Oct. 17, 1950 J. O. SANDERS 2,526,086

SAND FLUSHER

Filed Oct. 19, 1945 2 Sheets-Sheet 1

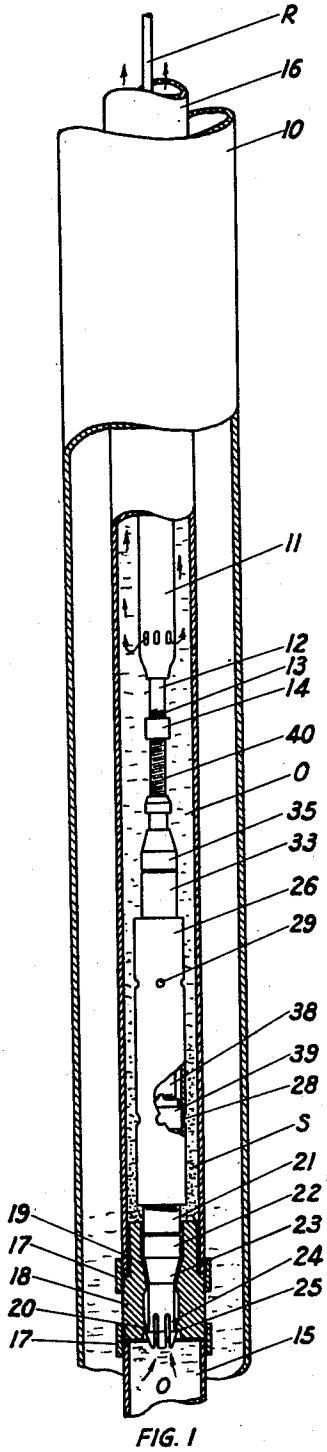


FIG. 1

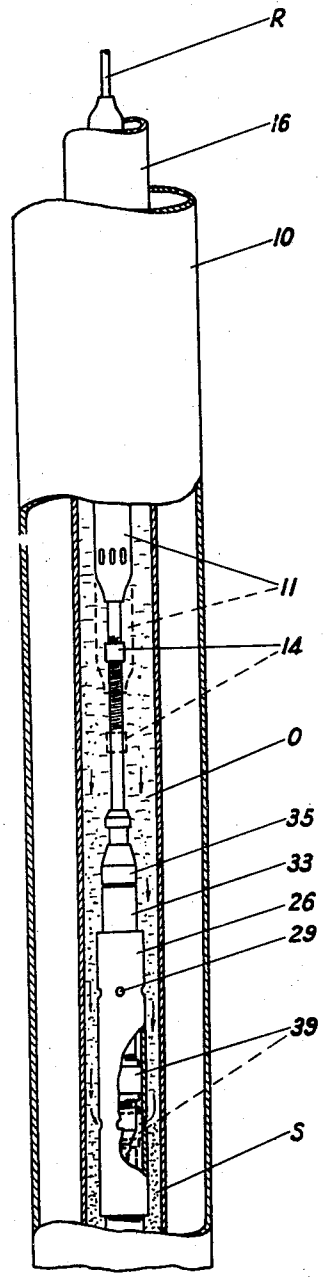


FIG. 2

INVENTOR.
Joseph O. Sanders

BY
A. F. Flournoy

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SAND FLUSHER

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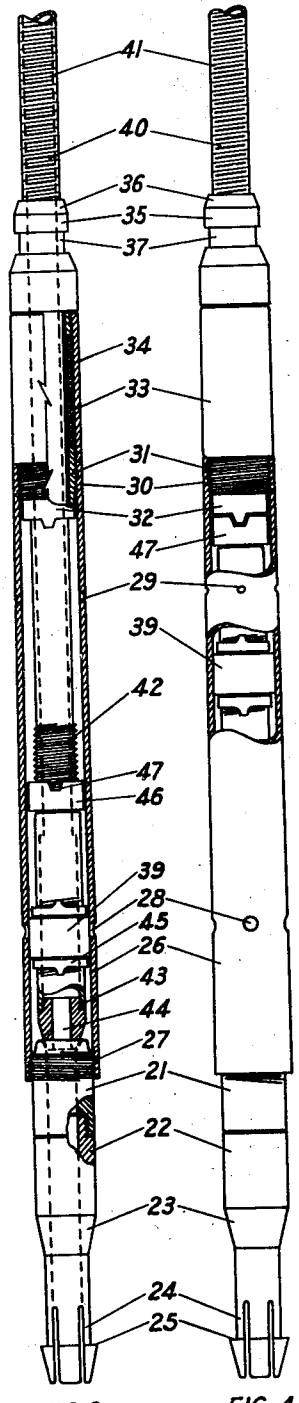


FIG. 3

FIG. 4

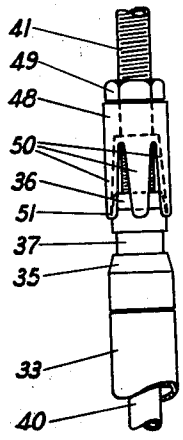


FIG. 7

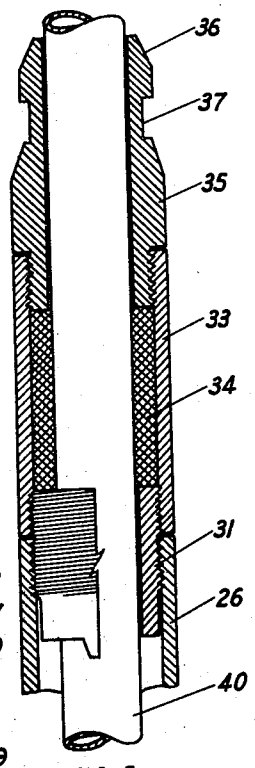


FIG. 5

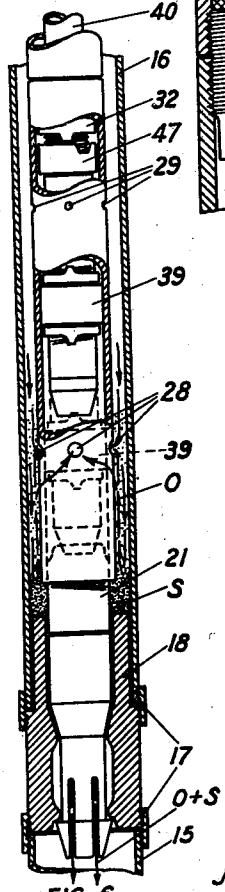


FIG. 6

INVENTOR.
Joseph O. Sanders

BY

A. F. Flowmoy

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UNITED STATES PATENT OFFICE

2,526,086

SAND FLUSHER

Joseph O. Sanders, Vivian, La.

Application October 19, 1945, Serial No. 623,331

5 Claims. (Cl. 103—204)

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My invention relates to pumping mechanisms for use in oil wells and more particularly to a means designed to be used on the lower end of a pump to dump oil from a string of tubing and to flush accumulated sand away from an oil pump's anchorage.

In the operation of oil wells under the prior art teachings in the use of the well known barrel type pump it is the customary practice to anchor the lower end of the lift tube into a collar made up into the string of tubing called sometimes a "shoe." The lower end of the lift tube or the equivalent member of pumps is anchored into the anchor receiving sleeve by means of a contractable fitting that is adapted to be forced into the anchor receiving sleeve to be frictionally held by it until it is pulled out of the sleeve along with the pump hanging at the end of the string of sucker rods. Many types of these anchors have been devised but all of the type that I have known of in actual practice on occasions will become frozen tight in the anchor receiving sleeve by fine sand that builds up around the anchor and settles down into the anchor receiving sleeve to such an extent that they cannot be pulled loose. This unhappy condition is aggravated by the fact that the string of tubing in which the pump is working will be filled with oil at the time the operator sees fit to withdraw the pump and lift the anchor means. The weight of the oil in the string of tubing in most cases will be nearly equivalent to the maximum lifting force of the pumping machinery, leaving but slight surplus lifting power to break loose the sanded up anchor.

After considerable use, the pump will naturally become defective and will require certain repairs or a replacement of parts. This will necessitate the disengagement of the pump from its anchorage to the tubing and anchor shoe, and a removal of it from the well together with the length of sucker rods.

Under conditions described above when the anchor could not be released, the entire string of tubing and the entire string of sucker rods would have to be raised and disjointed section by section until the anchor was reached. Such an operation is expensive not only in the loss of the producing time of the well, the expense of the crew's time in pulling the tubing and putting it back into the casing of the well, but also in the loss of a considerable number of barrels of oil that would be brought up in the oil filled string of tubing called "wet tubing" in the language of drillers.

An object of my invention is to provide a means

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for dumping oil from a string of tubing prior to the withdrawal of the pump.

Another object of my invention is to provide a means for flushing accumulated sand away from a pump anchorage to make it easy to free the pump's anchor from an anchor receiving sleeve or its equivalent.

Other objects and advantages of my invention will appear during the course of my detailed description of a sand flushing device embodying my invention illustrated in my accompanying drawings.

In the drawings:

Figure 1 is a broken elevation view illustrating a sand flusher embodying my invention shown in its collapsed position mounted on the lower end of a well pump.

Figure 2 is a vertical broken view of the assemblage illustrated in Figure 1 showing the sand flusher in its expanded position, its operating position.

Figure 3 is an enlarged elevation view in part cross section illustrating the sand flusher in its collapsed position.

Figure 4 is an enlarged vertical view in part cross section illustrating the sand flusher in its expanded position.

Figure 5 is an enlarged fractional view in part cross section of a portion of the sand flusher.

Figure 6 is a diagrammatic view illustrating the operation of the sand flusher.

Figure 7 is a vertical view illustrating a clamping device designed to be used with the sand flusher illustrated by Figure 3 and Figure 4.

Figure 1 of the drawings illustrates my invention in a sand flushing device in its operating position. Numeral 10 designates a string of casing. The pump barrel 11 is a part of a conventional type of oil pump in which the barrel 11 is the movable member of the pump while the piston (not shown) and the pump lift tube 12 to which it is attached are held stationary. Thus it can be seen that the piston and the lift tube 12 are held stationary during all of the pumping operation when my invention is used just the same as it would be in the prior art practice where the lift tube 12 is anchored. The only movement that my sand flusher makes is when the entire string of sucker rods R and pump attached to the same are to be drawn up out of the string of tubing for repairs or the like. My sand flusher is shown attached on the threaded end 13 of the lift tube 12 by means of an expanded nipple 14. The hollow pump barrel 11 is attached at its upper end directly to the string of sucker

rods R. This type of pump is well known in the prior art and since it does not constitute a part of this invention, is not shown in detail in the drawing. The mechanism consists of a piston and check valves mounted on the upper end of the hollow lift tube 12, on which the pump barrel slides during the pumping operation. When the string of sucker rods R draws the barrel 11 upward, the vacuum thus created opens the check valve on the end of the hollow lift tube 12 and draws the oil directly from the lower reservoir O. On the down stroke of the string of sucker rods R the oil, caught in the upper portion of the barrel, closes the check valve and is forced down through a by-pass through the barrel where it is exhausted through ports into the tubing as shown by the arrows in Figure 1; and hence is forced upward to the surface of the ground.

A lower length of tubing 15 is joined to the upper length of tubing 16 by means of the pair of collars 17 and the externally threaded anchor receiving sleeve 18 threadedly engaged in the collars 17. It is to be understood that other lengths of tubing may be added to the lower length 15 if the conditions of the well demand it.

The anchor sleeve 18 is provided with a cone shaped mouth 19 and is provided also with an inwardly extending peripheral anchor holding bead 20.

The flusher anchor 21, which I shall now describe in detail, and which forms part of my invention, is made in the same manner as a pump anchor used under the prior art teachings under which teachings the pump itself would be anchored directly to the aforementioned anchor receiving sleeve 18. In the manufacture of my sand flusher it is contemplated that the prior art type pump anchor may be incorporated as part of my invention. Under the prior art teachings the flusher anchor 21 (pump anchor) would be fastened on the threaded end 13 of the lift tube 12 by means of some form of nipple taking the place of the expanded nipple 14 shown in the drawings.

The tubular portion 22 of the flusher anchor 21 merges into a leaded cone shaped seat 23 which is adapted to rest in the cone shaped mouth 19 of the anchor receiving sleeve 18. The flusher anchor 21 is provided with a plurality of bevel ended gripping fingers 24 made by slotting the lower end of the flusher anchor 21. Each bevel ended gripping finger 24 is provided with a shoulder 25. These shoulders 25 are made of a size and so positioned that they will lodge under a peripheral bead 20 after the ends of the gripping fingers 24 have been forced below the periphery bead 20.

A flusher barrel 26 by means of its internally threaded lower end portion 27 is threadedly engaged to the flusher anchor 21. The flusher barrel 26 is provided with a plurality of fluid ports 28. The drawings show four of these ports 28, but it is to be understood that a greater or lesser number may be employed, if desired. The flusher barrel 26 is also provided with four downwardly slanting breather passages 29. The purpose of the fluid ports 28 and the breather passages 29 will be explained further on in this specification.

In the upper internally threaded end 30 of the flusher barrel 26, an externally threaded perforated plug 31 is mounted. The upper end of the perforated plug 31 constitutes an end member of a packing gland while its lower end is fashioned into a squared clutch jaw 32, the purpose of which will be explained later. The packing gland includes a shell 33 internally threaded at its upper and lower ends. The shell 33 is

screwed down on the plug 31 in abutting position with the upper end of the flusher barrel 26. A layer of packing material 34 is encased within the shell 33 and rests on the perforated plug 31. An externally threaded sand deflecting bushing 35 is threadedly engaged in the upper end of the shell 33 and serves as a jam nut to complete the packing gland.

The upper end of the sand deflecting bushing 35 is bevelled at 36. The principal function of the bevelled portion 36 is to prevent sand S from piling up on the upper end of the sand deflecting bushing 35 and settling around the plunger 38. The bevelled end 36 does, however, serve an additional function in connection with the peripheral groove 37 which function will be gone into later on in this specification in my description of a clamping device used with the structure I am now describing.

The only movable member that has been brought into my description thus far is the pump barrel 11 which in this type of pump moves up and down while the piston (not shown) and the lift tube 12 carrying the same to which the plunger 38 of my sand flusher is attached all remain stationary during the pumping operation.

The tubular plunger 38 of my sand flusher is moved only when the pump barrel 11 is pulled upwardly above its stroking position from which position it drags the pump piston (not shown), the lift tube 12 and the plunger 38 with it.

In the form of sand flusher I illustrate by Figures 1 and 2 and elsewhere in my drawings, the weight of the oil O in the string of tubing communicated through the breather passages 29 to the upper side of the sleeve 39 (serving as a piston) is relied on to hold my sand flusher in its collapsed position, as shown in Figure 1, during the entire period of the pumping operations. The weight of the oil O is sufficient to overcome tugging forces on the oil pump lift tube 12 tending to lift the plunger 38. The tugging forces are caused by the tight friction fit of the oil pump piston (not shown) and also the friction of the pump barrel 11 on the lift tube 12, which is indirectly connected to my plunger 38. These tugging forces are greatest at the start of a pumping operation when the pump is dry. After the pump has been operated a few strokes, a head of oil O above the plunger 38 will overcome this pump friction force.

The plunger 38 constitutes a tube 40, provided with external threads 41 at its upper end and also at its approximate mid-point 42 and lower end. From the drawing it will be seen that the outside diameter of the lower end of the plunger 38 is slightly larger than that of the upper end, beginning at the lower end of the mid-point threaded section 42, to permit an expansible sleeve 39 to be slipped over the threads 42 and held in position on the lower threaded section by a pair of jam nuts 45. Shouldered against the enlarged end of the plunger 38 on the threaded section 42 is a threaded collar 46 provided with an indentation 47 cut across the upper face thereof and arranged to serve as a clutch jaw engageable with the upper clutch jaw 32.

The expandable sleeve 39 is expanded into tight fitting contact with the inner wall of the flusher barrel 26 by adjusting the jam nuts 45. The reader will see in Figure 1 that in the collapsed position of my sand flusher the sleeve 39 closes the fluid ports 28. The sleeve 39 stays in this port closing position during the pumping operation. Let us suppose now that the pump

has to be removed for repairs or the like. This will mean withdrawing the length of sucker rods R, to which the pump is attached, from inside the length of tubing. When the string of sucker rods R is lifted upward beyond the normal pumping stroke, it can be easily seen that my plunger 38 will be carried with it toward the upper end of the flushing barrel 26. In so doing, the expandable sleeve 39 is moved away from the port holes 28. When these port holes 28 are open, the head of oil O, which has accumulated in the tubing during the pumping operation, will be free to flow therethrough and thus wash any accumulation of sand back into the main reservoir at the bottom of the well. Since the expandable sleeve 39 also acts as a piston in the flusher barrel 26, the oil will flow out of the breather holes 29 and back into the bottom port holes 28 with some degree of force, thus assisting the flushing of the sand.

Having now been cleaned of all accumulation as well as relieved of the weight of the head of oil against it, the hollow anchor 21 may be easily removed by a continued upward pull on the string of sucker rods; which force will cause a contraction of the notched fingers 24 of the anchor 21 and allow them to be released from the restricting bead 20.

The refinements of the above described packing gland and the feature of the sand deflecting bushing 35 prevent any sand S from getting inside of the flusher barrel 26 above the fluid ports 28. The breather passages 29 are slanted downwardly to prevent sand S from migrating through them into the inside of the flusher barrel 26. Oil O above the expandable sleeve 39 is flushed out through the breather passages 29 when the expandable sleeve 39 is moved upwardly in the flusher barrel 26.

Under normal conditions in the use of my sand flusher the two jaws of the clutch, the upper jaw 32 and the lower jaw 47, serve only as contacting members to limit the upward movement of the tubular plunger 38. It is only in a rare condition where my sand flusher would fail to operate that these clutch jaws, upper clutch jaw 32 and lower clutch jaw 47, would be used. Suppose, for example, there was not sufficient oil in the string of tubing to flush away enough sand S to allow the flusher anchor 21 to be freed from the anchor receiving sleeve 18, then the clutch jaws, upper clutch jaw 32 and lower clutch jaw 47, would be brought into operation. By turning the string of sucker rods R at the surface of the ground, the lower jaw 47, which is positively attached to it through means of the tubular plunger 38 extended up through the sand deflecting bushing 35, would be brought into positive engagement with the upper jaw 32 which is made fast to the flusher barrel 26 through means of its threaded engagement with the same. All of the pumps in common use are arranged and constructed so that at one end of the pumping barrel the piston is arranged to be fitted into a groove or slot to permit the lower lift tube to be disengaged from the anchor by a right-hand rotation of the rods R, due to the provision of a left-hand thread being provided on the upper or lower end of the flushing barrel 26. Thus it will be seen that the flusher barrel 26 will be made to turn with the sucker rods R and in doing so will be unscrewed at its lower end from the flusher anchor 21. The flusher barrel 26 should preferably be joined to the flusher anchor 21 by left hand threads, the opposite of the right hand threads used in the made up sucker rods R. In this way when the sucker rods R are turned to the right, the joints of the sucker rods R are made up while the joint between the flusher anchor 21 and the flusher barrel 26 is being unscrewed.

When the flusher barrel 26 is unscrewed, the lift tube 12 and members of the sand flusher attached to it can be lifted to the surface of the ground leaving the hollow flusher anchor 21 as a passage to flush the oil O and sand S through. It is to be borne in mind also that when the flusher barrel 26 is unscrewed from the flusher anchor 21 the entire weight of oil O in the string of tubing is dumped, making it easy to pull the dry string of tubing. At this point the reader must remember that under prior art practice when the pump anchor became frozen due to the accumulation of sand, the string of tubing had to be pulled loaded with oil which oil would usually be wasted.

The diagrammatic view, Figure 6 of the drawings, shows the sleeve 39 in solid lines at a position of its travel in moving from its lower dotted line position, a collapsed position of the sand flusher where it closes the fluid ports 28, to its extreme upper position of travel where the jaws of the clutch, lower clutch jaw 47 and upper clutch jaw 32, have been brought into contact. The clutch jaws are shown merely in abutting positions and not engaged with each other for the reason that this is the position the clutch jaws assume under normal operations.

When the sleeve 39 is dragged up above the fluid ports 28 by a slight movement of the pump upwardly above its operating position, all the oil O in the string of tubing from above the fluid ports 28 is permitted to flow through the ports 28 in a rushing stream down through the flusher anchor 21. This rushing stream of oil O will scour away the sand S from around the flusher anchor 21 and free it. Not only does my sand flusher remove the sand S from around the flusher anchor 21, but it dumps the heavy column of oil O in the string of tubing and greatly lightens the load on the pumping machinery the full capacity of which may then be employed, if need be, to pull the pump, the sand flusher attached to the same and the flusher anchor 21 forming part of the sand flusher out of the receiving sleeve 18.

Referring now to Figure 7 of the drawings, numeral 48 designates a multipronged grab threadedly engaged to the tube 40 at the threaded end 41 and locked to the same by a lock nut 49. The end of each finger 50 of the grab 48 is inwardly bevelled and terminates in an inwardly directed prong 51. The fingers 50 are bevelled to the same slope as the bevelled upper end 36 of the sand deflecting bushing 35 which serves as a means to spread the fingers 50 when the fingers 50 are being pushed down to a releasable locking position with the sand deflecting bushing 35. In the locking position the prongs 51 snap into the peripheral groove 37. The sole purpose of this device is to hold my sand flusher in a releasable collapsed position at the start of a pumping operation. The grab 48 is intended to be released by a pulling force of about 300 pounds which force will always be greater than the friction drag of the pump piston (not shown) in the pump barrel 11. This auxiliary device will not be needed except in rare cases where there is not enough oil O in the string of tubing to overcome the fric-

tion force between the pump piston (not shown) and the pump barrel 11.

It is to be understood that various changes in the size of and the arrangement of the parts of my above described sand flusher may be made within the scope of my invention.

Having thus described my invention, I claim:

1. In a device of the class described, the combination of a barrel, provided with a piston stop means and provided with one or more fluid ports, adapted to be vertically positioned in a string of oil producing tubing or the like, a bored anchoring means joined to the lower end of said barrel in communication with said barrel adapted to anchor said barrel inside of a string of oil producing tubing or the like, a tubular plunger slidably mounted in said barrel communicating with the bore of said anchoring means, said tubular plunger provided with a sleeve constituting a valve adapted to open and close said fluid port or ports, said plunger being made of a length to extend above the upper end of said barrel in its position of closing said fluid port or ports and adapted to be attached to the lower end of a lift tube of an oil pump and be moved by the same from its position of closing said port or ports to a position to open said port or ports to allow oil or other fluid to flow out of a string of oil producing tubing or the like through said fluid port or ports and then down through said bored anchoring means, and a jam nut threadedly engaged to said plunger constituting a stop means positioned to contact said piston stop means to limit the upward movement of said plunger with respect to said barrel in which it is slidably fitted, whereby said plunger, said barrel and said anchoring means may be drawn up with an oil pump.

2. The device as claimed in claim 1 wherein said fluid port or ports are located in said barrel at a position adjacent to said anchoring means whereby a flow of oil or other fluid through said fluid port or ports will flush sand accumulated above said anchoring means through said port or ports, and down through said anchoring means.

3. In a device of the character described, a barrel adapted to be depended vertically into a string of oil producing tubing, a hollow anchoring means on the lower end of said barrel to anchor the same at a desired depth in said tubing, a hollow plunger slidably mounted in said barrel, means on the upper end of said plunger for attaching the same to the lower end of a well pump supported by a string of sucker rods from the earth's surface, fluid ports in said barrel permitting a reverse flow from the area between said barrel and said tubing to the inner bore of said barrel and said hollow anchoring means back into said well, a packing gland

on said barrel embracing the upper end of said plunger to divert fluid only through said ports, valve means on said plunger closing said reverse flow ports when said plunger is in a downward position and adapted to open the same by an extended upward pull on said sucker rods.

4. The device as claimed in claim 3 wherein said barrel is provided with one or more breather ports located at a position between said fluid ports and said packing gland.

5. In a device of the class described, the combination of a barrel provided with one or more fluid ports adapted to be positioned vertically in a string of oil producing tubing or the like, a bored anchoring means threadedly joined to the lower end of said barrel and adapted to anchor said barrel inside of a string of oil producing tubing or the like, a packing gland formed at the upper end of said barrel adapted to prevent sand from entering the upper end thereof, said barrel also provided with one or more breather ports located between said fluid ports and said packing gland, a tubular plunger slidably mounted in said barrel through said packing gland, said plunger communicating with the bore of said anchoring means and adapted to open and close said fluid port or ports, said plunger being made of a length to extend above the upper end of said barrel in its position of closing said fluid port or ports and adapted to be attached to the lower end of a lift tube of an oil pump and be moved by the same from its position of closing said port or ports to a position to open said port or ports to allow oil or other fluid to flow out of a string of oil producing tubing or the like through said fluid port or ports and then down through said bored anchoring means, said barrel being provided with a clutch jaw adapted to engage a clutch jaw mounted on said plunger when said plunger is drawn upwardly whereby a rotary motion imparted to said plunger will rotate said barrel to unscrew the same from said bored anchoring means.

JOSEPH O. SANDERS.

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