June 5, 1928. 1,672,687

J. PENROD ET AL

WELL PUMP

Original Filed March 1, 1924 2 Sheets-Sheet 1

Fig. 1.

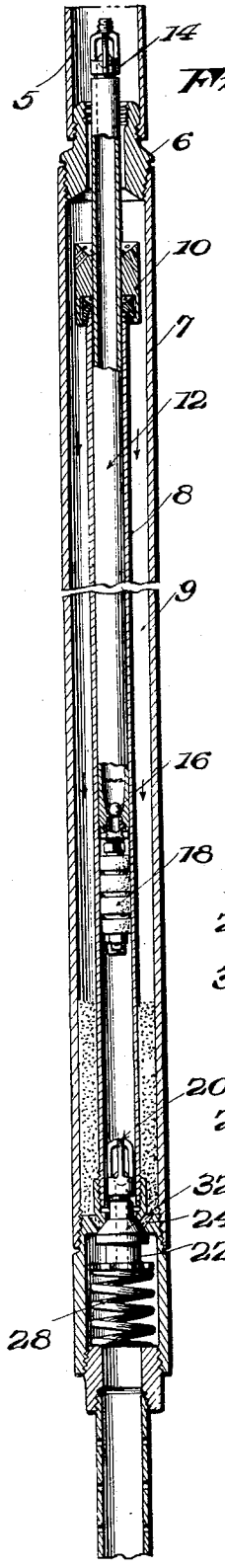



Fig. 2.

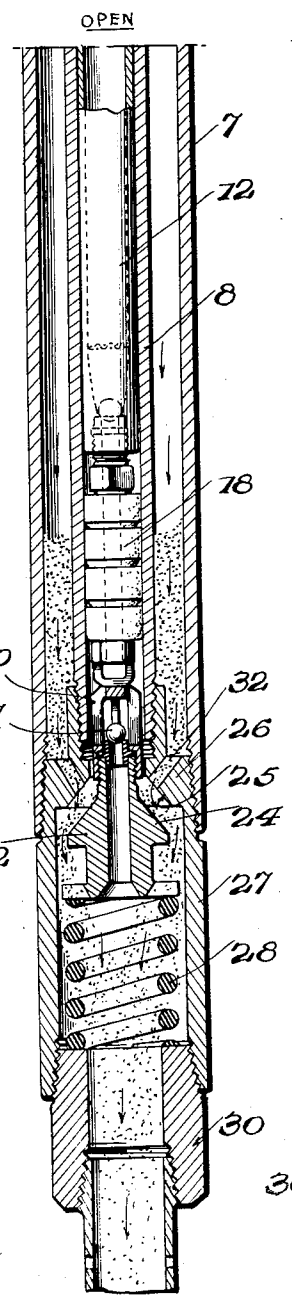



Fig. 3.

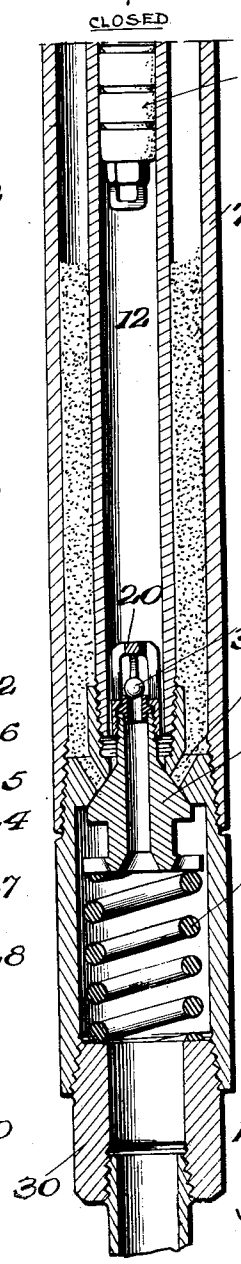



Fig. 4.

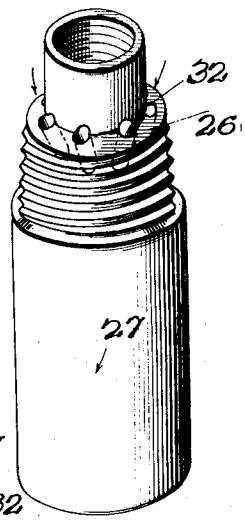
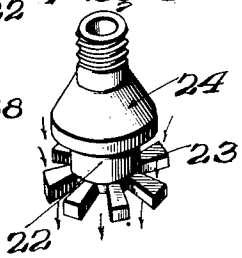



Fig. 5.




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Fig. 6.

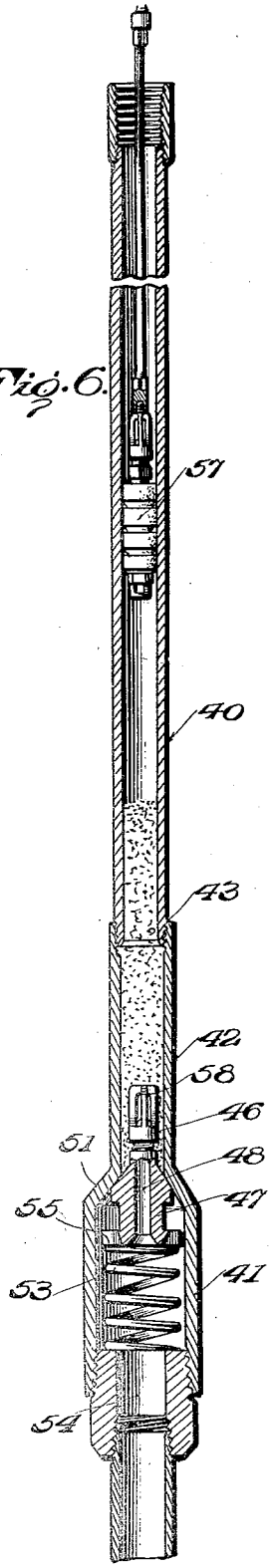



Fig. 7.

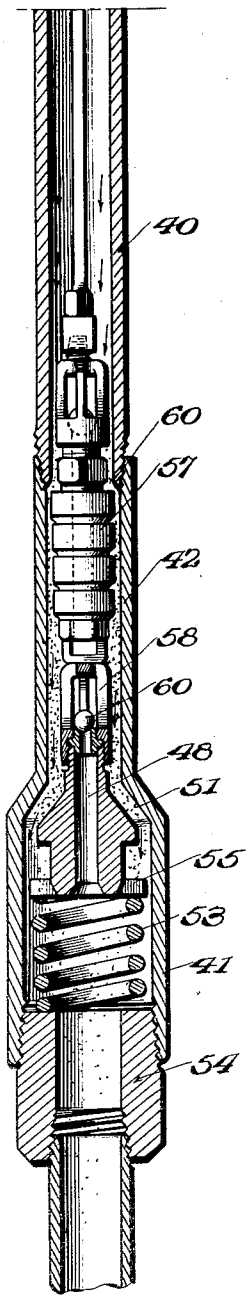



Fig. 8.

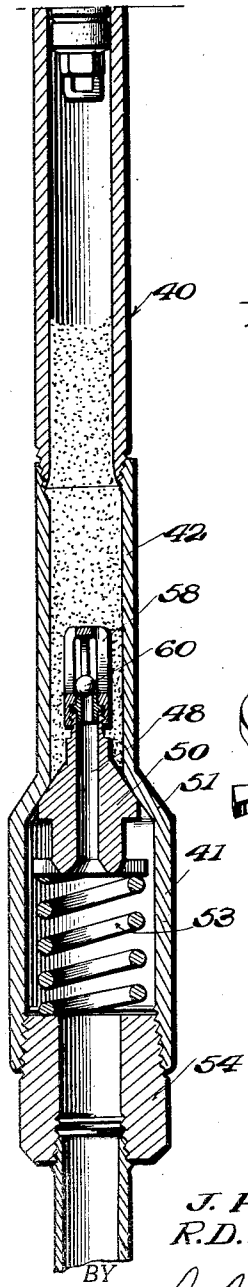
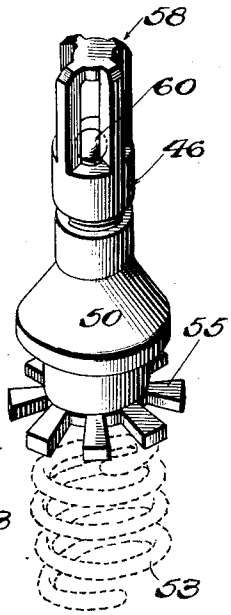



Fig. 9.




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# UNITED STATES PATENT OFFICE.

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## WELL PUMP.

Application filed March 1, 1924, Serial No. 696,191. Renewed December 15, 1926.

This invention relates to pumping mechanisms for use in oil wells and more particularly to a means to relieve the pump of sand which settles by force of gravity.

In the operation of oil wells the sand pumped up with the fluid settles either in a special trap provided or on the cups with the result that it is frequently necessary to pull the plunger to renew the cups. In case the pumping mechanism is provided with a sand trap or pocket the entire tubing must be periodically removed to the surface to discharge the accumulated sand.

The direct labor cost necessary to pull either the plunger or the tubing is substantial and this is greatly augmented by complete loss of production during the pulling operation.

It is, therefore, an important object of this invention to provide a pumping mechanism having simple and reliable means whereby the sand which settles in the column of fluid may be returned to the bottom of the well so that the necessity for frequently pulling various parts of the pumping mechanism to the surface is overcome.

A further object is to provide a sand relief or return means which may be incorporated in a pumping mechanism of the type illustrated in our prior United States patents or the standard pumping mechanism without involving a radical departure from prevailing practices.

A further object is to provide a sand return or relief means which will not in anyway interfere with maximum production and which may be cheaply manufactured.

Other objects and advantages will be apparent during the course of the following description.

In the accompanying drawings forming a part of this application and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a vertical sectional view through a pumping mechanism equipped with the improved sand return means, by means of which the sediment in the sand trap may be periodically returned to the bottom of the well;

Fig. 2 is a detail vertical sectional view through the lower portion of the pumping mechanism, the view illustrating the plunger holding the standing valve in its depressed or lower position to allow the sand accumulated in the trap to return to the bottom of the well;

Fig. 3 is a detail vertical sectional view through the lower portion of the pumping mechanism, the parts being shown in their normal position;

Fig. 4 is a perspective of a bushing or housing embodied in the invention;

Fig. 5 is a perspective of what might be said to be the base of the standing valve;

Fig. 6 is a vertical sectional view through a standard pumping mechanism equipped with the improved sand return means, the parts being in their normal position;

Fig. 7 is a detail vertical sectional view illustrating the plunger holding the sand return member in its lower position to allow the accumulated sand to return to the bottom of the well;

Fig. 8 is a detail vertical sectional view illustrating the parts in their normal position, and

Fig. 9 is a perspective of the standing valve and the spring which normally holds the standing valve in seated position.

In the drawing, wherein for the purpose of illustration is shown a preferred embodiment of the invention, the numeral 5 designates a tubing to which a bushing 6 is connected and as shown in Fig. 1 a shell 7 is connected to the lower portion of the bushing.

A barrel 8 is arranged within the shell 7 and co-operates with the same in the formation of an annular trap 9 for the reception of the sand which settles from the column of fluid above. The upper portion of the barrel 8 is provided with a sand scraper 10 preferably of the type illustrated in our several prior patents and as this member forms no particular part of this invention it is not illustrated in detail.

A plunger 12 is adapted to reciprocate in the barrel 8 and is provided with upper and lower valves 14 and 16, respectively, by means of which the fluid is prevented from returning to the bottom of the well. Of course, the lower portion of the plunger is also provided with a series of cups 18 which create a vacuum on the upward movement of the plunger and thereby elevate the oil or other fluid being pumped.

The invention forming the subject matter

of this application resides particularly in the means for allowing the sand which accumulates in the pocket 9 to return to the bottom of the well and to this end we provide the standing valve cage 20 with a more or less tubular base 22 having an annular shoulder 24 intermediate the ends thereof and adapted to contact with an inverted seat 25 on the under side of an inwardly projecting annular shoulder 26 formed on the upper end of a bushing or housing 27.

The inclined upper face of the annular shoulder 24 is normally held in liquid tight contact with the inverted seat 25 by means of a stout coil spring 28 confined between a bushing 30 and a plurality of radial lugs 32 on the lower end of the base 22.

With particular reference to Fig. 3 it will be seen that the inwardly projecting annular member 26 on the upper end of the housing is provided with an annular series of sand return ports or passages 32 which communicate with the sand trap so that when the standing valve is depressed as clearly shown in Fig. 2 the sand in the pocket or trap will quickly descend through the housing 27 and into the bottom of the well. The bore of the housing 27 is considerably greater than the external diameter of the tubular base member 22 and consequently ample space is allowed for the return of the released sand.

In the normal operation of the pumping mechanism the annular shoulder 24 is held tightly and in fluid tight contact with the inverted seat 25 so as to close the outwardly inclined ports 32 and prevent the trapped sand from mixing with the oil being pumped up through the bore of the base 22.

In operation, the plunger is reciprocated in the usual manner and the settling sand is received in the trap 9 and when the trap is loaded it is merely necessary to lower the plunger below its normal stroke to bump the standing valve from its seat 25 and the sand immediately flows through the ports 32 and returns to the bottom of the well. The column of oil above is sufficiently heavy to cause the sand to flow rapidly back into the bottom of the well and a suitable quantity of the oil may be allowed to flow back through the sand trap and the ports 32 to thoroughly wash the trap and the inclined shoulder 22 of all sediment.

It is important to note that the ports 32 constitute a series of jets by means of which the oil is directed over the inclined shoulder 24 so as to wash the same free of all sand and other matter which would prevent the same from again having liquid tight contact with its seat. When the sediment has been returned to the bottom of the well the plunger is moved up to its normal position and pumping may be resumed.

One of the most important features of the invention resides in the fact that the sand may be dumped from the trap without pulling any of the operating parts and without the loss of production. The sand dumping operation may be measured in minutes and may be performed without the employment of special mechanism at the surface.

The combined area of the ports 32 is sufficiently small to prevent the weight of the column of oil above from depressing the standing valve and operating the same at an improper time. More specifically, the sand dumping mechanism is entirely and absolutely under the control of the operator at all times.

It frequently happens that in pumping sandy or muddy fluid the ball valve 37 is held off the seat by the mud or sand. The mud accumulates within the cage 20 so that the pump ceases to pump. In that case it is ordinarily necessary to pull the mechanism to the surface to clean the parts but in this case it is only necessary to drop the traveling valve into engagement with the standing valve for unseating the same thereby allowing the column of fluid above to wash the valve cage and the ball valve free of all mud. When this has been done normal operation is resumed and the ball valve will freely operate.

Figure 1 illustrates that the valve cage 20 and the valve 37 therein are enclosed within the working barrel and that the cage constitutes a striking element for engagement by the lowering mechanism such as the plunger of the pump. Special attention is invited to the fact that the working barrel not only functions as such and as one wall of the annular sand receiving chamber, but also has a means to space the sand in the sand chamber from the valve 37 and the seat therefore whereby these parts are protected.

The inventive idea involved may be carried out in connection with a standard working barrel 40 illustrated in Figs. 6, 7 and 8. In this case, the housing 41 is provided with a tubular attaching portion 42 secured to the lower portion of the barrel as indicated at 43.

The standing valve is designated by the numeral 46 and is provided with an elongated base 47 having a bore 48 for the passage of the fluid. The upper portion of the tubular base is provided with an annular shoulder 50 adapted to flatly contact with an inverted seat 51 formed in the housing 41. The annular shoulder 50 and more particularly the inclined upper surface of the same is urged into fluid tight contact with the inverted seat 51 by means of a stout coil spring 53 confined between a bushing 54 and a plurality of radial lugs 55 on the lower end of the standing valve.

The helical spring 53 normally holds the annular shoulder 50 in fluid tight contact

with the seat so that the uncontrolled return of the oil to the well is prevented.

The usual plunger 57 is mounted for movement in the barrel 40 and by lowering the plunger into engagement with the cage 58 of the standing valve the standing valve is moved to the position illustrated in Fig. 7 so that sand which accumulates about the cups may be returned to the bottom of the well.

Fig. 7 plainly illustrates that when the plunger 57 is lowered into engagement with the valve cage it is received in the rather large portion 42 of the housing and consequently fluid and sand may freely flow down past the plunger and back into the well.

In the operation of this form of invention, the plunger normally reciprocates in the barrel 40 and does not engage the standing valve, but if it is desired to return the accumulated sand to the well it is merely necessary to allow the plunger to descend into engagement with the standing valve to depress the standing valve and this opens up a free passage for the return of the sand. When the sand has been returned to the well a suitable quantity of oil may be allowed to flow over the cups for thoroughly washing the same and for positively removing any sand which may remain on the inclined shoulder 50 of the standing valve. In case the ball valve 60 and the cage 58 become fouled the standing valve may be lowered to cause the oil to thoroughly wash the fouled parts.

When it is desired to resume normal operation of the well it is merely necessary to return the plunger to its normal position and the standing valve is seated by the helical spring 53. It is thus seen that the sand may be returned to the bottom of the well at frequent intervals and without inconvenience on the part of the operator.

The lower portion of the barrel may be beveled as shown at 70 to compress the cups of the plunger and allow the same to reenter the barrel when it is desired to resume normal operation.

The invention forming the subject matter of this application is not only capable of use as a means to return settling sand to the bottom of the well but is also capable of relieving the tubing of oil in case a fishing job is necessary. For instance, if the cage 58 is accidentally broken and the ball valve 62 remains on its seat the pressure of the column of oil above would prevent a fishing tool from securely engaging the ball valve. In that case, the plunger may be lowered to unseat the standing valve to relieve the pressure of the column of oil above so that a fishing tool may unseat the valve 60 and bring the same to the surface.

The foregoing illustrates that the invention may be carried out in connection with a pumping mechanism of the type patented and manufactured by us or in connection with the standard pumping mechanism illustrated in Figs. 6, 7 and 8.

The invention forming the subject matter of this application is capable of a wide variety of mechanical expressions as evidenced in the showing in the accompanying drawing and it is, therefore, to be understood that such minor changes in arrangement and construction of parts may be made as will remain with the spirit of the invention and the scope of what is claimed.

Having thus described the invention, what is claimed is:

1. A pump for use in oil wells comprising a barrel, a plunger adapted for reciprocation in the barrel, a standing valve having an annular shoulder provided with an inclined upper surface, a fixed member having an inverted seat normally engaged by said shoulder, and a spring engaging said standing valve and urging said shoulder into fluid tight contact with said inverted seat, said plunger being adapted to engage said standing valve to depress the same and thereby unseat the annular shoulder and allow sediment in the oil to return to the bottom of the well.

2. A pump for use in oil wells comprising a barrel, a plunger movable in the barrel, a standing valve having an annular shoulder, a fixed member having a downwardly presented seat engaged by said shoulder, and a helical spring engaging said standing valve and urging said shoulder into liquid tight contact with said seat, said plunger being adapted to engage and depress said standing valve and thereby unseat said annular shoulder and allow sediment in the oil to return to the bottom of the well and to allow a portion of the column of fluid above the pump to wash said shoulder.

3. A pump for use in oil wells comprising a barrel, a housing secured to the barrel and having a downwardly directed seat, a bushing connected to the housing, a one-way standing valve having an annular shoulder adapted to flatly contact with said downwardly directed seat, a helical spring confined between said standing valve and said bushing and normally holding said standing valve in engagement with said seat against the weight of the column of fluid above, and a plunger adapted to engage said standing valve to depress and unseat the annular shoulder whereby to allow accumulated sand to return to the bottom of the well and to allow a portion of the column of fluid above the pump to wash said shoulder free of sediment.

4. A pump for use in oil wells comprising a barrel, a housing secured to the barrel and having a seat, a bushing connected to the housing, a valve having a shoulder adapted to engage said seat, a helical spring con-

fined between said valve and said bushing and normally holding said valve in engagement with said seat against the weight of the column of fluid above, a shell surrounding the barrel and cooperating therewith in the formation of a chamber, and a plunger adapted to engage said valve to unseat the same, said seat being provided with a plurality of combined sand passages and fluid jets communicating with said chamber and adapted to direct the returning sand and fluid over said shoulder to clean the same.

5. A pump for use in oil wells comprising a barrel, a housing secured to the barrel and having an inverted seat, a standing valve having an annular shoulder adapted to flatly contact with said inverted seat, a spring yieldingly holding said standing valve in engagement with said seat against the weight of the column of fluid above, a plunger adapted to engage said standing valve to depress and unseat the same to allow accumulated sand to return to the bottom of the well and to allow a portion of the column of fluid above the pump to wash said shoulder free of sediment, said housing being provided with a plurality of combined sand passages and fluid jets to direct the returning sand and fluid over said shoulder, and a shell receiving said barrel and co-operating with the same in the formation of a sand trap communicating with said combined sand passages and fluid jets.

6. In a pumping mechanism, the combination of a barrel, a housing connected to the lower portion of the barrel and having an annular member provided with an inverted seat and a plurality of passages, a standing valve having fluid tight contact with said seat for normally closing said passages, a spring arranged within said housing and urging said standing valve into sealing engagement with said seat, and a shell connected to said housing and co-operating with the barrel in the formation of a sand trap, said passages having communication with said sand trap.

7. In a pumping mechanism, a shell having means whereby the same may be connected to a well tubing, a working barrel within the shell and cooperating therewith in the formation of an annular sediment receiving chamber, a sediment discharge valve for said annular chamber, and means movable through said barrel for actuating said valve.

8. A pump for use in wells comprising a shell having means whereby the same may be connected to a well tubing, a working barrel within the shell and cooperating therewith in the formation of a sediment receiving chamber, a plunger in the barrel, and a sediment discharge valve for said chamber, said discharge valve having a member extending into the working barrel and disposed in the path of travel of and adapted to be engaged by the plunger within the working barrel.

9. In a pumping equipment, the combination of inner and outer tubular members spaced to define a sediment receiving chamber, a housing at the lower portions of said tubular members and having an internal shoulder at the lower portion of said chamber and provided with jets, a sediment return valve normally closing said jets, and a spring within said housing and urging said sediment return valve to closed position against the weight of the column of fluid above.

10. A pump for use in fluid producing wells comprising inner and outer tubular members spaced to define a sediment receiving chamber, a fluid lifting unit in one of said tubular members, a housing at the lower portions of said tubular members and having an internal shoulder at the lower portion of said chamber and provided with jets, a sediment return valve normally closing said jets, and a spring within said housing and urging said sediment return valve to closed position against the weight of the column of fluid above, said sediment return valve being provided with a standing valve unit in the path of travel of and adapted to be engaged by the fluid lifting unit in one of said tubular members.

11. In a pumping mechanism, the combination of a barrel, a shell receiving the barrel and being spaced therefrom to define a sand receiving chamber, a valve at the lower portion of the barrel and normally acting to close the lower end of said chamber, and a spring urging said valve to closed position.

12. In a pumping mechanism, inner and outer interfitting tubular members spaced to define a sand receiving chamber, a movable valve for said sand receiving chamber and having a contact element extending into the inner tubular member whereby the same is spaced from the sand in said chamber and is constantly exposed to the action of a lowering device.

13. In a pumping mechanism the combination of a barrel, a shell receiving the barrel and cooperating therewith in the formation of an annular sand receiving chamber, a closure for the bottom of said chamber and consisting of a movable valve and a member having a combined sand passage and fluid jet communicating with said annular chamber and adapted to direct sand and fluid into contact with said valve to wash the valve, and means to move said valve to an extreme position.

14. In a pumping mechanism the combination of a barrel, a shell receiving the barrel and cooperating therewith in the formation of an annular sand receiving chamber, a closure for the bottom of said chamber and

consisting of a movable valve and a member having a combined sand passage and fluid jet communicating with said annular chamber and adapted to direct sand and fluid into contact with said valve to wash the valve, and means to move said valve to an extreme position, said valve having an inlet passage for the admission of fluid to the barrel.

15. In a pumping mechanism the combination of a barrel, a shell receiving the barrel and cooperating therewith in the formation of an annular sand receiving chamber, a closure for said annular sand receiving chamber and consisting of a valve and a seat, said valve being provided with an inlet passage adapted for communication with said barrel for conducting fluid thereto, and means normally holding said valve in seated position.

In testimony whereof we affix our signatures.

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ROBERT D. THOMPSON.