

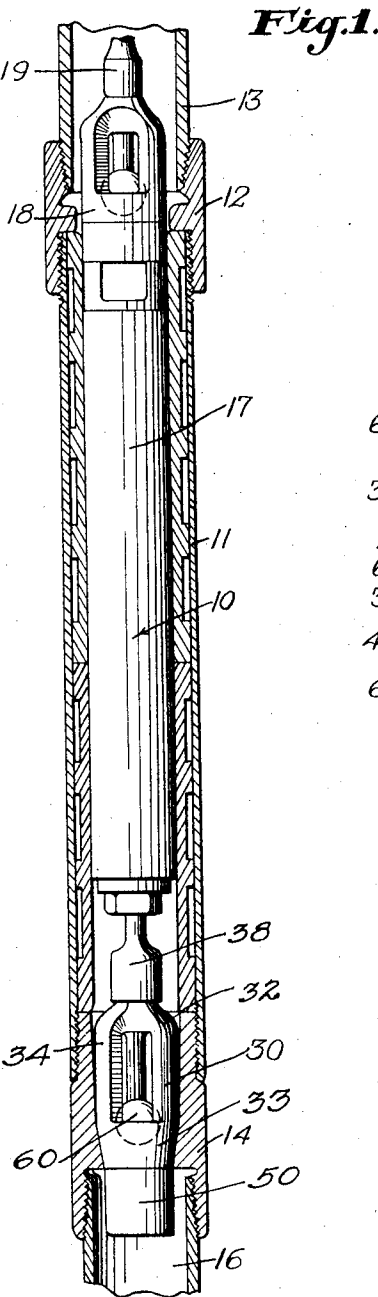
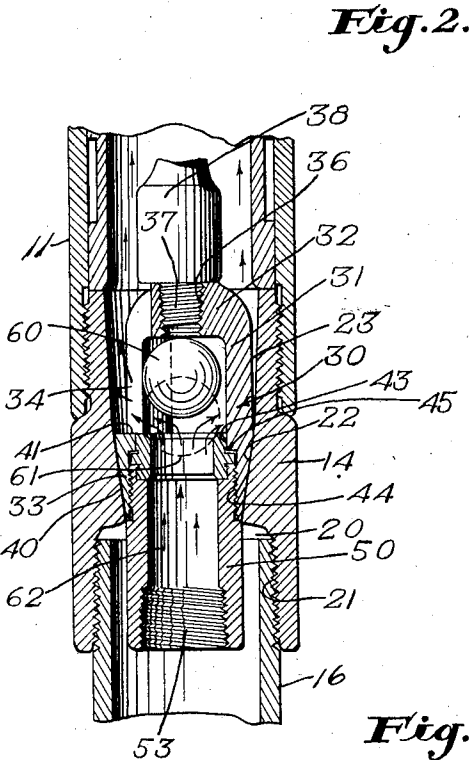
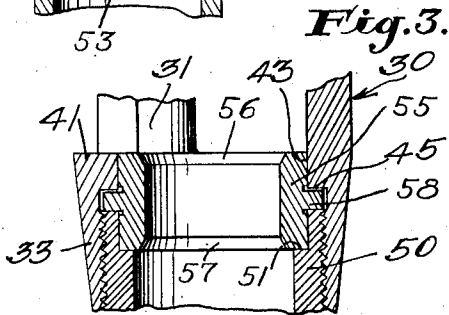
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STANDING VALVE CONSTRUCTION

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STANDING-VALVE CONSTRUCTION

Application filed July 23, 1927. Serial No. 208,005.

My invention relates to deep well pumping apparatus and more particularly to standing valve structures.

In pumping of wells, and particularly petroleum wells, a great amount of sand is carried by the pumped fluid. This is a handicap in many ways. One particularly damaging effect is the practical nullification of the merits of the Garbutt rod pump in which the standing valve is connected (with a suitable degree of lost motion) to the plunger of the pump so that (theoretically) the plunger and standing valve may be lifted to the surface on the string of sucker rods for inspection and repair. As at present constructed, the body of the standing valve of the Garbutt rod pump rests upon a seat formed in the lower collar of the pump barrel and extends upward a slight distance into the pump barrel. Thus any sand entering with the oil through the standing valve gradually settles between the upper portion of the standing valve body and the pump barrel, and packs solidly so as to effect what is known as "sanding in" of the standing valve. In other words, the standing valve cannot be moved by lifting on the sucker rods and in order to raise the working parts to the surface the pump tubing and sucker rods must be withdrawn in the same operation. This is an exceedingly unpleasant and difficult job which consumes much time and is very expensive.

It is an object of my invention to provide a standing valve which will not sand in.

A further object of my invention is to provide a standing valve with an interchangeable valve seat element.

Another object of the invention is to provide a standing valve adapted to be used in connection with a relatively short connecting collar for the pump barrel and intake pipe and provided with a seating member through which an unobstructed flow of liquid may be passed.

Further objects and advantages will be made manifest in the following description and in the accompanying drawings illustrating a preferred embodiment of my invention, in which—

Fig. 1 is a vertical sectional view of a well pump in which my invention is incorporated.

Fig. 2 is a vertical sectional detail view illustrating the standing valve structure of my invention.

Fig. 3 is a vertical sectional view illustrating in detail the ball seat ring of my invention.

Referring specifically to the drawings, the pump 10 shown in Fig. 1 has a barrel 11 which is attached by an upper collar 12 to the lower end of a string of pump tubing 13, and by a lower collar 14 to an intake pipe 16. A plunger 17 of the pump has a working valve 18 at its upper end which connects to a string of sucker rods 19 which extends upward through the pump tubing 13 to reciprocating means by which the plunger 17 is reciprocated in the barrel 11.

The lower collar 14 has a central opening 20 extending vertically through the collar. The lower portion of the opening 20 comprises a threaded cavity 21 which threadedly receives the upper end of the oil inlet pipe 16 so as to connect the collar to this pipe. The central portion of the opening 20 is provided with a tapered seat 22. The upper portion of the opening 20 may have a cylindrical surface 23 as indicated in Fig. 2, which tapers downward at a very slight angle.

The structure thus far described is standard in most of the Garbutt rod pumps in use in the oil fields. The novelty of my invention resides entirely in a standing valve 30 which may be described as follows.

A standing valve cage member 31 of the standing valve 30 includes a head 32 and a collar 33 which are connected by vertical bars 34. The head 32 is provided with a threaded hole 36 for receiving a threaded pin 37 of a Garbutt rod 38 which extends upward into the pump plunger 17 for the purpose of loosely connecting the standing valve 30 to the plunger 17 in the well known manner. The collar 33 is provided with a tapered exterior surface 40 which is complementary to the seat 22 so that the collar 33 makes a tight fit with this seat. As clearly shown in Fig. 2, the surface 40 extends vertically throughout the length of the collar 33 so that the upper sur-

face 41 of the collar 33 is substantially on a level with the upper extremity of the tapered seat 22. The collar 33 has a central bore 43 which extends downward from the surface 41 and which is of substantially the same diameter as the space embraced by the inner faces of the vertical bars 34. The bore 43 has a counterbore 44 formed in the lower portion thereof to provide a shoulder 45. The counterbore 44 is threaded and threaded receives the upper end of a tubular standing valve body 50. The upper end of the tubular body 50 has an annular internal recess 51 formed therein which is of the same diameter as the bore 43. The lower end of the tubular body 50 has internal threads 53 for the purpose of connecting a gas anchor thereto. A valve seat ring 55 has upper and lower seats 56 and 57 and an annular flange 58 which extends centrally from the outer surface thereof. The dimensions of the ring 55 permit it to be assembled between the cage 31 and the body 50, as clearly shown in Fig. 2, so that opposite ends of the ring 55 are snugly seated in the bore 43 and the recess 51 respectively. When the ring 55 is thus assembled, the annular flange 58 bears solidly against the shoulder 45 of the cage collar 33 and the upper face of the ring 55 is on the same level as the upper surface 41 of the collar 33. The ring 55 is symmetrical about a central transverse radial plane so that when one of the seats 56 or 57 has become worn, the standing valve structure 30 is disassembled and reassembled with the ring 55 in reverse position so that the other seat is disposed uppermost.

Confined in the space immediately above the seat ring 55 by the bars 34 is a ball 60, which is tapered to rest upon the uppermost seat of the seat ring 55, as shown by dotted lines 61, or be lifted by an upward flow of fluid of the standing valve structure 30 into the position in which it is shown in full lines in Fig. 2. When in dotted line position 61 the ball 60 will prevent a downward movement of fluid through the standing valve 30 and when it is raised into full line position of Fig. 2 it will direct a flow of fluid which passes upward through the ring 55 along the paths indicated by the arrows 62. It is to be especially noted that the fluid thus directed washes a space immediately above the upper edge of the tapered surface 40 of the cage collar 33. As the entire length of the surface 40 engages the tapered seat 22 of the collar 14, the extreme upper edge of the seat 40 also tightly contacts the seat 22, and as the space immediately above this edge is washed, as described, with each upward flow of fluid through the standing valve 30, there is no possibility of sand packing between the standing valve 30 and the collar 14 so as to sand the standing valve in place and prevent it being readily removed when desired.

While there is a slight space between each

of the vertical bars 34 and the surface 23 of the collar 14 in which sand might collect, there is sufficient washing action of the upward moving fluid around the bars 34 to prevent more than a very slight accumulation of sand in this space. Due to this fact, it is impossible for a sufficient amount of sand to accumulate between the bars 34 and the collar 14 to accomplish the sanding in of the standing valve 30. It is thus seen that the standing valve structure of my invention overcomes the handicap which formerly nullified the principal advantage of the Garbutt rod pumps and which provides a standing valve that cannot possibly become sanded in. Thus with the advent of the invention above described, the advantages of the Garbutt rod will be constantly available regardless of how large a quantity of sand may be carried by the oil in the well.

I claim as my invention:

1. In a deep well pump, the combination of: a barrel; a plunger in said barrel; a working valve; a collar provided upon said barrel, said collar having a tapered seat; a cage member having a base portion provided with a surface adapted to meet a surface of said seat to form a tight fit between said member and said collar, said base portion having a central bore; a valve seat ring disposed in said bore; valve means provided upon said member; and means for holding said valve seat ring in position in said bore.

2. In a deep well pump, a standing valve structure comprising: a collar having a tapered seat; a cage member having a tapered surface adapted to meet a surface of said seat to form a tight fit between said member and said collar; a valve seat ring carried by said cage member; a valve member adapted to seat on said valve seat ring; and means for detachably connecting said valve seat ring to said cage member.

3. In a deep well pump, a standing valve structure comprising: a collar having a tapered seat; a cage member having a tapered surface adapted to meet a surface of said seat to form a tight fit between said member and said collar; a valve seat member carried by said cage member, said seat member being formed with upper and lower seats; and means for holding said seat member in position in said cage member, said valve seat member being reversible.

4. In a deep well pump, a standing valve structure comprising: a collar having a tapered seat; a cage member having a tapered surface adapted to meet a surface of said seat to form a tight fit therewith; a valve ring carried by said cage member and having upper and lower seats; and a valve member adapted to seat upon said valve seat ring, said ring being adapted to be reversed to pro-

vide interchangeable seats for said valve member.

5 5. In a deep well pump, a standing valve structure comprising: a collar having a tapered seat; a cage member having a tapered surface adapted to meet a surface of said seat to form a tight fit therewith; a valve ring detachably connected to said member; upper and lower valve seats provided on said ring; a ball valve adapted to seat upon said seats, said valve ring being reversible to present either of said seats to said ball valve; and means for holding said valve ring in an adjusted position.

10 15 In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 20th day of July, 1927.

EARL J. CARNAHAN.

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