

Nov. 9, 1954

J. C. VROMAN

2,693,767

OIL WELL PUMP PLUNGER VALVE

Filed Sept. 17, 1951

FIG.1.

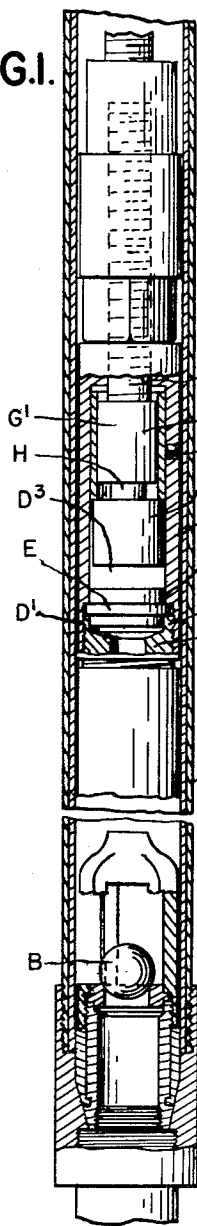


FIG.5.

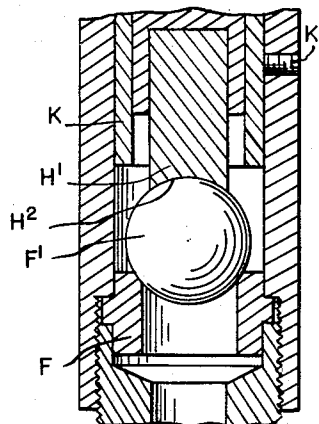
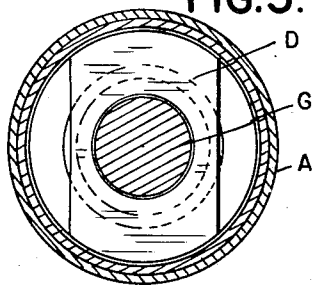


FIG.4.

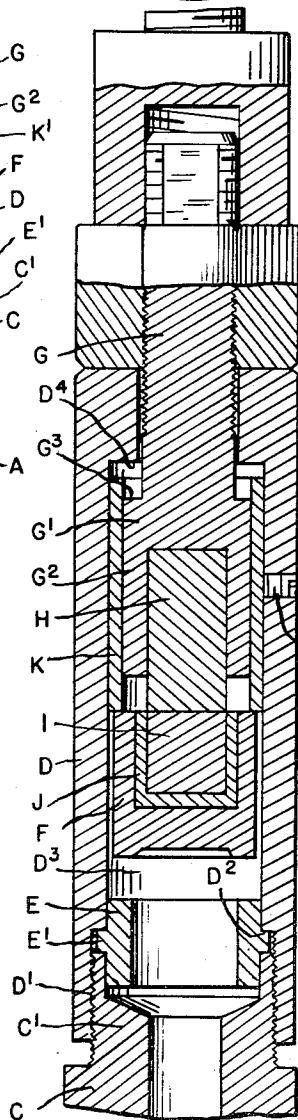


FIG.2.

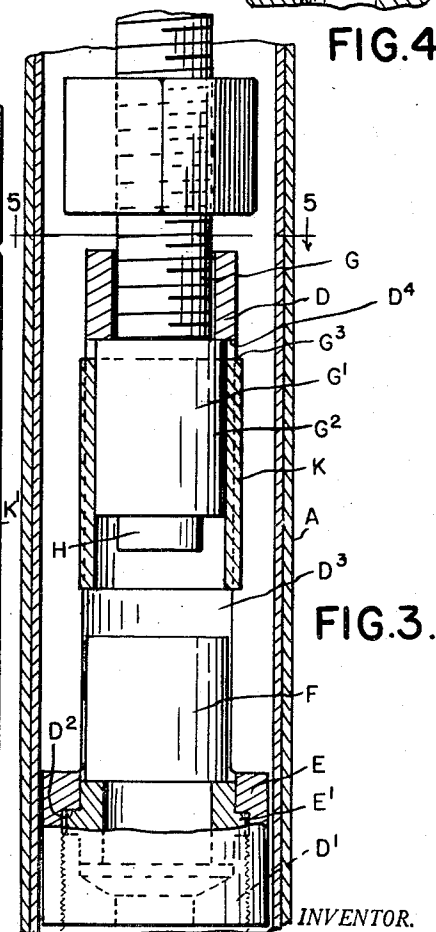


FIG.3.

INVENTOR.

JOHN C. VROMAN

BY

Whittemore Hulbert & Belknap

ATTORNEYS

1

2,693,767

OIL WELL PUMP PLUNGER VALVE

John C. Vroman, Detroit, Mich., assignor, by mesne assignments, of one-half to Robert C. Wynn, Grosse Pointe Woods, Mich.

Application September 17, 1951, Serial No. 246,895

7 Claims. (Cl. 103—179)

The invention relates to oil well pumping apparatus including a lower check valve in fixed position within the barrel or casing of the pump and a vertically reciprocating plunger actuated by a rod extending upward to the top of the well, said plunger being provided with a check valve controlling an oil passage therethrough. Thus during the down stroke of the plunger oil will pass upward therethrough lifting the check valve from its seat, while in the upward movement of the plunger the check valve automatically closes. In many oil wells there is present more or less natural gas which is commingled with the liquid oil and converts the same from an incompressible to a more or less compressible fluid. Thus in the operation of the pump, the plunger check valve instead of remaining separated from its seat during the whole downward movement of the plunger will have a chattering action which is detrimental causing wear in both the valve and its seat. Furthermore under extreme conditions the amount of commingled gas in the oil body between the upper and lower valves will cause it to merely expand and contract during plunger movement without unseating the valves.

It is the object of the invention to avoid this difficulty, which I have accomplished by means for holding the plunger valve separated from its seat during the entire downward movement of the plunger while permitting it to seat during the initial upward movement thereof.

The invention therefore consists in the construction as hereinafter described.

In the drawings:

Fig. 1 is a sectional elevation of an oil well pump including the plunger and the upper and lower check valves;

Fig. 2 is a vertical central section through the plunger illustrating the means for holding the valve raised from its seat;

Fig. 3 is a vertical section in a plane transverse to that of Fig. 2 showing the valve seated;

Fig. 4 is a view similar to Fig. 2 showing a modified construction; and

Fig. 5 is a section taken on the line 5—5, Fig. 3.

A is the barrel or casing of the pump having a lower check valve B located therein. C is the plunger which is provided with the usual lower tubular ringed portion (not shown) for seating within the barrel and an upper portion D which contains the check valve, and which is attached to the operating rod. As shown in Fig. 2, the portion D has a threaded socket D' at its lower end which engages a threaded nipple C' on the upper end of the ring portion. E is a tubular bushing forming the seat for the check valve and having a flange E' which is clamped between the nipple C' and a shoulder D². Above this valve seat is a recess D³ in which the check valve F is located, and the member D is grooved or cut away on opposite sides to communicate with the recess and provide upward passage for the oil. The upper end of the member D is connected to the operating rod G by a threaded coupling member G'.

As usually constructed the valve F is seated by gravity and is raised from its seat by the upward flow of liquid when the plunger is moving downward but, as above described, the presence of gas in the oil may cause a chattering of the valve. This I avoid by providing means for holding the valve spaced from its seat during the downward movement of the plunger, preferably using for this purpose a permanent magnet and a cooperating armature,

2

the one attached to the valve and the other located sufficiently above the valve seat to hold the valve fully open when the two magnetic members are in contact. It is, however, necessary to break the hold when the plunger starts upward as otherwise the valve would not re-seat. This is accomplished by providing a limited lost motion between the member D and the coupling member G' so that at the beginning of the upward stroke the member D remains stationary while the member G' moves upward to take up such lost motion. One of the cooperating members, permanent magnet and armature, is attached to the coupling member and the other to the valve and therefore, when in contact with each other, the valve will be lifted with the coupling member. To break the contact a knock-off member is so placed that it will arrest upward movement of the valve while the member G' continues its movement, whereupon the valve will be freed to engage its seat.

As specifically illustrated in Fig. 2, H is a permanent magnet which is secured in a socket in the member G' and I is the armature secured in a socket in the valve member F. I preferably place a bushing J of non-magnetic metal between the armature and the socket within the valve to minimize the passage of magnetic lines from the armature through the valve into the member D. The member G' is provided with a lower enlarged head portion G² forming a shoulder G³, which during the upward movement of said member contacts with a shoulder D⁴ on the member D. The knock-off member is preferably formed by a bushing K secured within the member D to surround the head G², the lower end of said bushing contacting with the armature before the shoulder G³ reaches the shoulder D⁴. Thus the continued upward movement of the member G' pulls the magnet H out of contact with the armature I permitting the valve to drop. It is of course obvious that the permanent magnet might be placed on the valve member and the armature on the member G', but I prefer the construction as above described.

In the modified construction shown in Fig. 4, a ball check valve F' is used which also constitutes the armature and the permanent magnet H' has the pole portion thereof concaved as at H² to fit the ball. Otherwise the construction is the same as that in Fig. 2, the knock-off member K arresting movement of the ball and separating the same from the member H'.

With the construction described, the initial downward movement of the plunger will cause the oil to lift the valve until the armature and permanent magnet come into contact. The valve will then be held in this position, which is such as to provide sufficient space above the seat E for the free flow of oil whether pure liquid or a mixture of liquid and gas. This prevents re-seating of the valve during the entire downward stroke of the plunger and therefore avoids any chattering movement. Furthermore it provides a freer passage for the escape of gas which avoids compression of the same when the plunger descends.

It is desirable to separate the armature from the magnet with a minimum upward movement of the rod. I therefore preferably provide means for adjusting the position of the knock-off member as, for instance, by securing the bushing K by a set screw K' so that it may be raised or lowered. I then position it at a point where the magnetic hold will be broken after a minimum upward movement of the member G'.

What I claim as my invention is:

1. In an oil well pump including a stationary barrel, a vertically reciprocating plunger therein having a passage therethrough, and a check valve and seat therefor controlling said passage; means other than fluid pressure for holding said valve spaced from its seat during the downward movement of said plunger, and means other than fluid pressure for detaching said valve from said holding means to permit seating thereof and retention on said seat during upward movement of said plunger by the force of gravity and of fluid pressure.

2. The construction as in claim 1 in which said holding means includes a permanent magnet and an armature, one being movable with the valve and the other positioned above the unseated valve.

3. The construction as in claim 2 in which the plunger

3

has an operating rod and a connection with a slight lost motion between said rod and said plunger for reciprocating the same, one of the two aforesaid members, magnet and armature being attached to said rod.

4. The construction as in claim 3 having a knock-off member on said plunger for separating said armature from the pole of the magnet during the upward lost motion movement of said rod.

5. The construction as in claim 4 having a ball check valve a portion of which also constitutes the armature, the permanent magnet being attached to the rod and having a concave pole fitting a portion of the spherical surface of the ball.

6. The construction as in claim 4 in which said knock-off member is adjustable in position on said plunger to

4

effect the breaking of the magnetic hold with a minimum upward movement of the rod.

7. The construction as in claim 6 in which the knock-off member is a sleeve surrounding the holding member which is attached to said rod and overlapping the valve to obstruct upward movement thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,418,043	Wilcox -----	May 30, 1922
1,602,879	Browning -----	Oct. 12, 1926
2,569,316	Jermon -----	Sept. 25, 1951