April 5, 1932. I. A. WEAVER 1,852,545

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Filed May 11, 1929 3 Sheets-Sheet 1

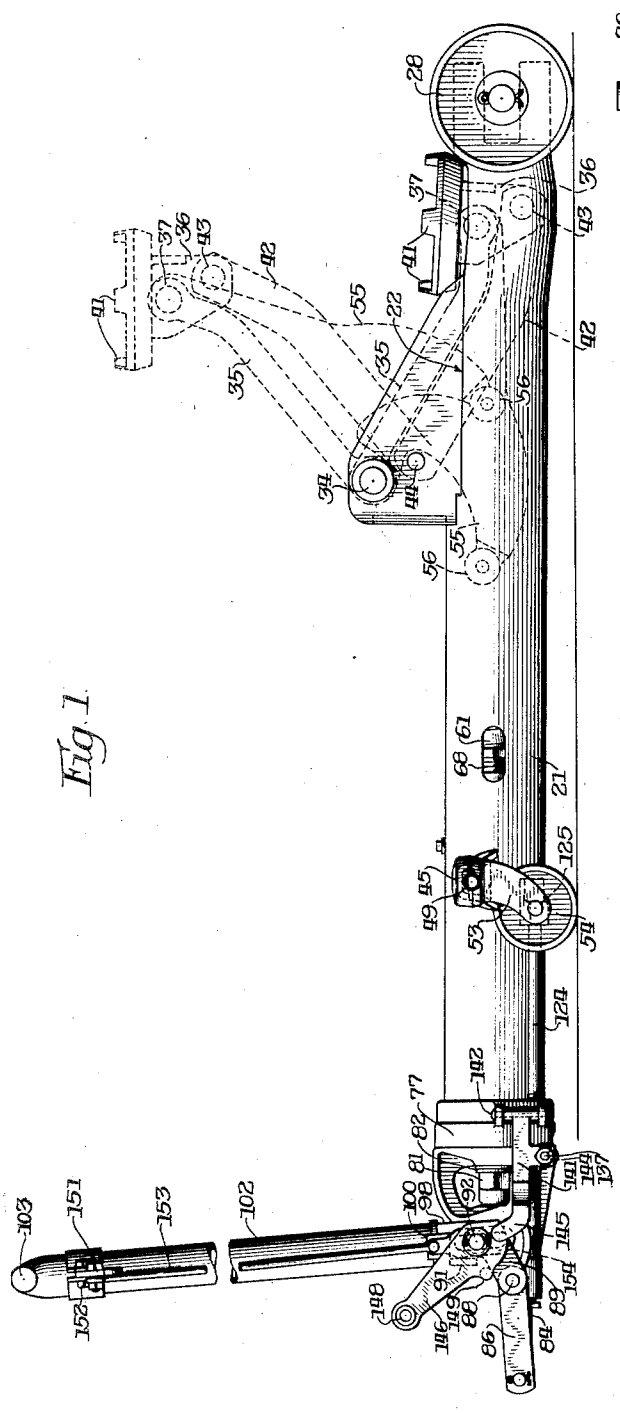

Fig. 1

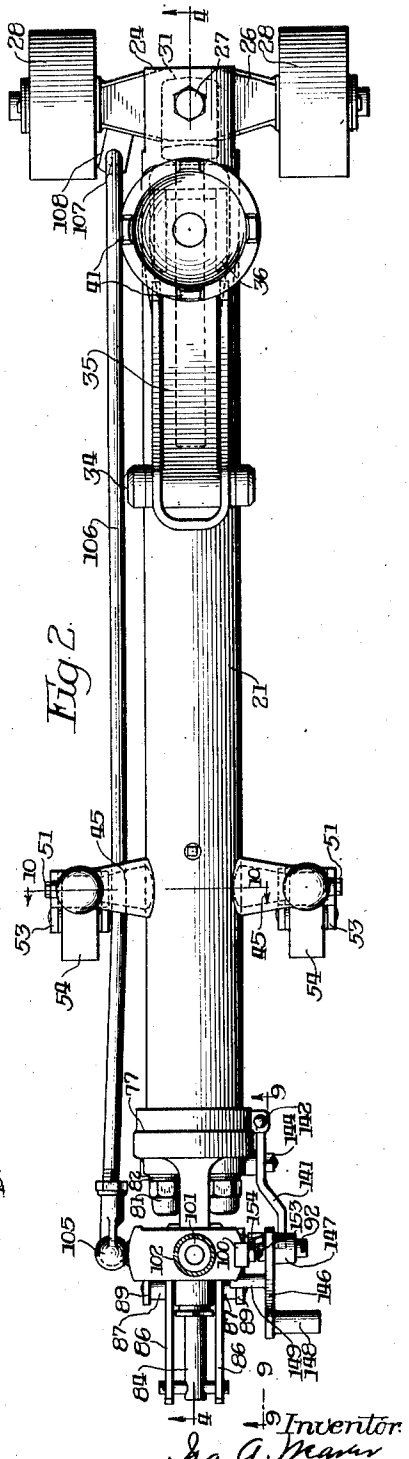

Fig. 2

Inventor
Ira A. Weaver
By Walter M. Fuller
Atty.

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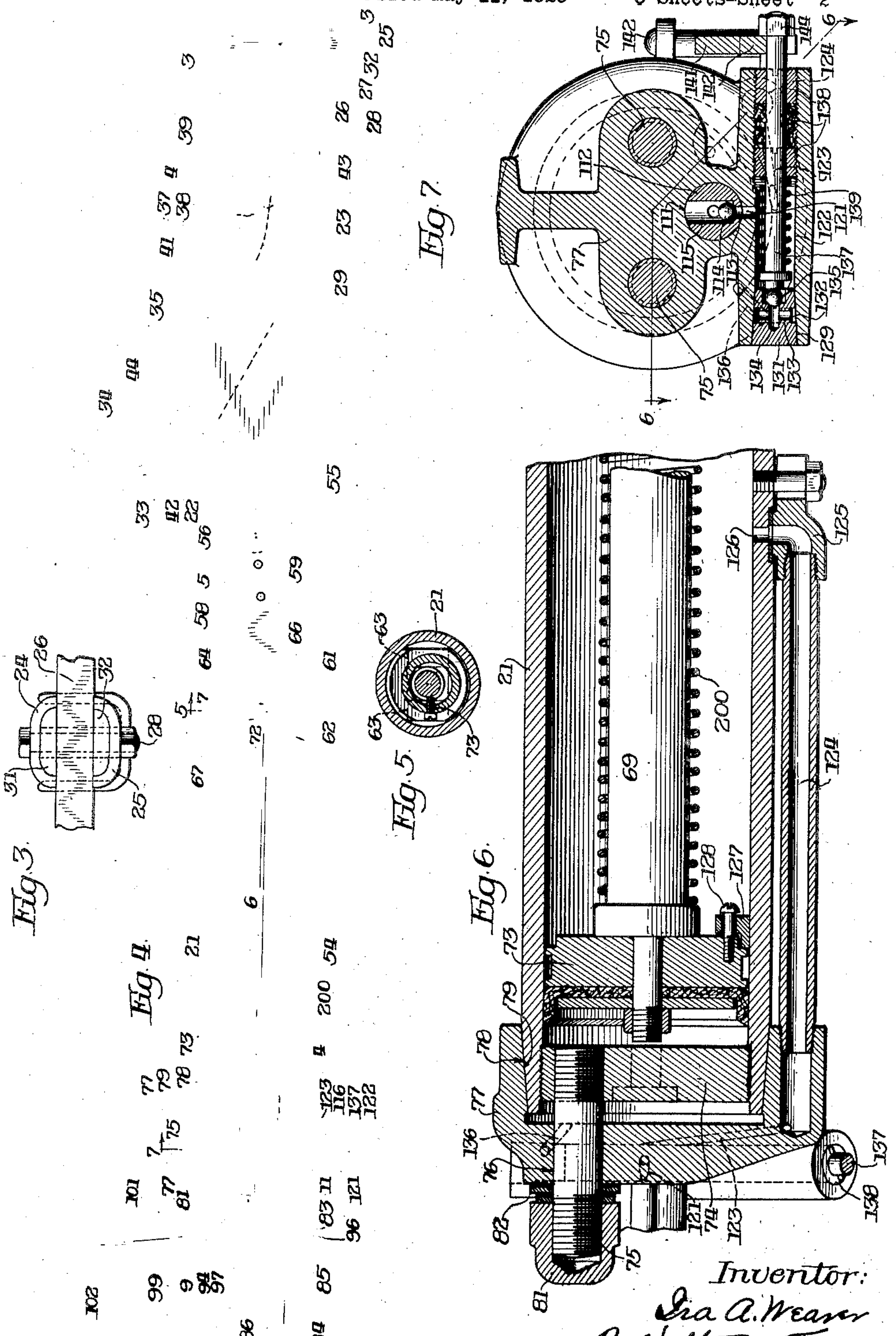

Inventor:
Ira A. Weaver
By Walter M. Fuller
Atty.

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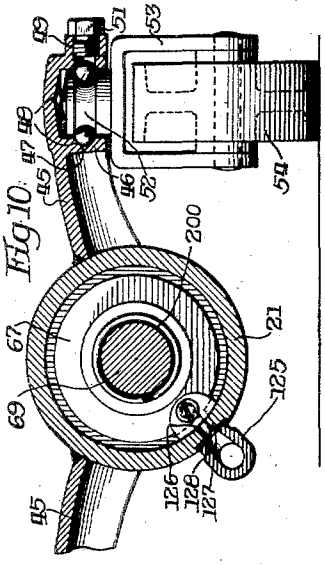

Fig 10.

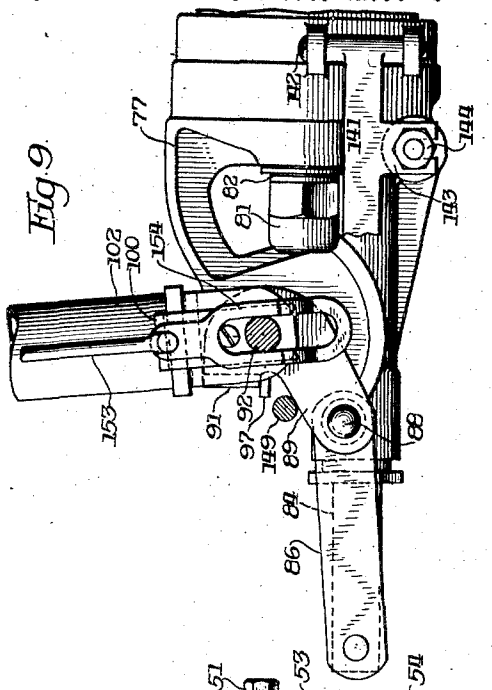

Fig 9.

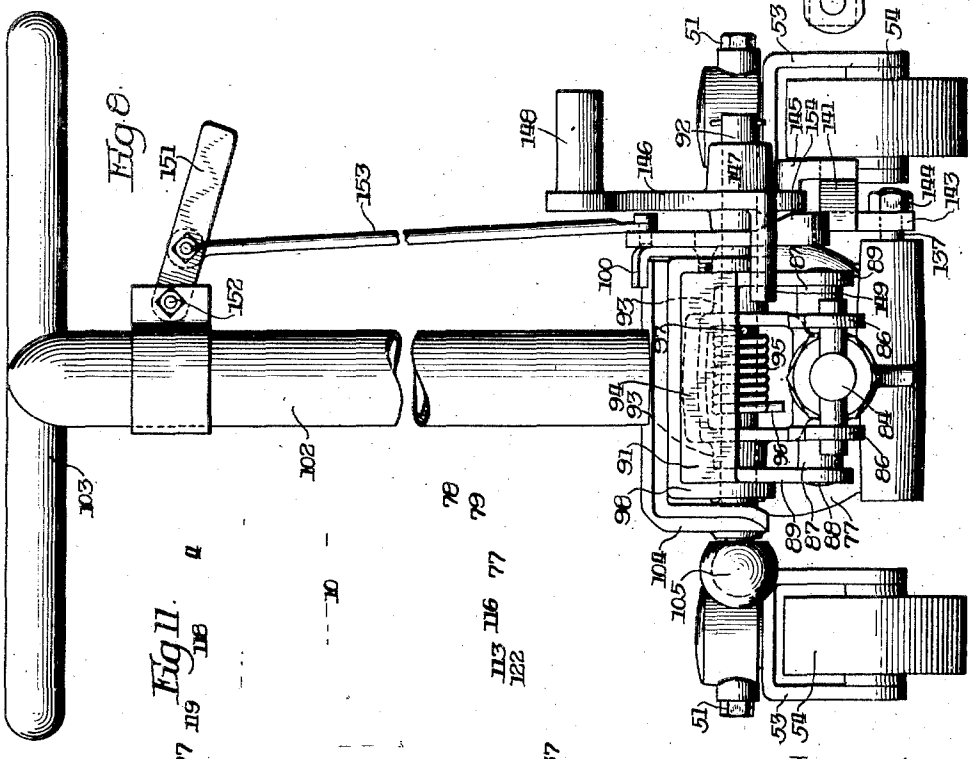

Fig 8.

Fig 11.

Inventor
Ira A. Weaver
By Walter M. Fuller
Atty

Patented Apr. 5, 1932 1,852,545

UNITED STATES PATENT OFFICE

IRA A. WEAVER, OF SPRINGFIELD, ILLINOIS, ASSIGNOR TO WEAVER MANUFACTURING COMPANY, OF SPRINGFIELD, ILLINOIS, A CORPORATION OF ILLINOIS

JACK

Application filed May 11, 1929. Serial No. 362,170.

The present invention relates more particularly to truck-jacks of the hydraulic type, the several features of novelty and improvement residing more or less in the structural characteristics of the mechanical elements employed and in their cooperation with one another, one of the prime aims of the invention being the provision of a jack of this type which is comparatively simple in structure, which possesses great lifting power for its size and which can be operated with relative ease and facility, other features of advantage of which will become apparent from a consideration of a present, preferred embodiment of the invention illustrated in the accompanying drawings, forming a part of this specification, and throughout the several views of which like reference numerals have been employed to designate the same parts.

In these drawings:

Figure 1 is a side elevation of the improved truck-jack showing the load-saddle in full lines in its lowermost position and in dotted lines in its most elevated relation;

Figure 2 is a plan view of the jack shown in Figure 1, the operating handle being broken away;

Figure 3 is a fragmentary end elevation of the jack as the parts are viewed from line 3—3 of Figure 4, the carrying-wheels being omitted;

Figure 4 is a central, vertical, longitudinal section on line 4—4 of Figure 2;

Figure 5 is a cross-section on line 5—5 of Figure 4;

Figure 6 is a fragmentary, lengthwise section on an enlarged scale on the broken line 6—6 of Figure 7;

Figure 7 is a cross-section on an increased scale on line 7—7 of Figure 4;

Figure 8 is an elevation of the handle-equipped end of the jack;

Figure 9 is an enlarged section of line 9—9 of Figure 2;

Figure 10 is a magnified, partial cross-section on line 10—10 of Figure 2; and

Figure 11 is an amplified, detail section showing the ball-valves controlling the operation of the oil-pump.

By reference to these drawings, it will be observed that the truck-jack has no main frame, other than the cylinder or tubular member 21 which, near one end of the appliance, is longitudinally slotted through its top at 22.

Such apertured, terminal portion of the tubular element, the latter comprising the power-cylinder and oil-reservoir of the jack and the main element of the frame structure, is deformed or deflected downwardly at 23 to permit of its reinforcement at this point and to allow the load-saddle to descend to a greater extent, and the end of the element 21 is somewhat flattened horizontally and slotted along its opposite sides to provide upper and lower terminal sections 24 and 25 which receive between them the central portion of a cross-bar 26 pivoted on an upright bolt 27 and supplied at its opposite ends with appropriate carrying-wheels 28, 28.

In order to strengthen such part of the appliance, the tubular member is provided internally with a reinforcing block or bar 29 shaped to conform to and bearing on the inner, lower surface of the element 21, being welded, riveted, or otherwise secured in position, such part 29 having a bifurcated end providing two ears 31 and 32 disposed between the upper and lower surfaces of the bar 26 and the adjacent faces of the cylinder sections 24 and 25, the pivot-bolt 27 extending through registering apertures in all five parts, all as is clearly shown in Figure 4.

Adjacent to one end of the slot 22, the jack has an upstanding bracket 33 welded thereto and providing suitable bearings or supports for a fulcrum or hinge pin 34 on which a bell-crank lever 35 is mounted to rock, the free end of the longer arm of such lever having a bracket or bearing member 36 hinged thereon at 37, the upper, round head 38 of the part 36 affording a suitable bearing for a revoluble, load-engaging saddle or seat 39, provided, as is customary, with a plurality of up-standing, retaining projections or lugs 41, 41.

In order to maintain the seat or saddle always practically horizontal in all of its various degrees of elevation, a link 42 of proper

length is pivoted to the bracket 36 at 43 and hinged to the bracket 33 at 44.

Near its other end, the cylinder or tubular element 21 has a pair of oppositely-disposed outstanding brackets or arms 45, 45 welded thereto, each having a circular flange 46 on its under surface grooved internally to provide a round raceway 47 for a plurality of anti-friction balls 48, 48, the flange in its outer side having a screw-threaded aperture 49 therethrough normally closed by a screw 51, leading inwardly to the ball raceway 47 and of a size to permit the introduction or extraction of only one of such balls at a time, provided the plug is removed for that purpose, the set of such balls also fitting in a concave, circular raceway 52 in the shank of a caster-yoke 53 in which a caster-wheel 54 is mounted to revolve in usual manner.

From this description, it will be clear that each one of such ball-bearings is completely protected from dirt and water and that the balls themselves act as a retaining means for the shank of the caster-wheel yoke in the recess provided in the supporting member 45.

In assembling these parts, the upright caster-wheel journal or stem is introduced into the vertical bearing in the bracket 45 so that the two raceways are in register, whereupon the balls are inserted individually in succession through the aperture 49 until they have all been introduced into place, whereupon the plug 51 is inserted to prevent their unintentional removal.

This construction provides a simple means for a protected and shielded ball-bearing, the members of which cannot become accidentally separated, and which is fully and completely fortified or preserved from foreign matter reaching it, particularly from above, it being understood that these jacks are sometimes used under cars which are undergoing a washing operation.

The shorter, curved arm 55 of the bell-crank lever 35 has a hardened, metal disc or roller 56 fixedly welded to its end and accommodated between a pair of retaining straps 57 riveted against the opposite sides of the shank of a link 58 having in its corresponding end a substantially semi-circular recess 59 forming a bearing for the part 56.

The link or connecting-rod 58 has a vertically-flattened enlargement 61 of substantially the same diameter as the internal calibre of the cylinder 21, such part 61 being rounded on its top and bottom to maintain a snug fit in the cylinder in its various positions of oscillation and to take at least a part of the strains.

This enlargement 61 has a cavity 62 and aligned bearings for the journal 63, 63 of a cross-shaft 64 flattened on one side at 65, the rounded portion of the shaft conforming to and bearing on the companion, curved surface 66 at the inner end of the recess 62.

Cylinder 21 is provided internally with a stationary, division wall 67 expanded to form a tight fit therewith, so that there is a fluid-tight connection between the wall and the cylinder, the former being centrally apertured and equipped with a stuffing-box 68 for the accommodation of a reciprocatory piston-rod 69, the flat end 71 of which bears against the plane face 65 of the shaft 64, such rod 69 having an annular groove 72 around it which receives the inner end of a retaining screw 73 extended through the part 61 to hold the link or connecting-rod 58 in operative association with the piston-rod 69.

At its other end, the piston-rod 69 carries a suitably-packed power-piston 73 adapted to fit and to reciprocate in the cylinder.

The adjacent end of the cylinder is internally threaded and accommodates a screw-threaded disk or plug 74 equipped with a pair of threaded studs 75, 75 extended out through apertures 76 in an end-cap 77 having a flared mouth 78 fitted closely over the corresponding, external, converging or tapered surface 79 on the end of the cylinder 21, nuts 81 on the studs, with intervening washers 82, drawing the parts firmly together, so that there is a very tight and accurate fit between the cap and the outer surface of the cylinder, the construction being such that the parts can be readily demounted, or separated, if necessary, to afford access to the inside of the appliance.

Cap 77, in its lower portion, has a longitudinal, cylindrical cavity 83 accommodating a conformable, slidable, suitably-packed plunger 84 extending out of the casting 77 through a stuffing-box 85, the protruding end of the plunger being connected by a pair of links 86, 86 through spacers 87, 87 and a shaft 88 to the two arms 89, 89 of a yoke 91, oscillatory on a shaft 92, supported in bearings 93, 93 of a forked portion 94 of the end casting 77, a coiled, torsional spring 95 surrounding that portion of the shaft 92 between the sides of the section 94 of the casting and one end 96 bearing against the casting and its other end 97 underlying the web of the yoke 91, as is clearly indicated in Figure 8.

Thus the spring tends to rock the parts in a direction to draw the pump-plunger 84 to its outermost position, another yoke 98, embracing the yoke 91, being also rockable on the shaft 92 and its center provided with an upstanding rod or stud shaft 99 and encasing sleeve 101 welded to the yoke a tubular handle or lever 102, equipped with a top cross-bar 103, at its lower end extending through an aperture of, and welded to, a bent arm 104, oscillatory on the member 101 and movably held to the yoke 98 by a clip 100 fastened to the latter.

Arm 104 has a ball and socket connection 105 with a rod 106 pivotally connected at 107 with an arm 108 rigid with the cross-bar 26,

the construction being such that the turning of the handle or lever 102—103 about its own axis rocks the bar 26 and the wheels 28 around the fulcrum bolt 27 to effect the desired steering of the truck-jack.

Turning to Figure 11, it will be noted that the plug or disk 74 has a passage 109 therethrough so that the oil or other liquid from the pump 83—84 may pass to the power-cylinder 21 and may also flow back to the oil-reservoir to the right of the power-piston when permitted to do so.

The end of the pump-cylinder 83 is made tapering at 111 to receive a correspondingly-shaped valve-plug 112 having a side port 113 controlled by a ball-check-valve 114 in a larger, cross passage 115 which intersects a longitudinal conduit 116 opening at one end into the pump-cylinder 83 and connecting at its other end with a port 117 opened and closed by a ball check-valve 118 and extended beyond the adjacent surface 119 of the casting 77, whereby the liquid from the pump-cylinder may be delivered through the port 117 into the conduit 109.

Port 113 is in direct connection with a passage 121 in the casting 77 leading to a transverse cavity 122 in its lower part (Fig. 7), which, by another passage 123, is in direct association with an external pipe or conduit 124 leading to a connection 125 (Fig. 6) and a port 126 through the cylinder-wall, which port is adapted to be opened and closed by a valve 127 riding on the corresponding portion of the inner surface of the cylinder 21 and having a longitudinally and transversely loose connection with the power piston 73 through an attachment screw 128 smaller than the hole in the valve through which it extends.

The chamber 122 (Fig. 7) has a flaring mouth 129 which receives a tapered valve-plug 131 having an annular groove 132 around it connected at diametrically-opposite points by a cross-passage 133 which also intersects a longitudinal cavity 134 in the plug equipped with a valve-seat and ball-valve 135.

Casting 77 is also furnished with a passage 136 (Figs. 6 and 7) which connects the space between the elements 74 and 77 with the annular groove 132 allowing the ball-valve 135 to be employed to govern or control the descent of the lifting-member of the jack.

The ball-valve 135 is normally held closed on its seat by a plunger 137, slidable longitudinally in a plurality of aligned apertures in a series of plugs 138, 138 screwed into one threaded end of the chamber 122, a coiled spring 139, encircling the rod 137, pressing at one end against the innermost plug 138 and bearing at its other end against an enlargement on the rod, whereby the spring normally holds the ball-valve closed.

Obviously, if the rod or shaft 137 is retracted against the action of such spring, the ball-valve will be permitted to open automatically and to establish a connection between that portion of the cylinder 21 to the left of the power-piston 73 and that part of the same cylinder to the right of such piston.

To draw back or retract such spring-actuated, holding member, a bent lever 141 is fulcrumed on the cap-casting 77 at 142, its slotted, depending extension 143 (Fig. 9) straddling the rod 137 adjacent to a terminal nut 144 screwed on to its threaded outer end, the free upturned end portion 145 (Fig. 1) of the arm 141 overlapping the outer face of a foot-lever 146 (Fig. 8) having a hub 147 oscillatory and also lengthwise slidable on the shaft 92, such lever having a foot-piece 148 and a projection 149 overlying the front edge of one of the bracket arms 89.

If such short-stroke pedal 148 is rocked upwardly and downwardly by the foot, which can be accomplished much more rapidly than the corresponding hand movement of the handle or lever 102, the pump can be actuated relatively more speedily to secure a quick initial rise of the load-saddle.

During such actuation of the foot-lever 146, the handle 102 remains stationary, the yoke 91 being automatically restored to position by the spring 95 after each down-rocking movement by the foot-lever.

This constitutes a simple and effective means for securing a rapid, preliminary, upward travel of the seat to the load.

An auxiliary handle 151, (Fig. 8) is pivoted to the lever 102 at 152 and is connected by a link 153 to a slotted cam 154 through which the shaft 92 extends.

When handle 151 is down, as shown in Figure 8, valve 135 remains closed owing to the pressure of the plunger 137 against it, but when it is desired to lower the load, the handle 151 is swung upwardly thereby lifting the cam 154 and shifting the lever 146 on and lengthwise of the shaft 92, with a complementary rocking movement of the lever 141, which retracts the plunger 137 from the ball-valve 135, allowing the latter to open, thus permitting the oil to flow from the cylinder 21 on one side of the power-piston 73 to the same cylinder on the opposite side of such piston.

The jack is operated practically as follows, assuming that it has been rolled to correct position with its seat or saddle directly below the load to be lifted:

The operator, by his foot, works the pedal 146—148 up and down several times, comparatively rapidly, at each upward actuation, causing the pump-plunger 84 to travel to the left, which movement sucks oil into the pump-cylinder 83 from the oil reservoir in cylinder 21 to the right of the power-

piston 73 through port 126, connection 125, conduit 124, passage 123, chamber 122, aperture 121 and port 113, the ball-valve 114 automatically opening under such circumstances, and each time the foot-lever is rocked down, effecting the inward travel of the plunger 84, such charge of oil previously drawn into the cylinder 83 being forced out thereof through passage 116, port 117 and aperture 109 into the cylinder 21 to the left of the power-piston 73, which it forces along a corresponding amount to the right, the swift foot working of the lever resulting in a relatively-quick ascent of the seat or saddle to the load.

Then greater power is required to lift the load step-by-step and this is accomplished by more slowly rocking the longer handle 102, 103 up and down the required number of times, thus operating the same pump at a reduced speed.

When the load-saddle and the bell-crank lever reach their uppermost positions, piston 73 will have moved sufficiently to cause valve 127 to cover port 126 over which it is firmly held by suction, if operation of the pump is continued, thus shutting off the supply of oil to the pump, which action precludes further elevation of the load.

To lower the saddle and its load at a substantially definite or predetermined low speed or rate, the workman swings handle 151 upwardly, thereby allowing valve 135 to open automatically by reason of the oil pressure acting on it, and permitting the oil on the left-hand side of the power-piston to flow to its other side, such oil transfer letting the load and saddle or seat gradually descend the required amount usually to its lowermost position, valve 127, by reason of its loose mounting on the piston, readily opening upwardly to allow such oil flow.

It will be noted that oil under substantial pressure is present only in the pump cylinder 83 and in the power-cylinder to the left of the power-piston 73, the chamber to the right of the power-piston comprising an oil reservoir one wall of which is formed by the plug or closure 67.

The latter is held in place in the tubular-member or cylindrical shell solely by friction, and, to obtain such a suitable fit the member 67 has two flaring walls equipped around their peripheries with a small amount of packing material.

After the part 67 has been properly positioned its diverging walls are squeezed toward one another, thus enlarging its diameter adequately to obtain the required frictional fit.

The packing, which is employed in grooves around the member, is used merely as a safeguard to assure complete closing of any scores on the inside of the cylinder.

Although herein only one desirable embodiment of the invention has been presented, those acquainted with this art will readily understand that it is susceptible of incorporation in physical forms differing substantially from one another in mechanical details.

In some cases it may be desirable to employ a coiled spring 200 bearing on the piston or plunger 73 to assist in returning the load-saddle to its lowermost position, but, in other instances, such spring may possibly be dispensed with.

I claim:

1. In a lifting-jack, the combination of a tapered plug having a side inlet-port and a side outlet-port and a longitudinal passage connecting said ports together and open at one end of the plug, check-valves controlling said two side ports, a hollow pump-cylinder having a tapered end recess adapted to receive said plug, a plunger reciprocatory in said cylinder, and means to operate said plunger.

2. In a lifting-jack, the combination of a substantially-horizontal hollow cylinder, a bell-crank lever fulcrumed on the jack, a load-saddle mounted on said lever, a power-piston slidable inside of said cylinder, a liquid pump connected to said cylinder and adapted to slide said piston in said cylinder to raise said lever and load-saddle, means to release the liquid in said cylinder to permit descent of said lever and saddle, and means connecting said power-piston and bell-crank lever including a rocking-link having a rocking and sliding bearing on the inner surface of said cylinder.

3. In a lifting-jack, the combination of a substantially-horizontal hollow cylinder, a bell-crank lever fulcrumed on the jack, a load-saddle mounted on said lever, a power-piston slidable inside of said cylinder, a liquid pump connected to said cylinder and adapted to slide said piston in said cylinder to raise said lever and load-saddle, means to release the liquid in said cylinder to permit descent of said lever and saddle, and means connecting said power-piston and bell-crank lever including a link having sliding and rocking bearings on the top and bottom inner surfaces of said cylinder.

4. In a lifting-jack, the combination of a substantially-horizontal hollow cylinder, a lever fulcrumed on the jack, a load-saddle mounted on said lever, a power-piston slidable in said cylinder, a piston-rod on which said power-piston is mounted, closures for said cylinder through one of which said piston-rod extends, a link hinged to said lever, a cross-shaft rockingly mounted in said link and having a flat face, the plane end of said piston-rod bearing on said flat face, a liquid-pump connected to said cylinder and adapted to slide said piston in said cylinder to raise said lever and load-saddle, and means to release the liquid in said cylinder to permit descent of said lever and saddle.

5. In a lifting-jack, the combination of a substantially-horizontal tubular-member, a lever fulcrumed on said jack, a load-saddle mounted on said lever, spaced closures for said tubular-member forming a power-cylinder between them, one of said closures being apertured and held in place solely by its friction with the inner surface of said tubular-member, a piston-rod slidable through said aperture, means operatively connecting said piston-rod and lever, a power-piston on said piston-rod and slidable in said power-cylinder, and means to effect the reciprocation of said power-piston in said power-cylinder to raise and lower said lever and load-saddle.

6. In a lifting-jack, the combination of a substantially-horizontal tubular-member slotted along a portion of its top, carrying-wheels for said member, a bell-crank lever fulcrumed on said member and occupying said slot, a load-saddle mounted on said lever, a closure for an end of said tubular-member, an apertured closure for an intermediate unslotted section of said tubular-member and held in place in the latter solely by its friction with the inner surface of said member, a piston-rod slidable through said aperture, a stuffing-box on said apertured closure cooperating with said piston-rod, a link connecting said piston-rod and bell-crank lever, a piston on said piston-rod and slidable in said tubular-member between said closures, a pump to force liquid into said tubular-member between said end-closure and said piston to effect travel of the latter to raise said bell-crank lever and load-saddle, and means to release the liquid from such chamber to allow descent of said bell-crank lever and said load-saddle.

7. In a lifting-jack, the combination of a substantially-horizontal hollow cylinder, carrying-wheels for said cylinder, said cylinder having an exterior tapered surface at one internally screw-threaded end thereof, a threaded plug in said cylinder and engaging said screw-threads, an end-closure for said cylinder having an inner tapered surface fitting over and bearing on said complementary tapered surface of said cylinder, means detachably securing said plug and closure together, a division-wall fixed in said cylinder dividing it into longitudinal sections, a power-piston fitting and slidable in said cylinder between said plug and division-wall, a piston-rod on which said piston is mounted and slidable through an aperture in said division-wall, a load-saddle near one end of the jack, means operatively connecting said piston-rod and load-saddle, a pump having valved conduit connections with the liquid-reservoir between said piston and division-wall and with the power-cylinder between said piston and plug, means to operate said pump to cause said load-saddle to rise, and means to connect said power-cylinder with said reservoir to allow the liquid to flow from the former to the latter to permit the descent of said load-saddle.

In witness whereof I have hereunto set my hand.

IRA A. WEAVER.