Dec. 15, 1959 W. S. PINE 2,917,277

DOUBLE-ACTING HYDRAULIC JACK

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Fig. 1.

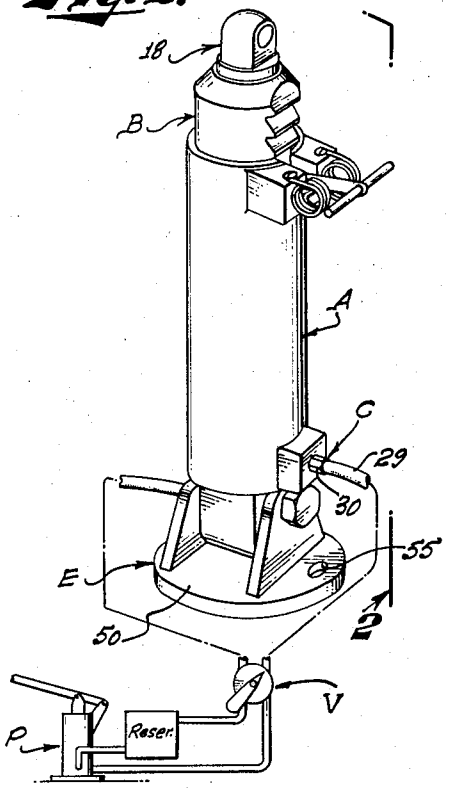


Fig. 2.

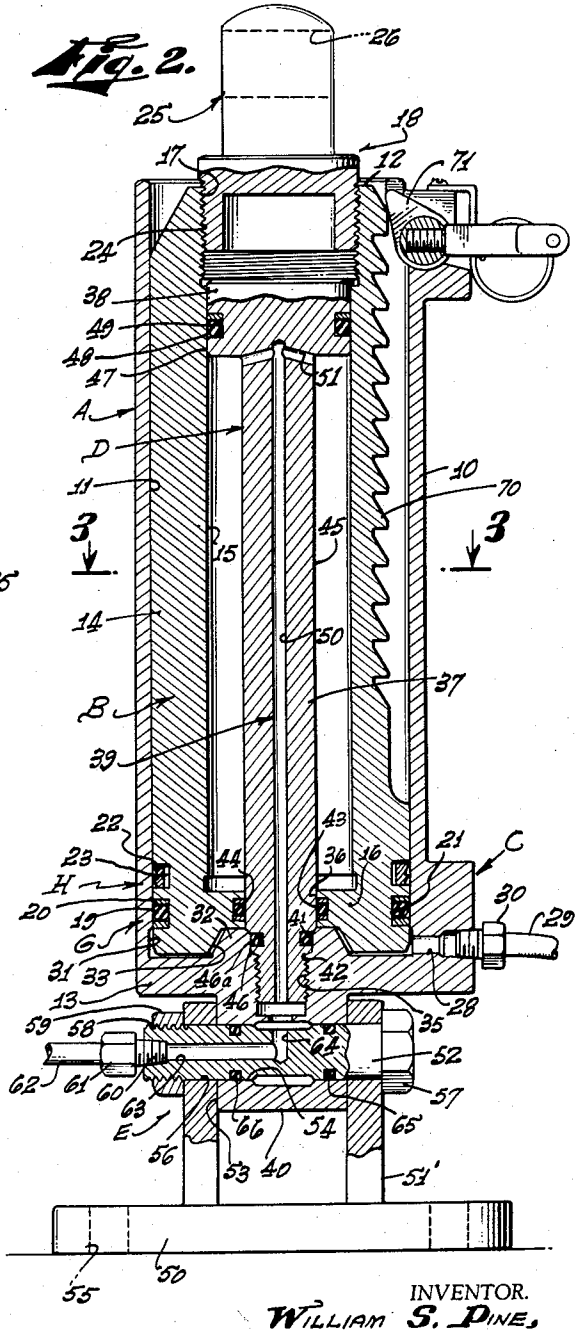
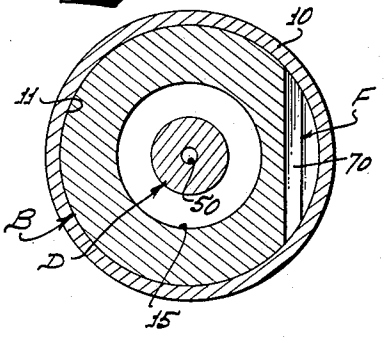


Fig. 3.



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DOUBLE-ACTING HYDRAULIC JACK

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This invention has to do with a jack and is more particularly concerned with a double-acting hydraulic jack.

The ordinary hydraulic jack involves a vertically disposed ground or support engaging cylinder and a vertically disposed work engaging ram shiftably carried by the cylinder and adapted to be shifted upwardly into engagement with a piece of work, upon the introduction of fluid into the cylinder. When it is desired to lower or retract the ram of the ordinary jack from engagement with the work, the fluid is bled or drained from the cylinder, thereby allowing the ram to shift downwardly therein. When a work load is on the ram, this method of retracting or lowering the ram is satisfactory, however, when there is no load on the ram or when the structure is arranged in an inverted, horizontal or inclined condition, retracting the ram in the manner set forth above is not possible or is so slow as to be practically unsatisfactory.

In the past, and in order to retract the ram of the ordinary jack more rapidly, when no load is applied thereto, or when it is arranged to work in an inverted or horizontal position, it has been necessary to apply manual pressure onto the ram. In many circumstances, however, the jacks are arranged in and about the work to which they are related in such a manner that manual pressure cannot be applied to the ram, with the result that the operator must simply wait for the jack to retract, or jimmy and work the entire construction about in a manner to cause the ram to retract.

An object of the present invention is to provide a double-acting hydraulic jack of the character referred to wherein the work engaging element or ram can be shifted longitudinally into and out of engagement with the work to which it is related by the introduction of fluid to the construction and regardless of the dispositioning of the jack.

A feature of the present invention is to provide a jack construction of the character referred to in which the work engaging element or ram is an elongate cylindrical member reciprocally mounted in a cylinder and over a stationary post and piston arranged within the cylinder and which is adapted to be shifted longitudinally outward of the cylinder by the introduction of fluid into the cylinder and which is adapted to be shifted longitudinally inward in the cylinder by the introduction of fluid into the ram, through the post.

Another object of the present invention is to provide a novel pivotal support means for the cylinder of the jack construction and through which fluid is conducted.

Still another object of the present invention is to provide a jack construction of the character referred to having releasable stop means adapted to normally prevent the ram from shifting longitudinally inward into the cylinder and which serves to prevent relative rotation between the ram and the cylinder.

It is a further object of the present invention to provide a novel jack construction involving a minimum

number of parts, each of which is easy and economical of manufacture and a construction which is both highly effective and dependable in operation.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of my invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a perspective view of a jack construction as provided by the present invention.

Fig. 2 is an enlarged detailed sectional view of the jack construction that I provide and taken as indicated by line 2—2 on Fig. 1.

Fig. 3 is a transverse sectional view taken as indicated by line 3—3 on Fig. 2.

The hydraulic jack construction provided by the present invention and illustrated throughout the accompanying drawings is shown as including, generally, a cylinder A, a tubular ram B slidably engaged in the cylinder, fluid supply means C adapted to conduct fluid under pressure into the cylinder A to shift the ram B longitudinally outward in the cylinder, hydraulically operated return means D related to the cylinder and the ram and adapted to shift the ram longitudinally inwardly in the cylinder, support means E pivotally supporting the cylinder and adapted to conduct fluid to the return means D, and stop means F carried by the cylinder and adapted to releasably engage the ram and prevent accidental inward shifting of the ram into the cylinder when the construction is in use.

The cylinder A is an elongate vertically disposed member having a straight, cylindrical side wall **10** defining a straight longitudinally disposed bore **11**, an open top **12** and a bottom wall **13**.

The ram B is an elongate vertically disposed tubular member having a straight longitudinally disposed annular side wall **14**, defining a central longitudinally disposed bore **15**, and a bottom wall **16**. The upper portion of the bore **15** in the ram B is internally threaded as at **17** and cooperatively receives a suitable work-engaging head **18**, which head closes the upper open end of the ram.

The ram B is adapted to be slidably engaged in the bore **11** of the cylinder A and is provided with suitable sealing means G adapted to establish sliding sealing engagement with the said cylinder bore. The sealing means G is shown as including an O-ring **19**, and a pair of anti-extrusion rings **20** engaged in a radially outwardly opening annular groove **21** in the lower end portion of the ram. In the preferred carrying out of the invention, a suitable wiping means H is provided on the ram B above the sealing means G. The means H is adapted to wipe and clean the bore **11** of the cylinder A in advance of the sealing means G, when the ram is shifted upwardly therein. The means H is shown as including an annular wiper ring **22** engaged in a radially outwardly opening channel **23** in the side wall **14** of the ram above the channel **21** in which the O-ring seal **19** is engaged.

In the particular case illustrated, the work engaging head **18** closing the upper end of the ram B is shown as including an externally threaded plug-like base **24**, threadedly engaged in the upper threaded portion **17** of the ram bore **15**, and a lug **25** projecting upwardly from the base. The lug **25** is provided with a laterally disposed opening **26** adapted to receive a pin or other like projection on the work to which the structure is related, or on a suitable work-engaging pad, or the like.

Since the particular form and nature of the head **18** can vary widely in practice and since it does not effect the novelty of the present invention, I will not burden this application with further detailed description thereof.

The fluid supply means C adapted to conduct fluid under pressure into the cylinder A, to shift the ram C

therein, is shown as including a laterally opening port 28 in the side wall 10 of the cylinder and communicating with the interior thereof adjacent the bottom wall 13, and a fluid supply line 29 with a fitting 30 at one end thereof and threadedly engaged in the port and adapted to conduct fluid from a suitable pump, or the like (not shown), to the cylinder.

In the preferred carrying out of the invention and to prevent the ram B from shutting off the port 28 and from seating against the bottom wall 13 in the cylinder A in a manner to prevent the proper flow and distribution of fluid therebetween, I provide a radially inwardly opening channel 31 in the bore 11 of the cylinder adjacent the bottom wall 13 and communicating with the port 28 and a central vertically disposed boss 32 on the bottom wall 13 of the cylinder and projecting upwardly therefrom to engage the bottom wall 16 of the ram and limit the downward movement of the ram and prevent it from seating on the bottom wall of the cylinder.

In the particular case illustrated, the boss 32 is of considerable vertical extent and the bottom wall 16 of the ram is provided with a downwardly opening recess 33, which recess is adapted to accommodate the major portion of the boss when the ram is down or fully retracted.

With the relationship of parts set forth above, it will be apparent that upon the introduction of fluid into the cylinder A through the port 28 of the means C, the ram B is shifted upwardly in the cylinder and into engagement with the work to which the structure is related.

The return means D related to the cylinder A and ram B, and adapted to shift the ram longitudinally inward in the cylinder, when it is desired to retract the ram from engagement with the work, is shown as including, a central longitudinally disposed opening 35 in the bottom wall 13 of the cylinder, a central longitudinally disposed opening 36 in the bottom wall 16 of the ram and aligned with the said opening 35 in the cylinder, a stationary vertically disposed post 37 engaged in the opening 35 to project upwardly from the bottom wall 13 of the cylinder and through the opening 36 in the ram, a piston 38 at the upper terminal end of the post 37 and slidably engaging the bore 15 in the ram, and fluid supply means 39 extending through the post and adapted to deliver fluid into the bore of the ram below the piston.

The central longitudinally disposed opening 35 in the bottom wall 13 of the cylinder A enters the boss 32 and extends downwardly through the wall 13 and into a depending arm 40 on the bottom wall 13, which arm forms a part of the support means E and will be described in detail in the following.

The opening 35 is shown as having an upper portion 41 with a straight cylindrical side wall and a lower portion 42 of reduced diameter and which is internally threaded, as clearly illustrated in the drawings.

The opening 36 in the bottom wall 16 of the ram is a simple straight opening and is shown as provided with a radially inwardly opening annular groove 43 in which an O-ring seal 44 is engaged.

The post 37 is an elongate vertically disposed rod-like member with a straight cylindrical outer wall 45 and is slidably engaged through the opening 36 in the ram and establishes sealing engagement with the O-ring 44 carried in the groove 43 in the said opening. The lower end portion of the post 37 is turned down or reduced as at 46 to slidably enter the upper portion 41 of the opening 35 in the bottom wall 13 of the cylinder and has an externally threaded extension of reduced diameter depending therefrom and threadedly engaged in the lower threaded portion 42 of the opening.

The lower reduced portion 46 on the post 37 is provided with an annular groove and carries a suitable O-ring seal 46^a adapted to engage the wall of the opening and to establish a fluid tight seal between the post and the said opening.

With the above relationship of parts, it will be apparent that the post 37 is fixed to the bottom wall 13 of the cylinder A and projects upwardly therefrom through the bottom wall 16 of the ram B and freely into the bore 15 thereof.

The piston 38 of the means D is a simple disc-shaped enlargement at the upper terminal end of the post 37 and has a cylindrical side wall 47 which establishes sliding engagement with the bore 15 in the ram. The piston 38 is sealed with the bore 15 of the ram by means of an O-ring 48 carried in an annular groove 49 provided in the side wall 47 of the piston.

The fluid supply means 39 of the return means D is shown as including a central longitudinal flow passage 50 in the post 37 and extending from the lower terminal end of the post where it communicates with the opening 35 in the bottom wall 13 of the cylinder, to a point adjacent the lower or bottom side of the piston 38 at the upper terminal end of the post, and one or more lateral ports 51 in the post and establishing open communication between the upper terminal end of the flow passage and the bore 15 in the ram, below the piston.

The actuating fluid for the return means D is delivered into the opening 35 in the bottom wall of the cylinder A through the support means E in a manner that will hereinafter be described.

With the relationship of parts set forth above, it will be apparent that upon the introduction of fluid into the bore 15 of the ram, below the piston 38, the ram is urged and shifted downwardly in the cylinder A.

In addition to the above, the post and piston 37 and 38 of the return means D serves as a stabilizer and a stop for the ram B, that is, the piston 38 being fixed and stationary relative to the cylinder and being slidably engaged in the bore 15 of the ram, serves to support and stabilize the ram in the cylinder. Further, the piston 38 is positioned a predetermined distance below the top of the cylinder A and serves to engage the bottom wall 16 of the ram when the ram is fully actuated and thereby prevents disengagement of the ram from the cylinder.

The support means E pivotally supporting the cylinder and adapted to deliver fluid to the opening 35 in the bottom wall 13 of the cylinder and to the means D, is shown as including, a flat horizontally disposed mounting plate 50, a pair of laterally spaced, vertically disposed ears 51' projecting upwardly from the plate and adapted to slidably engage the depending arm 40 on the bottom wall of the cylinder, and a fluid handling pin 52 engaged through and pivotally connecting the ears and the arm. The arm 40 is formed integrally with the bottom wall 13 of the cylinder and has flat vertically disposed parallel side walls 53. The arm 40 is provided with a central horizontally disposed bearing opening 54 extending from one side thereof to the other and intersecting and establishing open communication with the opening 35 in the cylinder and in which the post 37 of the return means D is engaged.

The mounting plate 50 of the means E is a simple, flat disc-shaped member and is provided with a plurality of vertically disposed openings 55 adapted to receive suitable fasteners, or the like, for securing the plate to a supporting surface.

The ears 51 of the means E are simple vertically disposed plate-like members fixed to and projecting upwardly from the mounting plate 50 to slidably engage the parallel side walls 53 of the arm 40, and are provided with axially aligned openings 56, which openings register with the opening 54 in the arm 40.

The pin 52 is an elongate horizontally disposed member having a head 57 at one end and a threaded extension 58 at the other end. The pin 52 is slidably engaged in the openings 54 and 56 in the arm 40 and ears 51, and is maintained engaged therewith by the head 57 provided at one end thereof and by a suitable lock nut 59 engaged

on the threaded extension 58 at the other end thereof, as clearly illustrated in Fig. 2 of the drawings.

The pin 52 is further provided with a threaded socket 60 at one end thereof and adapted to receive a fitting 61 at the end of a suitable conductor or supply line 62. A fluid passage 63 continues inwardly from the bottom of the socket 60 and terminates intermediate the ends of the pin and at a point adjacent the opening 35 in the bottom wall 13 of the cylinder A. A lateral port 64 is provided in the pin to intersect the inner end of the passage 63 and to establish open communication between the passage and the said opening 35.

With the above relationship of parts, it will be apparent that the cylinder A is suitably pivotally supported by the means E and that fluid can be advantageously conducted to and from the means D through the pin 52 of the supporting means.

In the preferred carrying out of the invention and to assure the passage of fluid from the port 64 into the opening 35, as when the arm 40 is rotated relative to the pin 52, the central portion of the pin 52 and/or the central portion of the opening 54 in the arm 40, are provided with annular fluid handling grooves, as clearly illustrated in Fig. 2 of the drawings.

In order to prevent the leakage of fluid outwardly, longitudinally of the pin 52, the pin is provided with a pair of longitudinally spaced annular grooves 65, which grooves occur at opposite sides of the port 64 and the opening 35 and carry O-ring seals 66, which engage and seal with the wall of the opening 54.

The stop means F carried by the cylinder and adapted to releasably engage the ram and prevent accidental inward shifting of the ram into the cylinder, when the construction is in use, is shown as including, a rack 70 established in one side of the ram B, as by milling, or the like, and a spring-loaded pawl or dog 71 pivotally carried by the cylinder A at the upper end portion thereof and releasably engaging the rack.

Since the particular means F that I provide does not effect the novelty of the present invention and can vary widely in form and construction, I will not burden this application with further detailed description thereof.

In practice, fluid can be delivered to the fluid handling lines 29 and 62 and thence into the cylinder or the ram by any suitable hydraulic pump, or the like. It is to be understood, however, that suitable valving means must be provided in the lines to bleed or drain the fluid from the cylinder and ram, when fluid is being introduced into the other.

With the view of disclosing a complete and operable mechanism or apparatus, I have, in Fig. 1 of the drawings, diagrammatically illustrated a typical hydraulic pump P and a suitable valve means E which could be employed to supply and control the flow of fluid to and from the cylinder A and the ram B of the construction that I provide. Since the particular pump and valve means employed can vary widely in form and construction and does not materially effect the novelty of the present invention, I will not burden this application with further detailed description of such a means.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims:

Having described my invention, I claim:

1. A hydraulic jack of the character referred to including, an elongate vertically disposed cylinder with a longitudinal bore and having a bottom wall closing the lower end thereof, an elongate cylindrical ram with a longitudinal bore and slidably engaged in the cylinder and having a bottom wall closing the lower end thereof and a work engaging head engaged in and closing the upper end thereof, sealing rings carried by the ram about the lower end thereof and establishing sliding sealing engagement with the bore of the cylinder; said bottom walls in the cylinder and the ram having central axially aligned openings, an elongate vertically disposed post engaged in said opening in the bottom wall of the cylinder to project upwardly therefrom in fixed relationship thereto and through the openings in the bottom wall of the ram, a piston fixed to the upper terminal end of the post and slidably engaging the interior of the ram, and fluid supply means selectively controlling the flow of fluid to and from the cylinder below the ram and to and from the interior of the ram below the piston, stop means adapted to prevent accidental downward shifting of the ram in the cylinder and including, a longitudinally disposed rack on the ram above the sealing rings and a spring actuated pawl carried by the cylinder at the upper end thereof and releasably engaging the rack.

2. A hydraulic jack of the character referred to including, an elongate vertically disposed cylinder having a longitudinally disposed bore and a bottom wall closing the lower end of the bore, fluid handling support means adjacent the said bottom wall and pivotally supporting the cylinder, an elongate ram slidably engaged in the bore in the cylinder and having a central longitudinally disposed bore, a bottom wall closing the lower end of the bore of the ram and a work engaging head threadedly engaged in the upper end of the bore to close said upper end of the bore and projecting from the cylinder, sealing means carried by the ram and engaging the bore in the cylinder, fluid supply means adapted to conduct fluid to and from the cylinder below the ram to shift the ram upwardly relative to the cylinder, return means adapted to shift the ram downwardly in the cylinder and including, central longitudinally disposed and axially aligned openings in the bottom walls of the cylinder and the ram, an elongate vertically disposed post threadedly engaged in the opening in the bottom wall of the cylinder to project upwardly through the opening in the bottom wall of the ram, sealing means carried by the bottom wall of the ram and engaging the post, a piston at the upper end of the post and slidably engaging the bore in the ram, sealing means carried by the piston and establishing sliding sealing engagement in the bore in the ram, and fluid conducting means conducting fluid to and from the bore of the ram below the piston and including, a central longitudinal flow passage in the post and establishing opening communication with the opening in the bottom wall of the cylinder and lateral ports in the post adjacent the piston and establishing open communication between the flow passage and the ram bore, said fluid handling support means including an arm depending from the bottom wall of the cylinder and having a bearing opening extending laterally therethrough and intersecting the opening in the bottom wall of the cylinder the lower terminal end of the post, a mounting plate with laterally spaced apertured ears projecting therefrom and positioned at opposite sides of the arm and a pivot pin engaged through the ears and the arm, said pin having a central longitudinally disposed flow passage entering it from one end and communicating with a fluid supply line and a lateral port intermediate its ends and establishing open communication between the flow passage and the opening in the bottom wall of the cylinder, and sealing means to seal between the pin and the arm and including longitudinally spaced sealing rings carried by the pin at opposite sides of the port therein and establishing sliding sealing engagement with the wall of the bearing opening at opposite sides of the opening in the bottom wall of the cylinder.

3. A hydraulic jack of the character referred to including, an elongate vertically disposed cylinder having a longitudinally disposed bore and a bottom wall closing the lower end of the bore, fluid handling support means adjacent the said bottom wall and pivotally supporting the cylinder, an elongate ram slidably engaged in the bore in the cylinder and having a central longitudinally dis-

posed bore, a bottom wall closing the lower end of the bore of the ram and a work engaging head threadedly engaged in the upper end of the bore to close said upper end of the bore and projecting from the cylinder, sealing means carried by the ram at the lower end thereof and engaging the bore in the cylinder, fluid supply means adapted to conduct fluid to and from the cylinder below the ram to shift the ram upwardly relative to the cylinder, return means adapted to shift the ram downwardly in the cylinder and including, central longitudinally disposed and axially aligned openings in the bottom walls of the cylinder and the ram, an elongate vertically disposed post threadedly engaged in the opening in the bottom wall of the cylinder to project upwardly through the opening in the bottom wall of the ram, sealing means carried by the bottom wall of the ram and engaging the post, a piston at the upper end of the post and slidably engaging the bore in the ram, sealing means carried by the piston and establishing sliding sealing engagement in the bore in the ram, and fluid conducting means conducting fluid to and from the bore of the ram below the piston and including, a central longitudinal flow passage in the post and establishing opening communication with the opening in the bottom wall of the cylinder and lateral ports in the post adjacent the piston and establishing open communication between the flow passage and the ram bore, said fluid handling support means including an arm depending from the bottom wall of the cylinder and having a bearing opening extending laterally therethrough and intersecting the opening in the bottom wall of the cylinder below the lower terminal end of the post, a mounting plate with laterally spaced apertured ears projecting therefrom and positioned at opposite sides of the arm and a pivot pin engaged through the ears and the arm, said pin having a central longitudinally disposed flow passage entering it from one end and communication with a fluid supply line and a lateral port intermediate its ends and establishing open communication between the flow passage and the opening in the bottom wall of the cylinder, and sealing means to seal between the pin and the arm and including longitudinally spaced sealing rings carried by the pin at opposite sides of the port therein and establishing sliding sealing engagement with the wall of the bearing opening at opposite sides of the opening in the bottom wall of the cylinder and stop means adapted to prevent accidental downward shifting of the ram in the cylinder and including, a longitudinally disposed rack on the ram above the sealing means thereon and a spring actuated pawl carried by the cylinder at the upper end thereof and releasably engaging the rack.

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