June 18, 1929. L. F. DAVIS 1,717,497

STANDING VALVE INSERTER AND PULLER

Filed June 10, 1926

FIG. 1.

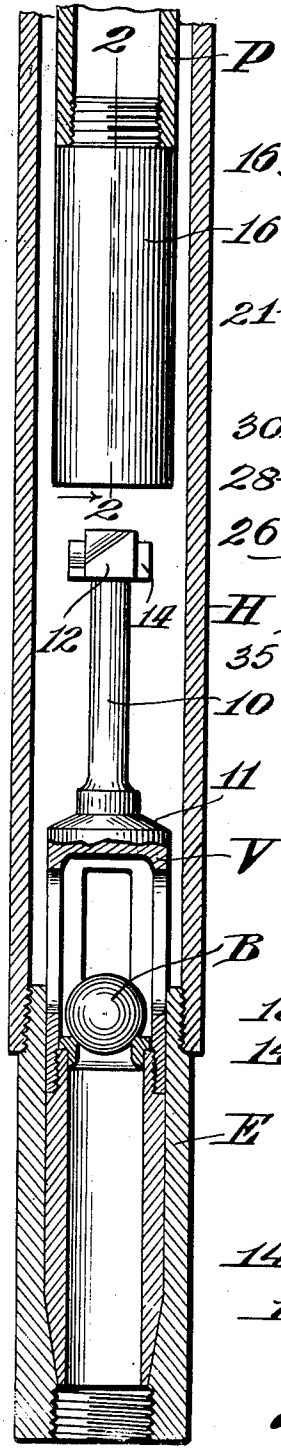


FIG. 2.

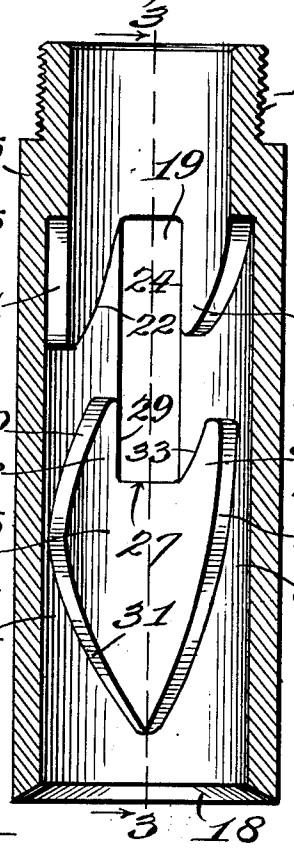


FIG. 3.

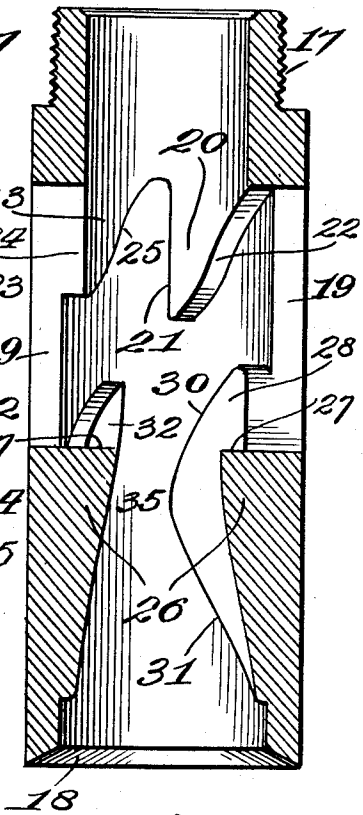


FIG. 4.

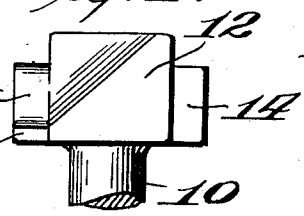


FIG. 6.

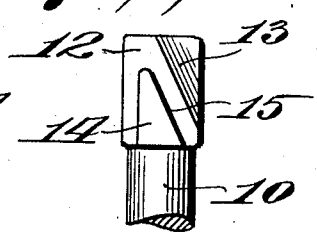
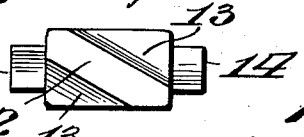


FIG. 5.



INVENTOR,
Lewis F. Davis.
By Martin P. Smith, Atty.

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UNITED STATES PATENT OFFICE

LEWIS F. DAVIS, OF SANTA ANA, CALIFORNIA.

STANDING VALVE INSERTER AND PULLER.

Application filed June 10, 1926. Serial No. 114,892.

My invention relates generally to deep well oil pumps and more particularly to a standing valve inserter and puller.

It will be understood that practically all deep well oil pumps employ a standing valve that occupies a fixed position within the lower portion of the valve housing and a working valve that is carried by the reciprocating pump plunger. For various reasons it is necessary to frequently disengage and withdraw from the well the standing valve and it is the primary object of my invention to provide relatively simple and efficient means for withdrawing the standing valve and likewise for inserting the same in proper position within the lower portion of the pump housing.

Further objects of my invention are to generally improve upon and simplify the construction of the existing forms of standing valve pullers and inserters; further, to provide a device of the character referred to that is positively connected to or disconnected from the stem of the standing valve as a result of right hand rotary motion imparted to the pulling and inserting device by the sucker rod and the pump plunger to which the puller and inserter is connected; and further, to provide a standing valve pulling and inserting device that possesses superior advantages in point of simplicity, durability and general efficiency.

With the foregoing and other objects in view, my invention consists in certain novel features of construction and arrangement of parts that will hereinafter be more fully described and claimed and illustrated in the accompanying drawing, in which—

Fig. 1 is a vertical section through the lower portion of a deep well pump housing and showing the standing valve and my improved standing valve pulling and inserting device positioned therein.

Fig. 2 is an enlarged vertical section taken on the line 2—2 of Fig. 1.

Fig. 3 is a vertical section taken on the line 3—3 of Fig. 2.

Fig. 4 is an elevational view of the head that is formed on the upper end of the stem of the standing valve.

Fig. 5 is a plan view of the head that is formed on the upper end of the standing valve stem.

Fig. 6 is an end elevational view of the standing valve stem head.

Referring in detail to the drawings, H designates the pump housing within which is arranged for operation the usual plunger P and secured to and depending from the lower end of the housing H is a cylindrical end piece E that serves as a housing, and seat for the lower cylindrical portion of the standing valve housing V, and which latter encloses the usual valve member, preferably a ball B.

In order that the standing valve may be readily handled by my improved inserting and pulling device, an axially arranged stem 10 is formed integral with and projects upwardly from the upper end of the valve housing V, there being an inclined shoulder 11 formed between the lower portion of said stem and the body of said housing. Formed integral with the upper end of stem 10 is a head 12 substantially rectangular in form and oppositely disposed upper corners of this head are cut away as designated by 13 in order to provide clearance between the head and certain portions of the pulling and inserting device as will be hereinafter more fully described.

Formed integral with and projecting outwardly from the ends of head 12 are vertically disposed lugs 14 and the upper portion of each lug on one side thereof is cut away as designated by 15 for clearance purposes when the head is engaged by the combined pulling and inserting member.

The pulling and inserting member contemplated by my invention comprises a short tubular body 16, the upper end of which is externally threaded as designated by 17 in order that it may be detachably connected to the lower end of the pump plunger P and the lower end of the wall of the tubular member 16 is beveled as designated by 18 to correspond with the inclined shoulder 11 at the upper end of the standing valve housing V.

Formed in the wall of member 16 intermediate its ends are oppositely arranged vertically disposed slots or openings 19, and formed on the inner face of member 16 immediately adjacent to the left hand side of the upper portion of each opening is a lug 20 having a straight vertically disposed side face 21 that is disposed approximately 90° from the plane occupied by the slots 19 and the opposite edge 22 of this lug extends from the lower end of said straight vertically dis-

posed edge 21 upwardly at an angle and terminates at the adjacent upper corner of the slot or opening 19.

Formed on the inner face of member 16 immediately adjacent to the upper right hand portion of each opening is a lug 23, the left hand edge 24 of which is vertically disposed and coincident with the upper right hand edge of the adjacent opening and from the lower end of said straight vertically disposed edge 24, the opposite side edge 25 of the lug 23 extends from the lower end of edge 24 upwardly to the upper end of the straight vertical edge 21 of lug 20.

Lug 20 is slightly longer than lug 23 so that its lower end occupies a horizontal plane a short distance below the plane occupied by the lower end of lug 23.

Formed integral with the inner face of the wall of cylindrical member 16 below each opening 19 is a lug 26 and the upper ends of these lugs occupy horizontal planes coincident with the plane occupied by the lower ends of the openings 19, thereby forming straight horizontally disposed shoulders 27 that project inwardly from the lower ends of said openings 19. A portion of each lug 26 extends upwardly immediately adjacent to the lower left hand portion of each opening 19 as designated by 28 and the right hand edge of this upwardly projecting portion is straight and coincident with the corresponding edge of the opening, as designated by 29. The opposite or left hand edge 30 of each upwardly projecting portion 28 is inclined so as to lie substantially parallel with the inclined edge 22 of the adjacent lug 20 and the lower end of said inclined edge 30 terminates in the same vertical plane with the straight vertical edge 21 of the adjacent lug 20. From the lower end of the inclined edge 30 of the lug 28, the edge at the left hand side of lug 26 extends downwardly and toward the right hand to form an inclined edge 31 that terminates on the inner face of member 16 at a point substantially in line with a line that passes vertically through the center of opening 19.

Projecting upwardly from the upper right hand portion of lug 26 is a lug 32, the left hand edge 33 of which is inclined to correspond with the inclination of the edge 25 of lug 23 and the right hand edge 34 of this lug 32 extends downward and gradually toward the opposite edge 31 of the lug 26 until it meets the lower end of edge 31. Thus the downward continuation of the right hand edge 34 of lug 32 forms the right hand edge for the lower portion of lug 26.

Lugs 28 are slightly longer than lugs 32 so that the upper ends of said lugs 28 terminate in a horizontal plane slightly above the horizontal plane occupied by the upper ends of said lugs 32.

As a result of the lug formation just described, the interior of the pulling and inserting member 16 is provided with a pair of oppositely arranged vertically disposed grooves or channels 35 that extend from points between the lower ends of the lugs 26 upwardly between the lugs 28 and 32, and the upper ends of said vertical grooves or channels terminating between the upper portions of the lugs 20 and 23, and said vertically disposed grooves or channels having communication with the vertically disposed spaces coincident with the openings 19, through the openings between the adjacent ends of lugs 20 and 28 and 23 and 32.

In the operations incident to the inserting of the standing valve in the lower portion of the pump housing, the stem 10 of the standing valve is inserted in the cylindrical member 16 and manipulated so that the under faces of lugs 14 rest upon shoulders 27 at the upper ends of lugs 26. The pump plunger carried by the lower end of the sucker rod and carrying the standing valve is now lowered into the well until the standing valve housing is positioned in end piece E and to drive the housing into said end piece so that it will be firmly seated therein, the sucker rod carrying the plunger P and cylinder 16 may be dropped with hammering movement until the beveled lower end 18 of member 16 strikes against the inclined shoulder 11 and a few strokes of this hammering action will very firmly drive the standing valve housing into end member E.

It will be understood that when the standing valve housing is connected to member 16 for the purpose of lowering the standing valve into the well and the lugs 14 are resting on shoulders 27, there is a space of an inch or two between the beveled lower end 18 of member 16 and the shoulder 11 and thus the hammering action just described may be readily accomplished. During this hammering action to secure the standing valve housing in end member E, the shoulders 27 on member 16 move downwardly away from the lugs 14 until the beveled face 18 strikes shoulder 11, and this action is permitted due to the opening in the interior of member 16 above said shoulders 27.

After the standing valve housing has been driven to its seat in end member E as just described with bevel face 18 resting firmly upon the corresponding bevel face 11 and it is desired to detach the inserting member from the standing valve shank, the sucker rods that are connected to pump plunger P and which extend to the top of the well are turned or rotated toward the right hand approximately three turns to every thousand feet of rod in the well. When sufficient right hand rotary tension has been applied to the rods to overcome the friction offered by the pump plunger and also the friction offered between the contacting beveled sur-

faces 18 and 11 the curved surfaces 22 will engage the lugs 14 on shank 10 and following this engagement the rods are elevated so as to draw pulling member 16 upward, and under rotary tension the lugs 14 follow the curved faces 22 of lugs 20 until the uppermost points of said lugs 14 pass beneath the lowermost points of lugs 20, and at this time the lower portions of the lugs 14 are engaged by the adjacent side edges of the upwardly projecting lugs 32, which action in effect provides a stop to limit the relative rotary movement and position the parts so that the pulling member 16 may be drawn upwardly during which movement the lugs 14 pass through the channels 35.

In this connection it will be noted that the length of the lugs 14 is slightly greater than the vertical distance from the lower ends of lugs 20 and the upper ends of lugs 32. Otherwise the device would re-engage by reason of the rotary spring tension of the puller 16 and the rods which carry the pump plunger P to which the puller is connected.

Thus it will be seen that the release or disengagement of the combined inserting and pulling member from the shank of the standing valve is brought about by a downward movement of the inserter and puller relative to the standing valve and its shank and by a short right hand rotary movement imparted to the inserter and puller, which rotary movement immediately follows the upward movement.

To pull the standing valve from its seat in the end member E, the pulling and inserting member is lowered onto the shank 10 and head 12 until the lower end of said pulling and inserting member rests upon the shoulder 11. During this downward movement of the pulling and inserting member, the lugs 14 pass through the vertically disposed channels 35 and when the beveled edge 18 rests on shoulder 11, the lugs 14 occupy horizontal planes just above the upper ends of the lugs 32. The rods which carry the pump plunger P and puller and inserter 16 are now rotated toward the right hand to develop rotary spring tension, and when the friction of the plunger and the contacting surfaces 18 and 11 is overcome the curved side faces 25 of the lugs 23 will engage the lugs 14 and then the pulling member is raised until the lugs travel down the curved edges 25 and pass beneath the lowermost ends of said lugs 23. By reason of the fact that the lugs 14 are longer than the distance between the lowermost points of lugs 23 and uppermost ends of lugs 28 the lugs 14 will strike against the straight side faces 29 of said lugs 30, thus positioning said lugs 24 directly over the shoulders 27 and when this point is reached the rods and pulling member are elevated and through the engagement of the lugs 14 on the shoulders 27 the standing valve will be withdrawn from member E.

While the standing valve housing is being lowered into the well or drawn upwardly therefrom, it is practically impossible for said housing to become accidentally disengaged from the pulling and inserting member, for the lugs 14 that project from the ends of head 12 are resting on shoulders 27 between the pairs of lugs 28 and 32 and thus the standing valve is held against rotary movement while being elevated or lowered. If the housing and stem should be moved upward relative to the pulling and inserting member, a disengagement cannot be effected unless the housing is rotated approximately a quarter of a turn, and which action is practically impossible as long as there is nothing to hold the valve housing and its stem against rotary movement of the member 16.

The vertical movement of the pulling and inserting member 16 while the parts are being engaged or disengaged has no effect on the valve housing and its stem, that is, said housing and stem are not rotated as a result of the engagement of the member 16 and interlocking engagement between the two parts is effected solely by a vertical and partial rotary movement of member 16, and which latter, it will be understood, is carried by the lower end of the pump plunger and the sucker rod, and which latter is always rotated toward the right hand by the actuating mechanism at the top of the well.

Thus it will be seen that I have provided a standing valve inserting and pulling device that is relatively simple in construction, strong and durable, inexpensive of construction, capable of being readily manipulated when connected to or disengaged from the stem of the standing valve housing and said device being very effective in performing the functions for which it is intended.

It will be understood that minor changes in the size, form and construction of the various parts of my improved standing valve inserter and puller may be made and substituted for those herein shown and described without departing from the spirit of my invention, the scope of which is set forth in the appended claims.

I claim as my invention:

1. The combination with a standing valve housing and its stem, which stem is provided with a pair of oppositely disposed lugs, of a substantially tubular member adapted to receive said stem and its lugs, said tubular member being provided with a pair of oppositely disposed longitudinally extending channels that are adapted to be traversed by the lugs on the stem, two pairs of upwardly presented lugs on the interior

of the tubular member between the lower portions of the vertical channels therein, two pairs of depending lugs on the interior of the tubular member between the upper portions of the channels therein and which pairs of lugs and pair of channels are arranged so that said tubular member may only be connected and disconnected with said stem and lugs by a rotary movement of said tubular member toward the right hand followed by a short vertical movement of said tubular member and so that the lugs on the stem may move to the upper ends of the channels between the pairs of depending lugs without relative rotative effort of said stem or tubular member.

2. The combination with a standing valve housing and its stem, which stem is provided with a pair of oppositely disposed lugs, of a substantially tubular member adapted to receive said stem and its lugs, said tubular member being provided with a pair of oppositely disposed longitudinally extending channels that are adapted to be traversed by the lugs on the stem, two pairs of upwardly presented lugs on the interior of the tubular member between the lower portions of the vertical channels therein, two pairs of depending lugs on the interior of the tubular member between the lower portions of the channels therein the ends of the upwardly presented pairs of lugs being spaced apart from the ends of the depending lugs so as to permit the passage of the lugs on the stem between the lugs within the tubular member during relative rotary movement between said stem and tubular member and which pairs of lugs and pair of channels are arranged so that said tubular member may only be connected and disconnected with said stem and lugs by a rotary movement of said tubular member toward the right hand followed by a short vertical movement of said tubular member, and so that the lugs on the stem may move to the upper ends of the channels between the pairs of depending lugs without relative rotative effort of said stem or tubular member.

3. The combination with a standing valve housing and its stem, which stem is provided with a pair of oppositely disposed lugs, of a substantially tubular member adapted to receive said stem and its lugs, said tubular member being provided with a pair of oppositely disposed longitudinally extending channels that are adapted to be traversed by the lugs on the stem, two pairs of upwardly presented lugs on the interior of the tubular member between the lower portion of the vertical channels therein the upper ends of the members forming each pair of upwardly presented lugs occupy different horizontal planes, two pairs of depending lugs on the interior of the tubular member between the lower portions of the channels therein which lugs and channels are arranged so as to permit the lugs on the stem to move through said channels to the inner ends thereof between the pairs of depending lugs without relative rotative effort on the part of said stem or tubular member the lower ends of the members of each pair of depending lugs occupying different horizontal planes and inwardly presented horizontally disposed shoulders formed between the members of each pair of upwardly presented lugs.

4. The combination with a standing valve housing having a stem and there being oppositely arranged lugs on said stem, of a substantially tubular member provided on its inner face with a pair of oppositely arranged longitudinally extending channels, pairs of spaced lugs formed on the inner face of the tubular member between said channels one member of each pair of lugs being longer than the other and which channels and pairs of lugs are arranged so that said tubular member is engaged with and disengaged from the stem by relative vertical movement of said stem or tubular member and by right hand rotary movement of the tubular member relative to said stem and inwardly presented horizontally disposed shoulders formed on the interior of the tubular member between the members of the lowermost pairs of lugs.

5. A standing valve inserting and pulling device comprising a substantially tubular member having formed on its inner face a pair of oppositely arranged longitudinally extending channels, spaced pairs of upwardly presented lugs formed on the interior of the tubular member between said channels one member of each pair of lugs being longer than the other and spaced pairs of downwardly presented lugs formed on the inner face of the tubular member between said channels and one member of each pair of downwardly presented lugs being longer than the other.

6. A standing valve inserting and pulling device comprising a substantially tubular member having formed on its inner face a pair of oppositely arranged longitudinally extending channels, spaced pairs of upwardly presented lugs formed on the interior of the tubular member between said channels one member of each pair of lugs being longer than the other, spaced downwardly presented lugs formed on the inner face of the tubular member between said channels one member of each pair of downwardly presented lugs being longer than the other and inwardly presented shoulders formed on the interior of the tubular member between said upwardly presented lugs.

7. A standing valve inserting and pulling device comprising a substantially tubular member having formed on its inner face a

pair of oppositely arranged longitudinally extending channels, spaced upwardly presented lugs formed on the interior of the tubular member between said channels, spaced downwardly presented lugs formed on the inner face of the tubular member between said channels and one member of each pair of the upwardly and downwardly presented lugs being longer than the other to provide a stop for engaging a part of the standing valve to which the inserting and pulling device is applied when said inserting and pulling device is rotated toward the right hand.

8. The combination with a standing valve housing and its stem, which stem is provided with an oppositely disposed pair of lugs, of a substantially tubular member provided with internally arranged channels and pairs of lugs that are arranged so that said tubular member and stem are interlocked by a relative vertical movement of the tubular member or stem and a subsequent right hand rotary movement imparted to said tubular member and one member of each pair of lugs being longer than the other to provide a stop for limiting the rotary movement of said tubular member.

9. The combination with a standing valve housing and its stem, which stem is provided with an oppositely disposed pair of lugs, of a substantially tubular member provided with internally arranged channels and pairs of lugs that are arranged so that a disengagement of the stem and tubular member may be effected by a relative vertical movement between the stem and tubular member, a partial right hand rotary movement of the tubular member relative to the stem and relative vertical movement between said stem and tubular member and one member of each pair of lugs being longer than the other to provide a stop for limiting the rotary movement of said tubular member.

10. A coupling device for standing valves, comprising relatively telescopic and rotative parts, one of which has a pair of lugs and the other of which has a pair of bearing seats for the lugs in one position of the parts, said seats being angularly spaced to provide clearance channels for the lugs and an annular series of guide cams opposed to and spaced from the said seats to permit rotation of the lugs in one direction only to and from the seats, said cams presenting clearance pockets in alignment with the said channels, whereby said lugs may pass into said channels and thence to the pockets without any rotative effort of the cams on the lugs when the parts are telescoped.

11. A coupling device for standing valves, comprising relatively telescopic and rotative parts, one of which has a pair of lugs and the other of which has a pair of hearing seats for the lugs, said seats being angularly spaced to provide clearance channels for the lugs and an annular series of guide cams longitudinally spaced from the said seats and permitting rotation of the lugs in one direction only, said cams presenting clearance pockets in alignment with the said channels, said parts having mutual stop shoulders which are engageable before the said lugs can bottom in the pockets as the parts are telescoped.

12. A coupling device for standing valves, comprising relatively telescopic and rotative parts, one of which has a set of lugs and the other of which has a set of bearing seats for the lugs, said seats being angularly spaced to provide entrance channels for the lugs and an annular series of guide cams longitudinally spaced from the said seats and having longitudinal stop faces to prevent turning of the telescoped parts in a reverse direction, said cams presenting clearance pockets in alignment with the channels, said parts having mutual stop shoulders which limit the movement of the lugs into the said pockets.

In testimony whereof I affix my signature.

LEWIS F. DAVIS.