

March 13, 1928.

1,662,296

C. A. CARLSON

GAS ANCHOR

Filed Aug. 24, 1925

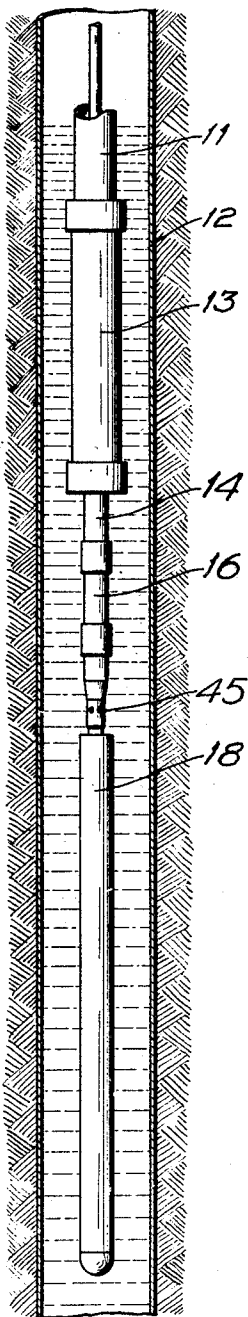


Fig. 1.

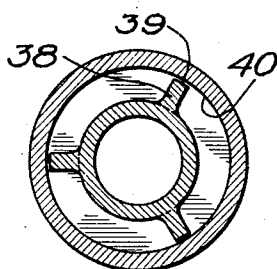


Fig. 3.

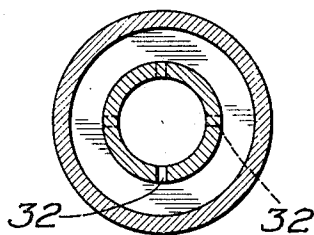


Fig. 4.

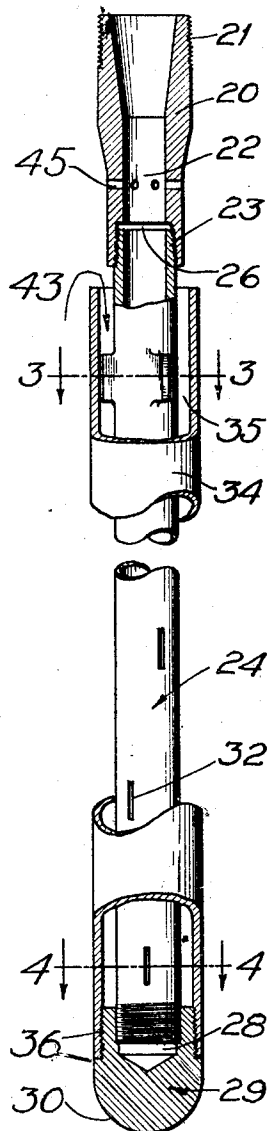


Fig. 2.

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Application filed August 24, 1925. Serial No. 52,180.

My invention relates to the art of pumping petroleum oil and it relates particularly to a novel gas anchor. It is well known in this art that the efficiency of an oil well pump is impaired by the presence of gas in the crude petroleum oil being pumped. To effect a separation of oil and gas so that only oil enters the pump, it is common practice to connect a gas anchor below the pump, which gas anchor excludes gas from the pump and permits it to operate at a higher efficiency than it would if the gas were not separated from the oil.

It is an object of this invention to provide a gas anchor which is efficient in separating gas and oil.

It is another object of this invention to provide a gas anchor in which a separating chamber is in full communication at its upper end with the exterior of the gas anchor.

It is also an object of the invention to provide a gas anchor having means for breaking up the mixture of gas and oil.

It is another object of this invention to provide a gas anchor which consists of few rugged parts which are uniquely attached together.

It is also an object of this invention to provide a guide plug at the lower end of the gas anchor for guiding it through the well casing when it is lowered to the bottom of a well.

It is another object of this invention to provide centralizing means for centralizing the upper ends of an inner and outer barrel of my invention.

Other objects and advantages of this invention will be made evident hereinafter.

Referring to the drawing in which I illustrate my invention,

Fig. 1 is a diagrammatic view showing a gas anchor of my invention attached to the lower end of a string of drill tubing below an oil well pump.

Fig. 2 is an enlarged partially sectioned and contracted view showing the gas anchor of my invention.

Fig. 3 is a section taken on the line 3—3 of Fig. 2, this view showing the centralizing means of my invention.

Fig. 4 is a section taken on the line 4—4 of Fig. 2.

With reference to Fig. 1, I show a pump tubing 11 which extends to the lower end of a well 12 and has a pump barrel 13 connected to the lower end thereof. Extending from the pump barrel 13 is a nipple 14, to the lower end of which is attached a standing valve body 16. A gas anchor 18 of my invention is secured to the lower end of the standing valve body 16.

As shown clearly in Figs. 2, 3 and 4, the gas anchor 18 of my invention has an upper connector body 20 which is threaded at its upper end as indicated at 21, thus adapting it to be secured to the standing valve body 16. The connector body 20 has an opening 22 formed therethrough. An upper end 23 of an inner barrel 24 is threadably secured in a threaded cavity 26 of the connector body 20.

The lower end of the inner barrel 24 is threadably secured in a cavity 28 of a guide plug 29, having a rounded nose 30, this guide plug 29 closing the lower end of the inner barrel 24. A plurality of elongated openings 32 is cut in the barrel 24 near the lower end thereof, which elongated openings 32 connect between the interior and exterior of the barrel. An outer barrel 34 is placed concentrically around the inner barrel 24 and an annular separating space 35 is thus formed between these inner and outer barrels 24 and 34. It should be noted, as clearly shown in Fig. 2, that the upper end of the outer barrel 34 terminates below the connector body 20 and also that the annular space 35 is fully open at its upper end. The lower end of the outer barrel 34 is threadably secured at 36 to the upper part of the guide plug 29. The outer barrel 34 extends almost the entire length of the inner barrel 24, terminating a short distance below the upper end thereof.

Extending from the inner barrel 24 near the upper end thereof is a plurality of radial centralizing fins 38. The outer edges 39 of these fins 38 may engage an inner face 40 of the outer barrel 34 for centralizing the upper end of the outer barrel 34 with respect to the inner barrel 24.

The operation of my invention is substantially as follows:

The oil in the well 12 in order to reach the pump barrel 13 must pass upward around the exterior of the outer barrel 34 and then downward through the annular separating space 35 until it reaches the elongated openings 32. The oil passes through the elongated openings 32 and upward through the interior of the inner barrel 24 and then passes through the opening 22 of the connector body 20, the standing valve body 16 and the nipple 14, thereby reaching the barrel 13. The oil flows into and through the gas anchor 18 of my invention during the up stroke of a plunger, not shown, which is situated in the barrel 13, there being a suction created at this time which draws the oil into the barrel. It should be noted that the oil to pass through the gas anchor must reverse its direction, as indicated by the arrow 43 of Fig. 2, at the upper end of the outer barrel 34. If the oil in the well contains gas, the suction produced by the up stroke of the plunger in the barrel does not greatly affect the upward travel of the gas due to the fact that the gas is so much lighter than the oil. Therefore, the gas carried in the oil is not reversed or drawn downward through the separating space 35. There is, however, a slight tendency for small bodies of gas to be drawn into the upper end of the separating space 35 because of the viscosity of the oil; but it soon reverses its direction due to its lightness and travels upward in the space 35 and upward in the well 12 outside the gas anchor 18. By reason of the fact that the annular space 35 is fully open at its upper end the gas may readily separate from the oil and pass upward through the well on the exterior of the pump tubing. By forming the annular space so as to be open at its upper end there are no cavities formed in which gas may collect. This is a desirable feature since any gas which collects tends to interfere with the normal operation of the gas anchor. The centralizing fins 38 serve a dual purpose; they not only centralize the inner and outer barrels, but they also break up the oil and gas which renders the separation easier. Practically none of the gas will pass to the lower part of the separating space 35 and pass through the elongated openings 32 into the interior of the inner barrel 24 and thus reach the pump barrel 13. Holes 45 are provided in the connector body 20; these holes connect the interior and exterior thereof and provide an outlet for any gas which might get inside the inner barrel 24.

It is very obvious from the drawing that the gas anchor of my invention is very simple in design. My gas anchor consists of four parts, namely, the connector body 20,

the inner barrel 24, the guide plug 29 and the outer barrel 34.

The guide plug 29 is provided with a rounded nose 30 so that it will pass readily through the casing of the well when it is being lowered to the bottom thereof.

The plug 29 serves as a means for connecting the inner and outer barrels 24 and 34 together, this being a very simple construction. The upper ends of the barrels 24 and 34 are retained concentric by means of radial centralizing fins 38.

The novel features of my invention not only provide an efficient gas anchor, but also cooperate to provide a gas anchor which has advantages of construction, namely, simplicity, which makes the manufacturing cost thereof low and the installation thereof easy, and rigidity, which is possible because the parts may be made very heavy.

Another feature of my invention, affirmed in practice, is that it can be run into small liners and obtain results equivalent to big pipe.

I claim as my invention:

1. In a gas anchor, the combination of: a tubular connector body adapted to be attached to a supporting member; an inner barrel having its upper end secured to the lower end of said connector body, there being openings formed near the lower end of said inner barrel for connecting the exterior of said inner barrel with the interior thereof; a guide plug secured to the lower end of said inner barrel, said guide plug closing the lower end of said inner barrel; an outer barrel secured at its lower end to said guide plug, said outer barrel being concentric around said inner barrel, there being an annular separating space formed between said inner and said outer barrels, the upper end of said outer barrel terminating below said connector body; and centralizing fins formed near the upper end of said inner barrel, said centralizing fins being arranged to engage an inner face of said outer barrel.

2. In a gas anchor, the combination of: a tubular connector body adapted to be attached to a supporting member; an inner barrel having its upper end secured to the lower end of said connector body, there being elongated openings formed near the lower end of said inner barrel for connecting the exterior of said inner barrel with the interior thereof; a round nose guide plug having a cavity in which a lower end of said inner barrel is secured, said guide plug closing the lower end of said inner barrel; an outer barrel secured at its lower end to said guide plug, said outer barrel being concentric around said inner barrel, there being an annular separating space formed between said inner and said outer barrels; and radially extending centralizing fins formed near

the upper end of said inner barrel, said centralizing fins being arranged to engage an inner face of said outer barrel.

3. The combination defined in claim 1 in which the connector body is provided with a port in its side wall establishing direct communication between the interior and exterior thereof.

4. The combination defined in claim 2 in

which the connector body is provided with 10 a port in its side wall establishing direct communication between the interior and exterior thereof.

In testimony whereof, I have hereunto set my hand at Long Beach, California, this 15 17th day of August, 1925.

CHARLES A. CARLSON.