Sept. 9, 1924. 1,507,989

H. H. DEFENBAUGH

SAND PUMP

Filed April 13, 1923 2 Sheets-Sheet 1

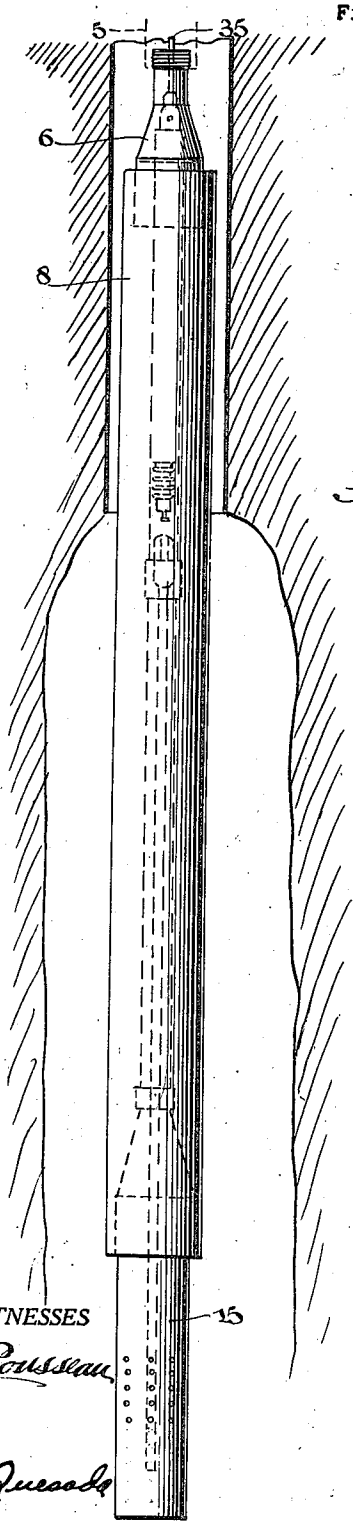


Fig. 1.

Fig. 4.

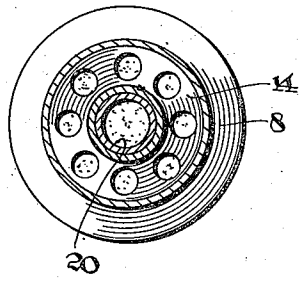


Fig. 5.

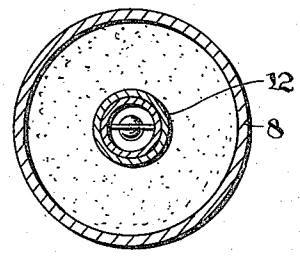
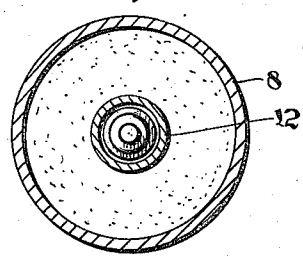


Fig. 6.



WITNESSES

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Fig. 2.

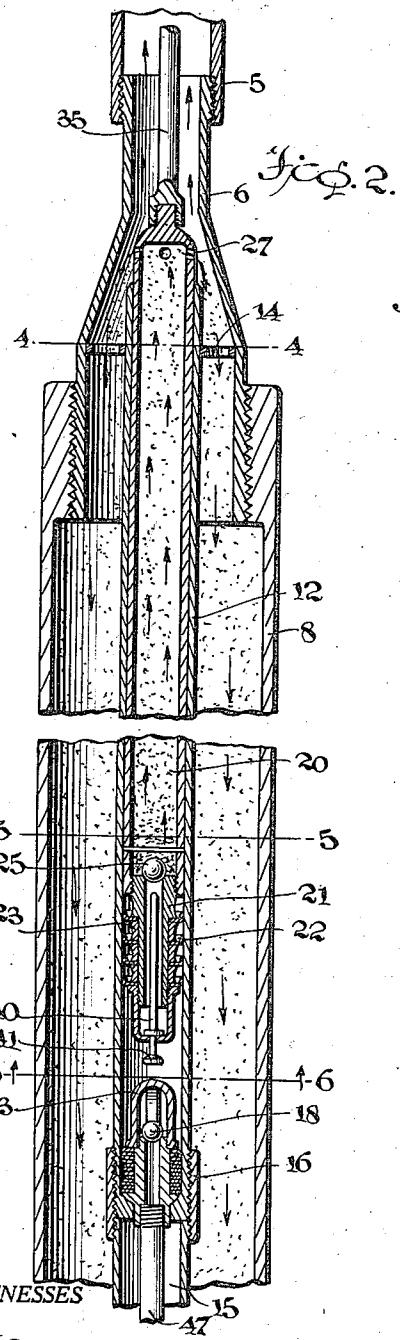
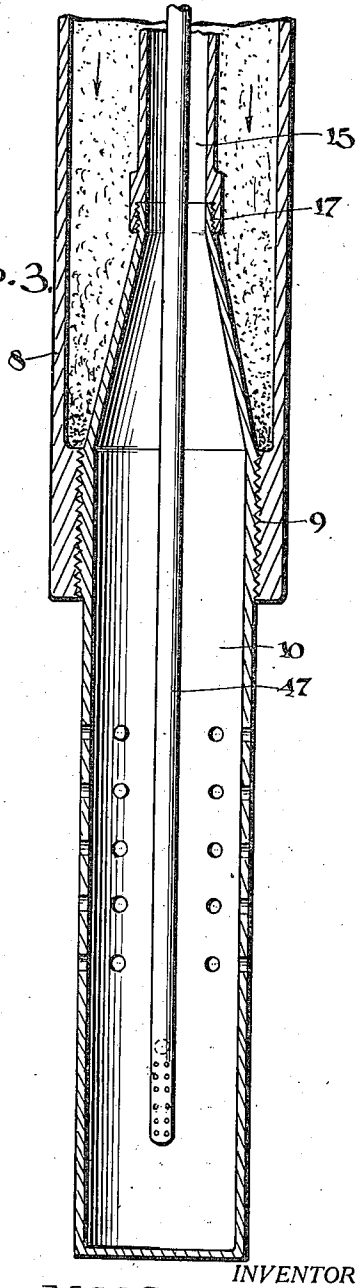


Fig. 3.



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UNITED STATES PATENT OFFICE.

HERBERT H. DEFENBAUGH, OF COPAN, OKLAHOMA.

SAND PUMP.

Application filed April 13, 1923. Serial No. 631,896.

To all whom it may concern:

Be it known that I, HERBERT H. DEFENBAUGH, a citizen of the United States, and resident of Copan, in the county of Washington and State of Oklahoma, have invented certain new and useful Improvements in Sand Pumps, of which the following is a specification.

This invention relates to pumping mechanisms especially adapted for use in oil wells.

More specifically the invention forming the subject matter of this application aims to provide a pumping mechanism for wells having simple and reliable means to permit sand and shale contained in the oil to settle into a receiver provided for that purpose so that the valve will be maintained comparatively free of sand and so that the sand which accumulates within the receiver may be periodically removed.

A further object is to provide a pumping mechanism having a novel form of tripping stem by means of which the upper valve of the valve mechanism is periodically elevated so that the gas between the upper and lower valves of the valve mechanism may escape and the fluid above the upper valve to enter the space between the valves to produce a priming action by means of which the well is again caused to produce after being pumped dry.

A further object is to provide a pumping mechanism of the character specified which is of highly simplified construction, durable in use and cheap to manufacture.

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 side elevation of the improved pumping mechanism.

Figure 2 is a vertical detail sectional view through the same.

Figure 3 is a detail sectional view through the lower portion of the pumping mechanism, the view illustrating the anchor.

Figure 4 is a horiontal sectional view taken on line 4—4 of Figure 2.

Figure 5 is a horizontal sectional view taken on line 5—5 of Figure 2.

Figure 6 is a horizontal sectional view taken on line 6—6 of Figure 2.

In the drawing wherein for the purpose of illustration is shown a preferred embodiment of the invention, the numeral 5 designates a joint of tubing having its lower end connected to a coupling 6. Figure 2 illustrates that the lower portion of the coupling 6 is substantially flared or enlarged in cross sectional area and has threaded engagement with the upper end of a sand receiver 8 of tubular formation.

With reference to Figure 3 it will be observed that the lower portion of the tubular sand receiver 8 is interiorly threaded as indicated at 9 for engagement with the upper portion of the anchor 10. The sand receiver 8 surrounds a working barrel 12 securely attached to the coupling 6 by means of a spider 14 and the lower portion of the working barrel 12 is joined with a barrel support 15 through the medium of a coupling 16. Figure 3 illustrates that the lower portion of the tubular barrel support 15 is in turn threaded onto the tapered upper end of the anchor 10 as indicated at 17.

Attention is directed to the fact that the working barrel 12 has its lower portion provided with the usual standing valve 18 by means of which the return of the fluid is prevented.

As illustrated in Figure 2 a plunger 20 of tubular formation has a working fit in the working barrel 12 and carries a travelling valve 21 at its lower end. The travelling valve 21 consists of the usual cup leathers 22 between which spacing elements 23 are arranged. In addition to this the travelling valve secured to the lower portion of the plunger 20 is provided with a spherical valve 25 which contacts with a seat on the upper portion of the travelling valve. It will be seen that on the downward movement of the travelling valve 21 the liquid and sand suspended therein will pass through the travelling valve 21, the tubular plunger 20 and out through the perforations 27 in the upper or rear portion of the plunger. The fluid thus discharged through the perforations 27 enters the gradually enlarged portion of the coupling 6 and thereby permits the sand and shale contained therein to settle.

In operation the sucker rod 35 is reciprocated by a pumping power or the like and the plunger 22 and the travelling valve are reciprocated within the working barrel 12 for pumping the oil. The fluid is discharged through the perforations 27 and passes up-

wardly through the tubing 5 and the sand, mud and shale suspended therein are allowed to gradually settle into the receiver 8. The spider 14 is perforated to permit of the free descent of the sand. Attention is directed to the fact that the upper end or what might be said to be the head of the plunger 20 is rounded so as to direct the settling sand laterally of the working barrel 12. As the openings 27 are in the sides of the plunger 20 the return of the sand by way of the openings 27 is very unlikely. Furthermore, the upper end of the working barrel 20 is beveled so as to provide a shed for the sand and to scrape the plunger free of sand as it enters the working barrel.

In carrying out the invention the valve 25 may be mechanically unseated by means of a trip stem 40, the lower end of which is provided with a contact head 41 to engage the cage 43 of the standing valve. The stem 40 constitutes a priming means which allows the gas accumulated between the valves to escape and the fluid from above to enter to produce a priming action by means of which the well is again caused to produce. That is to say in case the well is pumped dry the plunger is lowered to cause the head 41 to engage the cage 43 whereupon the upper end of the stem will unseat the valve 25 to permit the accumulated gas to escape. The fluid from above may now return to a point beneath the valve 25 and the pumping action may be resumed. Of course the product pumped by the well passes upwardly through a gas anchor 47 which is threaded into the lower end of the standing valve and which has its lower end perforate and arranged adjacent the lower end of the anchor 10.

The invention forming the subject matter of this application is especially valuable in small wells as the oil in the tubing is not entirely changed at each pumping and consequently the sand therein is allowed ample time in which to settle. By this invention the settling sand is directed away from the valve and into a sand receiver. The tubing may be periodically pulled for the purpose of emptying the receiver 8 and it is noted that the mechanism will effectively pump until the receiver is entirely full.

With reference to the foregoing description taken in connection with the accompanying drawings it will be seen that the invention is provided with simple means whereby the sand is reliably prevented from settling on both the upper and lower valves between and during the pumping periods. Therefore the valves will last for long periods and the necessity of frequently removing the tubing and barrel for replacement of parts is overcome.

Attention is directed to the fact that the perforations in the anchor 10 are approximately twelve inches from the lower end of the anchor so that the well can be pumped within twelve inches of the bottom. The slight space left in the bottom of the well is for obstructions which are too large to enter the holes in the anchor but such obstructions can fall to the bottom of the well and be disintegrated by the constant vibration of the tubing while the pumping operation is in progress. This vibration is sufficient to pulverize any sand or shale and mix it with the fluid which is pumped.

It will be observed that the coupling member 6 has its intermediate portion gradually decreased in internal diameter to define what might be said to be an annular baffle against which the oil strikes upon being discharged from the apertures 27. Therefore, the sand or other sediment in the oil will move downwardly upon striking the inclined baffle and the oil will move upwardly.

Having thus described the invention, what is claimed is:—

1. A pumping apparatus for wells comprising a sand receiver, a working barrel arranged in the sand receiver, a plunger of tubular formation having a working fit in the barrel and provided at its lower end with a valve, the upper portion of said plunger being provided with lateral discharge openings, the plunger being provided above said discharge openings with a rounded head by means of which the settling sand is directed into the receiver, the upper end of the working barrel being beveled to scrape the plunger free of sand as the plunger enters the working barrel and to direct the sand into the sand receiver and a standing valve arranged in the lower portion of said working barrel.

2. A pumping apparatus for wells comprising a sand receiver of tubular formation, a coupling member connected to the upper portion of the sand receiver, a working barrel arranged in the sand receiver in spaced relation to the same, a plunger of tubular formation having a working fit in the working barrel and provided at its lower end with a valve, the upper portion of said plunger being provided in its sides with discharge openings, the tubular plunger being provided above said discharge openings with a rounded head by means of which the settling sand is directed into said receiver, a standing valve arranged in the lower portion of said working barrel, a barrel support having connection with the lower portion of said working barrel, and an anchor connected to the working barrel and having threaded engagement with the lower portion of the receiver to close the same.

HERBERT H. DEFENBAUGH.