June 16, 1942. J. KELLY ET AL 2,286,550

STANDING VALVE PULLER

Filed Feb. 10, 1941

FIG. 1.

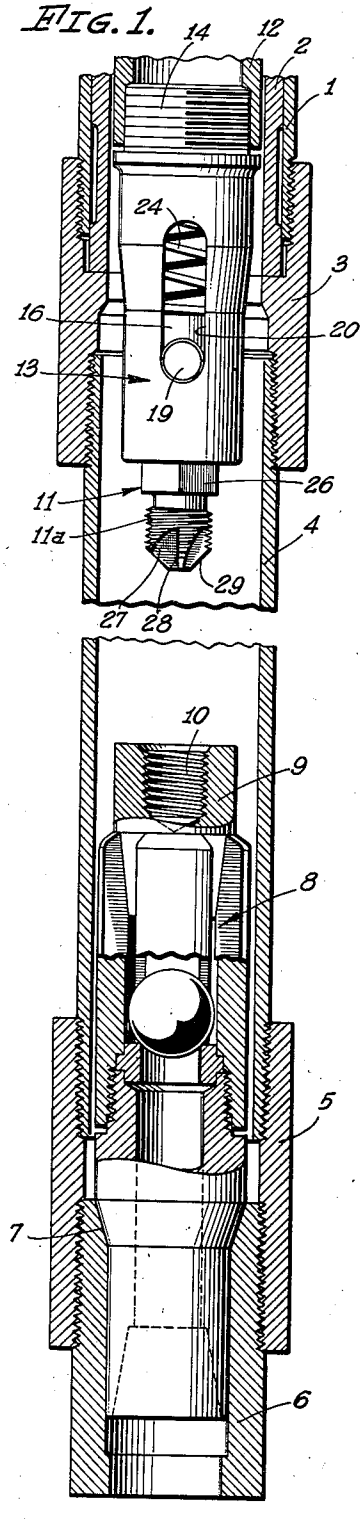


FIG. 2.

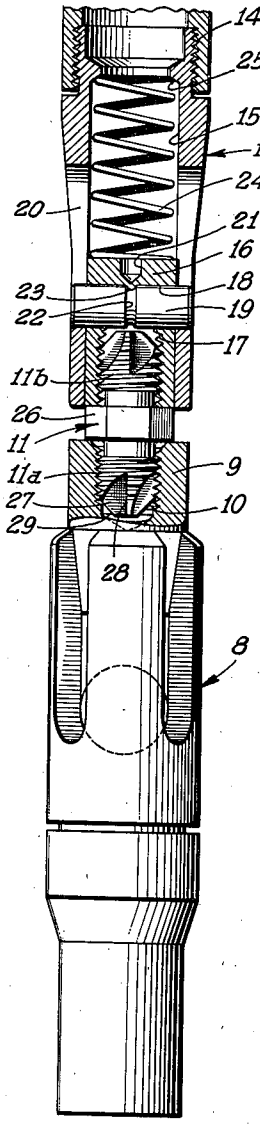
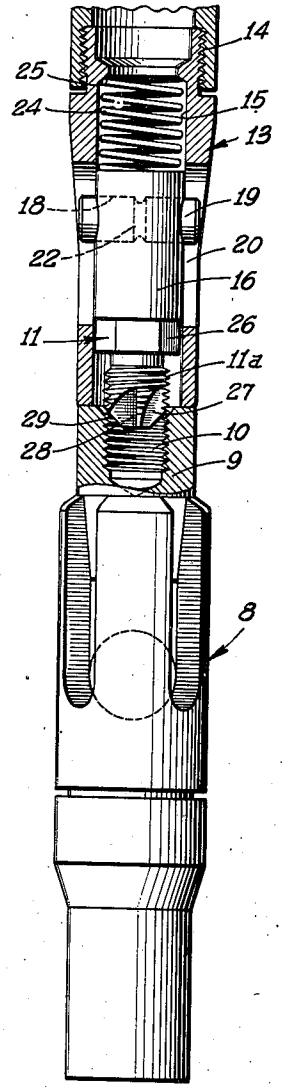


FIG. 3.



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STANDING VALVE PULLER

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Our invention relates to oil well pumps and has particular reference to a standing valve puller which may be attached to the lower end of a reciprocating pump plunger and employed for inserting or removing the standing valve of the pump.

It is common practice in the operation of oil well pumps to employ a standing valve puller which is carried by the lower end of the pump plunger and which includes a means which may be selectively operated to either connect the plunger to the standing valve of the pump when it is desired to remove the same to the ground surface for inspection and repair, or disconnect the plunger from the standing valve when the valve is re-inserted into the pump.

One of the simplest forms of the prior constructions included a box or female threaded element on the valve adapted to be engaged by a correspondingly threaded male member or pin secured to the pump plunger by means of which the plunger could be attached to or disengaged from the valve at will.

This form of the prior devices did not prove to be entirely satisfactory for the reason that the threaded box in the valve would in time become corroded, filled with sand and otherwise rendered incapable of attachment to the plunger pin, thus rendering the device inoperative. Furthermore, no means was provided for permitting the valve to be hammered securely into the tapered seat in which it was received by using the plunger as a hammer without damaging or destroying the threads on the plunger pin and in the valve box. Similarly, no means was provided for protecting these threads from damage resulting from the inadvertent hammering of the standing valve which occasionally results from unintended and unnoticed slippage between the pump rod and the pump operating mechanism.

When the threads of the valve box are so damaged or the valve puller is otherwise rendered inoperative, the valve can be renewed only by removing the plunger and fishing out the valve or by pulling the entire string of flow tubing. Both of these operations are laborious, time consuming, and expensive.

The present invention is directed to a box and pin type of standing valve puller which overcomes the above noted disadvantages and which, in addition, includes novel features of construction permitting the device to be readily and inexpensively manufactured and insuring long life and trouble-free operation.

It is, therefore, an object of our invention to provide a pin type of standing valve puller for use on oil well pumps which includes a means for cleaning corrosion, sand and other foreign material from the threaded box of the valve intended to be extracted through use of the valve puller.

It is also an object of our invention to provide a valve puller of the character set forth in the preceding paragraph in which the threaded pin which is carried by the plunger is formed as a tap, whereby the threads in the valve box may be cleaned and re-formed by merely screwing the pin into the box.

It is a still further object of our invention to provide a valve puller of the character set forth in the preceding paragraphs in which the pin is made double-ended, one end being threadedly engaged with the plunger and the other end projecting downwardly to engage the valve box, whereby the pin may be merely reversed to renew the threads on the box-engaging portion of the pin.

It is additionally an object of our invention to provide a valve puller of the character set forth in the preceding paragraph in which the pin portion is non-rotatably and telescopically mounted in a pin carrier secured to the pump plunger so that the pin may be teelscoped within the carrier to permit the carrier to be used as a hammer for driving the standing valve into seating relation with the tapered valve receiving seat.

Other objects and advantages of our invention will be apparent from a study of the following specifications, read in connection with the accompanying drawing, wherein:

Fig. 1 is a longitudinal sectional view of the lower portion of an oil well pump illustrating the standing valve as being received within the valve receiving seat and illustrating the lower end of the pump plunger as being equipped with a pin type of standing valve puller constructed in accordance with our invention;

Fig. 2 is a vertical sectional view similar to Fig. 1 but taken on the plane at right angles to the plane of Fig. 1 and illustrating the relative positions of the parts when the puller is connected to the standing valve for the purpose of inserting or removing the valve from the pump; and

Fig. 3 is a view similar to Fig. 2 but illustrating the manner in which the valve engaging pin portion of the puller may be telescopically received within the carrier or puller body to permit the carrier to be used as a hammer in driving

the standing valve into seating relation with the tapered valve receiving seat.

Referring to the drawing, we have illustrated in Fig. 1 the lower portion of a conventionally constructed oil well pump as including a pump barrel 1 lined with a suitable liner 2, the barrel 1 and liner 2 being secured to a collar or coupling 3 which serves to interconnect the barrel 1 with a pipe nipple 4. The nipple 4 is secured at its lower end as by means of a collar 5 to a standing valve supporting seat member 6 which is provided with a tapered seat 7 adapted to receive a correspondingly tapered portion of a standing valve 8.

The upper end of the standing valve 8 is provided with a boss or anvil 9 which is in turn bored and internally threaded as indicated at 10 to define a threaded box in the valve. This valve box is adapted to coact with a valve puller pin 11 to interconnect the standing valve 8 with a reciprocal pump plunger 12. The pin 11 may be secured to the lower end of the plunger 12 as by employing a puller body or pin carrier 13, the upper end of which is threaded as indicated at 14 to permit its attachment to the plunger 12 as by means of corresponding threads formed on the interior of the plunger bore.

The valve puller body 13 is preferably internally bored as indicated at 15 in Fig. 2 to slidably receive a guide block 16 which is in turn bored and threaded as indicated at 17 to permit attachment thereto of the valve puller pin 11. The block 16 is preferably held against rotation relative to the carrier 13 and is accordingly transversely bored as indicated at 18 to receive a cross pin 19, the outwardly projecting ends of which are received in longitudinally extending slots 20 formed in the walls of the carrier 13.

Loss of the cross pin 19 may be avoided by securing the cross pin 19 to the guide block 16, and we have illustrated in Fig. 2 a novel, simple and inexpensive form of construction for accomplishing this purpose. According to the present invention, the upper portion of the guide block 16 is counter-bored as indicated at 21 and the central portion of the cross pin 19 is circumferentially grooved as at 22. After the parts are assembled in the manner illustrated in Fig. 2, a center punch or small drift punch may be inserted into the counter-bore 21 and employed to deform a portion 23 of the material of the guide block 16 in such manner as to cause it to penetrate into the circumferentially extending groove 22 and thus serve to lock the pin 19 against lateral movement in the bore 18. This construction serves to mount the guide block 16 for longitudinal sliding movement relative to the carrier 13 but holds the block 16 against rotation relative to the carrier.

The block 16 is preferably urged to a lowermost position such as that illustrated in Fig. 2 as by providing a compression spring 24 which is received within the bore 15 above the guide block 16, the lower end of the spring 24 bearing on the upper surface of the guide block 16 and the upper end of the spring 24 bearing against a shoulder 25 formed by internally constricting the bore 15 near the upper end thereof.

In order that the pin 11 may be readily renewed in case the threads thereon become damaged sufficiently to impair further use of the tool, the pin 11 is preferably made double-ended so as to provide a downwardly projecting pin portion 11*a* adapted to be threadedly engaged with the valve box 10 and an upwardly extending pin portion 11*b* which provides the threaded engagement between the pin 11 and the guide block 16. The portions 11*a* and 11*b* are preferably made identical so that the pin 11 may be secured to the guide block 16 in either of two positions and the pin portions 11*a* and 11*b* are preferably separated by a polygonal portion 26 which may either comprise a squared or a hexagonal section to permit the use of a conventional wrench for the purpose of securing the pin 11 to the guide block 16.

As has been mentioned hereinbefore, the valve box 10 often becomes filled with sand and the threads thereof often become seriously corroded when the valve has been in operation for a considerable time. This condition serves to resist, and in some cases prevent, the establishment of a threaded engagement between the pin 11 and the box 10 if the pin is formed as an ordinary threaded stud. This disadvantage is overcome in the present construction by forming the pin portions 11*a* and 11*b* as thread cutting taps. This may be accomplished by providing in the pin portions 11*a* and 11*b* longitudinally extending flutes or channels 27 having one straight edge 28 serving to define a cutting edge on the tap. The channels 27 permit the material which is cut from the anvil 9 and the sand and corrosion which is cleaned from the threads 10 to be displaced and either received in the flutes 27 or conveyed by these flutes to a point outside of the box 10. In order to facilitate the tapping operation, the outward end of the portions 11*a* and 11*b* are preferably tapered as indicated at 29 in Fig. 1.

It will be observed that by this construction we have provided a pin 11 of such character that a threaded engagement with a standing valve may be accomplished by merely rotating the pin 11 even though the valve box 10 may be filled with sand or the threads thereof corroded to such an extent as to render a threaded connection to the standing valve 8 impossible with the conventional types of valve puller pins.

Our invention also provides for the protection of the threads in the valve box 10 and the threads on the pin 11 when the pump plunger 12 is to be used as a hammer for the purpose of driving the valve 8 into secure engagement with the tap 27, and also for preventing injury to these threads in case the lowermost point of the reciprocating travel of the pump is sufficiently low to cause engagement between the pin 11 and the box 10—a condition which sometimes obtains as a result of slippage between the pump rods and the pump operating mechanism at the ground surface.

Reference to Fig. 3 will indicate that if the plunger 12 is lowered a distance greater than that required to cause the pin 11 to engage the upper end of the anvil 9, the downward movement of the pin 11 and the guide block 16 will be arrested at the time this engagement occurs, whereas, the carrier 13 will continue its downward movement until such time as the lower end of the carrier strikes the upper surface of the anvil 9. This results from the fact that the pin carrying guide block 16 is slidably mounted within the carrier 13.

When the device of our invention is used to remove the standing valve from the pump construction, the plunger 12 is lowered from a position such as that illustrated in Fig. 1 to a position such as that illustrated in Fig. 3. Thereupon the sucker rods are rotated so as to rotate

the pump plunger and the pin 11 in such direction as to cause the pin to be screwed into the box 10 as is illustrated in Fig. 2. After this threaded engagement with the standing valve 8 is accomplished, the sucker rods may be elevated to pull the plunger 12 and the standing valve upwardly through the flow tubing to the ground surface.

The reverse operation is performed when it is desired to re-insert the standing valve, the plunger with valve attached being lowered through the flow tubing until the valve 8 is received within its seat 7. The plunger 12 may then be reciprocated through a very short stroke so as to cause a hammering impact to occur between the carrier 13 and the upper surface of the anvil 9 so as to wedge the standing valve 8 into the tapered seat 7 sufficiently to permit the sucker rod string to be rotated and unscrew the pin 11 from the box 10. After the pin 11 is disengaged from the box 10, the plunger 12 may be reciprocated through a longer stroke so as to forcibly hammer the standing valve 8 into the tapered seat 7 and firmly secure the valve 8 within the pump structure, this hammering operation being permitted by the telescopic mounting of the pin 11, whereby the pin is pushed upwardly into the interior of the carrier 13 in the manner illustrated in Fig. 3 when the hammering impacts are delivered by the plunger.

From the foregoing it will be observed that we have provided a standing valve puller of extremely simple construction and that we have included in such construction a means permitting the cleaning of sand, corrosion and other foreign material from the valve box 10, whereby the interconnection between the pump plunger and the standing valve may be effected even though the box 10 is seriously corroded or filled with sand.

Occasionally an installation may be encountered where the tendency of the standing valve box to become filled with foreign material is excessive as, for example, where the fluid which is pumped by the pump carries an excessive amount of sand. Under such circumstances it is perhaps advisable to associate the pin 11 with the standing valve rather than with the puller body 13. Under these conditions the double-ended pin 11 would be normally secured in the valve box 10 so as to present an upwardly directed male threaded portion 11b.

When it is desired to remove the standing valve, the puller body may be lowered and rotated in the manner hereinbefore described to provide the desired threaded connection between the upwardly directed end 11b of the pin 11 and the threaded box 17 which is formed in the guide block 16. By disposing the parts in these relative positions, less difficulty is encountered in interconnecting the puller body with the standing valve since the downwardly directed box 17 is subject only to corrosion and incrustation and will not become filled and packed with sand or other foreign material, such corrosion and incrustations as are formed in the box 17 being readily removed by the thread cutting tap comprising the pin end 11b.

Attention is directed to the fact that the provision of a pin 11 which is formed as a double-ended pin permits the threads which are employed for the purpose of inter-engaging the puller body and the standing valve to be readily renewed by the mere operation of reversing the normal position of the pin. In this connection attention is directed to the provision of the polygonal portion 26 which permits the use of a wrench for attaching the pin 11 to the guide block 16 or to the anvil portion 9 of the standing valve with sufficient firmness to prevent any relative rotation between the pin and the member to which the pin is normally secured.

Attention is furthermore directed to the fact that by means of the telescopic construction above described, injury to the threads of the pin 11 and in the valve box 10 are avoided in case the plunger is either deliberately or inadvertently lowered a distance sufficient to cause engagement between the puller and the standing valve.

While we have shown and described the preferred embodiment of our invention, we do not desire to be limited to any of the details of construction shown or described herein, except as defined in the appended claims.

We claim:

1. In a device for pulling a standing valve having an upwardly directed threaded valve box, the combination of: a puller body; and a double-ended pin including one downwardly projecting threaded end for engaging said valve box and an opposite end threadedly secured to said body, said ends of said pin being identical and formed as thread cutting taps, whereby said pin may be reversed to dispose said opposite end in a position to engage said valve box.

2. In a device for pulling a standing valve having an upwardly directed threaded valve box, the combination of: a puller body; and a double-ended pin including one downwardly projecting threaded end for engaging said valve box and an opposite end threadedly secured to said body, said ends of said pin being identical and spaced from each other by a central portion of polygonal cross section, whereby said pin may be reversed to dispose said opposite end in a position to engage said valve box and a wrench may be engaged with said central portion to secure said pin to said puller body.

3. In a device for pulling a standing valve having an upwardly directed threaded valve box, the combination of: a puller body having a longitudinally extending bore formed therein and having a pair of oppositely positioned longitudinally extending slots communicating between said bore and the exterior of said body; a guide block slidably received in said bore having a transversely extending aperture formed therein; a cross pin received in said aperture and extending into each of said slots for holding said block against rotational movement relative to said body; and a downwardly projecting threaded pin secured to said block, said pin being formed as a thread cutting tap.

4. In a device for pulling a standing valve having an upwardly directed threaded valve box, the combination of: a puller body having a longitudinally extending bore formed therein and having a pair of oppositely positioned longitudinally extending slots communicating between said bore and the exterior of said body; a guide block slidably received in said bore having a transversely extending aperture formed therein; a cross pin received in said aperture and extending into each of said slots for holding said block against rotational movement relative to said body, said cross pin having a circumferentially extending groove formed in the central portion thereof; means securing said cross pin against transverse movement relative to said block comprising a portion of said block deformed

into said groove; and a downwardly projecting threaded pin secured to said block, said pin being formed as a thread cutting tap.

5. In a device for pulling a standing valve having an upwardly directed threaded valve box, the combination of: a puller body; and a double-ended pin including one downwardly projecting threaded end for engaging said valve box and an opposite end threadedly secured to said body, said ends of said pin being identical and spaced from each other by a central portion having a transverse width greater than the diameter of the threaded ends thereof and defining shoulders at the junction of said central portion with said threaded ends, whereby said pin may be reversed to dispose said opposite end in a position to engage said valve box and locked in either position by screwing one of said threaded ends into said body sufficiently to engage one of said shoulders with said body.

6. In a device for pulling a standing valve having an internally threaded upwardly directed opening, the combination of: a puller body having an internally threaded downwardly directed opening; and a double-ended pin including oppositely directed threaded ends adapted to threadedly engage said internally threaded openings, said ends of said pin being identical and formed as thread cutting taps, whereby said pin will be normally engaged with one of said threaded openings and engageable with the other for the purpose of attaching said puller body to said standing valve.

7. In a device for pulling a standing valve having an internally threaded upwardly directed opening, the combination of: a puller body having an internally threaded downwardly directed opening; and a double-ended pin including oppositely directed threaded ends, one of which is normally engaged with said upwardly directed opening in said standing valve and the other of which is engageable with the other of said threaded openings for the purpose of attaching said puller body to said standing valve, said ends of said pin being identical and formed as thread cutting taps, whereby said pin may be reversed to dispose said opposite end in a position to engage said threaded opening in said puller body.

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