Aug. 28, 1928. 1,682,114

C. A. CARLSON

GAS ANCHOR

Filed April 28, 1926

Fig. 1.

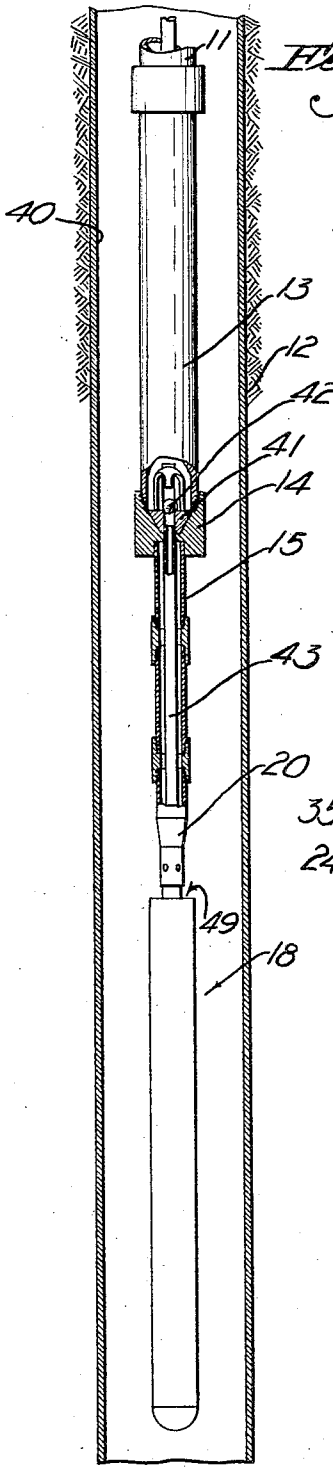


Fig. 2.

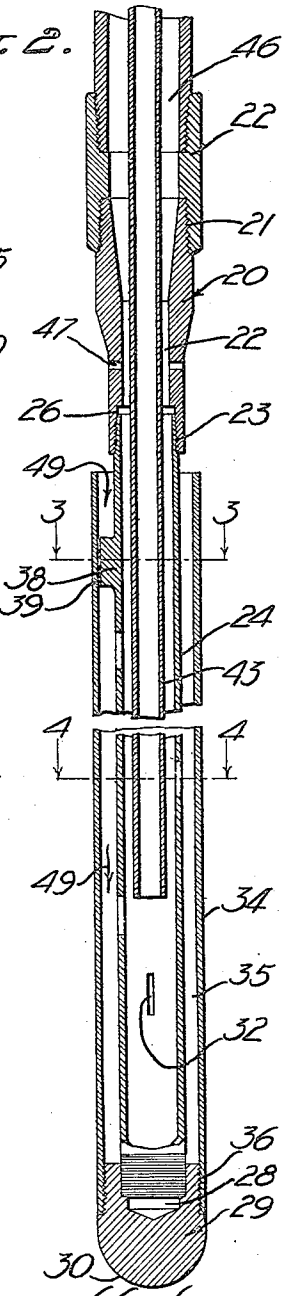


Fig. 3.

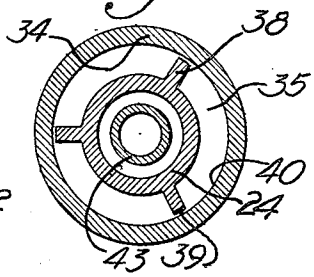
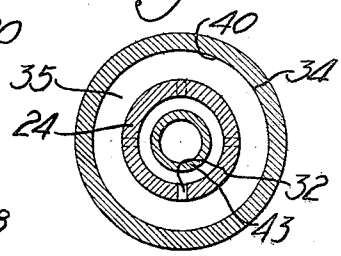


Fig. 4.



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UNITED STATES PATENT OFFICE.

CHARLES A. CARLSON, OF LONG BEACH, CALIFORNIA.

GAS ANCHOR.

Application filed April 28, 1926. Serial No. 105,073.

My invention relates to the art of pumping petroleum oil, and it relates particularly to a novel gas anchor.

In the oil pumping industry an oil well pump is secured at the lower end of a pump tubing near the bottom of a well. The pump tubing extends upward through the well to the surface of the ground, and has a branch pipe extending from the top thereof by means of which oil is conveyed to a suitable storage or place of use. The plunger of the pump which is situated in a pump barrel is connected to a string of sucker rods which extends up through the pump tubing, being connected to a walking beam of the derrick. The walking beam is actuated by operating mechanism and the plunger of the pump is reciprocated through the string of sucker rods. The pump barrel carries a standing valve and the pump plunger carries a working valve. During the up stroke of the plunger oil is drawn into the barrel, the standing valve being open during the down stroke of the plunger. The standing valve closes and oil passes in the barrel from a position below the plunger to a position above the plunger, the working valve being open. Oil carries a certain amount of the free gas which if present in large quantities greatly reduces the capacity of the pump since it tends to collect in the pump between the working and standing valves. This gas then expands and compresses with each stroke of the plunger in lifting the working valve and in allowing the standing valve to lift. To effect a separation of the oil and gas at the lower end of the well so that only oil enters the pump, it is common practice to connect a gas anchor below the pump which gas anchor is for the purpose of excluding gas from the pump, thus permitting 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 and which consists of few rugged parts which are uniquely secured together.

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

Another object of this invention is to provide a means for centralizing the upper ends of an inner and outer barrel of the invention.

Other objects and advantages will be made manifest 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 pump tubing below an oil well pump.

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

Referring to Fig. 1 of the drawing the numeral 11 denotes a pump tubing which is extended to the lower end of a well 12. Secured to the lower end of the pump tubing 11 is a pump 13. Extending from a lower collar 14 of the barrel of the pump 13 is a nipple 15. The gas anchor of my invention is secured to the lower end of the nipple 15 and is represented by the numeral 18.

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 a sleeve 22 by means of which it is attached to the nipple 15. The connector body 20 has an opening 22 formed therethrough. An upper end 23 of an inner barrel 24 is threadedly secured in a threaded cavity 26 of the connector body 20. The lower end of the inner barrel 24 is threadedly 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 connect between the interior and exterior of the inner 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. The lower end of the outer barrel 34 is threadedly secured at 36 to the upper part of the guide plug 29. The outer barrel extends almost the entire length of the inner barrel, 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 which engage an inner face 40 of the outer barrel 34 in order to centralize the upper end thereof with respect to the inner barrel 24.

Referring to Fig. 1, seated in the lower collar 14 of the barrel of the pump 13, is a standing valve body 41 having a ball valve 42. Secured to the standing valve body 41 is an eduction tube 43 which extends downwardly through the nipple 15, the connector body 20 and into the inner barrel 24, terminating but a short distance above the lower end thereof as shown in Fig. 2. The nipple 15 and the connector body 20 provide a gas collecting chamber 46. The connector body 20 is provided with a plurality of openings 47 which connect the gas collecting chamber 46 with the exterior of the connector body 20.

Oil in the well 12 in order to reach the pump 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 path of the oil is represented by arrows 49. The oil passes through the elongated openings 32 into the interior of the inner barrel 24. The oil passes upward through the interior of the inner barrel 24 and into the eduction pipe 43 by means of which the oil is conducted to the pump 13. The oil flows into and through the gas anchor 18 during the up stroke of a plunger (not shown) of the pump which is situated in the barrel. There is a suction created at this time which opens the standing valve which unseats the ball 42 and draws oil into the barrel.

The separation of the gas and oil by my invention is accomplished due to the fact that the oil in order to pass through the gas anchor must reverse its direction and pass downward at the upper end of the outer barrel 34. If the oil contains gas, the suction produced by the upstroke of the plunger in the barrel of the pump does not greatly affect the upward travel of the gas due to the fact that it is so much lighter than the oil, but it does affect the passage of the oil, drawing it into and through the gas anchor. The gas carried in the oil is not substantially reversed or drawn downward through the separating space. There is, however, a slight tendency for small bodies of gas to be drawn to the lower end of the outer barrel 34 and pass through the openings 32, this being because of the viscous nature of the oil. The gas, however, soon reverses its direction due to its lightness and travels upward inside the inner barrel 24 into the gas collecting space 46 formed at the upper end of the gas anchor. As this gas collects in any quantity it escapes from the gas anchor through the openings 47 formed in the connector 20. In actual experience it has been found that practically none of the gas will pass into the lower end of the eduction tube 43.

From the foregoing description it will be seen that the gas anchor of my invention is very simple and rugged in design consisting of five parts, viz, the connector body 20, the inner barrel 24, the guide plug 29, the outer barrel 34, and the eduction tube 43. The guide plug of the invention is provided with a rounded nose 30 for the purpose of guiding it through the casing when it is being lowered to the bottom of the well. Another utility of the plug 29 is that it serves as a means for connecting the inner and outer barrels 24 and 34 together. This is a very simple arrangement of parts. The upper end of the barrels 24 and 34 are centralized by the novel and simple radial centralizing fins. One important feature of the invention is that it is adapted to handle a large capacity of oil, being capable of being run into small liners and obtaining 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, said connector body providing a gas collecting chamber, there being openings connecting said gas collecting chamber to the exterior; 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 concentrical 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; 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; and an eduction tube extended through said member, said connector, into said inner barrel.

2. In a gas anchor, the combination of: a tubular connector body adapted to be attached to a supporting member, said connector body providing a gas collecting chamber, there being openings connecting said gas collecting chamber to the exterior; 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 concentrical around said inner barrel, there being an annular separating space formed between said inner and said outer barrels, the upper end of said annular separating space being in full communication with the exterior; radially ex-

tending 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; and an eduction tube extended through said member, said connector, into said inner barrel.

3. In a gas anchor of the class described, the combination of: an inner tube closed at the lower end thereof; an outer tube supported at its lower end by and surrounding said inner tube, said outer tube being closed at the lower end and having its upper end throughout its circumference spaced from and free from contact with said inner tube to provide an unrestricted annular inlet, there being a space formed between said inner and outer tubes, and there being means connecting said space to the interior of said inner tube; an eduction tube extending to a point near the lower end of said inner tube; and means for centralizing the upper end of said outer tube.

4. In a gas anchor of the class described, the combination of: an inner tube closed at the lower end thereof; an outer tube surrounding said inner tube, said outer tube being closed at the lower end and open at the upper end, there being a space formed between said inner and outer tubes, and there being means connecting said space to the interior of said inner tube; an eduction tube extending to a point near the lower end of said inner tube; and means in said space for breaking up emulsion.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 22nd day of April, 1926.

CHARLES A. CARLSON.