Oct. 8, 1963 B. F. SCHMIDT 3,106,526

SAND AND GAS DEFLECTOR FOR OIL WELL PUMPS

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FIG. 1.

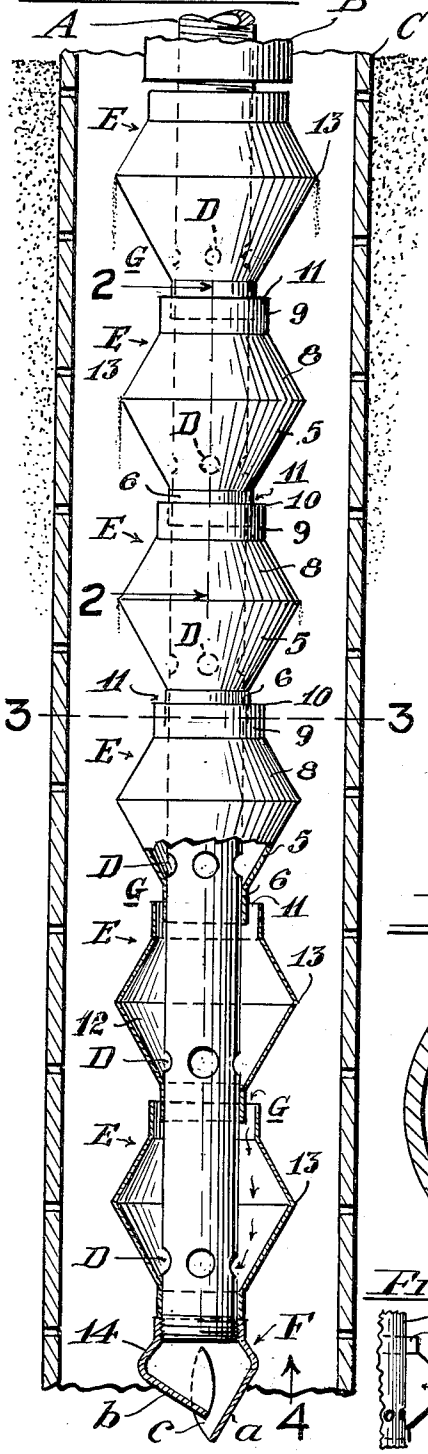


FIG. 2.

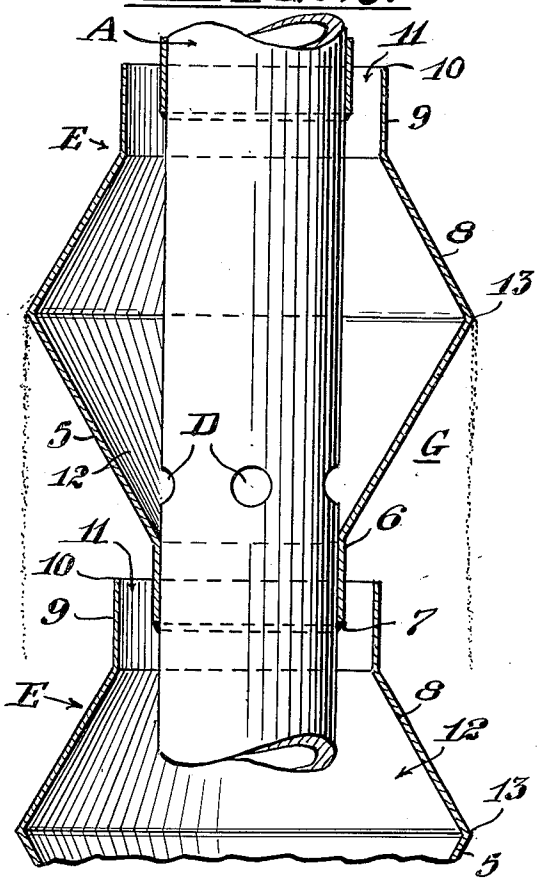


FIG. 3.

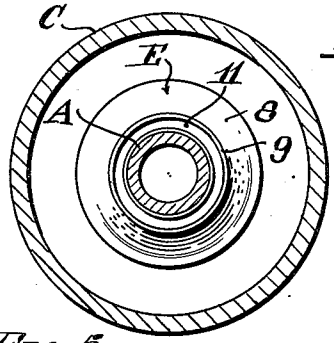


FIG. 4.

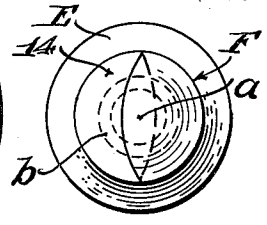
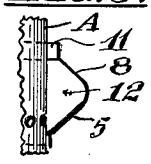


FIG. 5.



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SAND AND GAS DEFLECTOR FOR OIL WELL PUMPS

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This invention relates to a sand and gas deflector for oil well pumps and has as its primary object the provision of an attachment to the intake end of a pump employed in the pumping of an oil well wherein the crude oil is burdened by an excess of sand and gas, whereby the delivery of the sand and gas into the pump intake is prevented at least in part and whereby the volume of oil delivered by the pump in a given length of time is considerably increased.

Another object is to provide a length of intake tubing for attachment to the inlet of an oil well pump embodying an arrangement of baffles or deflectors attached to the tubing adapted on operation of the pump to guard against the entrance of sand or gas from the well into the tubing through inlet apertures in the latter.

Another object is to provide a construction of the above character which may be readily and economically fabricated, which is easily applied, and which may be designed to meet varying conditions in a well.

With the foregoing objects in view together with such other objects and advantages as may subsequently appear, the invention resides in the parts and in the combination, construction and arrangement of parts hereinafter described and claimed, and as illustrated by way of example in the accompanying drawings in which:

FIG. 1 is a view in elevation of the gas and sand deflector with parts shown in section;

FIG. 2 is an enlarged vertical section and elevation taken on the line 2—2 of FIG. 1;

FIG. 3 is a view in cross section taken on the line 3—3 of FIG. 1;

FIG. 4 is a view in end elevation of the attachment as seen in the direction of the arrow 4 in FIG. 1; and

FIG. 5 is a detail in section and elevation of a fragmentary portion of a modified form of the deflector shown in FIG. 2.

Referring to the drawing more specifically A indicates an elongated length of cylindrical tubing constituting a suction tube which is designed to be attached to the lower intake end B of a pump and extended downwardly therefrom in longitudinal axial relation to a perforated casing C positioned in the oil sands of a well.

The tube A has a series of circumferentially extending rows of spaced intake apertures D disposed at suitable distances apart along a length thereof, of which the lowermost row of such apertures is located near the lower end of the suction tube. The apertures D in each row thereof are of corresponding diameters, and those of the several rows are of gradually decreasing diameters progressively from the lowermost row to the uppermost row thereof, whereby the rate of flow of oil through the several rows of apertures will be equalized.

Each of the rows of apertures D is shielded by a baffle element E carried on the tube A, which baffle element comprises an annular shell encircling the tube A in spaced relation thereto and embodying an upwardly and outwardly inclined lower gas deflecting side wall portion 5 leading from a cylindrical sleeve 6 closely encompassing the tube A and affixed thereto as by a weld joint 7. The shell of the element E also embodies a downwardly and outwardly inclined upper sand deflecting side wall portion 8 the lower end of which merges or connects with the upper end of the wall portion 5 and the upper end of

which wall portion 8 terminates in a cylindrical wall 9 extending upwardly concentric with the tube A in spaced relation thereto and terminating in an even margin 10 extending perpendicular to the tube A and defining an annular inlet opening 11 communicating downwardly through the interior of the cylindrical wall 9 with the chamber 12 interiorly of the walls 5–8.

The margin 10 of the uppermost baffle element E is spaced slightly from the lower end of the pump B while the margins 10 of the succeeding subjacent elements E are slightly spaced relative to the underside of the lower side wall portion 5 of the adjacent superimposed element E as shown in FIGS. 1 and 2. The row of apertures D in the tube A shielded by a baffle element E opens to the chamber 12 at the lower end portion thereof.

The recited formation and arrangement of baffles E defines annular channels G between the outer faces of the inclined side walls 5 and 8 of adjacent baffles from the inner portions of which channels lead the inlet openings 11. The margins of the channels G comprise the circumferential outermost portions 13 of the adjacent baffles E formed by the juncture of the side walls 5 and 8, which portions extend in equi-spaced concentric relation to the well casing C.

In some instances, the side walls 5 and 8 may be conical with their base margins connected together throughout to form the outermost portions 13 of angular shape in section as shown in FIGS. 1 and 2, but in some cases the side walls 5 and 8 may be curved and joined at their margins to render the portions 13 rounded as shown in FIG. 5. The side wall portions 5 and 8 may be formed separately and united in any suitable manner as by welding, or they may be unitary and shaped to afford the chamber 12 by a spinning operation.

In practice the sum total of the cubic inch volume of the spaces formed by the several channels G must exceed by at least three to one the cubic inches of the volume of oil admitted to the pump on the intake stroke of the pump piston for the purpose presently to be described.

The lower end of the tube A is equipped with a guard F serving to prevent sand and gas from entering the open lower end of the tube A yet permitting free flow of sand out of the lower end of the tube A. To accomplish this purpose the guard F comprises a cylindrical cap 14 screwed on the lower end of the tube A having a slotted convergent end wall consisting of a pair of downwardly and inwardly inclined walls *a*—*b* extending in spaced overlapping relation to each other at their margins thereby affording a downwardly and laterally opening sand discharge slot *c*. Sand settling out of oil contained in the tube falls onto the inclined walls *a*—*b* and is directed thereby to discharge through the slot *c*.

The body of crude oil occupying the well casing C and surrounding the intake tubing A contains sand in suspension as well as gas, which substances are ordinarily delivered to discharge with oil being pumped, but where the pump is equipped with the intake tubing of the present invention, the sand and gas are prevented from entering the pump, at least in most part, which is effected in the following manner.

On down stroke of the piston of a single acting pump B the crude oil in the well will be static, during which period sand contained in the oil will precipitate while its gas content will bubble upwardly in the oil body in the usual manner.

In the operation of the invention a portion of the sand precipitating from the body of oil in the well above the uppermost baffle E will gradually come in contact with the downward sloping surface of the side wall 8 and will thereby be deflected from the channel G and the intake 11 therein. In like fashion at least a substantial portion of the sand precipitating from the oil bodies occupy-

ing the several channels G will settle on and be deflected by the inclined side wall 8 of subjacent baffles E throughout the series of baffles.

In this fashion the bodies of quiescent oil in the channels G will have their normal sand content at least materially reduced so that on the intake stroke of the pump piston whereby oil will be inducted from the channels G through the intakes 11 into the chambers 12 and through the intake openings D will be substantially free of sand. This condition is brought about by reason of the greatly increased volume of oil occupying the several channels G relative to the volume of oil extracted on each intake stroke of the pump piston augmented by equalization of the flow of oil through the several intake apertures D afforded by the apertures being of gradually decreasing diameters progressively from the lowermost to the uppermost thereof. By this formation and arrangement of the intake apertures, suction induced in the intake tube on upstroke of the pump piston is equalized throughout the length of the tube thereby insuring uniform flow of oil through the several apertures spaced along the length of the tube which minimizes induction of sand into the tube through the apertures, as compared with an arrangement wherein the apertures are of corresponding diameters throughout which results in augmented suction being developed in the uppermost apertures with greatly reduced suction developed in the lowermost apertures and which results in the induction of sand through the uppermost apertures which otherwise would not occur.

In like fashion a large portion of the gas content of the oil in the well casing will be prevented from entering the pump, the gas in rising in the oil surrounding the intake tubing being deflected from the channels G and the intakes 11 by the upwardly and outwardly inclined side walls 5 of the several baffles E. By the recited construction and arrangement of the baffle element E the walls of the shell thereof not only function to deflect sand and gas but in overlying the intake apertures D serve as shields to guard against the deflected sand and gas from entering said apertures.

While a specific embodiment of the invention has been shown and described, the invention is not limited to the exact details of construction set forth, and the invention embraces such changes, modifications and equivalents of the parts and their formation and arrangement as come within the purview of the appended claims. For example, while the assembly has been shown and described as positioned in a well with the inlets 11 as opening upwardly, such assembly may be disposed in a well with said inlets presented downwardly.

I claim:

1. In a sand and gas deflector for oil well pumps, an upright tube having groups of intake apertures spaced apart along the length thereof with the apertures of the several groups of gradually decreasing diameters progressively from the lowermost group to the uppermost group thereof; an annular hollow baffle encompassing each of said groups of apertures embodying a chamber from which the encompassed apertures lead, said baffles each embodying a downwadrly tapered closed gas deflecting lower end affixed to and closed by said tube and having an upwardly tapered sand deflecting upper end opening around said tube.

2. A sand and gas deflector for oil well pumps comprising a length of tubing attachable at one end thereto to a pump intake in depending relation thereto, said tubing having a series of spaced rows of apertures, a hollow baffle element encompassing said tubing in overlying relation to each of said rows of apertures, said baffle elements each comprising a shell embodying an outwardly and downwardly sand deflecting side wall having an upper end spaced from said tubing, an upwardly and outwardly inclined gas deflecting side wall having a lower end encompassing and abutting said tubing, said side walls having their outer portions interconnected throughout; and means fixedly connecting said shell to said tubing, said tubing having an open lower end, and a guard element overlying said open lower end through which sand may pass from said tubing, said guard element comprising a cap embodying a pair of downwardly and inwardly inclined side walls extending in spaced overlapping relation to each other at their margins whereby said guard element is adapted to exclude sand from entering the lower end of said tubing.

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