SAND TRAP FOR INSERT TYPE DEEP WELL PUMP

Filed Sept. 13, 1954

INVENTOR.
Arlie B. Brooks

BY
Wayland D. Keith
HIS AGENT
This invention relates to improvements in sand traps for pumping wells, and more particularly to sand traps used on and in conjunction with insert type deep well pumps.

Various sand traps have been proposed heretofore, but these were not adaptable for use on insert, reciprocating barrel type pumps that are used in oil wells to pump oil therefrom.

The device which constitutes the present invention is so constructed that it may be readily inserted on the bottom of an insert pump barrel and placed in the well with the pump barrel and standing valve, and removed therefrom as a unit, so that the pump barrel elements, as well as the standing valve may be serviced and at the same time, the sand may be removed from the sand trap simply by removing the pump rods, pump and sand trap from the well.

The particular sand trap disclosed herein is especially adaptable for use on insert type pumps wherein the plunger of the pump is anchored within the seating nipple or working barrel, and the barrel portion of the insert pump is reciprocated.

An object of this invention is to provide a sand trap for an insert type pump wherein the sand trap, standing valve and insert pump may be removed by the removal of the rods from the well.

Another object of this invention is to provide a sand trap wherein liquid, such as oil, in which the sand is entrained, is caused to flow upward through a tortuous route so that the sand will be agitated in such manner as to cause it to settle out into an especially formed trap, before the liquid in which the sand was entrained reaches the cups of the working barrel.

Another object of the invention is to provide a sand trap that is attachable to the rods and movable therewith, which removes the sand and other foreign solids before the liquid reaches the moving parts of the pump.

Still another object of the invention is to provide a sand trap for a pump which is simple in construction, easy to install and to remove from a well and to remove sand from the sand collecting chamber thereof.

With these objects in mind and others that will manifest themselves as the description proceeds, reference is to be had to the accompanying drawings, in which like reference characters designate like parts in the several views thereof, in which:

Fig. 1 is a fragmentary longitudinal sectional view through the lower portion of an insert type reciprocating pump for wells and through the sand trap, showing the sand trap and pump installed within the tubing of the well, with certain portions being shown in elevation, and with other portions broken away and shortened to illustrate the details of construction;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, looking in the direction indicated by the arrows;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1, looking in the direction indicated by the arrows; and

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1, looking in the direction indicated by the arrows.

With more detailed reference to the drawing, the numeral 1 designates a seating nipple or working barrel which is usually placed near the lower end of the tubing of a pumping oil well. The numeral 2 designates a seating collar on the lower end of the seating nipple 1, which collar has a tapered face 4 therein to complementarily receive the lower end of an insert type pump which is designated generally at 6. The insert pump has a reciprocating barrel 8 that is attached to a string of pump rods (not shown) to reciprocate the barrel 8 in the usual well known manner. The working barrel or seating nipple 1 is usually finished on the interior thereof to receive cups 10 in fluid tight relation so when the lower tapered end 12 of the pump seats in complementary relation in the tapered portion 4 of the seating collar 2, the fluid is sealed against passage between the cups and the tapered portion 4 and the lower tapered end of the pump.

The tapered lower end 12 of the pump is internally threaded to receive a nipple 14 which extends downward and is threaded both internally and externally to receive tubular members 16 and 18 respectively. The inner tubular member 16 has perforations 20 therein to permit passage of liquid inward thereinto from tubing 18 into and through nipple 14 and thence upward through standing valve 22 into and through passage 24 into insert pump barrel 8 to be pumped to the surface of the well.

The insert pump designated generally at 6, has a downwardly extending nipple 14, the upper end of which engages the valve seat of valve 22 to hold the valve seat in fixed relation within the pump 6. The lower end of the nipple 14 is screw threaded internally and externally to threadably receive the respective tubular members 16 and 18, which tubular members make up the inner and outer walls of the upper portion of the sand trap. The tubular member 16 has perforations 20 formed within the walls thereof to permit passage of fluid therethrough, furthermore, the tubular member 16 has a conical lower end 22 which is upturned, as indicated at 40, so as to direct any sand settling out axially downward, so as to keep to a minimum the agitation of the sand during the upward flow of fluid within the tubular member 18.

The tubular member 18 extends downward and is threaded at its lower end to threadably engage the exteriorly threaded upper end of the body of the standing valve 28. The inner diameter of the upper end of the body of standing valve 28 is threaded to threadably receive the upstanding tubular member 32. The tubular member 32 forms an annular space 38 within tubular member 18 so as to form a sand trap chamber. The upper end of the body of standing valve 28 serves as the bottom closure of the annular sand trap chamber 38. The upper end of the tubular member 32 is closed, however circumferentially spaced slots 36 are formed through the wall thereof, near the upper end, so as to permit the fluid flowing upward therethrough to flow out into the annular space 38 above the normal sand settling level, thereby forming a sand trap between the lower end of the insert pump 6 and the body of the lower standing valve 28.

It will be readily appreciated that insert pumps are run into the tubing on the lower end of the pump rod and likewise, the insert pump is removed from the tubing by removing the pump rod, therefore the sand trap may be removed each time the rods are pulled for repair or replacement of the insert pump.

The liquid and gas containing the solids, such as sand and the like, is drawn inward through pipe 26 from the formation reservoir near the bottom of the well. The liquid and gas containing the solids is drawn upward through a first standing valve 28 which seats on seat.
2,858,772

3. Thence oil, water and gas containing sand and other solids is drawn upward through a length of small tubing 32 having a series of transverse pins 34 therethrough which will serve as baffle elements to cause the agitation of the oil, gas and water within the tube, due to the high velocity of flow within this tubing, the fluid containing the sand and other foreign matter, passes out through slots 36 into a larger tubing 18, and due to the liquid passing into a larger cross-sectional area tubing, the velocity of the fluids is slowed materially, whereupon the sand and solids will be caused to settle downward into the annular space 38 which forms the sand trap. With the remaining liquid passing upward through pipe 18 and through perforations 20 into tubing 16, such other solids and sand that might pass upward into tubing 16, is directed downward through opening 40 in the lower conical end 42 of tube 16, the sand will then find its way downward into annular trap 38.

It is to be pointed out that the sand is efficiently removed during the pumping of the oil by the insert pump and that the sand may be removed from the sand trap each time the pump is removed from the well without the necessity of removing the tubing or making an additional trip with the rods to remove the sand trap and the sand therein.

While the device has been described and illustrated in some detail for one embodiment thereof, it is to be understood that changes may be made in the minor details of construction, and adaptations made to different installations without departing from the spirit of the invention or the scope of the appended claims.

Having thus described the invention, what is claimed is:

1. A sand trap for wells for use on the lower end of a pump rod, which sand trap comprises a nipple for attachment to the lower end of said pump rod, an inner and an outer tubular member telescoped together to form an annular space therebetween, which tubular members are attached to the lower end of said nipple, a body member, said outer tubular member being perforate and extending downward and being secured to said body member, said inner tubular member having perforations formed in the wall thereof, which inner tubular member extends downward for only a portion of the length of said outer tubular member and has at least a portion of the lower end thereof open, a tubing secured to said body member and upstanding therefrom within said outer tubular member for a portion of the length thereof, so as to form an annular chamber between the outer diameter of said tubing and the inner diameter of said outer tubular member, said body member having a substantially axial passage formed therein, which passage is in communication with the interior of said upstanding tubing, said upstanding tubing being closed at the upper end thereof, said upstanding tubing having lateral openings formed in the wall thereof near the upper end, and said body member forming a bottom for said chamber formed between said upstanding tubing and said outer tubular member.

2. A sand trap for use on the lower end of a string of pump rods, as defined in claim 1, wherein said inner tubular member has a conical lower end and wherein said opening formed in the lower end thereof is at the apex of said cone.

3. The sand trap as defined in claim 1, wherein said upstanding tubing has a series of transverse baffle elements therein.

4. The sand trap as defined in claim 1, wherein said body member is detachably secured to said outer tubular member.

5. The sand trap as defined in claim 4, wherein said upstanding tubing is detachably secured to said body member.

6. A sand trap as defined in claim 1, wherein said outer and said inner tubular members are threadably secured to said nipple at the respective upper ends of said tubular members and wherein said lower end of said outer tubular member and the lower end of said tubing are threadably secured to said body member at their lower ends.

References Cited in the file of this patent

UNITED STATES PATENTS

981,172 Comradr January 10, 1911
993,520 Hahn May 30, 1911
1,327,583 Arbon January 6, 1920
1,431,006 Kelsey October 3, 1922
1,632,216 Bradley June 14, 1927
2,189,272 Russell February 6, 1940
2,665,643 Greene January 12, 1954