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TUBING ANCHOR

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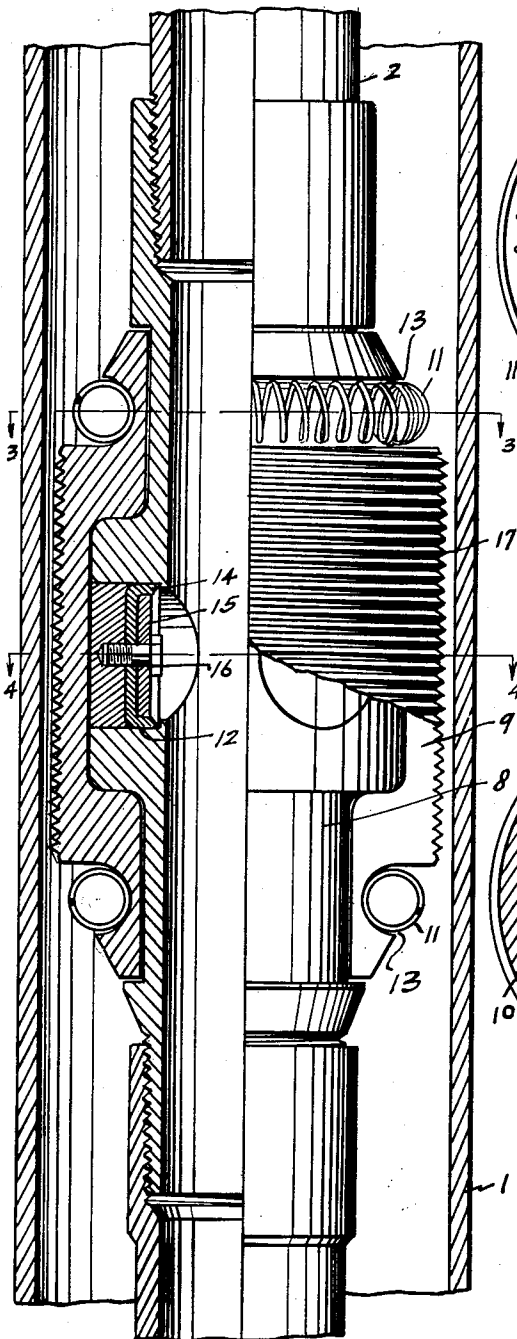


Fig. 2.

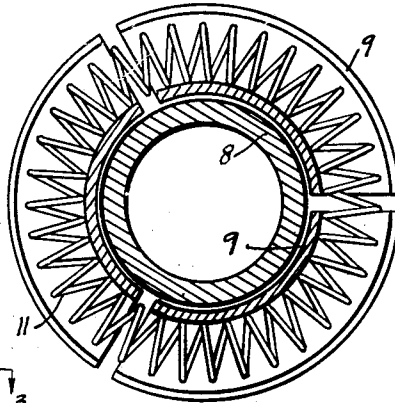


Fig. 3.

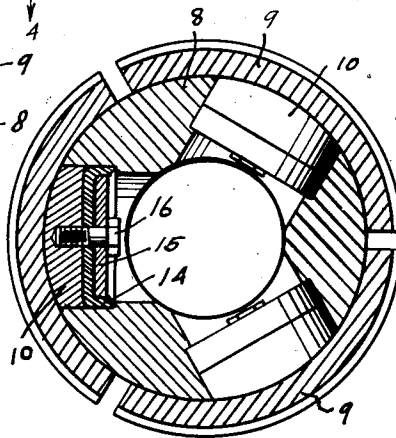


Fig. 4.

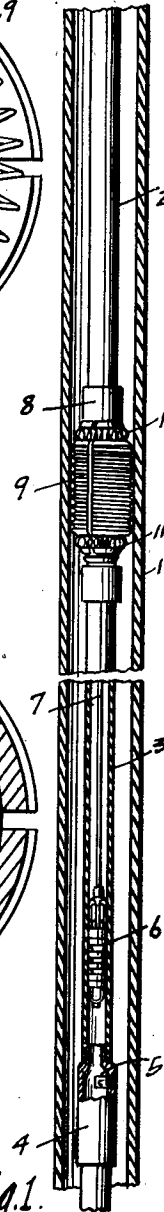


Fig. 1.

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TUBING ANCHOR

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5 Claims. (Cl. 103—219)

This invention relates to a tubing anchor.

One object of the invention is to provide improved means for anchoring a tubing, particularly a pump tubing, in a well.

Another object of the invention is to provide an anchoring device for tubing in a well whereby the tubing may be anchored to the well casing, or walls of the well, through means which are operative by the pressure of a column of fluid in the tubing.

Another object of the invention is to provide an anchoring means of the character described which will automatically release the walls of the casing upon the relief of the fluid column from the tubing, so that the tubing and pump may be removed from the well.

A deep well pump is usually located in a well at considerable depth and is attached to the lower end of the well tubing which extends to the ground surface and through which the fluid is delivered, by the pump, out of the well. At the lower end of the pump working barrel there is a standing valve and above it, in said barrel there is a traveling valve operable from the ground surface by the usual sucker rod. Upon upstroke of the traveling valve the fluid in the tubing above is forced upwardly and the standing valve is opened to draw in another charge into said barrel, and upon down stroke of the traveling valve the standing valve closes and the fluid beneath the traveling valve passes above said traveling valve.

The long string of tubing has a certain amount of elasticity and will stretch under its own weight and under the weight of the column of fluid therein. Upon upstroke of the traveling valve the said column will be lifted and the weight of the column on the standing valve, and therefore on the tubing, will be relieved and the tubing will thereupon contract, or shorten in length, unless the lower portion of said tubing is anchored in the well. This contraction of the tubing, in length, is accentuated by the frictional pull of the traveling valve on the working barrel as said valve moves upwardly. Accordingly if the tubing moves upwardly upon upstroke of the traveling valve the effective stroke of the traveling valve in the working barrel will be shorter, with respect to the working barrel, than the actual stroke of said traveling valve, thus causing a wastage of power and resulting in a decrease in efficiency of the pump. As the traveling valve moves downwardly the weight of the entire column of fluid in the tubing above is at once assumed, again, by said tubing, and this in addition to the weight

of the string of tubing, accentuated by the downward movement of the traveling valve subjects the tubing to a sudden downward stress, injuring said tubing, and causing it to lengthen and this downward movement of the tubing with the traveling valve, here again causes the effective downward stroke of the traveling valve to be shorter, with respect to the working barrel, than the actual stroke of said traveling valve again resulting in a loss of power, and in efficiency of the pump.

Furthermore if the pump tubing is not anchored relative to the casing the movements of said tubing above referred to will cause the tubing and casing to wear, often wearing holes in the casing to permit the inlet of water and wearing the tubing couplings in two, causing the tubing to part and often resulting in injury to, or loss of, the well.

The anchor herein described has been designed to prevent such movement of the pump tubing and to thereby, in effect, increase the pump stroke and capacity, make said pump more efficient, and prevent wear and injury to the pump tubing and the casing of the well.

With the above and other objects in view, this invention has particular relation to certain novel features of construction, operation, arrangement of parts and use, an example of which is given in this specification and illustrated in the accompanying drawing, wherein:—

Figure 1 shows a vertical sectional view of a well casing, showing a pump therein, partly in section with the anchor incorporated into the pump and in engagement with said casing;

Figure 2 shows an enlarged fragmentary vertical sectional view of the well casing showing a fragmentary side view of the pump and anchor partly in section.

Figure 3 shows a horizontal sectional view taken on the line 3—3 of Figure 2, and

Figure 4 shows a horizontal sectional view taken on the line 4—4 of Figure 2.

Referring now more particularly to the drawing wherein like numerals of reference designate similar parts in each of the figures the numeral 1 designates the casing or other wall of the well bore and the numeral 2 designates the pump tubing which includes also the pump working barrel

3. At the lower end of the barrel there is a standing valve 4 of any selected type, and associated with this standing valve there is a tubing drain tube 5, to be hereinafter referred to. A traveling

valve 6 is reciprocable in the barrel 3 through the usual sucker rod 7.

Means are provided for anchoring the tubing to the casing 1, or other walls of the well bore.

5 The anchoring means referred to is of such construction that the weight, or pressure, of the column of fluid in the tubing above will effect the engagement of said anchoring means with said casing or bore walls.

10 As illustrated the anchoring means referred to comprises the tubular insert 8, incorporated into and forming part of, the tubing 1; the expansible gripping jaws 9 thereon; the outwardly movable plungers 10 mounted in said insert, and the yieldable members 11 around the jaws to hold them in assembled relation.

The tubular insert 8, as shown, has its central portion outwardly thickened and provided with the radial cylinders 12 in which the plungers 10 20 are mounted and on each side of said thickened portion, above and below, said insert 8 is annularly counter sunk. The inner sides of the jaws 9 are shaped to conform to the contour of and to fit closely against the external surface of said insert 8 and at their ends said jaws are reduced and provided with the annular grooves or seats 13 in which the yieldable members 11, shown as coil springs, are located. The plunger 10 bears against the inner sides of the jaws 9 and the inner ends of the plungers carry the inwardly opening cup rings 14 which are clamped in place by the clamp plate 15 and set bolt 16. The inner ends of the plungers, as thus constructed, are exposed to the pressure of the fluid in the tubing.

35 During the operation of the pump in the well the tubing above the standing valve 4 will be constantly filled with the fluid being pumped. Usually the pump will be located in the well several thousand feet beneath the ground surface and the column of fluid above will exert a great pressure against the plungers and will force them outwardly and will force the jaws 9 into secure engagement with the casing 1 or other walls of the well and will thus hold the pump tubing securely anchored so that the length thereof will not vary as hereinabove explained, during the operation of the pump.

Preferably the external surface of the jaws 9 are toothed so as to more securely engage the casing. 50 These teeth are preferably formed by providing left hand threads 17 on said jaws. When it is desired to withdraw the pump the traveling valve 6 may be withdrawn, a suitable weight then dropped through the tubing to break off the inwardly projecting end of the drain tube 5 and the fluid in the tubing above will drain out and release the pressure on the plungers 10, thus permitting the release of the jaws 17 from the casing or walls of the well bore. If for any reason said jaws 9 should not readily release the casing the tubing 2 may be alternately elevated and lowered so as to jar said jaws from the casing and the springs 11 will then contract the jaws out of engagement with the casing so that the pump may be readily removed from the well. Any other type of tubing drain than that above described, may be used if desired.

The device has been shown and described as being applicable for the purpose of anchoring a pump tubing in the well but it is capable of gen-

eral application for other purposes for which it may be applicable. A single anchoring device has been shown, and described, but it is to be understood that a number of the devices may be arranged one above the other if it be found desirable to anchor tubing at a number of places. 80

What is now considered to be a preferred form of the invention has been shown and described by way of illustration merely. It is obvious that the mechanical structure of the device may be varied and equivalents substituted for the parts shown within the principle of the invention, and while what is now considered a preferred form has been illustrated the broad principle of the invention will be defined by the appended claims. 90

What we claim is:—

1. A tubing anchor comprising a tubular insert adapted to be connected into a well tubing and having an outwardly thickened portion intermediate its ends, expansible gripping means on said insert having the inner side thereof shaped to conform to the external contour of said insert, means mounted in the insert and exposed to the pressure of the liquid column in the tubing whereby said gripping means may be expanded into engagement with the walls of the well and means for retaining said gripping means in assembled relation with said insert. 95

2. The method of anchoring pump tubing of a reciprocating pump in a well casing which consists, in connecting in the string of well tubing above the working barrel a casing gripping device, lowering said tubing into the well casing to position said gripping device within the lower portion of the casing, and actuating said gripping device by subjecting the same to the pressure of the pumped liquid rising in the tubing to anchor said tubing against upward and downward movement. 100

3. In a well having a casing, a tubing anchor comprising, a tubular insert, radially movable gripping means carried by said insert and having teeth for gripping the casing when actuated so as to hold the insert against upward and downward movement, and hydraulic means for actuating said gripping means to holding position by exposition to the pressure of the liquid rising in the tubing. 105

4. A well tubing anchor comprising, a tubular insert adapted to be connected in a string of well tubing, radially movable gripping elements mounted in the insert and having V-shaped teeth for gripping a casing and holding against upward and downward movement of said insert, and hydraulic means for expanding said elements to anchor the insert exposed to and actuated by the pressure of the liquid rising in the tubing. 110

5. A well tubing anchor comprising, a tubular insert adapted to be connected in a string of well tubing, radially movable gripping elements mounted in the insert and having V-shaped teeth for gripping a casing and holding against upward and downward movement of said insert, hydraulic means for expanding said elements to anchor the insert exposed to and actuated by the pressure of the liquid rising in the tube, and means for retracting said elements when the pressure of the liquid is relieved. 115

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