

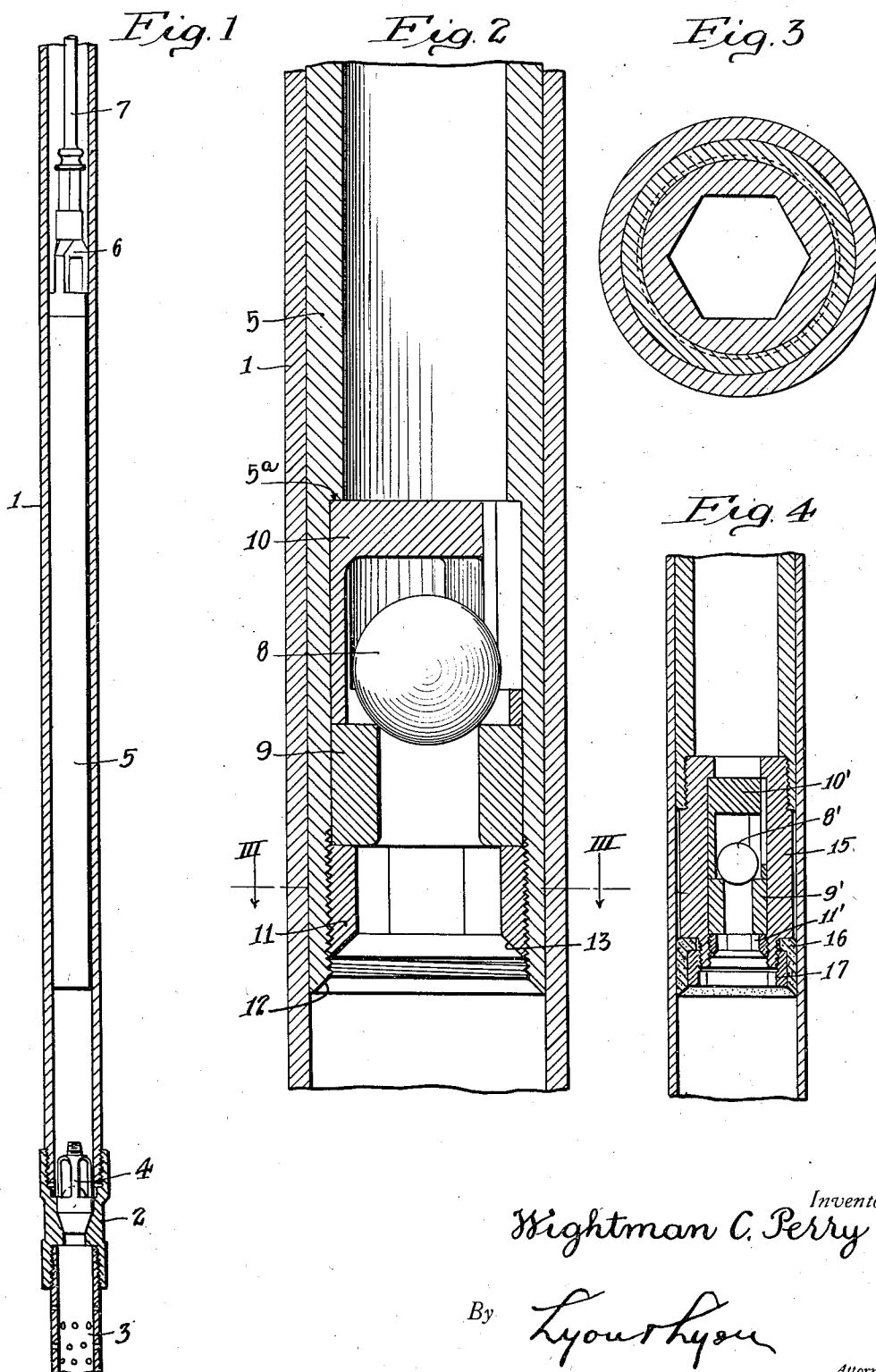
Dec. 31, 1935.

W. C. PERRY

2,026,058

PLUNGER VALVE FOR OIL WELL PUMPS

Filed Feb. 13, 1934



Wightman C. Perry ^{Inventor}

By *Lyon & Lyon*

Attorneys

UNITED STATES PATENT OFFICE

2,026,058

PLUNGER VALVE FOR OIL WELL PUMPS

Wightman C. Perry, Santa Fe Springs, Calif.

Application February 13, 1934, Serial No. 711,020

1 Claim. (Cl. 103—225)

This invention relates to the construction of oil well pumps and more particularly to a plunger construction for such pumps.

A broad object of the invention is to reduce the liability of an oil well pump to gas-lock, a condition which reduces the efficiency of the pump or may even render it entirely inoperative.

Another object is to provide a pump plunger and valve that is efficient and also inexpensive to manufacture.

The most common type of oil well pump comprises a pump barrel or cylinder positioned in the bottom of a well at the lower end of a string of oil tubing and having a piston or plunger therein which is reciprocated by a string of sucker rods extending up through the tubing string to the surface. The pump barrel is provided with a standing valve in its lower end and the plunger is provided with an upwardly opening check valve so that on each upward movement of the plunger, well fluid, which may include gas and/or water as well as oil, is drawn into the barrel through the standing valve and on the subsequent down stroke of the plunger this well fluid is compressed (during the initial part of the down stroke) until its pressure is greater than the hydrostatic pressure of the column of fluid extending from the plunger to the surface of the earth, after which the automatic valve in the plunger opens, permitting the fluid trapped below the plunger to flow through the plunger valve into the fluid column thereabove during the remainder of the down stroke. Of course, on each upward stroke of the plunger, the plunger valve closes and the entire oil column is lifted to discharge a portion of the oil into a feed line at the surface.

To the best of my knowledge, all oil well pumps of the type described for handling gassy fluids now employ a plunger having a valve member thereon which projects below the lower end of the plunger proper and provides an annular space between the valve member and the pump barrel in which gas (which is almost always present in various amounts in petroleum) may be trapped. If the oil being pumped contains much gas, the gas trapped below the plunger may make the pump inoperative. Thus if (1) the well is very deep and the static head of the oil in the tubing above the plunger is correspondingly great, (2) the oil pressure in the well at the pump level is relatively low as compared to the static head of the oil in the tubing above the plunger, and (3) the oil contains considerable gas; then substantially the entire down

stroke of the plunger may be employed in compressing the gas in the annular space about the valve member from well pressure to column pressure, and substantially the entire up stroke may be employed in expanding the trapped gas back to well pressure. Under such conditions it is obvious that little or no oil will be pumped.

In accordance with the present invention, I prevent the trapping of gas below the plunger and surround the valve member by mounting the valve member completely within the plunger or by sealing the lower end of the valve member with the barrel and so shaping the parts that any and all gas below the plunger has a free upward path to and through the plunger valve.

Referring to the drawing:

Fig. 1 is an elevational sectional view of an oil well pump having a plunger in accordance with my invention;

Fig. 2 is a detail vertical section through the lower end of the pump plunger showing the construction of the valve therein; and

Fig. 3 is a cross section in the plane III—III of Fig. 2.

Fig. 4 is a detail vertical section of a modified form of valve member adapted to extend below the end of the plunger.

Referring to Fig. 1, a portion of an oil well pump is disclosed which comprises a pump barrel or cylinder 1, adapted to be joined at its upper end to a string of oil tubing, not shown, and connected through a coupling 2 at the lower end to a section of perforated tubing 3, into which oil is adapted to flow from the well. It is to be understood that the section 3 and usually the entire pump barrel will be submerged in the oil in the bottom of the well. The coupling 2 is provided with a standing valve 4 of any well known construction, its function being to automatically open when the pressure within the pump barrel is less than the pressure of the oil in the tubing 3 to permit oil to flow into the barrel and to close in response to any increase in the pressure of the oil within the barrel to prevent it from being discharged back into the tubing 3.

A tubular plunger 5 is slidably mounted within the pump barrel 1, the plunger forming a sealing fit with the barrel, either by grinding the parts to an accurate fit or by means of suitable sealing or packing rings. In the embodiment shown in the drawing the seal is obtained by accurately fitting the plunger in the barrel. The plunger 5 is provided with a check valve at its lower end. The plunger is connected at its

upper end to the lower end of a string of sucker rods 7, through a cage 6.

The construction so far described is old and well known and does not constitute a part of the present invention. The latter resides in the particular construction of the plunger valve which is illustrated in Figs. 2 and 3 and 4. In Figs. 2 and 3 this valve comprises a ball 8 co-operating with a seat 9 and retained in position by a cage 10. The seat 9 and cage 10 are retained in position by a threaded plug 11. Thus it will be observed that the lower end of the plunger 5 is of larger internal diameter than the main portion of the plunger, constituting a recess into which the cage 10 and seat 9 fit snugly, the cage 10 resting against the shoulder 5a at the upper end of the recessed portion, the seat 9 resting against the lower edge of the cage and being forced thereagainst by the threaded bushing 11 which is screwed tightly into the lower end of the recessed portion. The upper end of the cage 10 is, of course, recessed about its margin to provide oil passages into the hollow plunger thereabove. As shown in Fig. 3, the inner surface of the bushing 11 is hexagonal to be engaged by a hexagonal wrench for insertion or removal.

It will be observed from Fig. 2 that the entire valve structure is positioned within the hollow plunger and above the lower edge thereof. Furthermore, this lower edge of the plunger and the lower edge of the bushing 11 may be beveled as shown at 12 and 13, respectively, to permit a free upward path to the valve for any gas that might be trapped below the plunger. The elimination of pockets which might tend to produce gas-lock is therefore eliminated in my construction without the necessity of excessively accurate and expensive machine work, which has been resorted to in the past to seal the valve member to the pump barrel, when the valve member projected below the lower end of the plunger.

In Fig. 4, I have disclosed a modified construction of valve member which projects below the end of the plunger but is provided with a cup at the lower end to seal with the pump barrel and thereby prevent the compression of gas in the annular space between the valve member and

the barrel. In this instance, the valve member comprises a tubular body 15 dimensioned externally to provide ample clearance with the barrel 1, and reduced and threaded at the upper end to screw into the barrel. A valve cage 10', valve 8' and valve seat 9' are retained within the body member 15 by a threaded bushing 11'.

The body member 15 is provided on its lower end with a cup 16 of flexible material, which seals with the pump barrel and prevents any gas in the well fluid from entering the space surrounding the tubular body 15, this cup being retained in position by a nut 17.

Since the construction shown in Fig. 4 provides a free upward path to the valve for gas 15 below the plunger, and eliminates gas pockets below the sealing surfaces of the barrel and plunger (the cup 16 constituting the sealing surface of the plunger in this instance), it functions to prevent gas-lock in the same manner as the construction shown in Fig. 3.

Obviously, the specific construction disclosed may be varied in detail without departing from the spirit of the invention and the invention is to be limited only as set forth in the appended 25 claim.

I claim:

A plunger for an oil well pump of the type comprising a pump barrel having a standing valve at the lower end thereof and a valved plunger reciprocable therein, said plunger comprising a single tubular member sealing with the pump barrel at its lower circumferential edge throughout its stroke, said tubular member having a recessed portion extending upwardly from its lower edge and a shoulder at the upper end of said recessed portion, a valve cage mounted in said recessed portion, said cage seating against said shoulder, an annular valve seat mounted in said recessed portion below said cage, a valve within said cage and a retaining bushing threaded into the lower end of said recessed portion for clamping said seat and cage against said shoulder, said retaining bushing lying completely within said plunger above the lower circumferential edge of the plunger whereby any gas below said plunger has a free upwardly extending path to said valve.

WIGHTMAN C. PERRY.