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E. OLDHAM

2,178,309

OIL FLOW PUMP

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Fig. 1

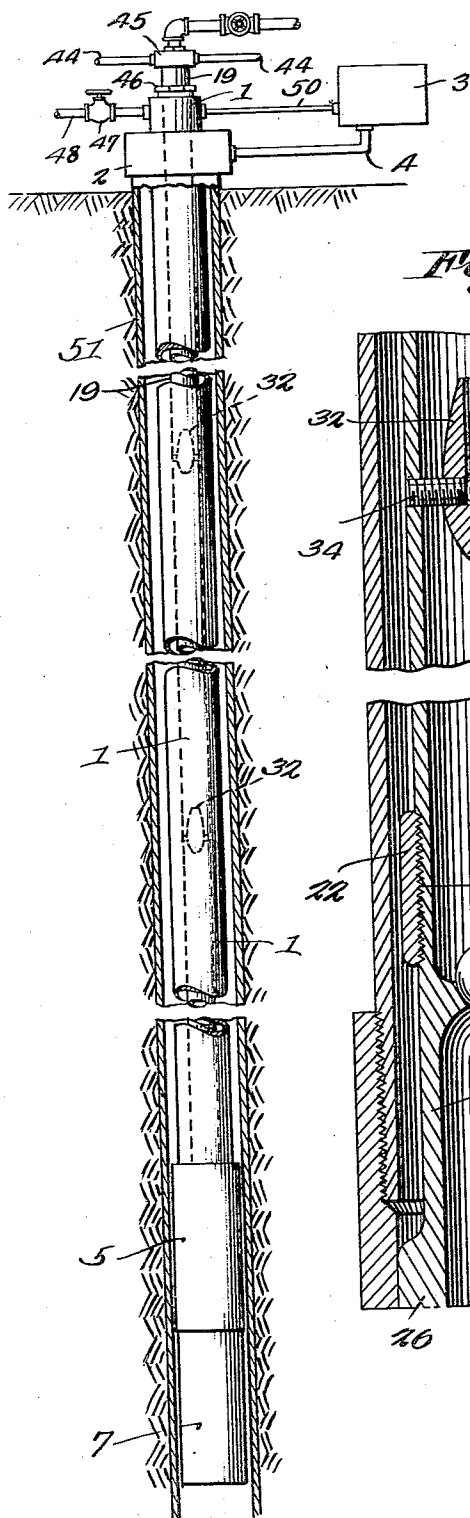


Fig. 2.

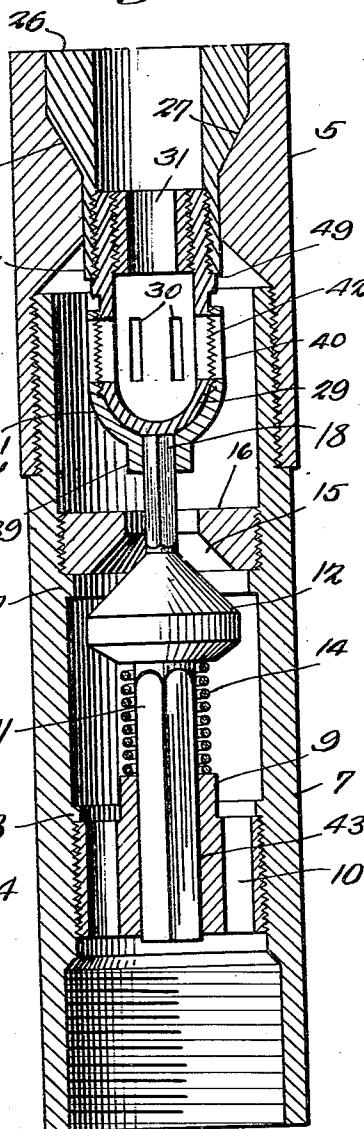
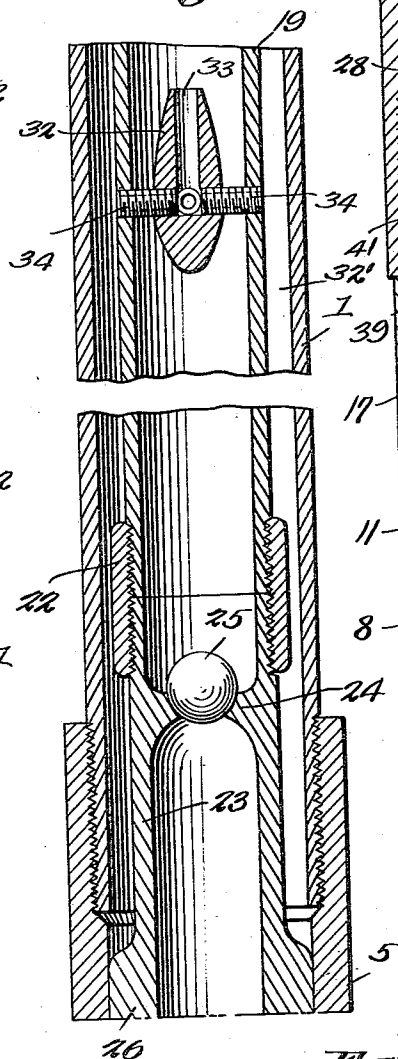


Fig. 3.



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UNITED STATES PATENT OFFICE

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OIL FLOW PUMP

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4 Claims. (Cl. 103—232)

The device forming the subject matter of this application is employed to force oil or other liquid out of a well, employing either built-up gas pressure or air pressure to carry the liquid to the surface. The invention aims to provide a device of the class described having a novel globe or nozzle, functioning to aid in lifting the liquid from the well. The invention aims to provide an article of the kind specified which is void of movable parts, it being possible, by duplication, to secure a stage action, so that the structure may be used upon deep wells if desired. The invention aims to supply a device of the class described in which the upkeep and lifting costs are reduced to a minimum, the device being well adapted to withstand hard use and having a long working life. A further object of the invention is to supply an article of the kind described, into which distillate or any other cleanser may be introduced readily, in the event of paraffine clogging.

It is within the province of the disclosure to improve generally and to enhance the utility of devices of that type to which the invention appertains.

With the above and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed, may be made within the scope of what is claimed, without departing from the spirit of the invention.

In the accompanying drawing:

Fig. 1 shows in elevation, a device constructed in accordance with the invention, parts being in section, and parts being broken away;

Fig. 2 is a longitudinal section showing the foot valve and parts associated therewith;

Fig. 3 is a longitudinal section showing the nozzle or globe and parts associated therewith.

The numeral 51 marks a well casing, carrying a casing head 2.

The gas regulator is shown at 3. The numeral 4 designates a pipe extended between the casing head 2 and the gas regulator 3. An outer tubing 1 is disposed within the well casing 51 and extends outwardly through the casing head 2. A pipe 50 connects the upper end of the outer tubing 1 with the gas regulator 3. A pipe 48 is connected to the upper end of the outer tubing 1 and may carry a valve 47. The pipe 48 is an example of any suitable means for producing air pressure or other fluid pressure within the outer

tubing 1, in the event that the gas pressure within the casing 51 is insufficient to supply the desired pressure within the outer tubing 1, by way of the pipe 4, the regulator 3 and the pipe 50.

There is a stuffing box 46 on the upper end 5 of the outer tubing 1. An inner or macaroni tubing 19 is located within the outer tubing 1, and extends upwardly through the stuffing box 46. A bull plug and gate structure 45 is mounted on the upper end of the macaroni tubing 19. The bull plug and gate structure 45 has outlets 44.

A coupling 5 is threaded on the lower end of the outer tubing 1. Near its upper end, the coupling 5 has an internal, downwardly tapered seat 6. The lower end of the coupling 5 is threaded 15 on the upper end of a foot valve casing 7. Near its lower end, the foot valve casing 7 is provided with a lower internal shoulder 8. A foot valve guide 9 is threaded upwardly into the casing 7, into abutment with the shoulder 8. The foot 20 valve guide 9 has vertical passages 10 there-through. The stem 11 of an upwardly tapered foot valve 12 slides longitudinally in the guide 9. The stem 11 of the foot valve 12 is polygonal in cross section, the opening 43 in the foot valve 25 guide 9 is correspondingly shaped, and, therefore, the valve 12 cannot rotate with respect to the foot valve guide 9. A compression spring 14 is disposed about the valve stem 11. The spring 14 abuts at its lower end against the guide 9, and 30 abuts at its upper end against the foot valve 12. The tendency of the spring 14 is to carry the foot valve 12 upwardly into contact with a seat 15 formed in a ring 16 threaded downwardly into the casing 7, into an abutment with an upper 35 internal shoulder 17 formed in the casing 7. The foot valve 12 has a nose 18 extended upwardly through the ring 16. The nose 18 is polygonal in cross section.

An inner tubing 19 is disposed within the outer 40 tubing 1. A coupling 22 connects the lower end of the inner tubing 19 with the upper end of a foot 23. The foot 23 has a seat 24 with which cooperates a downwardly closing check valve 25, for instance a ball valve. The foot 23 has a 45 thickened part 26, adapted to fit closely within the coupling 5 and provided with a tapered part 27, adapted to fit snugly on the seat 6 of the coupling 5. The foot 23 terminates at its lower end in a reduced neck 28, into which is threaded 50 the upper end of a cup-shaped valve opener 29. The valve opener 29 has side openings 30. A shoulder 43 on the valve opener 29 engages the lower end of the neck 28 of the foot 23. A bushing or bean 31 is threaded into the upper end 55

of the valve opener 29. The lower end of the valve opener 29 is adapted to engage the upper end of the nose 18 on the valve 12. The valve opener 29 is threaded at 42 into a vertically adjustable, cup-shaped gate 41, having openings 40, adapted to be brought more or less into registration with the openings 30 of the valve opener 29. The lower end of the gate 41 is marked by the numeral 39 and is so shaped as to fit against rotation on the upper end of the nose 18 of the valve 12.

A nozzle or globe 32 is located in the inner or macaroni tubing 19, at any suitable distance above the valve 25. The nozzle 32 is tapered from its intermediate portion toward its ends and is provided with a central bore 33, extended downwardly into the nozzle from the upper end thereof, the bore being terminated short of the lower end of the nozzle. Tubular, radially disposed connections 34 support the nozzle 32 in the inner tubing 19 and establish communication between the bore 33 and the space 32' between the inner tubing 19 and the outer tubing 1.

The outer tubing 1 is lowered into the well casing 51, the foot valve 12 being closed upon the seat 15, by the action of the spring 14. The inner tubing 19 is lowered into the outer tubing 1, until the tapered part 27 of the foot 23 engages the seat 3 in the coupling 5, the space 32' between the tubings 1 and 19 thus being sealed at its lower end against the entrance of oil, the space 32 between the tubings 1 and 19, and above the thickened part 26 of the foot 23, being reserved for the actuating pressure fluid, which may be either gas or air.

When the inner tubing 19 and associated parts are lowered into the outer tubing 1, the opener 29 engages the nose 18 of the valve 12 and opens the valve 12, against the action of the spring 14, as shown in Fig. 2. Then there is established a delivery conduit for oil, comprising the lower part of the foot valve casing 7, the passages 10 in the foot valve guide 9, the ring 16, the openings 40 of the gate 41, the openings 30 of the opener 29, the bean 31, the foot 23, the inner tubing 19, and one or both of the outlets 44, the check valve 25 preventing retrograde flow.

If there is sufficient gas pressure in the well casing 51, the pressure passes by way of the pipe 4, the regulator 3 and the pipe 50, into the outer tubing 1, the gas pressure flowing downwardly between the tubings 1 and 19. The gas, under pressure, passes by way of the connections 34 into the bore 33 of the nozzle 32, the fluid pressure having an upward action within the inner tubing 19, which draws up and forces upwardly and outwardly the oil, the oil leaving by way of the outlets 44, hereinbefore mentioned.

In the event that the gas supply from the well is not sufficient to bring about the result hereinbefore mentioned, additional pressure may be applied by a pump, compressor or the like (not shown), connected to the pipe 48, or, if desired, the gas pressure in the well, and additional pressure derived by way of the pipe 48, may be used together.

In deep wells, the necessary lift can be obtained by stage duplication, readily understandable from the foregoing, to persons skilled in the art to which the present invention appertains.

It is to be understood that the inner tubing 19 may be rotated at the will of an operator, and when the inner tubing is rotated, the foot 23—26 and the valve opener 29 are rotated also. Because the gate 41 is threaded at 42 on the opener

29, and because the gate 41 is held against rotation on the nose 18 of the valve 12, the gate 41 will be moved up and down, when the inner tubing 19 is rotated. By this procedure, the openings 30 of the opener 29 and the openings 40 of the gate 41 may be brought more or less into registration, and in that way the flow of oil from the well can be regulated. When the valve opener 29 is threaded into the neck 28 of the foot 23, the shoulder 49 on the valve opener is jammed hard against the shoulder on the neck and the opener thereby is secured fixedly to the neck, for all practical purposes. Moreover, the threaded connection 42 between the opener 29 and the gate 41 always is well lubricated by oil found in the well and permits a ready rotation of the opener with respect to the gate. Therefore, practically considered, the opener 29 does not tend to rotate in the neck 28 of the part 23, when the operation which consists in adjusting the gate 41 takes place as aforesaid. The bull plug and gate structure 45 may be opened when a governed blow-off is desired.

Having thus described the invention, what is claimed is:

1. In a device of the class described, an outer tubing and an inner tubing, the inner tubing constituting part of an outlet conduit for the liquid to be lifted, means for lifting liquid within the inner tubing, an upwardly closing foot valve assembled with the lower portion of the outer tubing, spring means for closing the foot valve, a valve opener carried by the inner tubing and cooperating with the foot valve to open the foot valve when the inner tubing is lowered into the outer tubing, and a gate receiving the valve opener, the gate and the valve opener having openings, the gate being threaded on the valve opener, and the gate being held by the foot valve, against rotation, whereby when the inner tubing and the valve opener are rotated, the gate will be moved longitudinally of the valve opener, thereby to bring the openings of the gate and of the valve opener into registration in varying amounts.

2. In a device of the class described, an outer tubing and an inner tubing, the inner tubing constituting part of an outlet conduit for the liquid to be lifted, means for lifting liquid within the inner tubing, an upwardly closing foot valve assembled with the lower portion of the outer tubing, spring means for closing the foot valve, a valve opener carried by the inner tubing and cooperating with the foot valve to open the foot valve when the inner tubing is lowered into the outer tubing, and a gate receiving the valve opener, the valve opener having a side opening, the gate being threaded on the valve opener, and the gate being held by the foot valve, against rotation, whereby when the inner tubing and the valve opener are rotated, the gate will be moved longitudinally of the valve opener, thereby to control the opening in the valve opener.

3. In a device of the character described, an outer tubing, and an inner tubing, the inner tubing forming a part of an outlet conduit for the liquid to be lifted, means for lifting liquid within the inner tubing, a resiliently tensioned upwardly closing foot valve assembled on the lower portion of the outer tubing, a perforated valve opener on the lower end of the inner tubing cooperable with the foot valve to open the same when the inner tubing is lowered into the outer tubing, a concentrically arranged perforated gate threaded on the valve opener and held by the foot valve against rotation, the perforations in said valve

opener and gate adapted for register with each other, whereby rotation of the inner tubing and perforated valve opener carried thereby will cause a variation of register of the openings in said valve opener and gate to control the amount of liquid being lifted.

4. In a device of the character described, an outer tubing, and an inner tubing, the inner tubing forming a part of an outlet conduit for the liquid to be lifted, a fluid pressure chamber formed between said tubing at the upper end thereof, means for lifting liquid within the inner tubing including an upwardly discharging nozzle supported in said inner tubing and provided with fluid pressure conducting passages in said nozzle supporting means, a resiliently tensioned up-

wardly closing foot valve assembled on the lower portion of the outer tubing, a perforated valve opener on the lower end of the inner tubing co-operable with the foot valve to open the same when the inner tubing is lowered into the outer tubing, a concentrically arranged perforated gate threaded on the valve opener and held by the foot valve against rotation, the perforations in said valve opener and gate adapted for register with each other, whereby rotation of the inner tubing and perforated valve opener carried thereby will cause a variation of register of the openings in said valve opener and gate to control the amount of liquid being lifted.

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15