June 15, 1926. 1,588,966

L. T. KIMMERLE ET AL

PORTABLE HYDRAULIC JACK

Filed Oct. 27, 1924 2 Sheets-Sheet 1

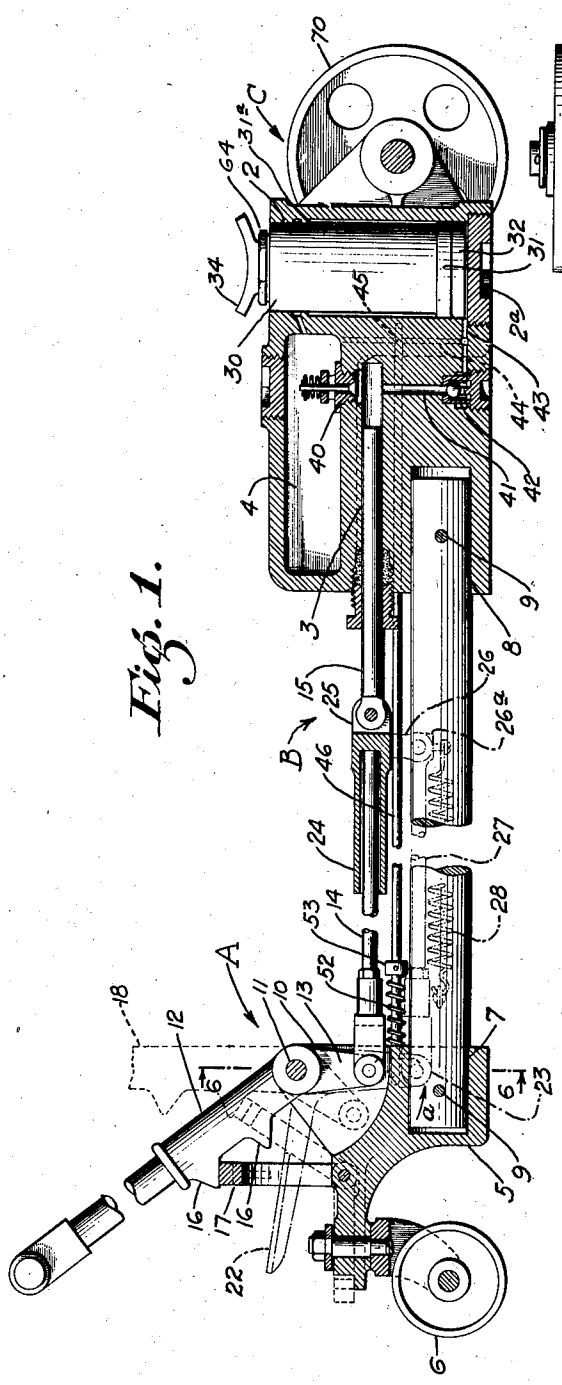


Fig. 1.

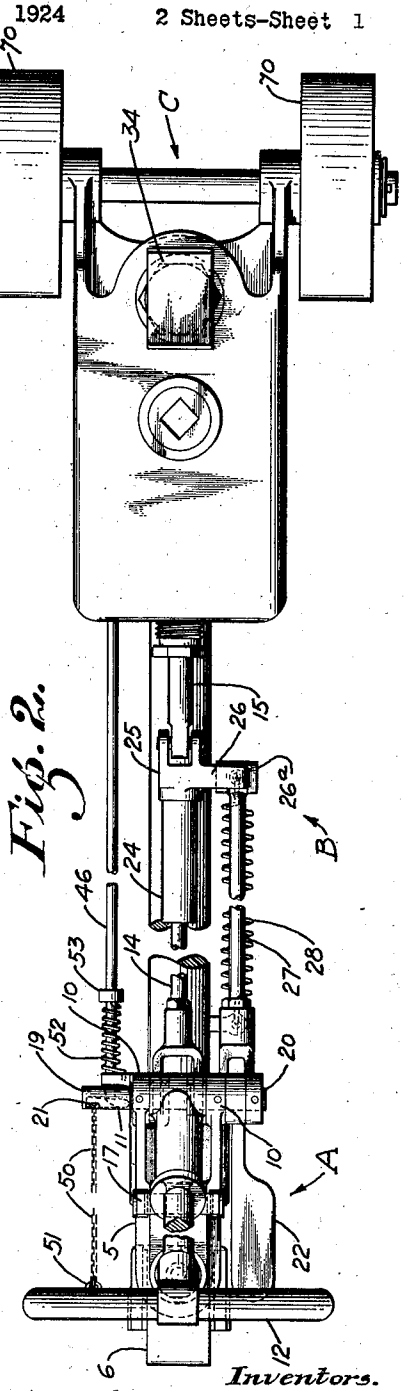


Fig. 2.

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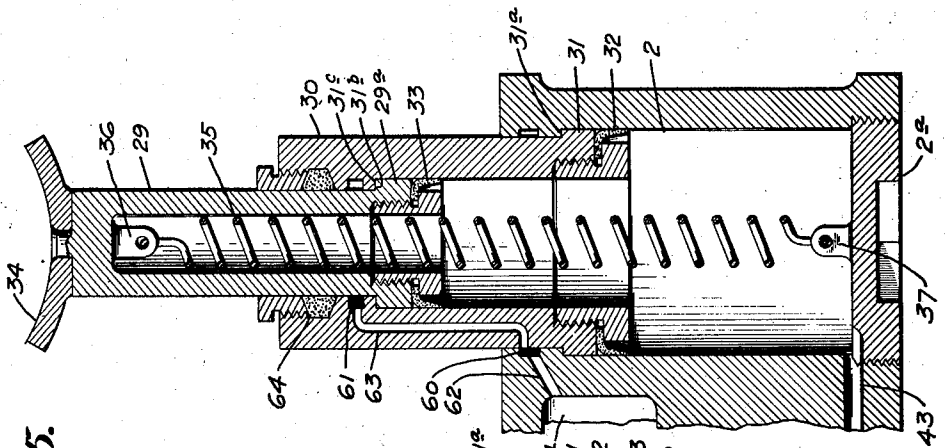


Fig. 5.

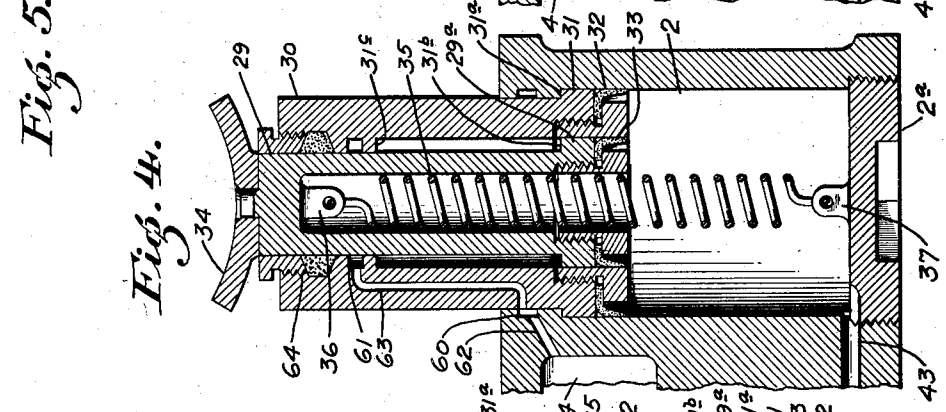


Fig. 4.

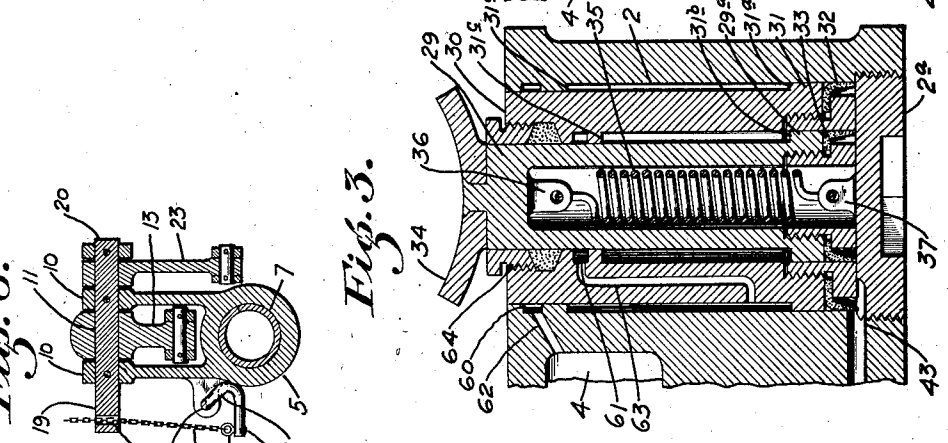


Fig. 3.

Fig. 6.

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UNITED STATES PATENT OFFICE.

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PORTABLE HYDRAULIC JACK.

Application filed October 27, 1924. Serial No. 746,216.

This invention relates to a truck, and especially to a hydraulic jack carried thereby and cooperating therewith.

The object of the present invention is to generally improve and simplify the construction and operation of portable hydraulic jacks, and especially to provide a jack of this character which is particularly adapted for use in garages and the like for lifting and handling automobiles, etc.; to provide a compound plunger and a pump cooperating therewith whereby a maximum lift may be obtained; to provide a handle whereby the truck may be steered and pulled, and which also serves the function of transmitting reciprocal movement to the pump; to provide a foot actuated pedal or lever whereby reciprocal movement may be transmitted to the pump independent of the handle; to provide a positive stop which prevents lifting of the compound plunger beyond a predetermined elevation; to provide a manual release which permits lowering of the compound plunger at any time desired; to provide means for automatically returning the compound plunger to lowered position when manually released; and further, to provide means for preventing escape of oil which may leak by the plungers.

One form which our invention may assume is exemplified in the following description and illustrated in the accompanying drawings, in which—

Fig. 1 is a central longitudinal section of the portable hydraulic jack.

Fig. 2 is a plan view of the same.

Fig. 3 is an enlarged detail section showing the jack cylinder and the compound plunger mounted therein, said view showing the compound plunger in its lowered position.

Fig. 4 is a similar view showing the compound plunger in its half way elevated position.

Fig. 5 shows the compound plunger when maximum elevated position is obtained.

Fig. 6 is a cross-section on line 6—6 of Fig. 1.

Referring to the drawings in detail, and particularly to Figs. 1 and 2, it will be noted that the portable hydraulic jack consists of a forward section A, an intermediate section B, and a rear section C.

The rear section consists of a single casting in which are formed a jack cylinder 2, a pump cylinder 3, and an oil reservoir 4. The forward section similarly consists of a single casting 5, in the forward end of which is pivotally mounted a caster or steering wheel 6. The casting is otherwise recessed, as indicated at 7, to receive the intermediate section B, which consists of a hollow shaft or tube, and the rear section is also recessed, as indicated at 8, to receive the opposite end of the tube, the tube being secured in both recesses by pins, set-screws or otherwise, as indicated at 9. The forward section is otherwise provided with a pair of interspaced bearing lugs 10, between which is pivotally mounted, on a shaft 11, a handle 12. This handle is provided with a crank arm extension 13, and this is connected through means of a rod 14 with a pump plunger 15 mounted in the pump cylinder 3, as will hereinafter be described.

The handle 12 serves two main functions, first, that of pulling and steering the truck, and secondly, that of transmitting a reciprocal movement to the pump plunger 15. The handle 12 is provided with two or more projecting lugs, such as shown at 16, which are engageable with a yoke-shaped supporting member 17 pivotally secured to the upper end of the casting 5. This support engages the lower lug 16 when it is desired to support the handle in a vertical position, as indicated by dotted lines at 18. It engages the upper lug 16 when it is desired to support the handle in the full line position shown, and the support 17 may be completely lowered when it is desired to employ the handle for operation of the pump or plunger 15, and similarly when pulling the truck about.

The shaft 11 is extended beyond the bearing lugs 10, as shown at 19 and 20. One end of the shaft is perforated, as at 21, to permit a chain to pass therethrough for purposes hereinafter to be described, while the other end of the shaft serves the function of supporting a foot pedal 22. This foot pedal has a crank arm extension formed thereon, as indicated at 23. The foot pedal is provided for the purpose of transmitting reciprocal movement to the pump plunger 15 independently of the steering arm 12, and this is accomplished as follows: By referring to Figs. 1 and 2, it will be noted that rod 14 is mounted within a tube 24, which is secured to and carried by a coupling member 25. The rod 14 is reciprocally mounted within the tube and is therefore free with

relation thereto, and also with relation to the coupling member 25. Just how it transmits reciprocal movement to the plunger 15 will later be described.

Secured to the tube 24 is an arm 26, the lower end of which is forked, as shown at 26^a, and forming a connection between the fork and the crank arm 23 is a rod 27. Depression of the foot pedal 22 swings crank arm 23 in the direction of arrow *a*. This movement is transmitted through rod 27 and arm 26 to tube 24, coupling 25, and plunger 15, and the plunger is thus forced inwardly into the cylinder. Other means are provided for returning the plunger and the mechanism actuating it, and this is accomplished by employing a spring, such as shown at 28; that is, depression of the foot pedal forces the plunger inwardly and release of the foot pedal permits the spring 28 to return the plunger and the pedal. It should be noted that the foot pedal operates entirely independent of the steering arm 12. This is due to the fact that the rod 14 is not connected with the tube 24, nor is the tube 24 connected with the rod. In other words, tube 24 may reciprocate on the rod, or the rod may reciprocate within the tube. The tube reciprocates on the rod when the foot pedal mechanism is actuated, and the rod reciprocates within the tube when the steering arm is operated.

The foot pedal is only employed for the purpose of pumping oil into the jack cylinder so as to raise the plungers until the load is engaged by means of the member 34. The supporting member 17 is then folded downwardly and the steering arm 12 is grasped by its handle and swung about the pivot 11. This handle presents a larger lever arm and as such permits introduction of oil under greater pressure than could be obtained by the foot pedal mechanism. It is for this reason that the arm 12 is employed when the load is engaged and is to be raised. Arm 12 transmits reciprocal movement through the crank arm 13 and rod 14; that is, the inner end of the rod 14 engages the forward end of the coupling member 25 and as such forces the plunger 15 inwardly. The spring 28 again serves the function of returning the plunger, the coupling and the tube, while rod 14 is returned by swinging movement of the arm 12 and the crank 13.

The cylinder 2 supports a compound plunger consisting of two sections, such as indicated at 29 and 30. The plunger 30 is slidably mounted in the cylinder 2 and its lower end is slightly enlarged, as shown at 31, to limit its upward movement; that is, the cylinder 2 is slightly reduced in diameter adjacent its upper end and as such forms an annular shoulder with which the plunger engages when it reaches its maximum elevation, as shown in Fig. 4. The lower enlarged end of the plunger is also provided with a cup-leather or other suitable packing member 32, so as to reduce leakage to a minimum, and it is furthermore hollow to form a cylinder or guide for the second or inner plunger indicated at 29. This plunger is hollow, as shown, and its lower end is also provided with a cup-leather or packing, such as shown, at 33. The upper end of the plunger is provided with a shoe or support, such as shown at 34, whereby the part to be lifted may be engaged and it is otherwise provided with an interior helical spring, such as shown at 35, whereby the plungers are automatically returned to lowered position when the oil pressure is released; the spring 35 being secured at its upper end to a lug 36 formed within the plunger 29, and being secured at its lower end to a lug 37 formed in the cylinder head 2^a, by which the lower end of the cylinder is closed. Plunger 29 is also enlarged at its lower end, as indicated at 29^a, and the upper end of plunger 30 is proportionately reduced, thus forming an annular shoulder or stop which limits upward movement of plunger 29.

Oil under pressure is delivered to the cylinder 2 for the purpose of elevating the plungers. This oil is taken from the reservoir 4. It passes through a check-valve 40 interposed between the reservoir and the cylinder 3 and enters the cylinder 3 during the suction stroke of the plunger 15. The oil then passes out through a passage 41 and a check valve 42, and finally enters the lower end of the cylinder through a passage 43.

The leverage obtained by the handle 21 through means of the crank 13 is considerable and when the small area of the plunger 15 is taken into consideration, it can be seen that oil can be transferred from the reservoir to the jack cylinder under practically any pressure desired. The passage 43 also connects with a by-pass passage 44, which is employed as an oil return passage between the cylinder and the reservoir. A valve 45 is mounted in this passage and this is provided with an extended rod 46, which passes through a lug in the forward casting 5. By referring to Figs. 2 and 6, it will be noted that rod 46 is bent downwardly and inwardly, as indicated by the numerals 47 and 48 respectively. Section 48 terminates in an eye 49 to which is attached a chain 50. This chain passes upwardly through the perforated end of shaft 11. The chain is then run parallel with the steering arm 12 and is attached at its upper end to the handle, as indicated at 51. Normally, valve 45 remains closed as it is only turned to open position when it is desired to lower the plungers 29 and 30. The valve is held in closed position by means of the spring 52, which surrounds the rod 46. One end of the spring is secured

to a collar 53 on the rod, while the other end is secured to the lug through which the rod passes. The spring is under tension and as such permits a turning movement to the rod and valve towards closed position, and this movement is limited so that the rod and valve cannot turn beyond closed position. This is accomplished by bending the rod, as shown at 47. The lower end of the bend engages the side of the casting A (see Fig. 6) when the valve reaches closed position, and it thus serves as a stop when closed position is reached. The extension 48 serves as a lever to turn the rod and valve to open position; that is, chain 50 is attached to this lever and it is therefore only necessary to pull upwardly on the chain when it is desired to open the valve and to release the chain when closing the valve, as spring 52 will automatically close it. The spring 35 insures a positive and automatic return of the plungers when the valve is opened, and is of considerable importance as it forces the oil under pressure back to the reservoir. The oil employed may be ordinary lubricating oil or otherwise, but it is well known that such oils become fairly thick and viscous, particularly on cold mornings, and it is therefore of considerable importance to employ means for forcibly returning the oil to the reservoir when it is desired to lower the lifting plungers, as they might otherwise have a tendency to stick or at least return with a very slow movement.

Means are provided for limiting the upward movement of the plungers, as previously stated, and means are also employed for preventing escape of leakage oil. To limit upward movement of the plungers, an annular shoulder 31 is formed on the lower plunger. This annular shoulder engages a similar annular shoulder 31^a formed in the upper end of the cylinder and a positive stop is thus formed. Movement of the upper plunger is limited in a similar manner by forming an annular shoulder 31^b on the plunger and an annular shoulder 31^c on the upper end of the lower plunger. To prevent escape of leakage oil, a pair of annular grooves is formed, as indicated at 60 and 61. The annular groove 60 is formed in the upper end of the plunger cylinder and it is connected with the oil reservoir through means of a port 62. The annular groove 61 is formed in the upper end of the lower plunger and it communicates with a port 63 formed in the lower plunger. This port is adapted to communicate with the annular groove 60 when the upper plunger is completely extended and escape of leakage oil is thus prevented. For instance, any oil which may leak by the lower packing will collect in the annular groove 60 and will thus be drained back to the oil reservoir. Similarly, any oil which may leak by the packing of the upper plunger will be caught by the annular groove 61 and will therefore drain through ports 62 and 63 back to the reservoir, and to positively prevent any oil from working out beyond the upper plunger, a stuffing box is formed at the point indicated at 64.

The jack is particularly intended for garage use and should therefore be constructed so that it may be readily moved about from place to place. This is taken care of by supporting the truck at the forward end by means of the caster 6, and the rear end by means of a pair of wheels, such as indicated at 70. The jack, so mounted, may be readily pulled about from place to place and as it is operated entirely from the forward end, it is possible to run it in under an automobile, where the shoe 34 may be brought in alignment with the part to be engaged. It is then only necessary to alternately depress the foot pedal so that oil under slight pressure is transferred from the reservoir into the jack cylinder. The oil just delivered quickly raises the plungers until the shoe 34 engages with the part to be elevated. If the load is not very heavy, depression of the foot pedal may be continued and the load raised, but if the load is too great for easy operation of the foot pedal, it is only necessary to lower the supporting member 17 so as to permit free operation of the handle 12. This handle, as previously described, is lifted up and down by the operator and this movement is in turn transmitted to reciprocate the plunger. The leverage produced by the handle 12 is so great that practically any load may be lifted. The plungers 29 and 30 will thus move in unison until the annular shoulders 31 and 31^a engage. The lower plunger is there positively stopped and the upper plunger 29 will then move independent of the plunger 30 if further elevation is desired; its extreme elevation being reached when the annular shoulders 31^b and 31^c engage. If it is desired to release the jack when the work is completed, it is only necessary to open the valve 45 by pulling upwardly on the chain 50. The oil will then quickly return to the reservoir through the passages 43 and 44, whether the oil be cool or otherwise, as the tension of the spring 35 will exert a sufficient pull to rapidly lower the plungers and simultaneously return the oil to the reservoir.

A hydraulic jack truck constructed, as here shown, is simple, substantial and easy to operate. Rapid elevation of the plungers may be obtained by use of the foot pedal and slower elevation of heavier loads that are encountered is obtained by operating the handle 12. Leakage oil is taken care of by the annular grooves 60 and 61 and the return passages formed and the jack are thus clean and, practically speaking, leak-proof.

While certain features of the present invention are more or less specifically illustrated, we wish it understood that various changes in form and proportion may be resorted to within the scope of the appended claims. We similarly wish it understood that the materials and finish of the several parts employed may be such as the experience and judgment of the manufacturer may dictate or various uses may demand.

Having thus described our invention, what we claim and desire to secure by Letters Patent is—

1. In a hydraulic jack of the character described, a jack cylinder, an oil reservoir adjacent the same, a pair of plungers mounted in the cylinder, said plungers telescoping with relation to each other and the cylinder, means for transferring oil under pressure from the reservoir to the cylinder to elevate the plungers in unison, and means for automatically by-passing oil which leaks by the plungers back to the reservoir when they reach maximum elevation.

2. In a hydraulic jack of the character described, a jack cylinder, an oil reservoir adjacent the same, a pair of plungers mounted in the cylinder, said plungers telescoping with relation to each other and the cylinder, means for transferring oil under pressure from the reservoir to the cylinder to elevate the plungers in unison, means for returning leakage oil which escapes from the cylinder back to the reservoir while the plungers are being elevated and when the plungers have assumed a predetermined elevation, means for manually releasing the oil under pressure in the cylinder when it is desired to lower the plungers, and means for automatically retracting the plungers to lowered position when the oil is so released, said means also returning the oil to the reservoir.

3. In a hydraulic jack of the character described, a jack cylinder having a leakage passage formed in its upper end, an oil reservoir adjacent the cylinder and in communication with the leakage passage, a main and a secondary plunger telescoping with relation to each other and the cylinder, means for transferring oil under pressure from the reservoir to the cylinder to elevate the plungers in unison, said main plunger having a leakage passage formed therein adapted to receive leakage oil from the secondary plunger at one end and so positioned that the other end of the leakage passage will register with the leakage passage in the cylinder when the main plunger reaches maximum elevation so that leakage oil from the secondary and the main plunger may be returned to the reservoir, and means for releasing the oil under pressure in the cylinder when it is desired to lower the plungers.

4. In a truck of the character described, a jack cylinder, a plunger mounted therein, an oil reservoir, a pump cylinder and plunger adapted to transfer oil from the reservoir to the jack cylinder, a handle on the truck for pulling and steering the same, means for transmitting movement from the handle to reciprocate the pump plunger, a foot-actuated pedal on the truck, and means for transmitting movement therefrom to reciprocate the plunger independently of the handle.

5. In a truck of the character described, a jack cylinder, a plunger mounted therein, an oil reservoir, a pump cylinder and plunger adapted to transfer oil from the reservoir to the jack cylinder, a pair of levers pivotally mounted on the truck, one being hand and the other being foot-actuated, and means for transmitting movement from either lever to reciprocate the pump plunger.

6. In a truck of the character described, a jack cylinder, a plunger mounted therein, an oil reservoir, a pump cylinder and plunger adapted to transfer oil from the reservoir to the jack cylinder, a pair of levers pivotally mounted on the truck, one being hand-actuated and the other being foot-actuated, means for transmitting movement from either lever to reciprocate the pump plunger in one direction, and other means for returning the plunger.

7. In a truck of the character described, a jack cylinder, a plunger mounted therein, an oil reservoir, a pump cylinder and plunger adapted to transfer oil from the reservoir to the jack cylinder, a pair of levers pivotally mounted on the truck, one being hand-actuated and the other being foot-actuated, means for transmitting movement from either lever to reciprocate the pump plunger in one direction, and other means for returning the plunger, said means also adapted to return the foot-actuated lever to a predetermined normal position.

8. In a truck of the character described, a jack cylinder, a plunger mounted therein, an oil reservoir, a pump cylinder and plunger adapted to transfer oil from the reservoir to the jack cylinder, a pair of levers pivotally mounted on the truck, one being hand-actuated and the other being foot-actuated, a crank arm extension on each lever, a coupler secured to the pump plunger, a tube carried thereby, a rod connected with one crank arm and extending into the tube, said rod being reciprocal within the tube and adapted to engage the coupler to force the plunger inwardly, an arm secured to the tube and coupler, and a rod connecting said arm and the other crank arm.

9. In a truck of the character described, a jack cylinder, a plunger mounted therein, an oil reservoir, a pump cylinder and plunger adapted to transfer oil from the reservoir to the jack cylinder, a pair of levers pivotally mounted on the truck, one being hand-

actuated and the other being foot-actuated, a crank arm extension on each lever, a coupler secured to the pump plunger, a tube carried thereby, a rod connected with one crank arm and extending into the tube, said rod being reciprocal within the tube and adapted to engage the coupler to force the plunger inwardly, an arm secured to the tube and coupler, a rod connecting said arm and the other crank arm, and a spring for reversing the movement of the plunger and the foot-actuated mechanism.

10. In a truck of the character described, a casting disposed at one end thereof, said casting having an oil reservoir formed therein, a jack cylinder, and a pump cylinder, said casting also having passages formed therein communicating with the oil reservoir, the pump cylinder and the jack cylinder, and said casting also having a return passage formed therein communicating with the jack cylinder and the oil reservoir, a pair of interspaced wheels supporting the casting, a cylindrical elongated rod secured in the opposite end of the casting, a second casting secured to the opposite end of said rod, said casting being supported by a single caster wheel, and means carried by said last named casting for operating a pump in the pump cylinder and for operating a valve which controls the return passage.

11. In a hydraulic jack of the character described, a jack cylinder having a leakage passage formed in its upper end, an oil reservoir adjacent the cylinder and in communication with said leakage passage, a main plunger mounted in the cylinder and reciprocal therein, said plunger having a central cylinder chamber formed therein and a vertically disposed leakage passage which communicates at its upper end with the upper end of the central cylinder chamber, the lower end of said leakage passage adapted to register with the leakage passage in the cylinder when a predetermined position is assumed, a stuffing box at the upper end of the central cylinder chamber and above the leakage passage in the main plunger, a second plunger extending through said stuffing box and reciprocal in the central cylinder chamber of the first named plunger, means for transferring oil under pressure from the reservoir to the cylinder to elevate the plungers in unison, and means for releasing the oil under pressure in the cylinder when it is desired to lower the plungers.

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