Jan. 1, 1929. 1,697,321

H. N. MARSH

SELF CONTAINED GAS ANCHOR

Filed May 31, 1927

Fig 1

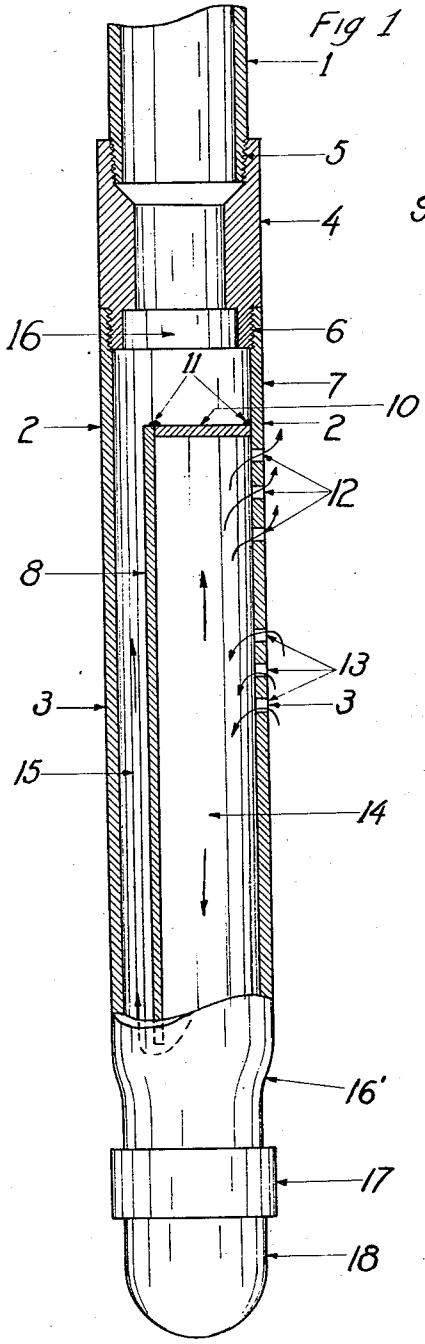


Fig 2

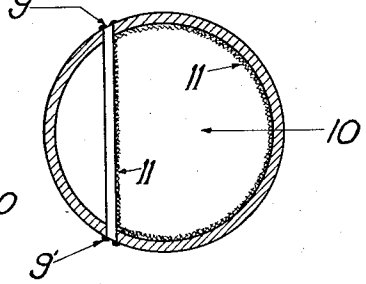


Fig 3

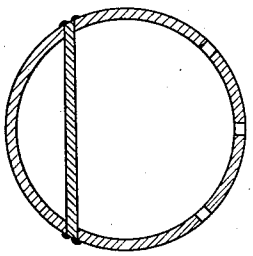
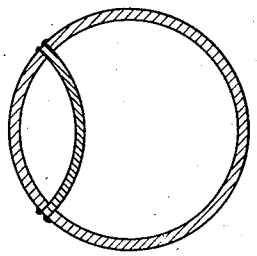


Fig 4



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Patented Jan. 1, 1929. 1,697,321

UNITED STATES PATENT OFFICE.

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SELF-CONTAINED GAS ANCHOR.

Application filed May 31, 1927. Serial No. 195,552.

A type of gas anchor in common use at this time consists essentially of a downward extension of the pump suction, such extension being open at the bottom, and of a shield placed therearound, such shield being closed at the bottom and substantially open at the top, the upper portion of the shield communicating with the oil in the well casing through slots or perforations formed in the shield.

In the gas anchors of this type heretofore constructed the extension of the pump suction with constitutes the anchor proper has consisted of a pipe of suitable length screwed into or otherwise made fast to the bottom of the standing valve block, and the shield has consisted of a suitable length of a larger size of pipe made fast at its upper end in some suitable manner to the bottom of the working barrel, the two pipes being concentric and leaving an annular space therebetween through which the oil flows downward at a retarded velocity for the separation of such gas as may be entrained in the oil.

When building anchors of this type for use in wells of very small diameter the outside diameter of the shield is rigidly limited and the thickness of the metal of which the concentric tubes is composed is a material proportion of the total transverse area of the anchor. Inasmuch as it is highly desirable to retain the greatest possible available transverse area for the purpose of reducing the velocity of the oil flowing through the anchor to the greatest possible extent, it is desirable to use as little metal as possible in the walls of the tubes or channels of which the anchor is composed.

I have discovered that by building an anchor having a shield of a diameter which the well casing will freely admit, and forming the channel which constitutes the pump suction extension inside this shield by a straight or curved partition wall placed therein, I not only reduce the transverse area of metal wall as compared with the ordinary construction of two concentric pipes, but also obtain a materially better hydraulic radius or ratio of cross sectional area to perimeter of the downpass. The latter improvement is of material importance, not only in reducing loss of head due to friction, but also by reducing the turbulence which acts to retard the separation of gas from oil in the downpass.

A preferred manner of constructing my improved gas anchor is shown in the attached drawing in which

Figure 1 represents a complete device attached to the working barrel of the pump.

Figure 2 is a cross section of Fig. 1 on the line 2—2 showing particularly the manner in which the partition wall and the partition cap are inserted and made fast.

Figure 3 is a cross section of Figure 1 on the line 3—3 indicating particularly the manner in which the partition wall is inserted in the shield and

Figure 4 is a similar cross section illustrating an alternative shape of partition wall.

It will be understood that these drawings are strictly diagrammatic and that I do not limit my invention to the particular means shown for placing the partition in the shield, nor to any curvature or particular curvature of the partition, nor to the particular means for attaching the shield to the pump.

Referring particularly to Figure 1, 1 represents the lower end of the working barrel, which is screwed into the coupling 4 by means of the threads 5, corresponding threads being formed in the upper end of coupling and on the lower end of the working barrel. The lower end of the coupling may be recessed and the projecting end threaded as shown at 6, and corresponding internal threads formed in the shield 7, by which the shield may be made fast to the coupling, or any other suitable or preferred means of attaching the shield to the coupling may be used. Inside the shield 7 is placed a partition 8 which divides the shield into two parts. This partition may be placed in the shield as shown at 9—9′ in Fig. 2 by removing with a flame cutting tool, or preferably by means of a mechanical cutting tool used in a planer or shaper. the portion of the wall of the shield representing the distance between 9 and 9′, inserting a strip of sheet metal to form the partition 8, replacing the portion of the shield previously removed, and welding the edges of the strip to the walls of the reformed shield as indicated in Figures 2 and 3. A piece of sheet metal is then formed to fit the space left between the partition and the wall of the shield as indicated at 10, and this piece welded to the partition and to the wall of the shield as indicated at 11. By following this procedure all points to be welded are readily accessible to either a gas or electric welding tool and the structure shown may be made

up without encountering any mechanical difficulties, but I do not restrict myself to any particular manner of inserting and closing off the partition inasmuch as there are numerous ways in which the partition may be placed and made fast which will suggest themselves to those skilled in the art.

The partition which separates the narrow suction extension from the wider downpass is not carried to the bottom of the shield but is stopped at the usual distance thereabove, which may be several feet. The total length of the shield may be varied to suit individual preference. For a 3″ diameter shield a length of 8′ measured to the bottom of the partition is usually sufficient, but a different length may be used if preferred.

Near the upper end of the shield and on the downpass or larger side thereof a number of perforations should be placed as indicated at 12 and 13. These perforations should not extend far enough around the shield that any of them would come on the narrow side which constitutes the up-pass. The perforations may be placed in two rings or bands as indicated in the drawing, these bands being spaced a few inches apart, or they may be placed in a single band, as preferred. The size of the perforations should preferably be about ¼″ for a 3″ anchor though larger or smaller perforations may be used if desired. The total area of the perforations should be not less than the transverse area of the downpass side of the anchor as indicated at 14, and should preferably be two or three times greater in total area.

The up-pass or pump suction channel formed in the shield, as at 15, should be as large as casing diameters will permit. In ordinary cases the area will correspond to the transverse internal area of a 1″ or 1¼″ pipe.

The bottom of the shield may be closed by swaging the pipe of which it is composed down to the diameter of the next smaller pipe size, as indicated at 16, screwing it into the coupling 17 and blocking this coupling with the bull plug 18, but any other suitable or preferred means for closing the bottom of the shield may be used, the manner of closing the shield at this end being no part of my present invention.

In operation this anchor functions in the following manner. Oil flows into the perforations 13 from the space between the shield 7 and the well casing, not shown, giving up a portion of its entrained gas at the point where it makes a right angle turn to enter such perforations. On entering the shield the oil again turns at a right angle and flows downward through the space 14, being prevented from passing into the pump suction by the partition cap 10. Because of the relatively large transverse area of the downpass 14 the flow of oil downward is so retarded that gas bubbles may rise through it by gravity and escape into the casing outside of the shield through the perforations 12, the gas being prevented from passing into the pump suction by the partition 8 and rises through the up-pass 15 by which it is conducted into the chamber 16 and thence to the pump suction, all as indicated by the directional arrows placed on the drawing.

I claim as my invention:

A gas anchor, comprising: a tube adapted to form a longitudinal extension of a pump barrel and to be attached to and communicate with the lower end of said barrel at its upper end only, and having its lower end closed; a longitudinal partition extending from wall to wall of said tube, joined to said wall at its longitudinal edges and dividing said tube into two longtudinal channels of unequal area, said partition terminating at its upper end at a point below the upper end of said tube and at its lower end at a point above the lower end of said tube so as to permit the passage of liquid beneath the lower end and over the upper end of said partition; a closure joining the upper end of said partition to a portion of the inner circumference of said tube in such manner as to close the upper end of only the wider of said unequal channels, and openings through said tube wall beneath said closure communicating with said wider channel only and at substantially the upper end of said channel.

In witness that I claim the foregoing I have hereunto subscribed my name this 23rd day of May, 1927.

HALLAN N. MARSH.