

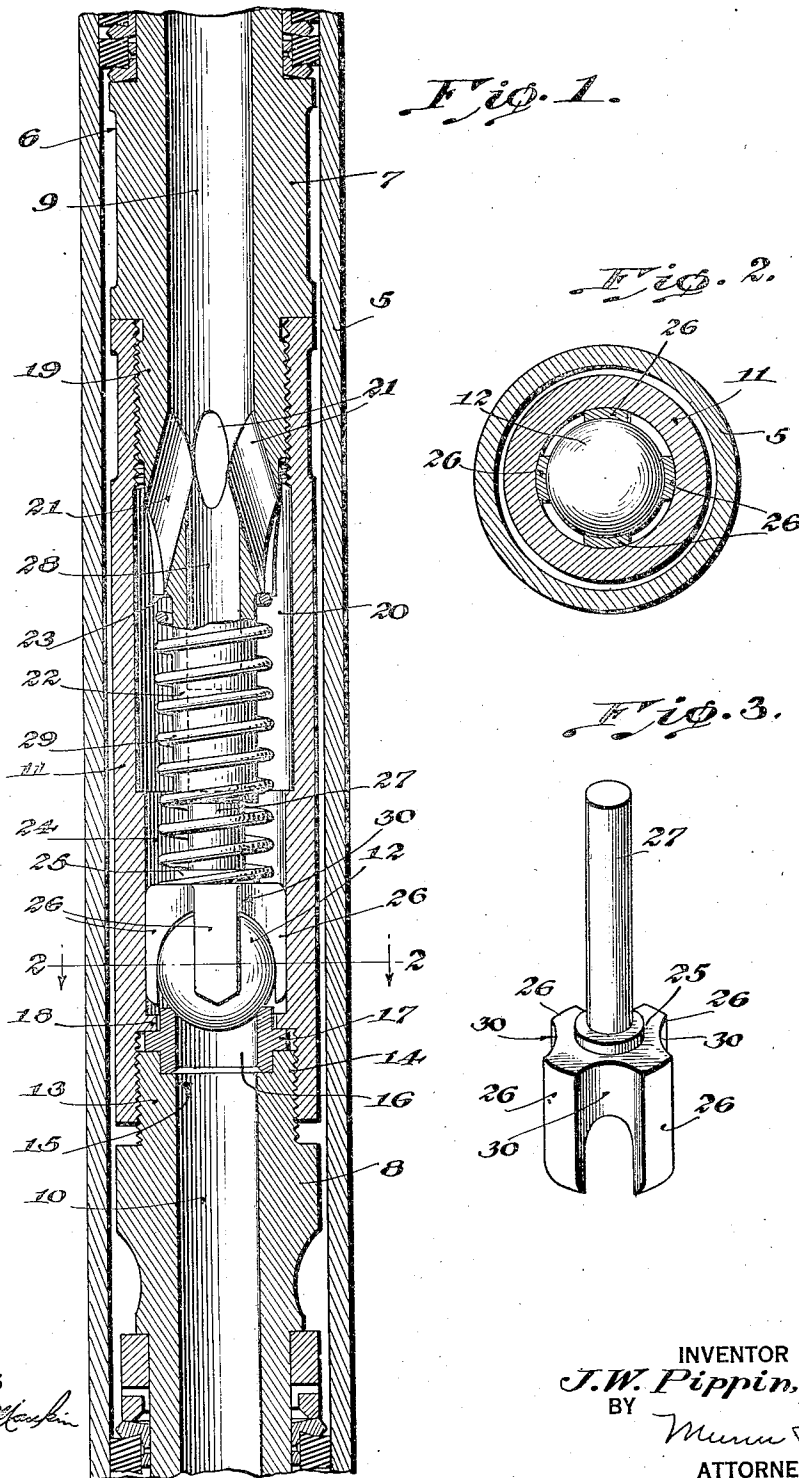
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VALVE FOR WELL PUMP PLUNGERS

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VALVE FOR WELL PUMP PLUNGERS

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1 Claim. (Cl. 251—121)

My invention relates to well pump plungers and particularly to an improved form of valve mechanism therefor.

It is a well known fact among oil men and other operators of wells that the well tubing and casing do not always extend into the earth in a true vertical path. It also happens, particularly in the deeper wells, that the casing will develop a curve when being sunk into the earth and will diverge from the true vertical path a considerable distance. Well operators have experienced great difficulty in the past in pumping oil from such curved wells, it having been of the common experience that it is almost impossible to keep a pump plunger satisfactorily working in such a well for more than two or three days at a time.

Heretofore, the only remedy for this condition has been to shorten the string of pump rods and operate the pump at a higher level, above the curvature in the tubing. Now it is also well known that a much larger flow of oil is induced by operating the pump plunger as far down into the well as possible. It will thus be seen that in addition to causing a large loss of time due to pulling the well to repair the plunger, a reduced production usually results due to the fact that it becomes necessary to operate the pump at a higher level.

I have found that the failure of pumps operating in curved wells is due to the fact that the travelling valve seat is usually pounded out on one side due to the fact that the pump is operating on an incline.

With these conditions in mind, it is a primary object of this invention to provide a pump plunger which will operate satisfactorily in curved wells as well as in straight wells.

It is a further object of the invention to provide a pump plunger which may be operated at any depth in a curved well regardless of the point of curvature with respect to the operating level of the pump.

A further object of the invention is to provide a valve for a pump plunger in which the ball element is at all times positively guided to its seat.

Another object of the invention is to provide a pump plunger in which the ball valve will be positively prevented from uneven wearing of the seat regardless of the inclination of the pump during operation.

A still further object of the invention is to provide a pump in which there will be an absolutely free flow of oil from above the valve cage.

Other objects and advantages, not specifically mentioned, will become apparent during the course of the following detail description when read in conjunction with the accompanying drawing which forms a part of this application, and in which:

Figure 1 is a vertical central section of a portion of a well pump plunger embodying my invention;

Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 1; and

Fig. 3 is a perspective view of my improved reciprocating valve cage.

Referring now to the drawing in detail, wherein like numerals refer to like parts throughout the same, 5 indicates a well tubing in which a reciprocating pump plunger 6 is operated in the usual manner. The pump plunger 6 includes a conduit section 7 and a conduit section 8 provided with centrally disposed liquid conduits 9 and 10 respectively. The conduits 7 and 8 are spacedly connected by means of a tubular sleeve 11 which forms a housing or chamber for the ball valve 12.

The conduit 8 terminates upwardly in a reduced end portion 13 which is threaded into the lower end of the sleeve 11 as at 14. The extreme upper end of the conduit 8 is provided with an annular seat 15 which surrounds the upper end of the bore 10 thereof. A valve seat 16 of conventional construction is seated on the upper end of the conduit section 8 and on the seat 15. The valve seat 16 is formed with an annular shoulder 17 which is clamped between the upper end of the conduit 8 and a shoulder 18 formed within the bore of the sleeve 11 at the inner terminus of the screw threaded portion at the lower end thereof. The conduit section 7 terminates in a downwardly extending stud 19 which is threadedly engaged within the upper end of the sleeve 11. The stud 19 is slightly reduced in diameter below the screw threaded portion thereof and projects into the upper portion 20 of the bore of the sleeve 11. A plurality of upwardly converging passages 21 place the vertical portion of the conduit 9 of the section 7 in communication with the upper portion 20 of the sleeve 11. The stud 19 is further reduced in diameter and is formed into a tubular depending sleeve 22 which extends an appreciable distance below the apertured portion of the stud. An annular shoulder 23 is formed at the juncture of the tubular depending projection 22 with the apertured portion of the stud 19.

The lower end of the bore or sleeve 11 is re-

duced in diameter as at 24, said reduced portion terminating at the annular shoulder 18. It will be noted that the valve seat 16 extends slightly above the shoulder 18 and into the reduced bore section 24. The ball valve 12 is positively guided in its vertical movement by means of a travelling guide or fingered cage 25. The inner faces of the fingers 26 of said cage and also the body portion thereof are spherically curved to produce a seat for the reception of the upper surface of the ball valve 12. The outer faces of the fingers 26 are formed and sized to have a snug sliding fit within the bore 24 as clearly shown in Fig. 2. It will be noted that the fingers 26 each present a surface of substantial length to the surface of the bore 24 so as to form effective guides for the cage 25 during vertical movement thereof. The cage 25 is further provided with an upstanding pin or projection 27 which is formed circular in cross section and sized to have a sliding fit within the bore 28 of the depending sleeve 22 thereby producing a further guide for the valve cage 25 and positively assuring that said cage will travel in a true path concentrically of the valve seat 16.

In order that the valve cage 25 will at all times be in close contact with the upper surface of the ball valve 12 an expansible coil spring 29 is provided between the shoulder 23 on the stud 19 and the upper surface of the cage 25. The coil spring 29 surrounds the sleeve 22 and the pin 27 of the cage and is thereby effectually prevented from being displaced during operation of the pump.

It will be particularly noted from an inspection of Fig. 1 that the fingers 26 are of such length that when the ball valve 12 is upon the seat 16, they embrace the valve and reach to a point within a very short distance of the upper surface of said seat. It will also be noted that the ball valve 12 will be effectually cushioned when forced from its seat by the upwardly flowing oil and will thereby be prevented from being broken.

Upon a down stroke of the plunger 6 during the operation of the pump, the oil or other liquid passing upwardly through the conduit 10 will force the ball valve 12 from the seat 16, then passing between the fingers 26 and into the up-

per portion of the bore of the sleeve 11. It may here be noted that the valve cage 25 is apertured or cut away as at 30 between each of the fingers 26 so as to offer little or no obstruction to the upward flow of the oil past the ball valve 12. The upper section 20 of the sleeve 11 is also enlarged so as to provide ample space around the sleeve 22 for the upwardly flowing liquid. By providing the plurality of upwardly converging liquid conduits 21 connecting the bore section 20 with the conduit 9 in the section 7 I have also provided a very effective means for passing the liquid from the sleeve 11 into said conduit 9 as it will be noted that the liquid is hardly diverted from a true vertical path in its passage through the sleeve to the conduit 9.

The sliding cage 25 positively holds the ball valve in accurate alinement with its seat and absolutely prevents the ball from striking the sides of the seat unevenly regardless of the inclination at which the pump may be operating.

Although a preferred embodiment of the invention has been shown and described, it will be understood that various changes in the details of construction may be made without departing from the spirit of the invention as defined by the appended claim.

I claim:

A movable valve body including a pair of sections having a liquid conduit extending there-through, a tubular sleeve connecting said sections together and forming a valve chamber therebetween, a valve seat carried by the end of one of said sections, a ball valve carried in said chamber and normally resting on said seat, a longitudinally movable valve contacting head normally urging said valve to its seat, a stem carried by said head, a stud carried by said other section and having a tubular extension extending into said chamber, said stem being received in the lower end of said tubular extension, said stud having a plurality of upwardly converging liquid passages formed therein establishing communication between said chamber and said conduit in said section.

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