Dec. 6, 1949 M. SIMART 2,490,284

HYDRAULIC JACK

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Fig. 1.

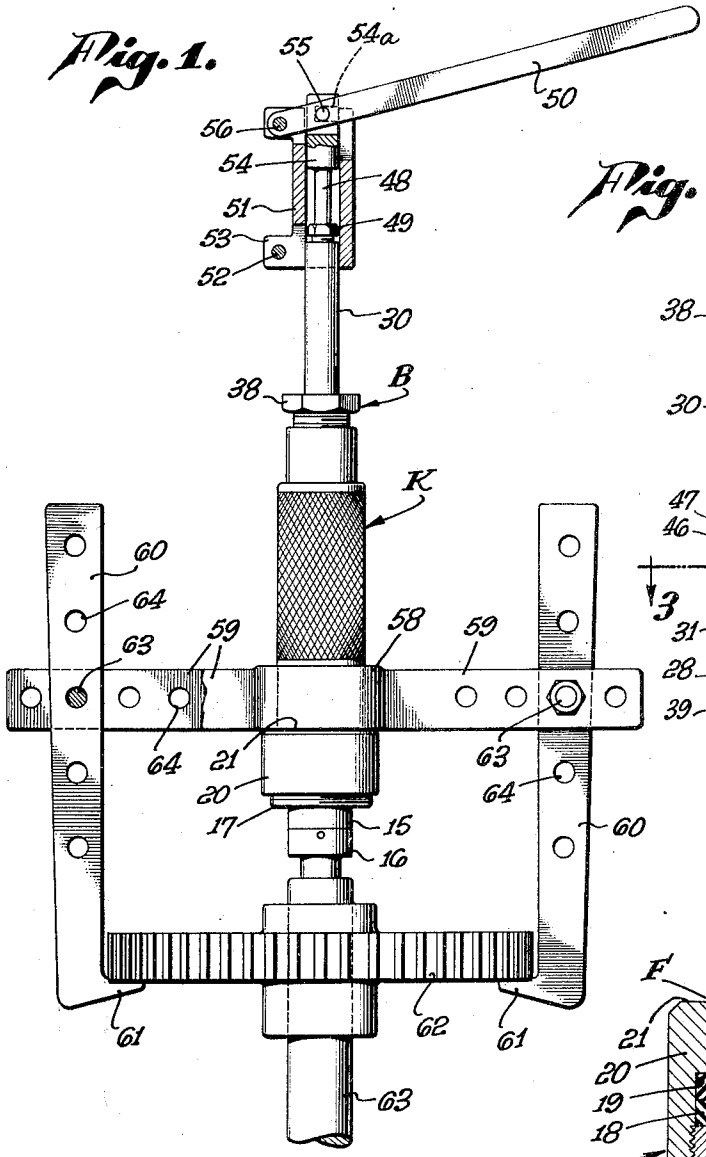


Fig. 2.

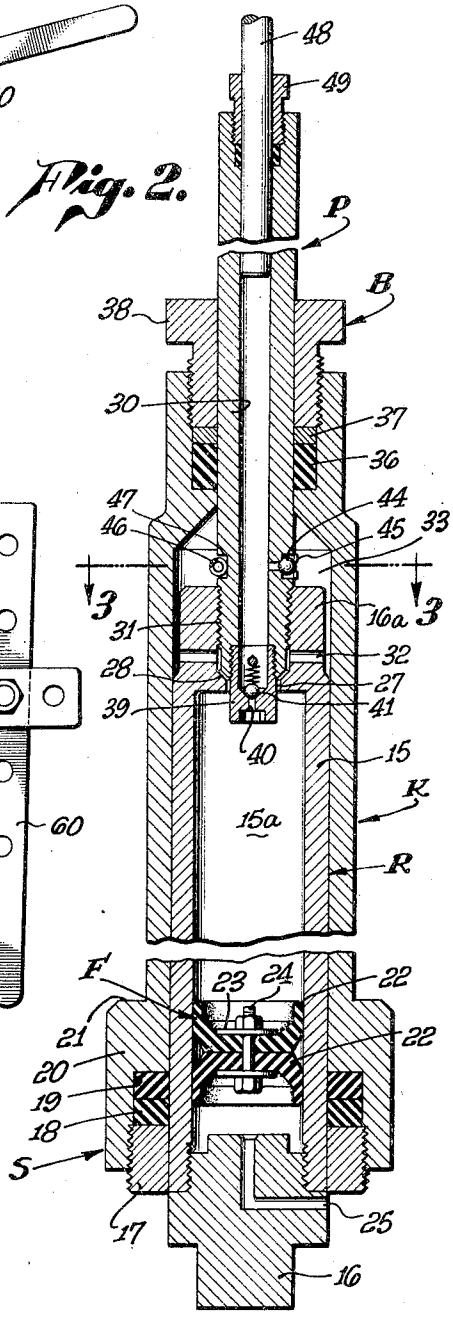
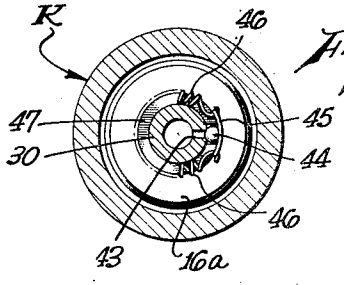


Fig. 3.



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Fig. 4.

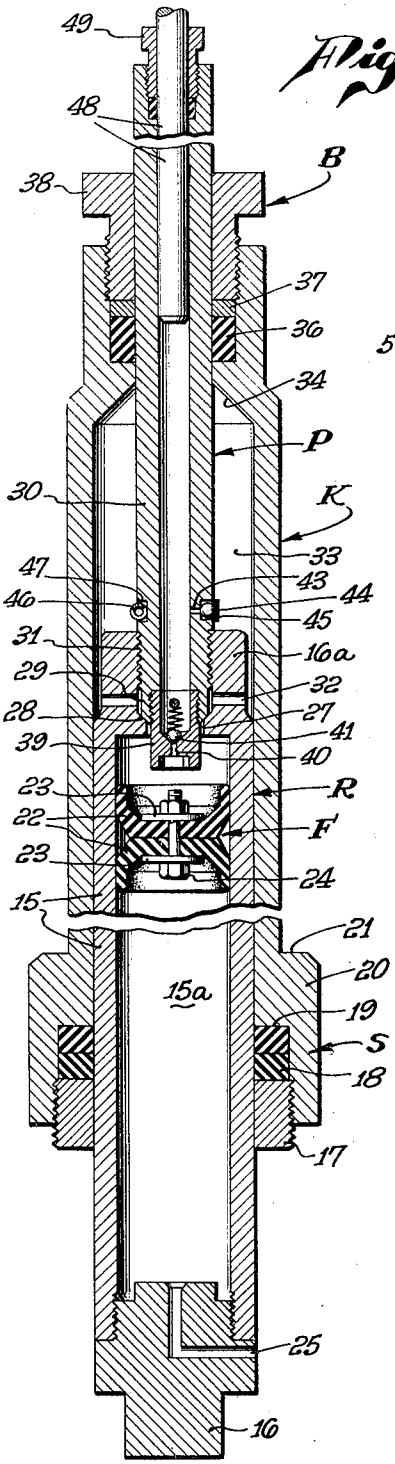


Fig. 5.

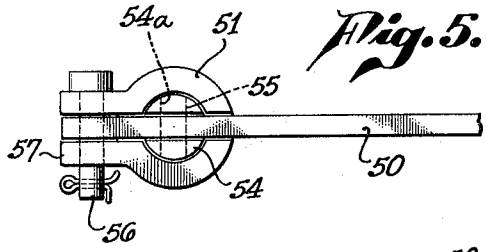


Fig. 6.

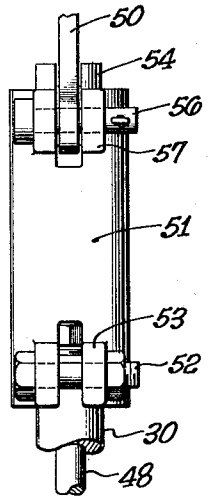
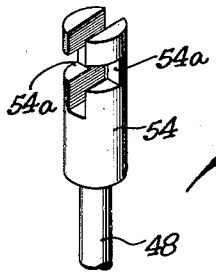


Fig. 7.



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HYDRAULIC JACK

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3 Claims. (Cl. 60—52)

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My invention relates to hydraulic devices particularly adapted, although not necessarily, for use as pullers for removing gears and the like from shafts, and while my invention will be described herein and is illustrated in the accompanying drawings as incorporated in a pulling device, its structure and mode of operation lends itself to use as a pushing device such for example as a hydraulic jack.

It is a purpose of my invention to provide a hydraulic pulling device for gears and the like, which is characterized by its structural simplicity and low cost of manufacture, and by its shortness in overall length as compared to similar devices which greatly facilitates its manual operation and permits its use in places inaccessible to other hydraulic devices.

It is also a purpose of my invention to provide a hydraulic pulling device embodying a ram constructed to provide a reservoir for the pressure fluid employed, and a simple means, devoid of springs, which is automatically operable to insure the required circulation of fluid from the reservoir to a point exteriorly of the ram for hydraulically projecting the ram.

A further purpose of my invention is the provision of a hydraulic pulling device embodying a pump the cylinder of which can be actuated to open a release valve and allow return of fluid to the reservoir incident to retraction of the ram.

I will describe only one form of hydraulic device in its adaptation to gear pullers and will then point out the novel features thereof in claims.

In the accompanying drawings:

Fig. 1 is a view showing in side elevation and partly in section, one form of hydraulic device embodying my invention incorporated in a gear puller and showing the puller applied to a shaft and gear.

Fig. 2 is an enlarged longitudinal sectional view of the device of Fig. 1, and wherein the ram of the device is in retracted position and the release valve open.

Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a view similar to Fig. 2 showing the ram in projected position.

Fig. 5 is a plan of the lever mounting sleeve of Fig. 1, on the same scale as Fig. 4.

Fig. 6 is a side elevation of the sleeve of Fig. 5.

Fig. 7 is a detail perspective view of the rod piston head.

Similar reference characters refer to similar parts in each of the views.

Referring specifically to the drawings, my invention in its present embodiment comprises a casing K which is of tubular form to provide a cylinder, and slidable in this casing is a ram R. The ram includes a cylinder 15 slidably fitted in

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the casing K so that the casing and the cylinder are axially movable relatively. On the outer end of the ram cylinder is a head 16 in the form of a screw plug which may be of the construction shown in Fig. 2 and which is adapted to engage the end of the shaft for removing a gear therefrom, as will be more fully described hereinafter.

To seal the joint between the ram cylinder, and the casing against fluid leakage, a stuffing box S is carried by the end of the casing. This box, in the present instance, comprises a collar 17 and washers 18, preferably of leather, which are fitted within a recess 19 in a head 20 of the casing K. The collar is screw-threaded in the head 20 to confine the washers against displacement and to cause them to form a seal about the ram to prevent the escape of fluid.

The head 20 is formed to provide an annular shoulder 21, which functions as an abutment or seat for a ram carrying frame, as will be more fully described hereinafter.

The interior of the ram cylinder 15 provides a fluid reservoir chamber 15*a* the ends of which are defined by the outer head 16 and an inner head 16*a*, the latter being an integral part of the cylinder and slightly spaced from the inner wall of the casing K. Within this chamber 15*a* a piston F is slidable axially and, in the present instance, such piston is made up of a pair of reversely disposed leather cups 22 secured one to the other by a bolt 24 carrying washers 23. This piston is designed to function as a follower for the fluid contained in the chamber, and this following action is permitted by the provision of a vent port 25 in the head 16, as will be more fully described later herein.

The inner ram head 16*a* is bored axially to form a release port 27 having a seat 28 for a release valve 29, the valve being formed on the inner end of the barrel or cylinder 30 of a pump designated generally at P. This pump cylinder has its inner end screwthreaded as at 31 in the ram head 16*a*, so that by screwing or unscrewing it within the head the release valve 29 can be actuated to close or open the port 27. Radially disposed ports 32 are provided in the ram head 16*a*, these ports leading from the port 27 to a fluid pressure chamber 33 formed between the inner end of the ram cylinder 15 and the confronting conical wall 34 of the casing K.

By virtue of the threaded connection 31 between the ram head 16*a* and the pump cylinder 30, the pump cylinder is movable axially with the ram, and to provide for such movement and at the same time prevent the escape of the pressure fluid from the chamber 33, the casing K is constructed to receive a conventional stuffing box B made up of a leather packing ring 36, metal ring 37, and a nut 38 threaded in the casing K.

One the inner end of the pump cylinder 30 a

plug 39 is threaded therein. This plug is provided with a port 40 controlled by a ball check valve 41, and in such manner that fluid can flow upwardly but not downwardly through the port. The pump cylinder at a point beyond the head 16a is formed with an outlet port 43 controlled by a ball valve 44 so that fluid may flow outwardly from the cylinder into the chamber 33 but not inwardly of the cylinder. This ball valve is held in closed position by a plate 45 (Fig. 3) connected to the ends of a coil spring 46 seated in a groove 47 formed in the pump barrel 30.

The pump P includes a rod piston or plunger 48 movable axially therein and sealed against the escape of fluid from the cylinder by a stuffing box 49 which is of conventional construction. This rod piston is adapted to be manually reciprocated by a lever 50 mounted on a frame 51. The frame is in the form of a split sleeve with its lower end receiving the upper end of the pump cylinder 30, and securely clamped thereto by a stud 52 extending through ears 53 formed on the sleeve. The rod piston 48 extends upwardly into the sleeve 51, where it is provided with a head 54 grooved as at 54a to receive the opposite ends of the pin 55 on the lever 50. One end of the lever is pivoted by a pin 56 extending through ears 57 on the upper end of the sleeve 51 so that by rocking of the lever reciprocation of the rod piston 48 can be effected. This pin 56 is removable from the ears 57 to allow detachment of the lever 50 when required.

In the adaptation of my invention to the gear puller it is necessary to provide some means for operatively connecting the casing K to the gear so that upon operation of the ram R the gear will be pulled from the shaft upon which it is mounted. Such means may consist of a collar 58 mounted on a casing K to abut the shoulder 21. This collar is provided with radial extensions 59 on which are mounted arms 60 having hooks 61 engageable with the gear 62 on the shaft 63. The arms 60 are mounted on the extensions by bolts 63 and to permit the necessary adjustments of the arms on the extensions both longitudinally and laterally, the extensions and arms may be provided with a plurality of openings 64 for reception of the bolts 63, as will be understood.

The operation of the device is as follows:

With the ram R in retracted position as shown in Fig. 2 the piston F is at the outer end of the reservoir chamber 15a, the pressure fluid formerly contained in the pressure chamber 33 having been returned to the chamber 15a through opening of the valve 28. To open the port 27 and thus place the ports 32 into communication with the port 27 so that the fluid can flow from the chamber 33 into the chamber 15a, the operator can, by pulling the pump cylinder 30 outwardly to its fullest extent, cause the head 16a to move to its innermost position. Under return of the fluid to the reservoir chamber the piston F is forced outwardly toward the head 16, the port 25 permitting of this because it permits the expulsion of air from the ram to atmosphere.

To project the ram R from the casing K, and to thereby exercise a pulling action on the arms 60 to effect removal of the gear 62 from the shaft 63, the rod piston 48 is reciprocated by the lever 50 to pump fluid from the reservoir into the pressure chamber 33. Upon outward movement of the rod piston suction is produced in the pump cylinder to open the valve 41 and suck oil from the reservoir into the cylinder. Upon inward movement of the rod piston the fluid in the cylinder is actuated to close the valve 41 and open the valve 44, thus permitting the fluid to be expelled from the cylinder into the chamber 33. In this operation it will be understood that as the rod piston is reciprocated the fluid operates to project the ram from the casing to ultimately remove the gear 62 from the shaft 63.

During the operation the piston F, by reason of the vent port 25, is free to and does follow the fluid in the reservoir. In this manner the length and area of the reservoir decreases automatically as the fluid is drawn therefrom, and so as to maintain that space between the piston and the inner end of the ram completely filled with fluid. Thus under the fluid withdrawing action of the pump there can at no time be formed in the reservoir a space devoid of fluid to render the pump inoperative.

To permit retraction of the ram following its operation to remove the gear 62, the operator merely unscrews the pump cylinder until the release valve 29 is unseated from the port 27, when the chambers 15a and 33 are placed in communication with each other to permit return of the fluid to the chamber 15a under retractive movement of the ram by pulling outwardly on the pump cylinder.

By virtue of forming the fluid reservoir within the ram itself, the overall length of the device as a whole is greatly reduced over previous devices, and as a result of this shortening the device is less bulky, may be more readily operated, and may be positioned in places normally inaccessible to hydraulic devices of great length. Also, by forming the release valve on the inner end of the pump cylinder it is possible to actuate this valve through the pump cylinder, thereby facilitating retraction of the ram and without the necessity of employing a separately operable release valve.

Although I have herein shown and described only one form of hydraulic device as incorporated in a gear puller, it is to be understood that my device is capable of being incorporated in a pushing device such for example as a hydraulic jack, without departing from the spirit and scope of my invention and the scope of the appended claims.

I claim:

1. In a hydraulic device of the character described: a tubular casing; a ram slidable in one end of said casing; a pump slidable in the other end of said casing; said ram being hollow to provide therein a fluid reservoir chamber, and said ram and casing constructed to provide a fluid pressure chamber at the inner end of said ram; a release port and communicating release ducts in the inner end portion of said ram; said port communicating with said reservoir chamber, and said ducts communicating with said pressure chamber; said pump including a cylinder and a piston; a release valve on said cylinder for said port, and said cylinder threaded in said ram to actuate said valve; an inlet port in said cylinder leading from said reservoir chamber to said cylinder; an outlet port in said cylinder leading from the latter to said pressure chamber; check valves for said inlet and outlet ports; a piston in said reservoir chamber; a head closing the outer end of said ram; and a vent port in said head.

2. In a hydraulic device of the kind described: a tubular casing having one end of increased outward diameter, a peripheral shoulder being provided by said portion, and having the opposite end decreased in inward diameter; a tubular ram slidable in said casing with one end working out-

wardly through the end of the casing of increased outward diameter, a sealing gland being arranged in said casing end engaging against the surface of said ram; a head closing the inner end of said ram, a fluid pressure chamber being provided between the end of decreased diameter of the casing and the head of the ram; a piston provided with oppositely directed cup washers working within said tubular ram, the space between said piston and the ram head providing a hydraulic fluid reservoir, the opposite side of the piston being open to atmospheric pressure; an elongated pump cylinder mounted at its inner end in said head closing the inner end of the ram and rotationally adjustable therein and extending outwardly through the end of the casing of reduced internal diameter; a valve structure permitting hydraulic fluid to flow into the pump cylinder through the ram head but preventing flow of fluid in the reverse direction; a second valve structure permitting fluid to flow from the pump cylinder into the fluid pressure chamber but preventing flow of the fluid in reverse direction; a release valve structure controlled by the rotational adjustment of the pump barrel in the ram head to permit fluid to return from the pressure chamber through the ram head to the fluid reservoir; and a reciprocable piston in said pump cylinder; load engaging elements mounted on said peripheral shoulder; and a head closing the outward end of the ram having an unobstructed air passage formed therein.

3. In a hydraulic device of the kind described: a tubular casing reduced in diameter at one end; a tubular ram extendable through the end of the casing and having a head closing its inner end; a pump cylinder extending through the reduced

diameter end of the casing in fluid tight sliding contact therewith and threaded into the head closing the inner end of the ram; a floating piston mounted in said tubular ram and constituting a movable wall; a reservoir of fluid carried in said ram between said movable wall and the head closing the inner head of the ram; a passage way through said ram head controlled by manipulation of the pump cylinder to enable fluid from between said ram head and the reduced diameter end of the casing to flow into said reservoir; valve means enabling fluid to flow into said pump cylinder from the reservoir and out of the pump cylinder into the space between the ram head and the reduced diameter end of the casing, said valve means being effective to prevent reverse flow of the fluid; a reciprocable pump plunger in said pump cylinder and extending outwardly therefrom; and a head mounted on the outward end of the ram and formed to admit atmospheric pressure to the outer side of said floating piston.

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