

Oct. 30, 1951

C. D. HANCOCK

2,573,567

PUMP AND RAM HYDRAULIC LIFTING DEVICE

Filed June 11, 1949

2 SHEETS—SHEET 1

Fig. 1.

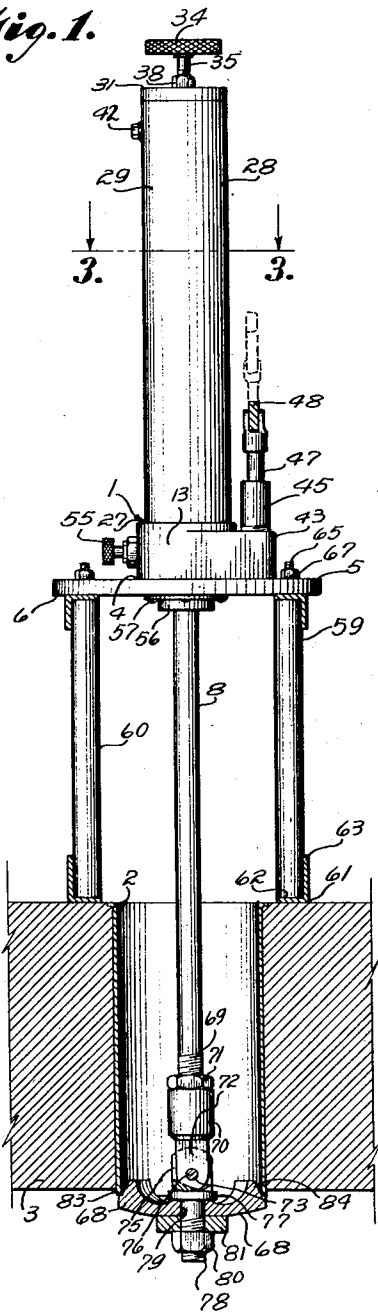


Fig. 2.

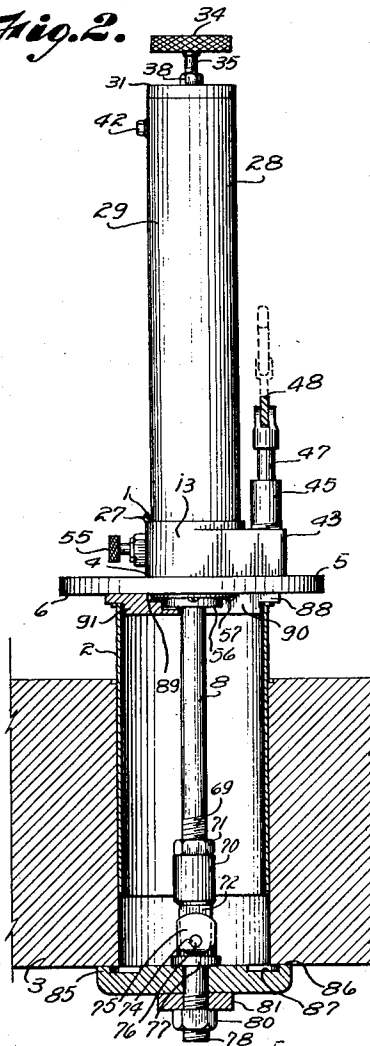
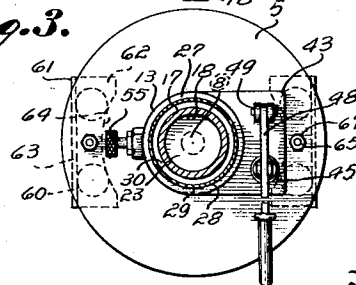


Fig. 3.



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2 SHEETS--SHEET 2

Fig. 4.

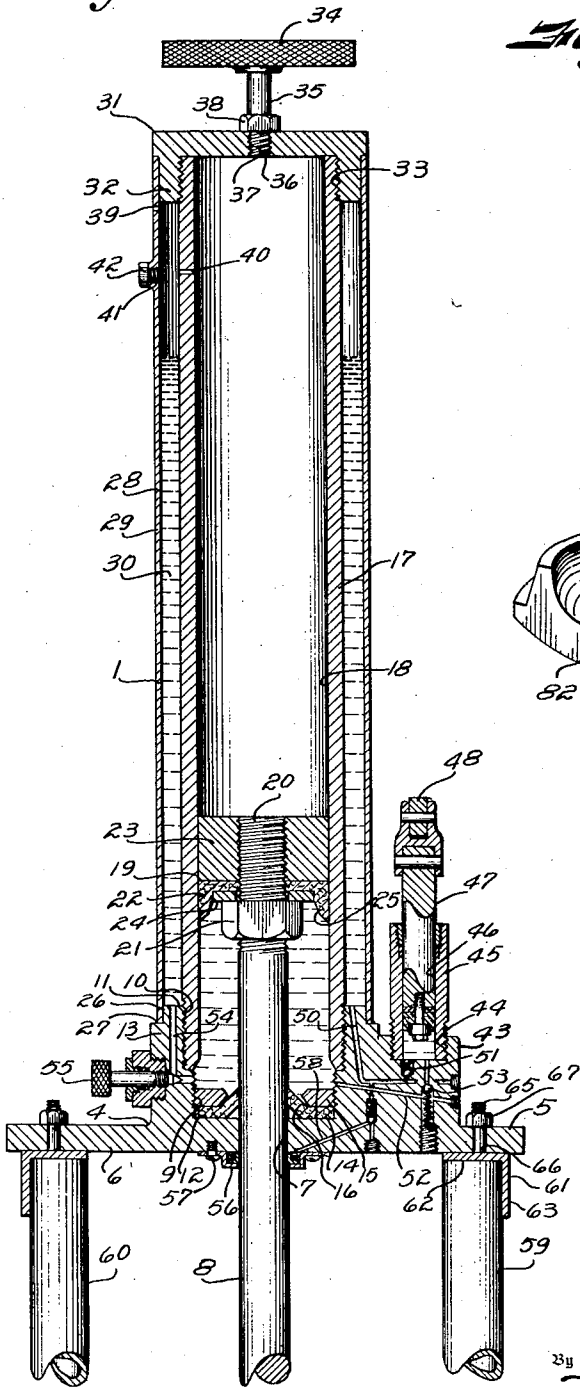


Fig. 5.

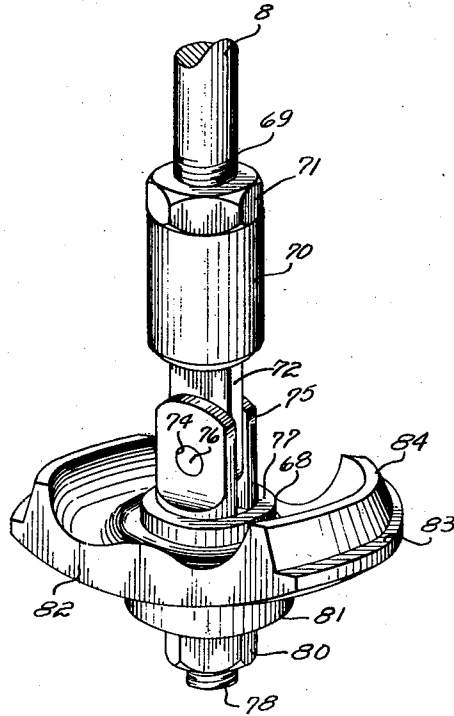
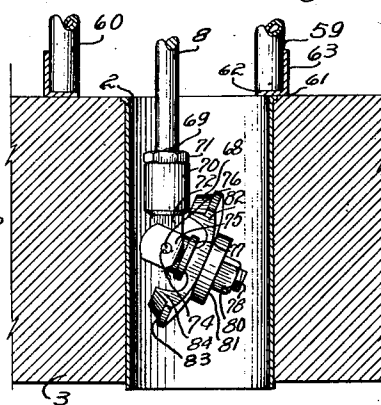


Fig. 6.



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PUMP AND RAM HYDRAULIC LIFTING DEVICE

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3 Claims. (Cl. 60—52)

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This invention relates to apparatus for pulling and/or inserting sleeves in cylinders of automobile and other engines and has for its principal object to provide a portable apparatus adapted to pull and/or insert sleeves in cylinder blocks while said blocks and the engine crankshafts are in place in a vehicle or in any other location such as on a floor.

It is common practice to construct engines with cylinder liners or sleeves made of wear resistant steel which are pressed into the cylinder block. The sleeves must be a tight fit and therefore require considerable force to remove or seat them. While other pullers have been used for removing the sleeves, they have not been such that all of the work may be done without removing the block from the vehicle and without removing the crankshaft or other apparatus from said cylinder block.

Other objects of the invention are to provide an hydraulic apparatus for pulling and/or inserting sleeves in cylinders wherein the working pressure in the apparatus tends to telescope the members in all operations; to provide a piston rod and sleeve engaging members which are foldable to pass through the sleeve to apply said member to the sleeve without disassembly of any parts; to provide removable stands or pedestals which support the hydraulic apparatus and are adapted to be located adjacent the cylinder openings and occupy a minimum of space whereby even the sleeves of the cylinder adjacent the dashboard of an automobile may be pulled or inserted; to provide an hydraulic sleeve puller which is substantially free of leakage of fluid and has a reservoir for said fluid as a part of the puller assembly; and to provide a sleeve puller and inserter which has relatively few parts, is economical to manufacture, of strong sturdy construction, compact, light of weight, and efficient in use for quickly applying same to a cylinder block and pulling and/or inserting the sleeves therein.

In accomplishing these and other objects of the present invention, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a fragmentary sectional elevation of a sleeve puller and/or inserter embodying the features of the present invention, shown in operative position with respect to a cylinder block for pulling a sleeve therefrom.

Fig. 2 is a fragmentary sectional elevation showing the apparatus in operative position for inserting a sleeve in a cylinder block.

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Fig. 3 is a horizontal cross sectional view on the line 3—3, Fig. 1.

Fig. 4 is a longitudinal sectional view through the sleeve puller and/or inserter showing the fluid passages therein.

Fig. 5 is a detailed perspective view of the lower end of the piston rod with the sleeve engaging member thereon.

Fig. 6 is a fragmentary sectional view showing the sleeve engaging member folded relative to the piston rod for moving of same through the sleeve.

Referring more in detail to the drawings:

1 designates a sleeve puller and inserter for pulling and/or inserting sleeves 2 into cylinder blocks 3. The puller and inserter 1 has a head 4 having an annular flange 5 provided with a flat lower plate 6. Centrally located in the head 4 is a bore 7 adapted to slidably mount a piston rod 8. The head 4 is also provided with threaded counterbores 9 and 10 opening from the upper end 11 of said head and terminating as at 12 in spaced relation to the flat base 6, said counterbores forming a wall 13 extending upwardly from the flange 5. Located at the bottom of the counterbore 9 is a seal member 14 secured in engagement with said bottom by a nut 15 threaded into the counterbore 9, the inner edges of said seal member 14 being turned upwardly to form a lip 16 which engages the piston rod 8 whereby pressure above the seal member tends to force the lip into tight engagement with the piston rod and prevent leakage of fluid thereby.

A cylinder 17 extends upwardly from the head 4 and has its lower end secured in the counterbore 10 as by threading to provide a fluid-tight joint, said cylinder being provided with a bore 18 in which is slidably mounted a piston 19 fixed on the upper end of the piston rod 8. In the illustrated structure the upper end of the piston rod is provided with threads 20 and screwed thereon is a nut 21 adapted to clamp a cup-shaped seal member 22 to a piston body member 23 secured on the upper end of the rod 8. A washer 24 preferably is provided between the nut and the body member, said washer being of reduced size relative to the cylinder whereby the cup-shaped seal member has a downwardly turned peripheral flange 25 which fluid pressure forces into engagement with the surface of the bore 18 to provide a seal therebetween.

The upper end of the wall 13 is of reduced diameter as at 26 to form a shoulder 27. A cylindrical jacket 28 is pressed over the upper end of the wall 13 and into engagement with the shoulder 27 and secured thereto to provide a fluid-

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tight joint, said member 28 being tubular to provide a wall 29 spaced from the wall of the cylinder 17 to provide an annular space 30 adapted to contain hydraulic fluid. The wall 29 preferably extends to substantially the same height as the cylinder 17, and the bores of the cylinder and the annular space 30 are both closed by a cap member 31. The cap member 31 preferably is provided with a flange 32 having internal threads 33 adapted to be screwed on the upper threaded end of the cylinder, the outer surface of the flange 32 being of such size as to engage the inner surface of the wall 29 whereby there is a fluid-tight seal between the cap, cylinder and tube. The cap preferably has a handle member 34 provided with a shank 35 having threads 36 for screwing same into a threaded bore 37 in the cap, a suitable nut 38 being provided to lock the shank to the cap member, said handle being for facilitating the movement and handling of the sleeve puller and/or inserter.

Arranged in the wall 29 below and adjacent the lower end of the flange 32 is a small aperture 39 to provide a vent for the space 30. The cylinder 17 is provided with an aperture 40 providing communication between the bore of the cylinder and the annular space 30, said aperture being spaced below the cap member a distance slightly greater than the full length of the piston 19 whereby said aperture will release pressure from the cylinder when the piston nears the cap forming a limit to the upward movement of said piston. The wall 29 is also preferably provided with a threaded bore 41 adapted to be closed by a suitable plug 42 which may be removed for filling the annular space with the hydraulic fluid.

The head 4 is provided with a laterally extending boss 43 having a threaded recess 44 opening from the upper end of the boss for receiving the lower end of a cylinder 45 having a bore 46 slidably mounting a pump plunger 47, the upper end of which is pivotally connected to a lever 48 suitably mounted as at 49 for reciprocating the plunger 47. The head is provided with a passage 50 providing communication between the annular space 30 and the lower end of the bore of the cylinder 45, said passage having a suitable valve 51 whereby upward movement of the plunger 47 draws fluid from the annular space 30 into the bore of the cylinder 45 and downward movement of the plunger 47 effects closure of the valve 51. The head is also provided with a passage 52 providing communication between the bore of the cylinder 45 and the counterbore 9 of the head, above the seal member 14 and below the piston 19, said passage 52 having a suitable valve 53 adapted to close on the up stroke of the plunger 47 and open on the down stroke whereby fluid may be moved from the bore of the cylinder 45 into the cylinder 18 to apply fluid pressure to the lower portion of the cylinder 17 to effect lifting or upward movement of the piston 19. Air above the piston 19 escapes through the aperture 40 into the annular space 30.

In order to effect a release of fluid from the bore 18 of the cylinder 17 the head is provided with a passage 54 providing communication from the lower end of the cylinder 17 to the annular space 30. A suitable needle valve 55 is suitably mounted in the head for selectively opening and closing the passage 54. Mounted on the flat space 6 of the head 4 is a suitable seal member 56 held

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in place by a retainer 57 suitably secured to the head. The seal 56 suitably engages the piston rod 8 to provide a fluid seal therefor whereby any fluid which might escape past the seal member 14 is trapped by the seal member 56 and such fluid may escape through a passage 58 in the head which communicates with the annular space 30, a suitable valve being provided for preventing flow of fluid from the annular space to the seal member 56.

When the apparatus is to be used for pulling a sleeve from a cylinder block the head is supported in spaced relation to the upper face on said block, the spacing being greater than the length of the sleeve 2. This spacing is effected by a stand 59. The stand preferably consists of a pair of members, each consisting of spaced tubular columns 60 having their ends secured as by welding to end members 61. The end members preferably consist of angles having one leg 62 engaging the ends of the tubular columns 60 and the other leg 63 engaging the side of the columns. The flange 62 preferably is cut away as at 64 to provide an arcuate inner edge which substantially is formed on a radius from the axis of the sleeve whereby the stand may be placed as close to the opening in the cylinder block as possible. The upper end members are provided with studs 65 which extend through openings 66 in the flange 5, nuts 67 being threaded on said studs to secure the stands to the flange if desired. The cylinder 17 and the piston rod 8 are of such length that when the flange 5 is supported on the stand 59 and the piston 19 at the lower end of the cylinder, the piston rod will extend sufficiently through the sleeve to arrange a pulling head 68 in engagement with the lower end of the sleeve 2 and there will be sufficient movement of the piston 19 in the cylinder 17 to remove the sleeves from the cylinder block.

In order to mount the pulling head 68 on the piston rod the lower end of said rod is preferably threaded as at 69 and screwed into a fitting 70, a lock nut 71 being arranged on the threads of the piston rod whereby it may be tightened to lock the fitting on the end of the piston rod. Depending from the fitting 70 is an ear 72 having an aperture 73 extending transversely thereof and adapted to align with apertures 74 in spaced ears 75 for mounting a pin 76 to pivotally connect the ear 72 to the ears 75. The ears 75 are preferably integral with a collar 77 and depending therefrom is a shank 78 which extends through a bore 79 in the head 68 whereby a nut 80 threaded on the lower end of the shank 78 will clamp the head against the collar 77. It is preferable that a washer 81 be provided between the nut and the head. The head 68 preferably is of cylindrical contour with the sides flattened or machined off as at 82. The outer diameter of the cylindrical portion is less than the outer diameter of the sleeve, said head having a shoulder 83 adapted to engage the lower edge of the sleeve and which is preferably provided with an upwardly and inwardly sloping rib 84 spaced inwardly from the outer periphery of the head whereby said head is self-centering when moved into engagement with the sleeve. With this arrangement the head may be pivoted on the pin 77, whereby said head and piston rod may be moved through the sleeve to arrange the head below the sleeve without dismantling any of the head assembly or removing the crank from the engine.

When it is desired to insert sleeves into a cyl-

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inder block the head 68 is removed from the shank 78 and a similar head 85 substituted therefor, the head 85 being of sufficient outer diameter to engage under the cylinder block as at 86, Fig. 2, and the upper face of the head preferably provided with a recess 87 to provide clearance for the sleeve to be pressed into the cylinder block and extend therebelow as in conventional practice. With this arrangement a plate 88 is arranged in engagement with the lower face 6 of the head 4, said plate being recessed as at 89 to provide clearance for the seal retainer 57. The plate preferably is slotted as at 90 to permit same to be slipped over the rod 8 and arranged in place without disassembly of the lower portion of the apparatus. Also the plate 88 has a depending axial boss 91 to engage in the core of the sleeve 2.

In using an apparatus constructed as described for pulling sleeves from a cylinder block, a pulling head of suitable size is mounted on the shank 78 and secured thereon. After the cylinder head, pistons, and connecting rods have been removed from the engine, the sleeve puller and inserter is lifted into alignment with the bore of the sleeve, the head 68 pivoted on the pin 76 and said head and rod moved through the bore of the sleeve to position the head below the lower end of said sleeve. The head is then pivoted whereby the shoulder 83 engages the lower edge of the sleeve. The stand 59 is placed on the upper surface of the cylinder block and under the flange 4 as illustrated in Fig. 1. The valve 55 is closed to prevent escape of fluid from the cylinder 17 to the annular space 30. Then by operation of the lever 48 to reciprocate the plunger 47, hydraulic fluid is drawn from the annular space 30 through the passage 50 into the bore of the cylinder 45 and said fluid forced through the passage 52 into the cylinder 17 to apply hydraulic pressure below the piston 19 whereby the hydraulic pressure forces the piston 19 upwardly in the cylinder 17, said pressure also tending to force the lip 16 of the seal member 14 into engagement with the piston rod 8 to prevent leakage of the hydraulic fluid. The force exerted on the piston 19 will effect movement of the piston 19, the piston rod and head 68 to pull the sleeve out of the cylinder block. Air entering the aperture 39 permits free flow of the fluid through the passage 50 and air escaping through the aperture vents the upper end of the cylinder 17. Also if the lever 48 is continued to be operated to reciprocate the plunger 47, the piston 19 may move into the proximity of the cap 31. However, it cannot apply pressure thereon as before it engages said cap, the aperture 40 will be opened to vent the pressure from below the piston into the annular space 30. Movement of the valve 55 opens the passage 54 to permit escape of fluid from under the piston 19 whereby the fluid moves from the cylinder into the annular space 30 permitting the piston to be moved to the lower end of the cylinder. The same operation is repeated until all of the sleeves are removed from the cylinder block.

When it is desired to place new sleeves in the cylinder block, the head 68 is replaced by the head 85. The new sleeve is placed in the upper end of the opening of the cylinder block and the apparatus is lifted to align the piston rod with the bore of the sleeve. The piston rod and head 85 are then moved through the bore of the sleeve and the bore of the cylinder block whereby the head 85 may be arranged under the cylinder

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block as is illustrated in Fig. 2. The plate 88 is then placed in engagement with the bottom of the head 4 and engaged with the upper end of the sleeve. Then by operation of the lever 48 to reciprocate the plunger 47, fluid pressure is applied to the cylinder 17 under the piston 19 whereby the piston is moved upwardly in the cylinder 17 tending to draw the head 85 toward the head 4, the effect of which is to force the sleeve downwardly into the bore of the cylinder block.

After the sleeve has been inserted into position, the valve 55 is opened to allow escape of fluid pressure from the cylinder into the annular space 30 whereby the piston may be moved downwardly in the cylinder and release the head 85 from engagement with the cylinder block. Then the entire head 85 may be pivoted on the piston rod whereby it can be removed through the sleeve.

It is to be noted that in each of these operations the pressure is applied to the piston 19 in the same direction. Provision has been made to prevent leakage of any fluid and by merely changing the head and support, the apparatus may be used for either pulling or inserting sleeves. Also the sleeves may be pulled with a minimum of removal of parts from the engine.

It is believed obvious that I have provided a sleeve puller and inserter which is simple to manufacture, efficient in operation, completely portable, and capable of quickly removing or inserting sleeves in cylinder blocks.

What I claim and desire to secure by Letters Patent is:

1. An hydraulic jack for operating on sleeves of engine cylinder blocks comprising, a cylinder, a jacket concentric with said cylinder and spaced therefrom, means closing the ends of the cylinder and jacket to provide a fluid reservoir therebetween, a piston slidably mounted in the cylinder, a piston rod fixed to the piston and extending from the cylinder, seal means in the cylinder engaging the piston rod to effect a pressure seal closing the end of the cylinder, a second seal engaging the piston rod and secured to the means closing the end of the cylinder, a valve controlled passage for flow of fluid from the second seal to the reservoir, an hydraulic pump mounted on one of the cylinder closing means, and valve controlled passages connecting the reservoir, pump and cylinder whereby operation of the pump applies fluid pressure to the cylinder between the piston and said first seal means for forcibly moving the piston in the cylinder, said movement pulling the piston rod into the cylinder.

2. An hydraulic jack for operating on sleeves of engine cylinder blocks comprising, a cylinder, a jacket concentric with said cylinder and spaced therefrom, heads closing the ends of the cylinder and jacket to provide a fluid reservoir therebetween, a piston slidably mounted in the cylinder, a piston rod fixed to the piston and extending from the cylinder through one head, seal means in the cylinder engaging the piston rod and secured to said one head to effect a pressure seal closing the end of the cylinder, a second seal engaging the piston rod and secured to said one head closing the end of the cylinder, a valve controlled passage in said one head for flow of fluid from the second seal to the reservoir, an hydraulic pump mounted on said one head, and valve controlled passages connecting the reservoir, pump and cylinder whereby operation of the pump applies fluid pressure to the cylinder be-

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tween the piston and said first seal means for forcibly moving the piston in the cylinder, said movement pulling the piston rod into the cylinder through the seal means.

3. An hydraulic jack for operating on sleeves of engine cylinder blocks comprising, a cylinder, a jacket concentric with said cylinder and spaced therefrom, heads closing the ends of the cylinder and jacket to provide a fluid reservoir therebetween, one head having a bore coaxial with the cylinder, a piston slidably mounted in the cylinder, a piston rod fixed to the piston and extending from the cylinder through the coaxial bore of the head, seal means in the cylinder engaging the piston rod to effect a pressure seal closing the end of the cylinder, a second seal engaging the piston rod and secured to the exterior of said one head closing the end of the bore therein, a valve controlled passage in said one head for flow of fluid from the second seal to the reservoir, an hydraulic pump mounted on said one head, valve controlled passages in said one head connecting the reservoir, pump and cylinder whereby operation of the pump applies fluid pressure to the

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cylinder between the piston and said first seal means for forcibly moving the piston in the cylinder, said movement pulling the piston rod into the cylinder through the seal means, and valve means for effecting communication between the cylinder and reservoir for escape of fluid from the cylinder to the reservoir.

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