

Aug. 20, 1929.

T. W. PEDERSEN

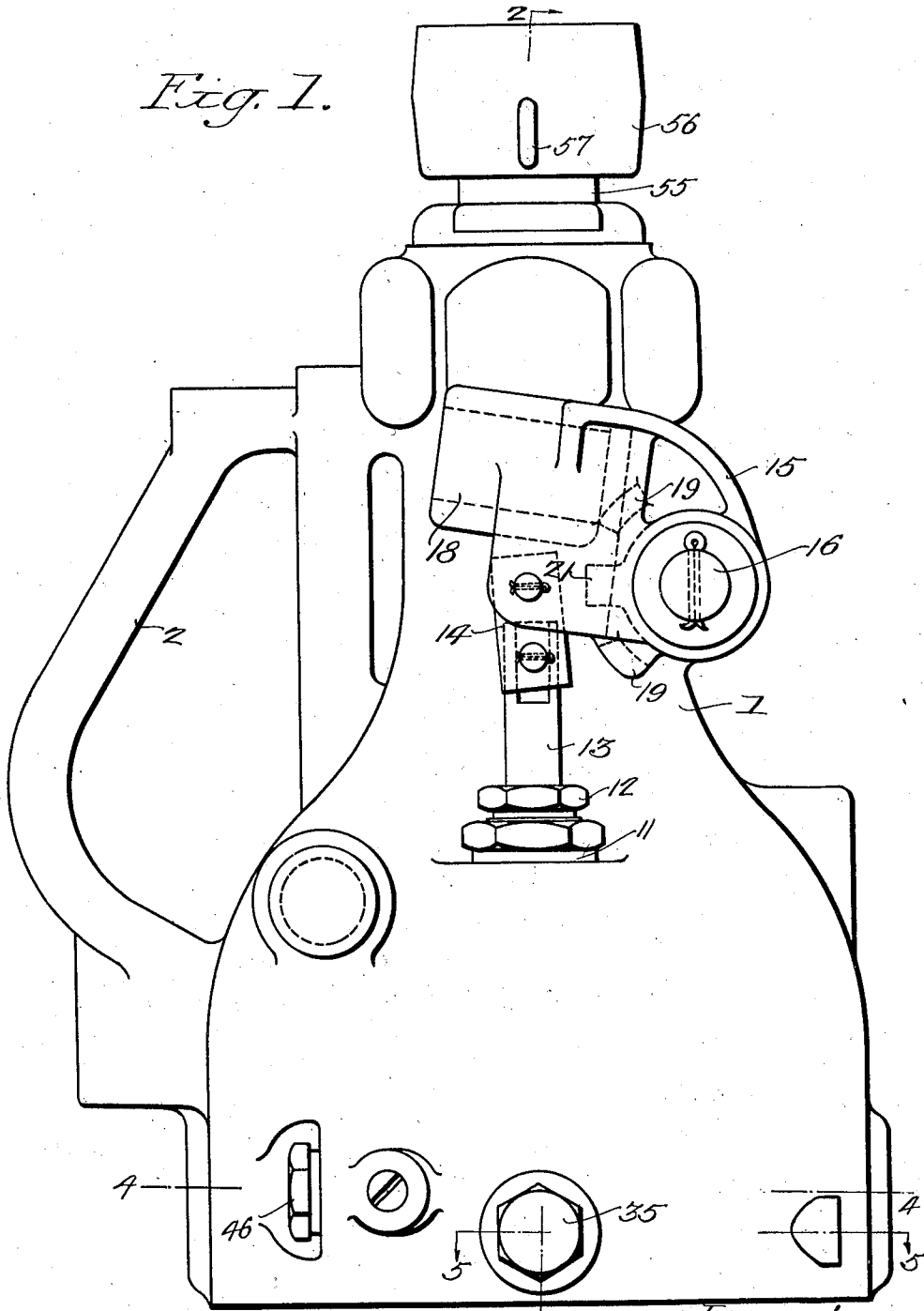
1,725,720

HYDRAULIC JACK

Filed March 22, 1927

4 Sheets-Sheet 1

Fig. 1.



Inventor:
Thomas W. Pedersen,
by his Attorneys
Houston & Houston

Aug. 20, 1929.

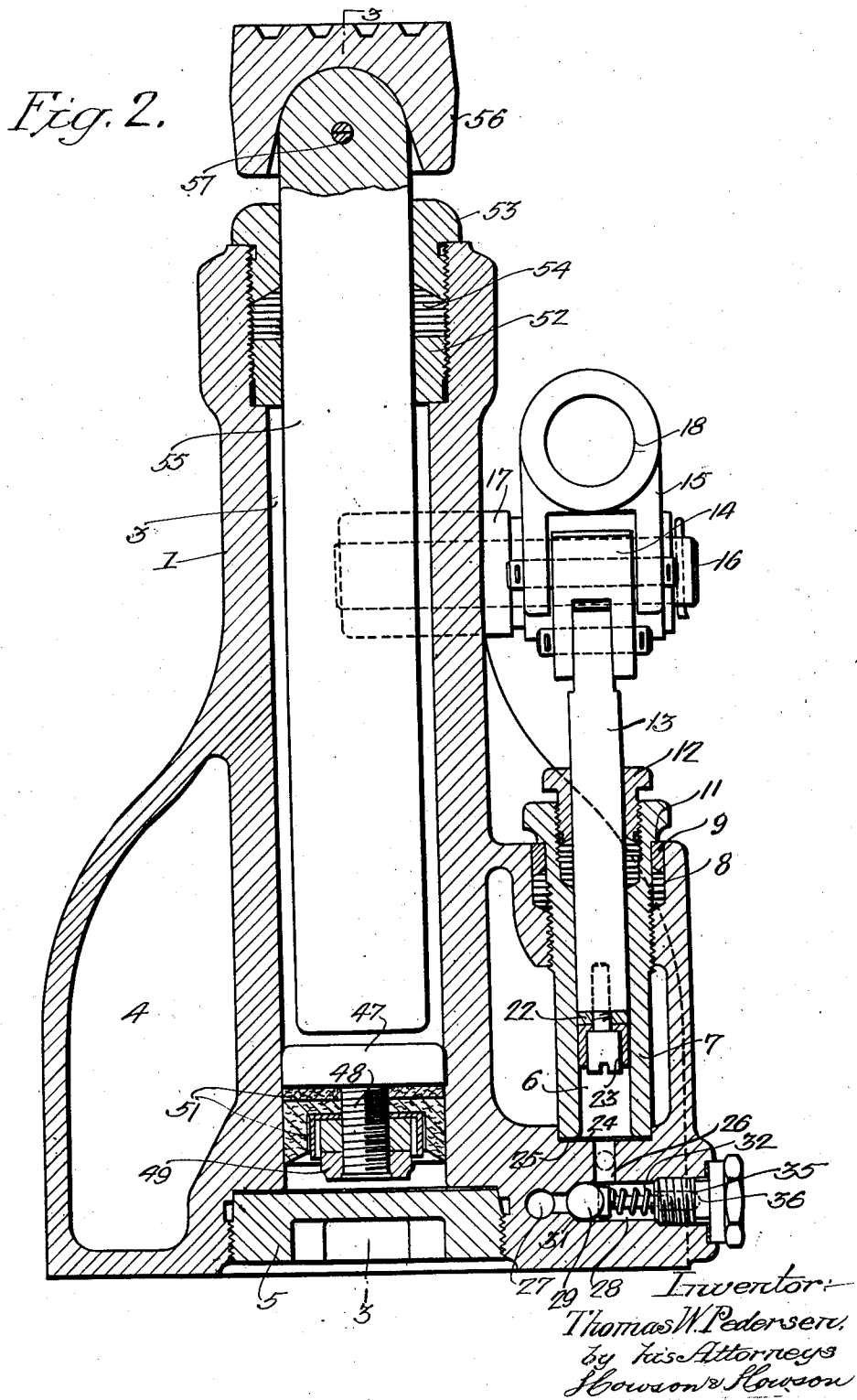
T. W. PEDERSEN

1,725,720

HYDRAULIC JACK

Filed March 22, 1927

4 Sheets-Sheet 2



Aug. 20, 1929.

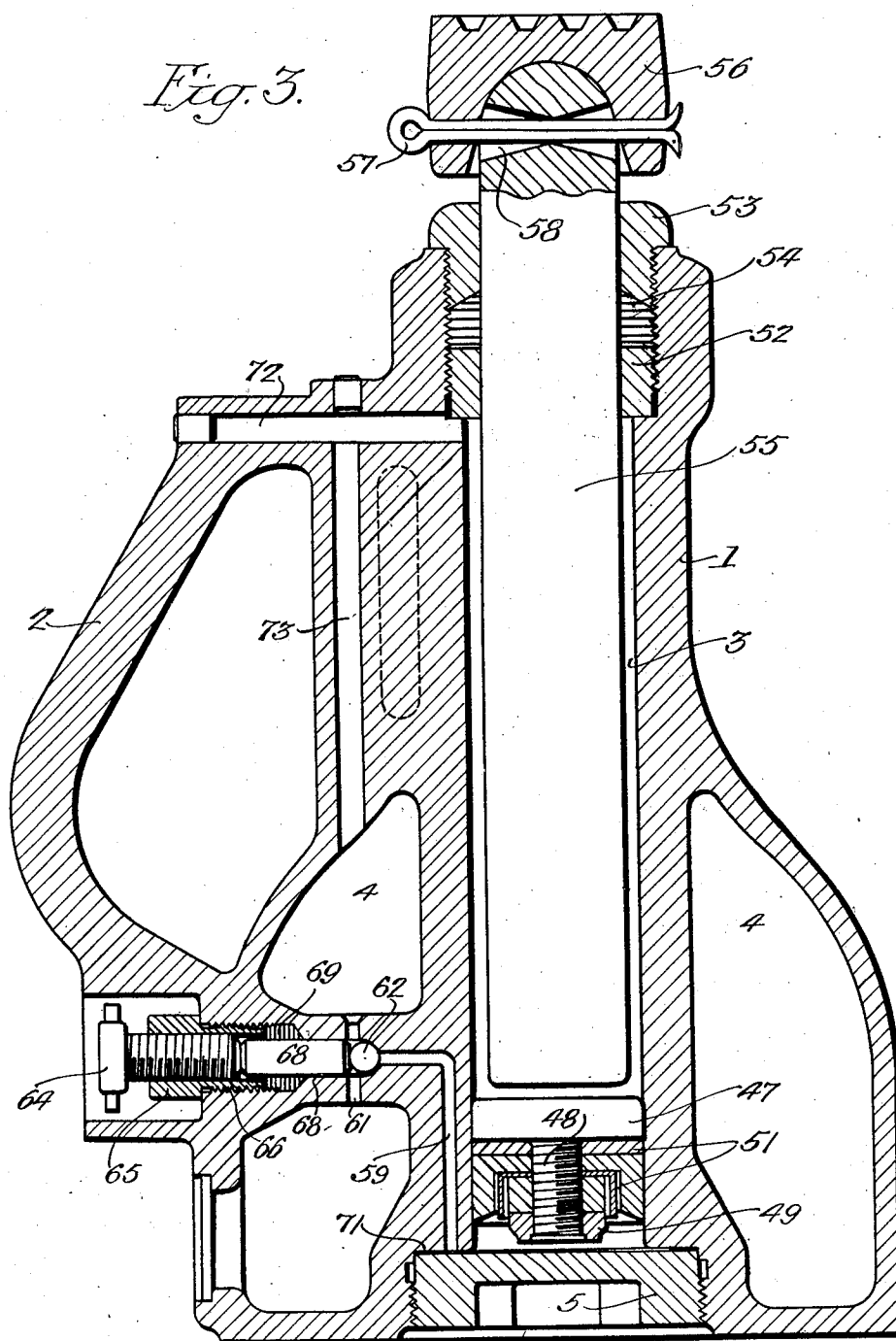
T. W. PEDERSEN

1,725,720

HYDRAULIC JACK

Filed March 22, 1927

4 Sheets-Sheet 3



Inventor:-
Thomas W. Pedersen,
by his Attorneys,
Hewson & Hewson

Aug. 20, 1929.

T. W. PEDERSEN

1,725,720

HYDRAULIC JACK

Filed March 22, 1927

4 Sheets-Sheet 4

Fig. 4.

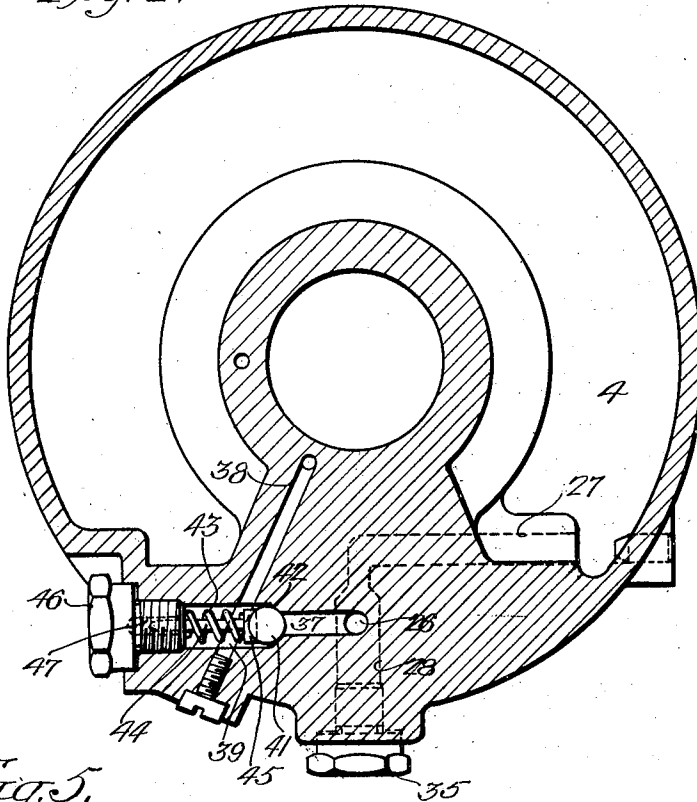
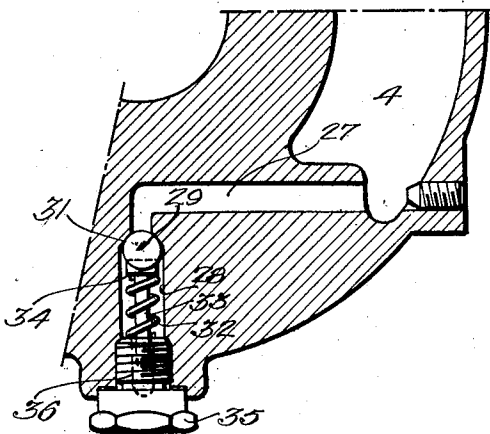


Fig. 5.



Inventor
Thomas W. Pedersen,
by his Attorneys
Hewson & Hewson

Patented Aug. 20, 1929.

1,725,720

UNITED STATES PATENT OFFICE.

THOMAS W. PEDERSEN, OF NEW YORK, N. Y., ASSIGNOR TO THE OIL JACK COMPANY, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

HYDRAULIC JACK.

Application filed March 22, 1927. Serial No. 177,369.

This invention relates to improvements in hydraulic jacks, and the principal object of the invention is to provide a jack of this type having improved structural characteristics facilitating and cheapening their manufacture and rendering them more durable than other jacks of their class.

One of the specific objects of the invention is to prevent scoring of the cylinder by the plunger due to eccentric loading, and to this end the invention contemplates the provision of a novel form of piston confined entirely to the cylinder and operating in conjunction with a plunger entirely separate therefrom.

Another object of the invention is to provide means whereby the plunger is self-aligning with respect to the packing members at the top of the cylinder in which the plunger operates.

Another object of the invention is to provide means whereby the piston packings may be easily removed from the cylinder for replacement or repair.

A further object of the invention is to provide a novel form of valve controlling the flow of fluid in the jack, the valve construction reducing the cost of manufacturing these parts by avoiding the necessity for close machine work in fitting the parts in the jack body.

A still further object of the invention is to provide novel means for connecting the jack cylinder with the reservoir whereby the effective height of the jack cylinder is increased without increasing the overall dimensions of the jack.

The invention also contemplates the provision of a novel form of swivel head having certain desirable self-adjusting features as hereinafter described.

The above and other useful ends appearing hereinafter I accomplish by means of the construction and design illustrated in the attached drawings, in which:

Figure 1 is a side elevation of a jack made in accordance with my invention;

Fig. 2 is a section on the line 2—2, Fig. 1;

Fig. 3 is a section on the line 3—3, Fig. 2;

Fig. 4 is a horizontal section on the line 4—4, Fig. 1, and

Fig. 5 is a fragmentary horizontal section on the line 5—5, Fig. 1.

Referring to the drawings, the jack in a preferred form comprises a substantially

bottle-shaped casing 1 having at one side an integral handle 2. The casing 1 comprises a main cylinder 3, and in the lower part a reservoir chamber 4, said reservoir extending around the lower part of the cylinder. The cylinder 3 at the bottom of the casing 1 is countersunk, and this recess is threaded for reception of a screw plug 5, which closes the bottom of the cylinder 3 except for certain passages establishing communication between the cylinder 3 and the reservoir, and a pump cylinder, all as hereinafter described.

At one side of the main cylinder 3 is a pump cylinder 6, this being formed by a tubular cylinder member 7 threaded into the casing 1 as shown in Fig. 2. The top of the threaded aperture which receives the member 7 is countersunk to form a packing box in which the packing 8 is retained by a follower 9 which itself is forced down and held in place by a flange 11 at the top of the member 7 and the member 7 itself is countersunk at the top to form a stuffing box through which the pump plunger 13 extends and which includes a follower 12 which is threaded into the recess above the packing. The pump plunger as shown in Figs. 1 and 2 is connected through a link 14 with a lever 15 pivotally mounted upon a stub shaft 16 projecting from a boss 17 on the casing 1, said lever 15 having a socket 18 for reception of a suitable operating lever. By oscillating the lever 15, the plunger 13 is reciprocated in its cylinder, the stroke of the piston being limited by a pair of lugs 19, 19 on the lever which coast with a fixed teat 21 on the casing. Suitable packing elements 22 are secured to the bottom of the plunger by means of a set screw 23, and the lower end of the cylinder member 7 rests on a seat 24 in the casing, the joint between the casing and the member 7 being sealed at this point by a gasket 25.

The lower end of the pump cylinder 6 communicates with the reservoir 4 through a vertical channel 26 and a horizontal channel 27. This channel 27 opens into an enlarged chamber 28 communicating with the channel 26, see Fig. 4, which chamber houses a check valve comprising a ball 29 which is held to its seat 31 closing the channel 27 by means of a spring 32 acting through the medium of a plunger 33 which bears against the ball 29. The spring is confined between the

shoulder 34 of the plunger 33 and the inner face of a plug 35 threaded into the outer end of the chamber 28. The plug 35 is recessed from its inner end as indicated at 36 for reception of the outer end of the plunger 33 whereby the latter is permitted to move back when the ball 29 is forced from its seat. It will be understood that when the valve is closed, the passage 26 is shut off from the passage 27, thereby breaking communication between the pump cylinder and the reservoir. When the pump plunger, however, is raised, the check valve 29 permits flow of oil or other actuating medium from the reservoir 4 into the pump cylinder, backflow, however, being prevented.

The pump cylinder is also connected through horizontal passages 37 and 38 with the bottom of the main cylinder 3. As shown in Fig. 4, the channel 37 communicates with the vertical channel 26 entering the pump cylinder, and the channel 37 has an enlarged part 39 constituting a chamber for a check valve 41 permitting flow from the pump cylinder to the main cylinder, but preventing flow in the opposite direction. The valve 41 is in the form of a ball which is normally held to a seat 42 by a spring 43 operating through a plunger 44. The spring is confined between the head 45 of said plunger and the inner face of a plug 46 threaded into the outer end of the chamber 39, the plug being recessed in its inner face as indicated at 47 for the reception of the outer end of the plunger 44, this permitting longitudinal movement of the plunger against the spring pressure when the valve 41 is forced back. It will now be seen that with the downward movement of the plunger 13 in the pump cylinder, any oil that may have been drawn into this cylinder is forced through the channels 37 and 38 into the bottom of the main cylinder 3.

Within the main cylinder 3 is a piston 47, this piston being comparatively small and having thereon a threaded stud 48 by means of which, and a nut 49, suitable packing elements 51 may be attached to the under side of the piston. The casing 1 at the top of the main cylinder 3 is countersunk and threaded for reception of a packing gland 52 and follower 53 between which is held packing material 54. Through this packing box projects into the cylinder a plunger 55 which is entirely independent of the piston 47 but which is forced upwardly in the cylinder by the piston when the latter is advanced therein by fluid pressure created as hereinbefore set forth.

The outer end of the plunger 55 is adapted for reception of a shoe 56, the end of the plunger being rounded and the shoe 56 having a correspondingly rounded recess into which the rounded top of the plunger is adapted to fit, forming thereby a ball and

socket joint between these parts and providing for free self-adjustment of the shoe 56 under misaligned load conditions. The shoe 56 is held on the plunger 55 by means of a split pin 57 so arranged with respect to the rounded or hemispherical contacting surfaces of the plunger and the shoe as to permit oscillation of the shoe about the axis of the said pin. The pin 57 extends through an aperture 58 in the plunger, and this aperture is formed with a double reverse taper, as shown in Fig. 3, which permits a rocking movement of the pin to complete the universal connection between the shoe and the plunger.

As described above, when the pump plunger 13 is reciprocated, actuating fluid is drawn from the reservoir 4 and forced into the main cylinder 3 below the piston 47. The latter accordingly is forced upwardly, and by engaging the lower end of the plunger 55 elevates the latter.

To permit return of the piston 47 to the bottom of the cylinder, a connection is formed between the bottom of the cylinder and the reservoir. This connection, as shown in Fig. 3, consists of a passage 59 communicating with the bottom of the cylinder 3 and extending over to a vertical channel 61 communicating at both top and bottom with the reservoir 4. The passage 59 is normally closed off from the passage 61 by a ball valve 62 normally held to its seat 63 by means of a manually adjustable set screw 64 threaded in a bushing 65, which in turn is threaded into a recessed chamber 66 in the casing. The chamber 66 communicates through a short passage 67 with the passages 59 and 61, the ball valve 62 being seated in the bottom of the said passage 67.

Intermediate the inner end of the set screw 64 and the ball 62 is a plunger 68, this plunger being a separate element and independent, except for operative contact, from the ball 62 and the set screw 64. The bottom of the chamber 66 forms a box for packing 69, this being compressed around the plunger 68 by the bushing 65. The valve 62 normally is closed, but when the plunger 47 is to be returned to the bottom of the cylinder following elevation in the manner previously described, the valve may be opened by backing off the set screw 64 to permit the plunger 68 and the ball 62 to move outwardly and thereby permit passage of the fluid from the main cylinder 3 through the passages 59 and 61 to the reservoir.

It will be noted that the joint between the plug 5 and the casing 1 is sealed by means of a gasket 71, this gasket being comparatively narrow so as to leave a space between the casing and the bottom of the plug 5. It is with this space that both the

channel 38 and the passage 59 communicate, as shown in Figs. 3 and 4. By utilizing the clearance left by the gasket between the two parts in this manner for the connections between the main cylinder, the pump cylinder and the reservoir, the effective height of the cylinder 3 is maintained at a maximum. It will further be noted that with the construction described, the packing of the piston 47 is accessible for removal and replacement by merely unscrewing the plug 5, no special tools being required for this purpose.

In the event of leakage of the actuating fluid past the piston 47, the leakage will be automatically returned to the reservoir 4 through a passage 72 at the top of the casing which communicates with the top of the cylinder 3 and a communicating or cross passage 73 communicating with the reservoir 4.

The operation of the device will be readily understood from the foregoing description, the jack being placed in a suitable position with the shoe 56 engaging the load with the piston 47 and plunger 55 depressed in the cylinder as shown in the drawings. The pump is actuated as described to withdraw the actuating fluid from the reservoir 4 and project it into the cylinder 3 below the piston 47. The piston 47 being forced up in the cylinder engages the lower end of the plunger 55 and brings pressure to bear upon the load.

By reason of the self-adjustable feature of the shoe 56, the components of the operating pressure which are angular to the axis of the plunger 55, are reduced to a minimum, and by reason of the independence of the plunger from the piston 47, there is no tendency for the piston, in spite of its comparatively narrow bearing on the cylinder wall, to score or dig the side of the cylinder. This separate construction of piston and plunger also works a material saving in the cost of manufacture by reason, first, that no exact alignment is required between the cylinder and the threaded bushings 52 and 53 at the top, and secondly, because the plunger may be formed for example of a piece of cold rolled steel, while the piston is extremely simple and easy to manufacture. It will be apparent that when necessary, the plunger 55 may be withdrawn completely from the cylinder without affecting the operation of the jack or disturbing the operating parts. A further manufacturing advantage is obtained in the form of the valve controlling the flow of the actuating fluid from the main cylinder to the reservoir, for by utilizing the loose piston 68, accurate machine work and its attendant cost is avoided.

I claim:

1. In a hydraulic jack, the combination with a cylinder, of a piston confined to said

cylinder, a plunger of smaller diameter than the bore of the cylinder separate from but actuable by said piston projecting from the cylinder, a reservoir, a pump, and valve-controlled passages connecting the said pump with the cylinder and with the reservoir.

2. In a hydraulic jack, the combination with a cylinder, of a piston confined to said cylinder, a plunger of smaller diameter than the bore of the cylinder separate from but actuable by said piston, a stuffing box at the top of the cylinder through which said plunger projects, a reservoir, a pump, and valve-controlled passages connecting the said pump with the cylinder and with the reservoir.

3. In a hydraulic jack, the combination with a cylinder, of a piston confined to said cylinder, a plunger of smaller diameter than the bore of the cylinder separate from but actuable by said piston and of lesser diameter than the said cylinder, a guide for the plunger at the top of said cylinder through which the plunger extends, a reservoir, a pump, and valve-controlled passages connecting the said pump with the cylinder and with the reservoir.

4. In a hydraulic jack, the combination with a cylinder, of a piston confined to said cylinder, a plunger of smaller diameter than the bore of the cylinder separate from but actuable by said piston, a stuffing box at one end of said cylinder through which the plunger extends, said stuffing box including a bushing secured in the open end of the cylinder and constituting a guide for the plunger, a reservoir, a pump, and valve-controlled passages connecting the said pump with the cylinder and with the reservoir.

5. In a hydraulic jack, the combination with a cylinder, said cylinder being countersunk at one end, of a plug insertable in the countersunk recess to close the end of the cylinder, a piston confined to the cylinder and adapted to be withdrawn from the cylinder through said countersunk end when said plug is removed, and a plunger of smaller diameter than the bore of the cylinder separate from but actuable by said piston projecting into the other end of said cylinder.

6. In a hydraulic jack, the combination with a cylinder having a countersunk recess at one end, of a plug insertable in said recess to close the cylinder, a piston in said cylinder including packing elements, means for securing said packing to the piston accessible through said countersunk end of the cylinder, and a plunger of smaller diameter than the bore of the cylinder separate from but actuable by said piston and projecting through the other end of the cylinder, a reservoir, a pump, and valve-controlled pas-

sages connecting the said pump with the cylinder and with the reservoir.

7. In a hydraulic jack, the combination with a casing including a main cylinder, of
 5 a piston operative in said cylinder, a plunger of smaller diameter than the bore of the cylinder separate from but actuable by the piston and projecting from one end of the cylinder, a reservoir chamber in said
 10 casing, and a pump operatively connected with the said reservoir chamber and with the main cylinder and including a cylinder member insertable through an opening in said casing, said opening being countersunk
 15 for reception of packing material surrounding the piston, means on the cylinder member for retaining the said packing in position, means for sealing the joint between the inner end of the cylinder member and the
 20 pump casing, a plunger in the cylinder projecting from the outer end thereof, said cylinder member having at its outer end a countersunk recess for reception of packing surrounding the plunger, and a bushing se-
 25 cured in the outer end of said countersunk recess and retaining the packing in place.

8. In a hydraulic jack, the combination with a casing including a main cylinder countersunk at one end, of a plug adapted
 30 to be inserted in said recess to close that end of the cylinder, a narrow gasket sealing the joint between the plug and the casing and forming a space between the inner face of the plug and the casing directly communi-
 35 cating with the cylinder, a reservoir chamber within the casing, a pump, and valve-controlled passages extending from the said space between the plug and the casing to the pump and to the reservoir, a piston in
 40 said cylinder, and a plunger operatively associated with the piston and projecting from the other end of said cylinder.

9. In a hydraulic jack, the combination with a casing including a main cylinder, of
 45 a piston operative in the cylinder, a plunger

of smaller diameter than the bore of the cylinder separate from but actuable by the piston and projecting from one end of the cylinder, a reservoir chamber in said casing, a pump, and valve-controlled passages con-
 50 necting the pump with the reservoir and with the cylinder, a passage also connecting the main cylinder with the reservoir chamber, and a manually-operated valve controlling said last-named passage and compris-
 55 ing a valve element adapted when seated to close the passage, a member threaded in the casing whereby pressure may be exerted upon the valve to hold it to its seat, and a separate cylindrical member interposed be-
 60 tween the valve and the threaded element, and a stuffing box accessible from the outside of the casing and providing for a packed joint around said cylindrical member.

10. In a hydraulic jack, the combination
 65 with a casing including a main cylinder and a reservoir chamber, of a pump mounted in said casing and operatively connected with the main cylinder and with the reservoir chamber, a piston operative in the main cy-
 70 linder, and a plunger of smaller diameter than the bore of the cylinder separate from but actuable by the piston and projecting from one end of said cylinder, the outer end
 75 of said plunger being formed on the arc of a circle, a head having a correspondingly formed recess and adapted to fit adjustably on the rounded end of said plunger, said
 80 plunger having a transverse opening reversely tapered towards the center, and a pin extending through said opening and through apertures in said head, the trans-
 85 verse opening being so arranged that the axis of the pin extends through a point corresponding with the center of the rounded end of said plunger whereby the head is
 universally adjustable with respect to the plunger.

THOMAS W. PEDERSEN.