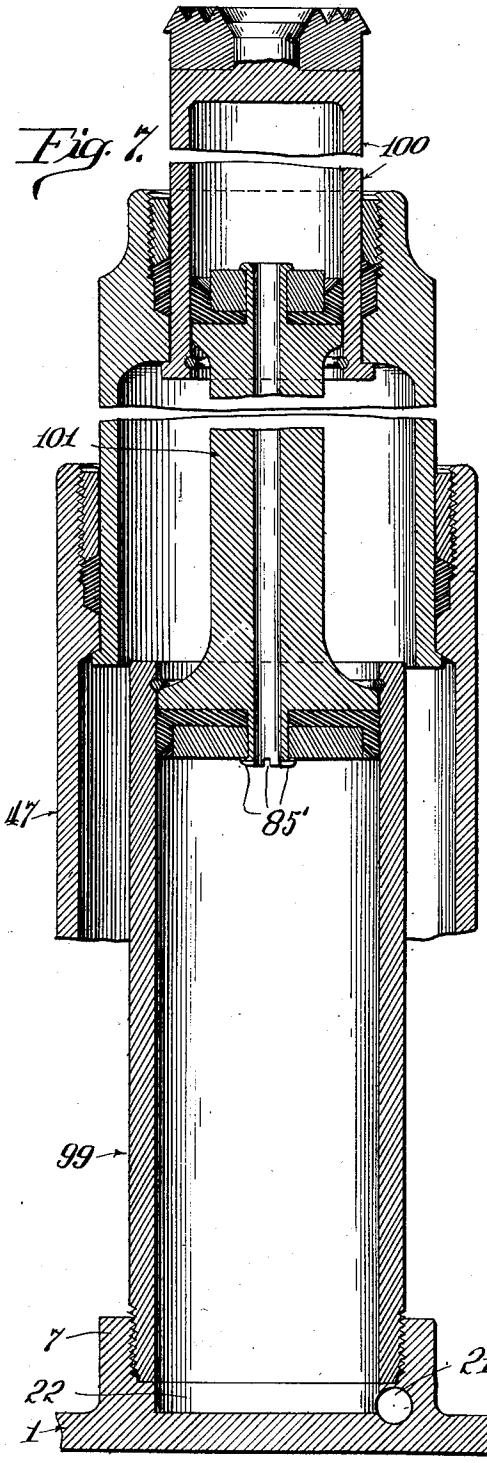

Fig. 8.

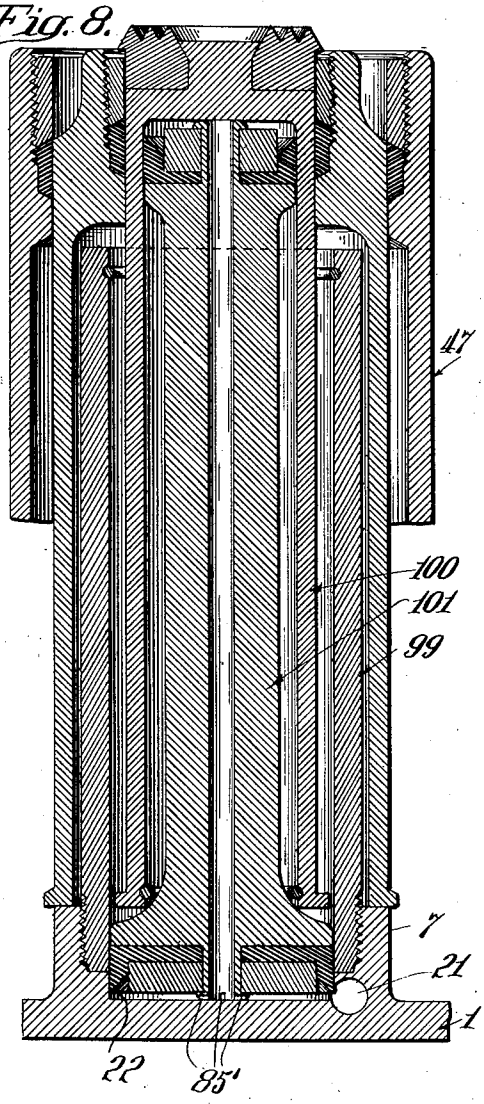

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Fig. 9.

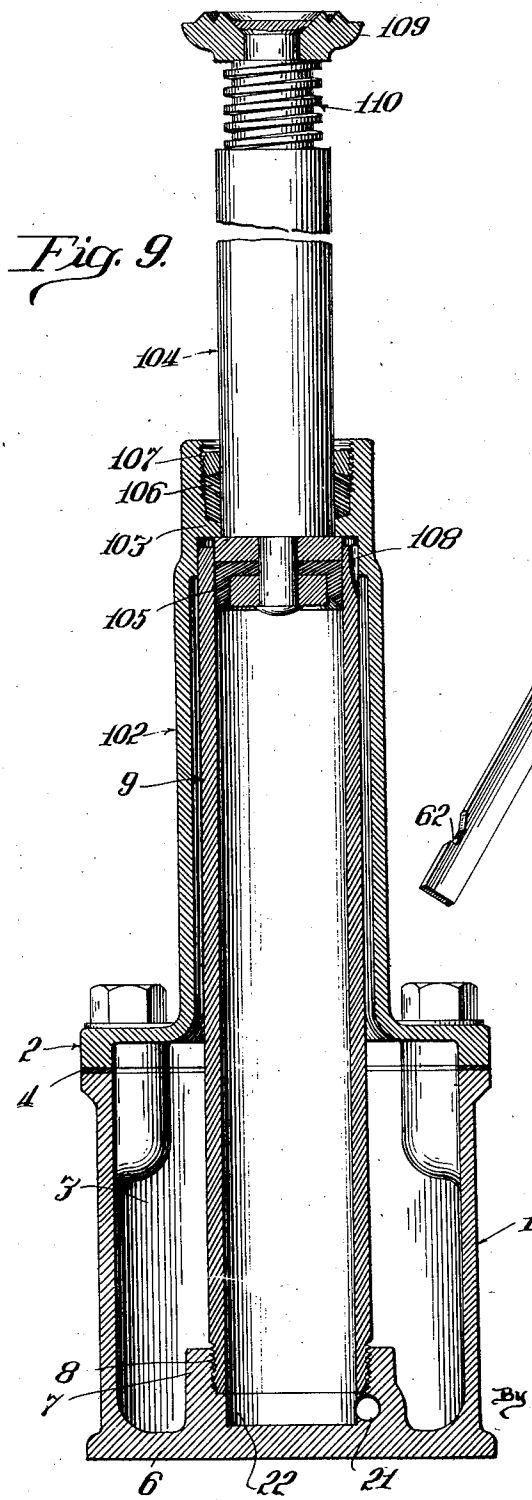
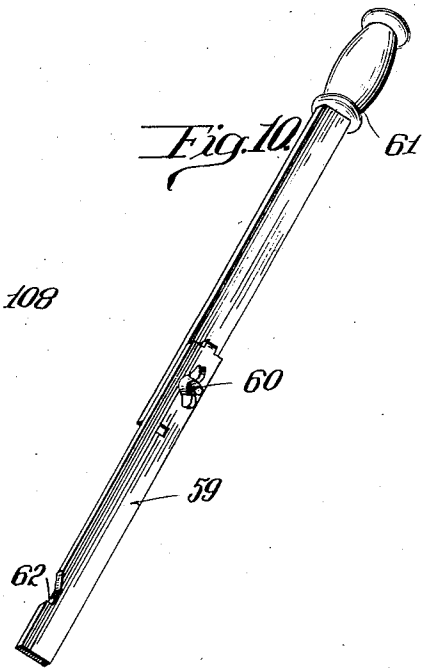


Fig. 10.



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UNITED STATES PATENT OFFICE

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HYDRAULIC LIFTING JACK

Application filed January 25, 1929. Serial No. 334,947.

This invention relates to certain new and useful improvements in hydraulic lifting jacks, and more particularly to an improved jack of the vertically movable piston type, the jack being compact and self-contained and adapted to be located directly beneath the load and operated by a vertically oscillated extension handle.

Briefly described, this jack embodies a two-part closed casing which forms the oil or liquid reservoir, and in which are housed the lifting mechanism, pump, and valved passages. These parts are so arranged that the joints between all moving parts through which oil under pressure may be forced open directly into the reservoir so that all leakage is automatically collected. The lifting rams, the pump piston and the rod for operating the lowering valve project upwardly through packed passages or openings in the top of the housing or standard, but these joints are ordinarily above the oil level, and are never compelled to resist the passage therethrough of oil under pressure.

The principal object of this invention is to provide a new and improved hydraulic jack of the type briefly described hereinabove, and disclosed more in detail in the specifications which follow.

Another object is to provide a jack comprising a closed housing forming a reservoir into which the leakage of all oil under pressure is automatically discharged.

Another object is to provide a hydraulic jack embodying a vertically oscillatable operating handle which is fulcrumed in the most advantageous position on the upper central portion of the jack.

Another object is to provide a jack of this type having a removable handle, said handle being movable when in operating position so as to automatically operate the lowering valve.

Another object is to provide a jack of this type having an improved form of lowering valve adapted to be automatically operated by the jack handle so as to provide a slow lowering of the jack when under load, the same valve being movable to a second position which permits rapid lowering of the jack when not under load.

Another object is to provide stops on the operating handle and standard whereby the jack may be rocked bodily by means of the handle in order to disengage the jack from the load. Another object is to provide a filling plug for the reservoir so positioned as to automatically regulate the amount of liquid in the jack.

Another object is to provide a removable handle and means for positively locking the handle to the jack so that the handle may be utilized to pull the jack from under the load.

Other objects and advantages of this invention will be more apparent from the following detailed description of certain approved forms of jack embodying the principles of the invention.

In the accompanying drawings:

Fig. 1 is a vertical sectional view through a preferred form of jack in elevated position, portions of the upwardly extended members being broken away.

Fig. 2 is a similar view, showing the jack in lowered position.

Fig. 3 is a horizontal section, taken substantially on the line 3—3 of Fig. 2.

Fig. 4 is a horizontal section taken substantially on the line 4—4 of Fig. 1.

Fig. 5 is a vertical section taken substantially on the line 5—5 of Fig. 1.

Fig. 6 is a view similar to the right-hand portion of Figs. 1 and 2 but illustrating the position of the parts for quickly lowering the jack.

Figs. 7 and 8 are partial vertical sections showing the elevated and lowered positions respectively of a somewhat modified form of jack. These views are taken in a plane corresponding to the plane of line 7—7 of Fig. 1.

Fig. 9 is a vertical section, similar to Figs. 7 and 8, but showing a single-lift jack embodying only one lifting ram.

Fig. 10 is a perspective view of the removable handle.

Referring first to Figs. 1 to 6 inclusive, the jack standard or housing comprises a hollow base 1 and a cover or closure 2 re-

movably secured to the base by a plurality of screw bolts or similar fastenings 2a. The base 1 houses a reservoir 3 for the supply of oil or other operating liquid, and a gasket 4 is clamped between the base 1 and closure 2 to prevent leakage at this joint. The gasket 4 will ordinarily be above the oil level, when the jack is in normal upright position, the highest oil level being indicated at 5 in Fig. 2, when the jack is lowered.

The bottom 6 of base casting 1 is formed with an upwardly extending central hollow stud 7 into which is screwed at 8 the lower end of the hollow cylinder or sleeve 9. The upper end of cylinder 9 is open. A vertically extending pump cylinder 10 is bored in another portion of base casting 1, the upper end of cylinder 10 opening into the reservoir 3 below the top of base 1. The base 1 is also formed adjacent its bottom 6 with certain thickened portions in which oil passages or conduits are bored from three of the outer sides as will be apparent from Fig. 3. A passage 11 extends transversely inwardly from the front of the jack (as seen in Figs. 1, 2 and 3), the outer end of this passage being permanently closed by screw plug 12. A passage of smaller diameter 13 extends axially inwardly from the inner end of passage 11 and intersects the lower portion of pump cylinder 10. A ball valve 14 is held against seat 15 at the outer end of passage 13 by a spring 16 which bears at its outer end against the plug 12. A still smaller passage 17 extends from the inner end of passage 13 into reservoir 3, a ball valve 18 being held against seat 19 at the inner end of passage 17 by means of spring 20 which bears at its other end against the ball valve 14. A passage 21 extends inwardly from one end of the base 1 so as to intersect the passage 11 and to communicate at its inner end with the cavity 22 in boss 7 at the lower end of lifting cylinder 9. The outer end of passage 21 is closed by the screw plug 23. Passage 24 extends inwardly from the rear of the base casting and has a smaller passage 25 leading from its inner end into the passage 21. A ball valve 26 which functions as a safety valve is held against the seat 27 at the outer end of passage 25 by means of a compression spring 28. The force of this spring may be adjusted by means of the screw plug 29 engaged within the outer threaded portion of passage 24. The outer end of passage 24 is closed by the screw plug 30.

A discharge passage 31 has a smaller lower portion 31' communicating with transverse passage 25, the passage 31 leading vertically upward through an integral portion 32 of the base casting adjacent the pump cylinder 10. A removable valve-seat plug 33 screwed into the upper end of member 32 at the top of passage 31 is formed with a lower valve seat 34 from which leads upwardly the smaller discharge passage 35. A ball valve 36 is normally held upwardly against seat 34 by the compression spring 37. A release pin 38 of considerably smaller diameter than the passage 35 in which it is positioned, has an enlarged lower end or head 39 which fits within the passage 35 with only a slight clearance therearound to permit a very restricted flow of oil through passage 35 past the head 39 when the release valve 36 is unseated as shown in Fig. 2. When the release pin 38 is depressed to the extreme position shown in Fig. 6, so as to move the head 39 down completely out of passage 35, a much less restricted flow of oil through passage 35 is permitted whereby the jack may be quickly lowered, all as explained more in detail hereinafter.

A passage 40 is formed in the closure 2 directly above the release valve and coaxial therewith, and a valve-operating rod 41 is vertically movable through this guide passage 40. The rod 41 makes a rather loose fit in the passage 40 so as to provide a slight clearance to permit the escape of air around rod 41 when this rod is depressed. A compression spring 42 bears at its lower end on the valve housing 32 of base 1, and bears at its upper end against an annular shoulder 43 formed on rod 41 so as to clamp a leather washer 44 upwardly against the under face of cover 2 and thus normally seal the air escape passage and prevent the escape of oil at this point in case the jack is temporarily laid on its side. Ordinarily this washer will be positioned above the oil level. The lower end of rod 41 is formed with an inverted baffle cup 45 into which the upper end of release pin 38 projects. When the rod 41 is pressed downwardly as shown in Figs. 2 and 6, it will engage the upper end of release pin 38 and depress the same so as to open the release valve 36. The oil that spouts up through the release passage 35 will be deflected downwardly into the reservoir by the baffle cup 45 at the lower end of rod 41. The lower end of rod 41 is notched as indicated at 46 to permit the free escape of oil from cup 45 when the release valve is completely depressed as shown in Fig. 6.

The cover or closure 2 is formed with an upwardly extending sleeve portion 47 which surrounds and is substantially concentric with the lifting cylinder 9. Sleeve 47 is formed at one side with a lug or boss 48 to which a handle socket member 49 is pivoted or fulcrumed by means of the pivot pins 50. The rear portion of this socket member 49 is of an inverted U-shape, and a pivot pin 51 connects the lower portions of the side walls 52 thereof. A pump piston 53 is fitted snugly for vertical reciprocation within pump cylinder 10, the upper portion of piston 53 extending outwardly through a passage 54

in closure 2. A packing 55 is held about the piston 53 at the outer end of passage 54 by means of a gland or screw plug 56. The outer end of piston 53 is laterally notched at 57 to engage the pivot pin 51. Vertical rocking movement of the handle socket 49 will cause the piston 53 to reciprocate vertically, the notch 57 permitting the necessary lateral movement of pivot pin 51, as it swings about the axis 50. The outer portion of socket member 49 is formed with the socket 58 into which projects the end of the removable handle 59 (shown in perspective in Fig. 10). This handle is preferably made in the form of a flat bar member, or a plurality of such bar members pivotally connected at 60 to permit the handle to be folded for storage purposes. The outer end of the handle may be provided with a suitable grip 61. The inner end of the handle is notched as indicated at 62. A latch member 63 is pivoted on pin 64 in a slot 65 in member 49 above the socket 58. When the handle is pushed into the socket 58, the end of the handle 59 will engage the cam surface 66 on latch 63 and rock the latch outwardly until it drops into the notch 62. The latch will then engage the shouldered end of notch 62 and prevent the removal of handle 59 unless the latch is rocked outwardly by manually depressing the finger 67 at the outer end thereof.

A compression spring 68 is housed in a passage 69 in the socket member 49 and bears at one end against a fixed stop 70 and at the other end against the inner end of removable handle 59 so as to urge the handle outwardly as far as permitted by the latch 63. The handle 59 may, however, be pushed inwardly against the resistance of spring 68 until it engages a fixed stop 71 in the socket member, as shown in Fig. 2. The upper end of the valve-operating rod 41 projects upwardly between the side walls 52 of socket member 49 and is normally positioned beyond the inner end of handle 59, as shown in Fig. 1, so that the handle and socket member may be oscillated without engaging the rod 41. However, when the handle 59 is pushed inwardly against stop 71, as shown in Fig. 2, and the handle and socket are then depressed, the inner end of handle 59 will engage the upper end of rod 41 and depress the same to unseat the release valve, all as shown in Fig. 2. This downward movement of the valve-releasing mechanism will be limited by the engagement of stop surface 72 on the socket member with stop 73 on cover member 2, whereby the complete removal of head 39 from passage 35 will be prevented. In order to depress the release pin to the extreme position shown in Fig. 6, it is necessary to lift the handle and socket member and push the pin 41 down manually, as illustrated in Fig. 6.

The inner or lower lifting ram 74 has a head 75 at its lower end fitted for vertical sliding movement within the cylinder 9. A cupped washer 76 of leather or other suitable packing material is held in place at the lower end of head 75 by a nut 77 and slidably engages the inner surface of cylinder 9 to prevent the escape of oil under pressure around the ram 74. A split wire ring 78 snapped into a groove in the upper end of cylinder 9 prevents the complete withdrawal of ram 74 from cylinder 9. The upper end of ram 74 is formed with a head 79 provided with a cup washer 80 held in place by nut 81 and engaging the inner surface of the hollow cylindrical ram 82. This upper ram 82 is closed at its upper end and formed with a load engaging head 83. The lower end of ram 82 is open and provided with a stop ring 84 to prevent the complete withdrawal of head 79 on the lower ram 74. The lower ram 74 is hollow or is provided with a central oil passage 85 to connect the interior of cylinder 9 with the interior of the hollow upper ram 82. Slots 85′ are provided in the lower end of ram 74 to permit oil to enter passage 85 when the ram is completely lowered, as shown in Fig. 2. In the form of the invention here shown, it will be noted that the upper end 79 of ram 74 is considerably larger than the lower head 75, and the cylindrical opening in upper ram 82 is large enough to telescope down over the fixed cyilnder 9, or as clearly shown in Fig. 2.

A guide sleeve 86 is formed with an inwardly extending upper annular collar 87 slidably engaging the outer cylindrical surface of the upper ram 82, and engaging an outwardly extending collar 88 at the lower end of ram 82 to prevent removal of sleeve 86 over the lower end of the ram. A packing ring 89 above the collar 87 is held in place by a gland or packing nut 90. In an exactly similar manner, an inwardly extending collar 91 formed in the upper end of sleeve portion 47 of cover 2, slidably engages the outer cylindrical surface of sleeve 86. An outwardly extending collar 92 at the lower end of sleeve 86 prevents the withdrawal of the sleeve from the cover. A packing 93 above collar 91 is held in place by nut 94. A split stop ring 95 secured in the lower end of sleeve 86 prevents the upper ram 82 from passing downwardly therethrough. When the jack is lowered or collapsed, all of the rams and guide sleeves will be telescoped within one another as shown in Fig. 2 so as to form a low and compact assembly.

When the jack is to be used to elevate a load, the handle 59 is secured to the jack by pushing same into the socket member until the latch 63 snaps in place. The handle cannot now be removed without manually unlatching the latch 63, whereby the handle may be used to manipulate the jack into and out of position beneath the load. During the

elevating operation, the handle is rocked up and down through a short arc in the usual manner. This will impart a series of vertical reciprocations to the pump piston 53. On the upward stroke of the piston, oil will be drawn into the pump cylinder through passages 17 and 13 and past the ball valve 18, the valve 14 being held closed during this operation. On the succeeding down stroke, ball 14 will be forced from its seat 15 while ball 18 is forced against its seat 19, and the oil in pump cylinder 10 will be forced through passage 21 into cylinder 9, and thence through slots 85' and passage 85 into the space in ram 82 above head 79 of ram 74. Since upper head 79 has a greater area than lower head 76, the successive charges of oil forced into cylinder 9 will first elevate the ram 82, the oil passing through the passage 85 in ram 74 into the hollow upper ram 82. After ram 82 has been raised until stop ring 84 makes contact with head 79, the two rams will be elevated as a unit, the oil now filling the cylinder 9 beneath head 76. The rams will be elevated to the positions indicated in Fig. 1, this upward movement being limited by the engagement of the collars 88 and 92 with the collars 87 and 91, respectively. At this time the cylinder 9, ram 74 and ram 82 will be filled with oil as indicated in Fig. 1. The outer sleeve 86 merely serves as a guide sleeve and housing member, being drawn up by the upper ram 82. It also serves to stiffen the rams and accept part of the lateral thrusts. Any oil under pressure that tends to leak from the upper end of cylinder 9 past washer 76 and head 75 will spill directly into the reservoir 3. In exactly the same manner any oil from the interior of upper ram 82 that finds its way past head 79 will also flow directly into the reservoir 3. There is no oil under pressure bearing against the packed joints 93 and 89 which lead to the outside of the jack. It will also be noted that any oil that leaks past pump piston 53 out of the upper end of cylinder 10 will flow directly back into reservoir 3. There is no oil under pressure bearing against the packed joint 55 about the upper portion of piston rod 53.

If at any time excessive pressure is developed in the jack, this oil pressure will overcome the safety valve 26 and oil will flow from passage 21 through passage 25 and past valve 26 into the passage 24 and thence upwardly through the open port 96 into reservoir 3. Ordinarily valve 26 will remain closed at all times, the pressure of spring 28 being suitably regulated for this purpose by means of the adjustable screw plug 29.

When the jack is to be lowered, the handle 59 is first pushed in against the resistance of spring 68 until the inner end of the handle engages the stop 71, and the handle is then swung down to the position shown in Fig. 2 so as to bring stop 72 on socket member 49 against the stop 73 on the cover plate. This will depress the operating rod 41 so as to engage and lower the release pin 38 and unseat the release valve 36, all as shown in Fig. 2. Oil under the pressure of the load will now flow from cylinder 9 through passages 21, 25, 32 and 31, past the unseated valve 33 and around the restricting head 39 and thence through passage 35 back into the reservoir 3. The restricted clearance around head 39 will permit only a slow discharge of the oil so that the load will be slowly lowered.

It should also be noted that when the handle has been lowered so as to engage the stops 72 and 73, the handle is so locked to the jack standard or housing that the standard may be rocked about its rear edge by means of the handle, so as to secure sufficient further lowering of the rams to permit the jack to be withdrawn from beneath the load. The fact that the removable handle is temporarily locked to the jack by means of latch 63 permits all of these manipulations to be performed without the handle becoming prematurely detached from the jack.

When the jack is removed from the load, the rams may be quickly and completely lowered by manually depressing rod 41 as shown in Fig. 6, thus permitting a free flow of oil through discharge passage 35, since head 39 is now lowered completely out of the passage.

It will be noted that every cylinder or passage housing a movable member and containing oil under working pressure opens directly into reservoir 3 and not into the outer air. When the jack is in its normal upright position, none of the packed joints leading to the exterior of the jack are in contact with the oil in the jack. The only time that oil can flow into contact with the packed joints between the ram and guide sleeves, and between the piston rod and cover plate, is when the jack is inverted or laid on its side, and the oil thus flowing against these joints is not under pressure. At such times, the operating rod 41 will be forced outwardly by spring 42 so as to clamp the washer 44 against the inner side of cover 2 and seal the air escape passage around rod 41 and prevent the escape of oil therethrough.

When the jack is to be filled with oil, the plug 97 is removed from the filling opening 98 and a suitable quantity of oil poured into the jack. At this time the lifting members should be all in the lowered or telescoped positions shown in Fig. 2. The jack is then set up in normal vertical position and any excess of oil will flow out through the open inlet passage 98, thus determining the proper oil level 5. The filling plug 97 is then screwed in place.

In the modified form of jack indicated in Figs. 7 and 8, the operation is the same as in the first described form, with the exception

that the upper lifting ram is adapted to telescope down into the fixed cylinder instead of outside thereof. In order to permit this, the fixed cylinder 99 is made of larger diameter than the corresponding cylinder 9 in the first described modification, and the upper ram 100 is made smaller than the corresponding ram 82 as first described. The hollow lower ram 101 will have its larger head at the bottom and its smaller head at the top, instead of vice versa as in the first described modification. The other parts of the jack will be identical with those of the jack already described, except for such changes in the proportions of the parts as may be made necessary by the changes hereinabove noted.

In the single lift jack indicated in Fig. 9, the sleeve portion 102 of the cover plate 2 (corresponding to the sleeve portion 47 in the form first described) extends upwardly around the fixed cylinder 9 in spaced relation to but closely adjacent the cylinder. At its upper end the sleeve 102 engages the upper end of cylinder 9 so as to steady the same and is provided with an inwardly extending annular shoulder 103 slidably engaging the outer cylindrical surface of the ram 104. Ram 104 is provided with the usual washer 105 at its lower end slidably engaging the inner surface of cylinder 9. A packing 106 in the upper end of sleeve 102 is held in place by nut 107. The upper end portion of cylinder 9 is provided externally with one or more vertically extending oil grooves or notches 108. Any oil that finds its way past washer 105 and spills out of the upper open end of cylinder 9 will flow down through the groove or grooves 108 inside of the sleeve 102 and thence back into reservoir 3. The operating mechanism for this jack may be the same as for the multiple lift jack already described.

If desired, the lifting head 109 may be positioned at the upper end of a threaded post 110 screwing into the hollow ram 104. By manually screwing out the post 110 before the jack is inserted beneath the load, an additional lift may be obtained.

I claim:

1. In a hydraulic jack, a standard consisting of a hollow base and a cover plate therefor, the interior of the base serving as a reservoir for liquid, a lifting cylinder mounted in the base at its lower end and terminating short of the cover plate so as to open into the reservoir at its upper end, a lifting ram slidably fitted in the cylinder and guided at its upper end through an opening in the closure, a pump cylinder formed in the base and opening at its upper end into the reservoir, a pump piston extending from the pump cylinder and guided through an opening in the closure, valved passages in the base connecting the cylinders and the reservoir, including an upwardly extending discharge passage opening into the reservoir, a valve in this passage, a valve operating rod guided for vertical movement through an opening in the closure, a handle socket pivoted to the standard and pivotally connected with the pump piston, a handle slidable longitudinally in the socket, a spring tending to expel the handle from the socket, and a latch for holding the handle in the socket, the handle being in position to engage the operating rod when pushed into the socket against the resistance of the spring.

2. In a hydraulic lifting jack, a hollow base forming a reservoir, a closure therefor, lifting mechanism including a pump mounted in the base, valved passages connecting the lifting mechanism, pump and reservoir, including a discharge passage having a restricted outlet passage opening into the reservoir, a spring-pressed valve within the discharge passage and normally engaging the inner end of the outlet passage to close same, a release pin having an enlarged head loosely fitting within the outlet passage, a valve-operating rod mounted slidably in the closure, a spring normally urging the rod upwardly, an operating handle pivoted on the closure and adapted when swung down to engage the upper end of the rod and move same to engage and depress the release pin and unseat the valve, there being stops on the handle and closure for limiting this downward movement, further manual depression of the rod when the handle is lifted serving to move the head on the release pin out of the outlet passage.

3. In a hydraulic lifting jack, including a standard, lifting mechanism, a pump, a reservoir and valved passages, a handle socket pivotally mounted on the standard, a pump piston pivotally connected with the socket, a valve-operating rod, a handle slidably fitted within the socket and adapted when pushed to an extreme position therein to engage the operating rod, a spring tending to push the handle out of the rod-engaging position, and a latch for removably holding the handle in the socket and for limiting the spring-propelled movement of the handle.

4. In a hydraulic lifting jack, a standard, lifting mechanism including a pump piston and a valve-operating rod projecting upwardly in spaced relation from the standard, a handle socket member pivotally mounted on the standard and pivotally engaged with the upper end of the pump piston, the member being formed with a handle-receiving socket in its outer end portion, the rod projecting upwardly into the open lower side of the member behind the socket, a removable handle having a notch in one side of the end portion thereof, this end portion being slidably received in the socket, a spring mounted in the socket member and engaging the end of the handle to resist movement of the

handle into the socket member, there being a slot in the side of the member communicating with the socket, and a latch pivotally mounted in the slot and engaging in the notch to limit movement of the handle out of the socket.

5. In a hydraulic lifting jack, a standard, lifting mechanism including a pump piston and a valve-operating rod projecting upwardly in spaced relation from the standard, a handle socket member pivotally mounted on the standard and pivotally engaged with the upper end of the pump piston, the member being formed with a handle receiving socket in its outer end portion, the rod projecting upwardly into the open lower side of the member behind the socket, a removable handle having a notch in one side of the end portion thereof, this end portion being slidably received in the socket, a spring mounted in the socket member and engaging the end of the handle to resist movement of the handle into the socket member, there being a slot in the side of the member communicating with the socket, a latch pivotally mounted in the slot and engaging in the notch to limit movement of the handle out of the socket, the notch and latch each having cam surfaces at one side thereof to permit the handle to be pressed inwardly against the spring into the path of the rod, thus automatically camming the latch out of the notch.

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