April 11, 1939. C. D. HATHCOCK 2,154,331

HYDRAULIC PUMP

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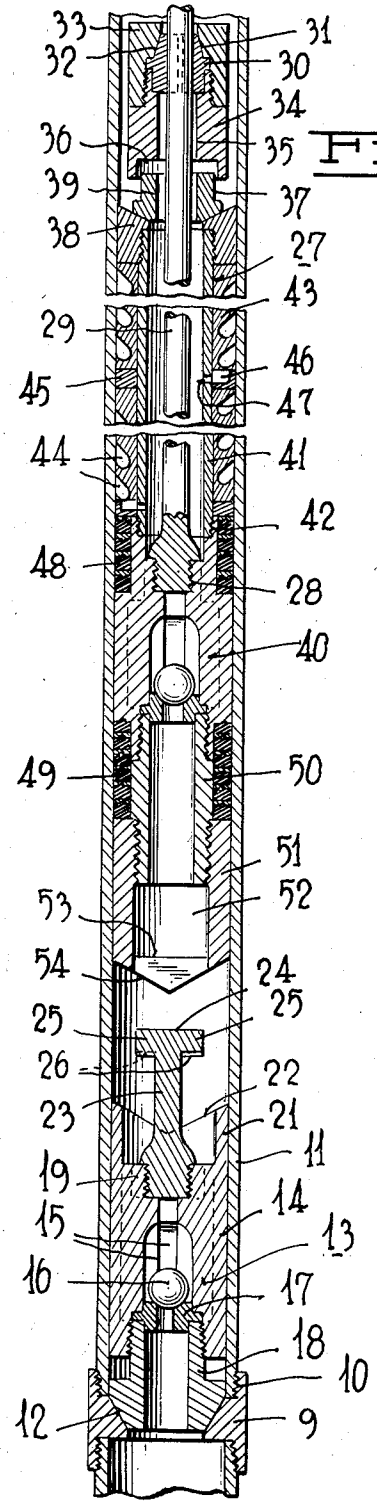
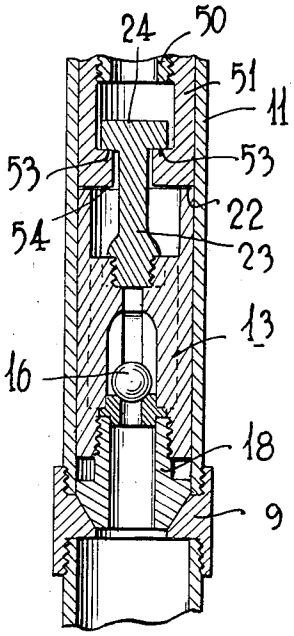


Fig. 1.

Fig. 2.



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Fig. 3.

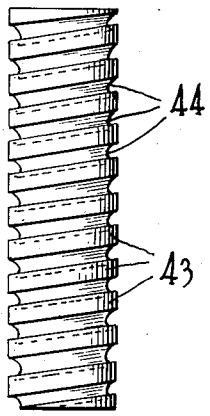


Fig. 4.

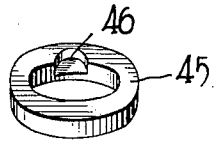


Fig. 5.

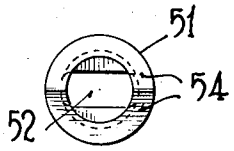


Fig. 7.

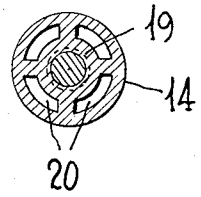


Fig. 6.

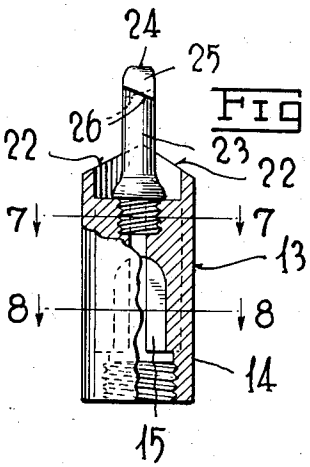
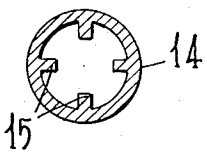


Fig. 8.



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HYDRAULIC PUMP

Craven D. Hathcock, Oklahoma City, Okla.

Application February 9, 1938, Serial No. 189,647

11 Claims. (Cl. 103—225)

This invention relates to improvements in reciprocating pumps for oil or water wells.

One of the objects of the invention is the elimination entirely of hazards caused and difficulties encountered by sand silicates or other abrasive matter which invariably exists in all oil or water wells, and particularly in deep oil wells. Attempts have been made heretofore to overcome the wear and other disadvantages caused by such contaminations, by using different composition cups, leathers and even oil grooves with a view of procuring a fluid seal between the plunger and working barrel to avoid a noticeable slippage, but as such means readily become worn, they are rendered useless, necessitating expensive repairs and replacements.

Other objects of the invention are to provide novel means for flexibly attaching the sucker rod string to the plunger unit; to furnish an improved standing valve having fluid passageways so arranged as to prevent any accumulation of sand therein; and to supply a novel travelling valve.

A further object is to furnish a novel pump barrel and plunger provided with means for conducting the sand and other gritty material which accumulates above the plunger and between the plunger and the inner surface of the barrel, into the interior of the plunger during reciprocation of the latter, whereby such gritty material is transferred from the well in suspension in the liquid, so as to prevent scoring of the periphery of the plunger and the bore of the barrel.

With the foregoing objects outlined and with other objects in view which will appear as the description proceeds, the invention consists in the novel features hereinafter described in detail, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

In the drawings,

Fig. 1 is a vertical sectional view partly in elevation, of my improved pump with the plunger at the lower end of its downward stroke.

Fig. 2 is a fragmentary vertical sectional view partly in elevation, of the pump, but showing the plunger in an abnormally lowered position and in engagement with the garbot of the standing valve, to illustrate the manner of displacing or removing the latter.

Fig. 3 is a side elevation of a grooved sleeve forming part of the plunger assembly.

Fig. 4 is a perspective view of a spacing ring or sand retainer forming part of the plunger assembly.

Fig. 5 is a top plan view of the standing valve.

Fig. 6 is a side elevation, partly in vertical section, of the standing valve.

Figs. 7 and 8 are horizontal sectional views of the standing valve, taken respectively on the lines 7—7 and 8—8 of Fig. 6.

Referring to the drawings, 9 designates a conventional bottom shoe which has a threaded connection at 10 with the lower end of the working barrel 11. The shoe forms a seat 12 for the lower end of a standing valve unit 13. In accordance with the present invention, the standing valve consists of an imperforate tubular body 14 having vertically disposed internal ribs 15 forming a cage for a valve member 16 which I prefer to be of ball-shape. Such valve member cooperates with a tubular seat 17 that is held in position by a conventional valve seat member 18 that is screwed into the body 13 and cooperates with the seat 12.

As best shown in Figs. 6 and 7, the upper end portion of the body 13 is provided with a spider 19 so as to form arc-shaped ports 20 that communicate with the interior of the valve cage and allow fluid from the well to flow through the standing valve.

The body 13 is provided at its top with a collar 21, the upper edge of which is cut or shaped to form diametrically opposite substantially V-shaped crotches 22.

A garbot pin 23 has its lower end screwed into the spider 19, and its head 24 is of T-shape to form oppositely extending arms 25 having under surfaces downwardly inclined in opposite directions, as indicated at 26.

The plunger assembly 27, in accordance with the invention, is secured at 28, preferably by means of a threaded joint, to the sucker rod string 29. The assembly preferably consists of a split sleeve 30, the sections of which have inclined or parti-conical surfaces 31 which are engaged by a frusto-conical portion 32 of the bore of a nut 33. This nut has a threaded connection with the upper end of a sleeve 34, which has a bore 35 of larger diameter than the diameter of the sucker rod string. It will be obvious that this construction allows the sleeve 34 to be adjustably secured to the rod string at various elevations, and allows some lateral play between the rod string and the surface of the bore 35.

The sleeve forms a socket 36 which acts as a guide for a tubular check valve 37 that cooperates with a seat ring 38. It will be observed that the bore 39 of the check valve is also of larger diameter than the sucker rod string. Conse-

quently, the valve is very loosely fitted around the sucker rod, and as it is guided only by the sleeve **34**, the construction forms a flexible joint at this point, allowing the check valve to seat properly, even if the sucker rod string should be crooked or out of center at this point, due to various causes. The check valve, properly spaced, also works in unison with the travelling valve **40**, and performs an important function when the pump is idle. Being flexibly mounted, it is properly seated at all times when the pump is not in motion, regardless of the position of the sucker rod, and consequently, it prevents the sand content in liquid above the check valve from settling back and interfering with the travelling valve.

The seat ring **38** is preferably screwed on to the upper end of a tubular member **41** that is connected at **42** to the travelling valve. The member **41** surrounds the tubing string, and it in turn is surrounded by one or more sleeves **43** which substantially fill the annular space between the member **41** and the inner surface of the barrell **11**. Each sleeve has a spiral groove **44**, as best shown in Fig. 3, and arranged at the lower end of each sleeve is a sand retaining ring **45** having a pocket **46** which communicates with the lower end of the groove. Consequently, any sand travelling down the groove will eventually enter the pocket **46** and will then pass through a port **47** in the member **41** to be carried upwardly by the pumped liquid.

The travelling valve **40** is similar in construction to the standing valve **13**, and the plunger assembly adjacent to the travelling valve is preferably provided with conventional packing rings **48** and **49**.

Threaded collars **50** and **51** are secured to the lower end of the travelling valve, and the collar **51** has a laterally elongated bore **52** to receive the head **24** of the garbot. Within this bore there are shoulders **53** (see Fig. 2), to cooperate with the inclined surfaces **26** when the plunger assembly is employed in lifting the standing valve.

The lower end of the member **51** is provided with diametrically opposite V-shaped edge portions **54** designed to engage the inclined surfaces **22** for the purpose of camming the shoulders **53** into engagement with the surfaces **26** when the plunger assembly is lowered sufficiently to interlock with the garbot pin **23** and the plunger assembly is turned about the vertical axis relatively to the standing valve **13**.

Referring again to the valve seat ring **38** above described, it will be observed that the outer edge of the inclined surface of this ring is sharpened and acts to scrape any lime or other sediment that may deposit on the barrel **11**. Thus, when the plunger assembly moves upwardly in the barrel, the seat ring **38** will act as a scraper against the inner wall of the barrel and maintain said wall free from lime or other sediment deposits that might accumulate on said wall during the upward travel of the oil.

From the foregoing it is believed that the construction, arrangement of parts and the operation of the pump will be clear to those skilled in the art, and it is obvious that changes may be made in the details disclosed, without departing from the spirit of the invention, as expressed in the claims.

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

1. A reciprocating pump plunger assembly for a well pump adapted to travel vertically in a working barrel and comprising a tubular plunger body having an upper valve seat and provided with an external spiral groove extending below said seat, a passageway placing said groove in communication with the bore of the body, a valve cooperating with said seat, and a travelling valve secured to the body and arranged below said spiral groove.

2. A reciprocating pump plunger assembly for a well pump adapted to travel vertically in a working barrel and comprising a tubular plunger body having an upper valve seat and provided with an external spiral groove extending below said seat, a passageway placing said groove in communication with the bore of the body, a valve cooperating with said seat, and a travelling valve secured to the body and arranged below said spiral groove, said spiral groove being arranged in a sleeve that is detachably secured to the plunger body.

3. A reciprocating pump plunger for a well pump arranged to travel vertically in a working barrel and comprising a tubular plunger body having spaced groups of external spiral grooves, means including ports in the body placing the lower ends of the grooves in communication with the bore of the body, a check valve cooperating with the upper end of said bore, and a travelling valve secured to the lower end portion of the body.

4. A reciprocating pump plunger for a well pump arranged to travel vertically in a working barrel and comprising a tubular body provided with a travelling valve, a string connected to said body, a tubular check valve arranged at the upper end portion of the body and surrounding said string, said valve having a bore of materially larger diameter than the string to allow the check valve to seat without interference by the string, and means for guiding the check valve.

5. A reciprocating pump plunger for a well pump arranged to travel vertically in a working barrel and comprising a tubular body provided with a travelling valve, a string connected to said body, a tubular check valve arranged at the upper end portion of the body and surrounding said string, said valve having a bore of materially larger diameter than the string to allow the check valve to seat without interference by the string, and means for guiding the check valve, the last mentioned means comprising a socket arranged at the upper end of the check valve and secured to the string.

6. A reciprocating pump plunger for a well pump arranged to travel vertically in a working barrel and comprising a tubular body provided with a travelling valve, a string connected to said body, a tubular check valve arranged at the upper end portion of the body and surrounding said string, said valve having a bore of materially larger diameter than the string to allow the check valve to seat without interference by the string, and means for guiding the check valve, the last mentioned means comprising a sleeve, means for adjustably connecting the sleeve to the string whereby the sleeve may be arranged at various elevations on the string, said sleeve having a socket at its bottom in which the check valve reciprocates.

7. A reciprocating pump plunger for a well pump arranged to travel vertically in a working barrel and comprising a tubular body provided with a travelling valve, a string connected to said body, a tubular check valve arranged at the upper end portion of the body and surrounding said string, said valve haing a bore of materially

larger diameter than the string to allow the check valve to seat without interference by the string, and means for guiding the check valve, the last mentioned means comprising a sleeve, means for adjustably connecting the sleeve to the string whereby the sleeve may be arranged at various elevations on the string, said sleeve having a socket at its bottom in which the check valve reciprocates, the bore of the sleeve being of materially greater diameter than the string.

8. In a well pump of the character described, a tubular plunger assembly provided at its lower end with internal shoulders and bottom cam surfaces, a standing valve arranged below the plunger and having a garbot provided with a head having oppositely extending arms adapted to be engaged by said shoulders for lifting the standing valve by upward movement of the plunger assembly, said standing valve having cam surfaces arranged below the head of the garbot pin and adapted to cooperate with the cam surfaces of the plunger assembly for camming said shoulders into engagement with said arms.

9. In a well pump of the character described, a tubular plunger assembly provided at its lower end with internal shoulders and bottom cam surfaces, a standing valve arranged below the plunger and having a garbot pin provided with a head having oppositely extending arms adapted to be engaged by said shoulders for lifting the standing valve by upward movement of the plunger assembly, said standing valve having cam surfaces arranged below the head of the garbot pin and adapted to cooperate with the cam surfaces of the plunger assembly for camming said shoulders into engagement with said arms, the bottom surfaces of said arms being inclined downwardly in opposite directions.

10. In a well pump of the character described, a tubular plunger assembly provided at its lower end with internal shoulders and bottom cam surfaces, a standing valve arranged below the plunger and having a garbot pin provided with a head having oppositely extending arms adapted to be engaged by said shoulders for lifting the standing valve by upward movement of the plunger assembly, said standing valve having cam surfaces arranged below the head of the garbot pin and adapted to cooperate with the cam surfaces of the plunger assembly for camming said shoulders into engagement with said arms, said cam surfaces being of substantially V-shape.

11. A reciprocating pump plunger assembly for a well pump adapted to travel vertically in a working barrel and comprising a tubular plunger body having an upper valve seat and provided with an external spiral groove extending below said seat, a passageway placing said groove in communication with the bore of the body, a valve cooperating with said seat, and a travelling valve secured to the body and arranged below said spiral groove, said valve seat having a sharply defined outer edge adapted to scrape the inner wall of the working barrel.

CRAVEN D. HATHCOCK.