March 24, 1953 E. W. MONG 2,632,401

WELL PUMPING APPARATUS

Filed Jan. 15, 1947

Fig. 1.

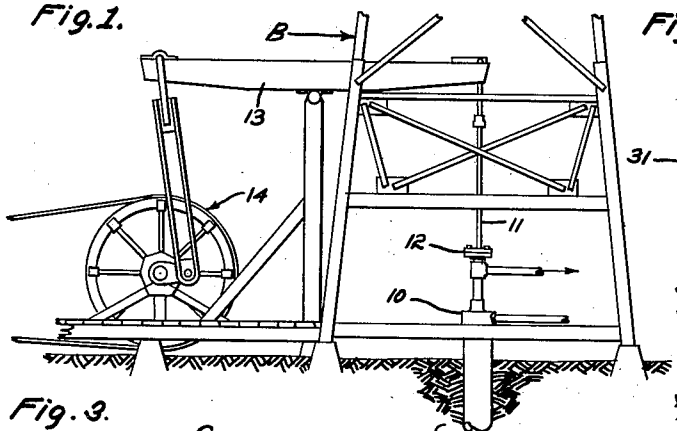


Fig. 2.

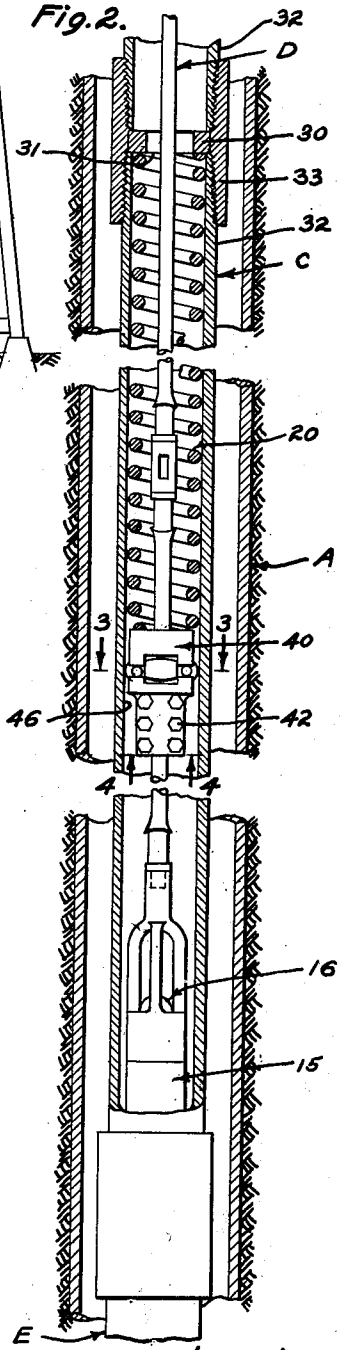


Fig. 3.

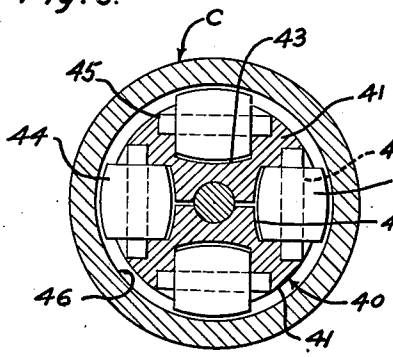


Fig. 4.

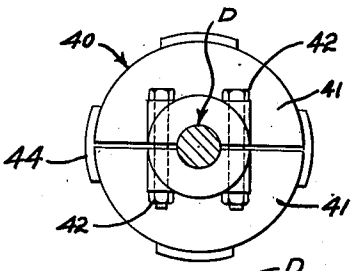
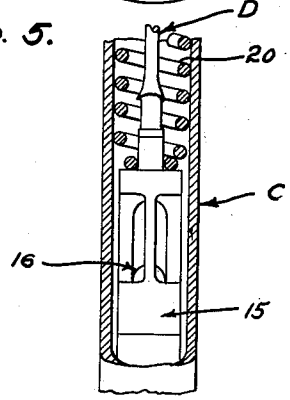
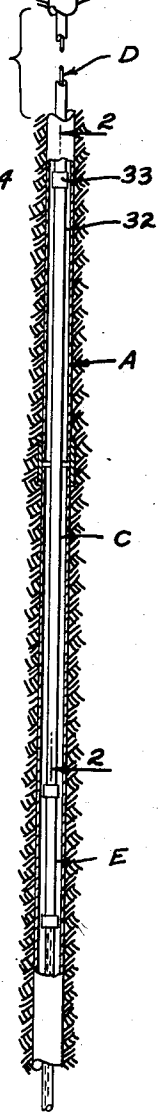


Fig. 5.





Inventor
Edgar W. Mong
By W. W. Clapp
Attorney

Patented Mar. 24, 1953

2,632,401

UNITED STATES PATENT OFFICE

2,632,401

WELL PUMPING APPARATUS

Edgar W. Mong, Los Angeles, Calif.

Application January 15, 1947, Serial No. 722,279

3 Claims. (Cl. 103—211)

1

This invention has to do with well pumping apparatus and it is a general object of the invention to provide apparatus useful in wells producing heavy or viscous fluids which tend to retard normal pumping operations. It is common to remove the pump fluids such as oil from wells by means of reciprocating pumps. When this type of equipment is used the pump is located in the well to be submerged in the fluid to be pumped and it has a reciprocating part with a reciprocating plunger or a reciprocating barrel operated by a sucker rod that extends to the top of the well. The sucker rod is commonly operated or reciprocated at its upper end by means of a walking beam and the arrangement of parts is such that the force applied from the walking beam acts to pull the rod upwardly to lift the reciprocating part of the pump and consequently elevate fluid that has entered the pump. Gravity is relied upon to lower the reciprocating part and ordinarily the force of gravity is sufficient to overcome the drag that tends to retard downward movement of the reciprocating parts. Where the fluid being handled is heavy or viscous the rod submerged in the viscous fluid carried in the tubing extending from the pump to the top of the well is retarded by the fluid so that it is very slow to return or move downward following operation by the walking beam. The rod being long and slender, return or downward movement of the walking beam has but little influence upon the rod during the return or down stroke. Attempts have been made to overcome the difficulty above outlined, usually by introducing light fluids intended to cut or dilute the fluid from the well or by heating the fluids in the well.

It is a general object of my present invention to provide a mechanical means at or near the pump operable to exert downward pressure on the reciprocating element of the pump so that its return or down stroke is not dependent upon the action of gravity alone.

Another object of the present invention is to provide a device for returning the reciprocating part of a well pump which acts on the pump part to supplement the action of gravity acting on that part and the rod that operates that part without in any way interfering with or impairing the normal tendency of the pump part and rod to return through the action of gravity.

Another object of the present invention is to provide an attachment applicable to a well pump or to well pumping apparatus which involves a minimum number of parts which are simple

2

and dependable in operation. The structure provided by the present invention is characterized by a single, simple helical spring applied to the pumping apparatus to normally yieldingly act downwardly on the reciprocating pump part to exert a downward or return pressure thereon.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of the invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a view illustrating a typical well equipped with pumping apparatus. Fig. 2 is an enlarged longitudinal detailed sectional view taken at the upper end portion of the well pump showing the structure that I have provided to act in conjunction with the reciprocating parts of the pumping apparatus. Fig. 3 is an enlarged, detailed transverse sectional view taken as indicated by line 3—3 on Fig. 2. Fig. 4 is an enlarged detailed transverse sectional view taken as indicated by line 4—4 on Fig. 2, and Fig. 5 is a view similar to a portion of Fig. 2 showing another form of my invention wherein the return spring that I provide acts directly upon the pump part to be returned.

My present invention is intended for use in connection with or for application to well pumping apparatus of the type ordinarily employed to handle well fluids, that is, it is intended primarily for use with apparatus involving a well pump of the reciprocating type, either the working barrel type or working plunger type.

In the apparatus illustrated in the drawings there is a well casing A extending from the derrick B into the well bore and a tubing C is carried by a head 10 at the upper end of the casing and extends downwardly through the casing into the portion of the well from which the fluid is to be drawn. An operating or sucker rod D extends downwardly through the tubing to operate the pump E at the lower end of the tubing. A polish rod 11 at the upper end of the rod D operates through a suitable stuffing box 12 and a rod operating mechanism is provided at the derrick. The particular operating mechanism illustrated involves a walking beam 13 actuated by a suitable operating mechanism 14. The particular pump E illustrated in the drawings involves a reciprocating element 15 at the upper end of which there is a working valve 16. The lower end of the rod D is joined or connected to the cage of the valve 16.

In accordance with my present invention I

provide a resilient member preferably a spring 20 at or near the pump E to normally yieldingly urge the reciprocating element 15 of the pump downwardly. In accordance with the broader principles of my invention the reciprocating part of the pump and the rod D coupled thereto form a reciprocating unit urged downwardly by the spring 20. In the form of the invention illustrated in Fig. 2 of the drawings the spring 20 acts through the lower end portion of the rod D in urging the reciprocating part 15 of the pump downwardly whereas in Fig. 5 of the drawings the spring acts directly on the part 15 of the pump. The spring 20 is preferably a helical compression spring of substantial length freely fitting within the tubing C. The convolutions of the spring are spaced so that the spring can be compressed a substantial amount, the structure being proportioned so that the spring can compress an amount somewhat in excess of the stroke of the reciprocating part 15 of the pump.

In accordance with my invention the upper end portion of the spring 20 bears on a seat ring 30 carried in the tubing C. The seat ring is provided to present a downwardly facing shoulder 31 against which the upper end of the spring 20 abuts. In practice the seat ring may be applied to or mounted in the tubing in any suitable manner. In the particular case illustrated the tubing C involves sections 32 joined by couplings 33 and the seat ring 30 is located in a coupling 33 where it is confined between the ends of the sections 32 applied to the coupling.

In the form of the invention illustrated in Fig. 2 of the drawings the lower end of spring 20 bears downwardly against a stop 40 applied to the rod D at or near the pump E. In the drawings I have shown the stop 40 located on the rod somewhat above the pump and I have shown the stop as a sectional collar involving sections 41 joined by suitable fasteners 42. The fasteners 42 may be bolts by which the sections of the collar are clamped tightly on the rod D at the desired point along the rod. The preferred form of collar involves circumferentially spaced peripheral recesses 43 carrying rollers 44 mounted on pins 45 which rollers project outwardly from the collar to engage the inner wall 46 of the tubing. The rollers provide antifriction means on the collar reducing or minimizing friction and wear between the collar and the tubing. Through the split collar construction the stop against which the spring bears can be adjusted along the rod D so that it is located at the desired point relative to the seat 30 in order to relate the parts so that the spring 20 has the desired action.

In the form of the invention illustrated in Fig. 5 the upper end of the spring 20 may be seated against a seat ring 30 the same as shown in Fig. 2. In this form of the invention the lower end of the spring 20 instead of acting on the reciprocating element of the pump through a stop 40 and a portion of the rod D, acts directly on the reciprocating part of the pump. It will be observed that in this form of the invention the lower end of the spring seats directly on the cage of valve 16, which is a part of the reciprocating element of the pump.

With the construction that I have provided the pumping apparatus will handle very heavy or thick oil or other fluid that would otherwise retard pumping action or render it completely impractical. With my apparatus the rod and reciprocating element of the pump are moved upwardly through the action of the walking beam in the manner common to well pumping equipment, and when the walking beam has reached the top of its stroke and starts down it exerts downward pressure on the upper end of the rod at the same time that gravity, acting on the element 15 and the rod, and the load of fluid above the reciprocating element 15, tend to move the element 15 downwardly. These forces tending to move the reciprocating pump element downwardly are supplemented by the downward pressure exerted by the spring 20 to the end that the downward movement or return of the reciprocating element 15 of the pump is speeded up. The structure that I have provided acts to hold the rod under tension so that it is straight and by holding the rod straight in the tubing wear on the rod and on the wall of the tubing is minimized.

By proper proportioning and application of the spring 20 the pump action is speeded up to the point where practical pumping operations can be carried on under circumstances that would be otherwise very slow and difficult, if not totally impractical. It is to be understood, of course, that in operating the structure that I have provided the action may be supplemented by means ordinarily employed when handling very heavy or viscous fluids, that is, dilution of the pump fluid or heating thereof may be resorted to as circumstances may require. However, under ordinary circumstances the action of ordinary pumping equipment, supplemented by the spring that I have provided, will speed up operation sufficient for practical production.

Certain elements of the structure above described are disclosed in structure set forth and claimed in my copending application entitled "Well Pumping Apparatus Involving a Sucker Rod" filed January 15, 1947, Serial No. 722,280, now Patent No. 2,536,982.

Having described only typical preferred forms and applications of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. An attachment for well pumping equipment having a tubing extending into the well from the top thereof and a pump operating rod extending downwardly in the tubing from its upper end including, a unitary seat ring defining a round opening passing the rod with clearance, the outer peripheral portion of the ring being applicable to the tubing, the ring forming a fixed abutment in the tubing removed from the upper end of the tubing, a stop clamp applicable to the rod forming a fixed abutment thereon below the ring, and a helical compression spring surrounding the rod and having its upper end engaging the seat and its lower end engaging the stop clamp, the clamp including separable sections and screw means selectively setting the sections on the rod.

2. An attachment for well pumping equipment having a tubing extending into the well from the top thereof and a pump operating rod extending downwardly in the tubing from its upper end including, a seat applicable to the tubing to be fixed therein below the upper end of the tubing, a stop clamp applicable to the rod below

the seat, and a compression spring having its upper end engaging the seat and its lower end engaging the stop clamp, the clamp including separable sections, means securing the sections together around the rod, and anti-friction rollers carried by the sections and projecting therefrom.

3. In combination, a well tubing having sections of equal diameter and a unitary coupling collar internally threaded at its ends and receiving opposing ends of the sections, a pump carried by the tubing and having a reciprocating part, an operating rod for said part within the tubing and extending to the top of the well, a seat ring fixed in the tubing above said part, a stop clamp set on the rod below the seat, and a compression spring engaged between the seat and the stop clamp, the clamp having separable rod engaging parts and screw means selectively

setting said parts on the rod and the seat ring being a ring within the coupling collar and confined between said opposing ends of the sections.

EDGAR W. MONG.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
91,943	Kock	June 29, 1869
363,721	Brewer	May 24, 1887
875,372	Palm	Dec. 31, 1907
940,347	McCarthy et al.	Nov. 16, 1909
1,531,697	Hopkins et al.	Mar. 31, 1925
2,065,541	Schaffer et al.	Dec. 29, 1936
2,075,428	Dickson	Mar. 30, 1937