

Feb. 11, 1930.

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DOUBLE DELIVERY PUMP

Filed April 16, 1928

2 Sheets-Sheet 1

Fig. 1.

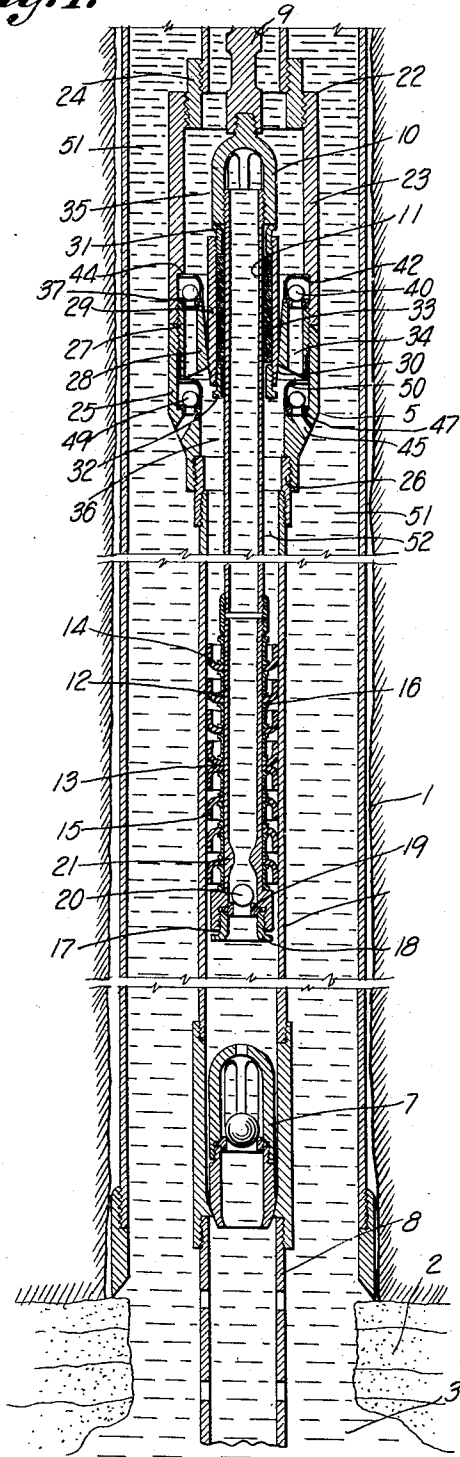
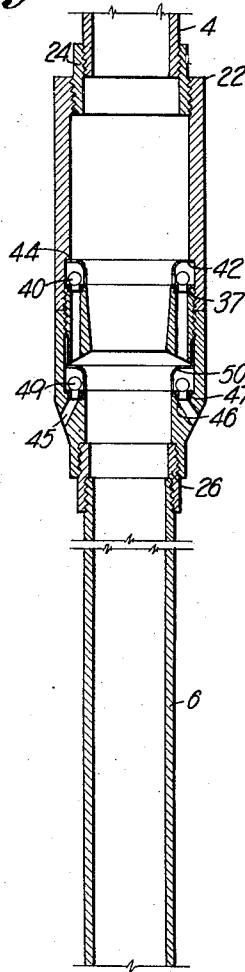


Fig. 2.



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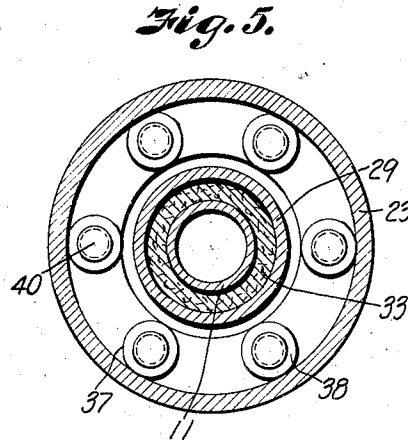
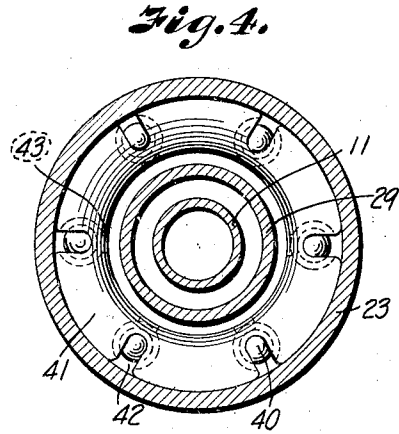
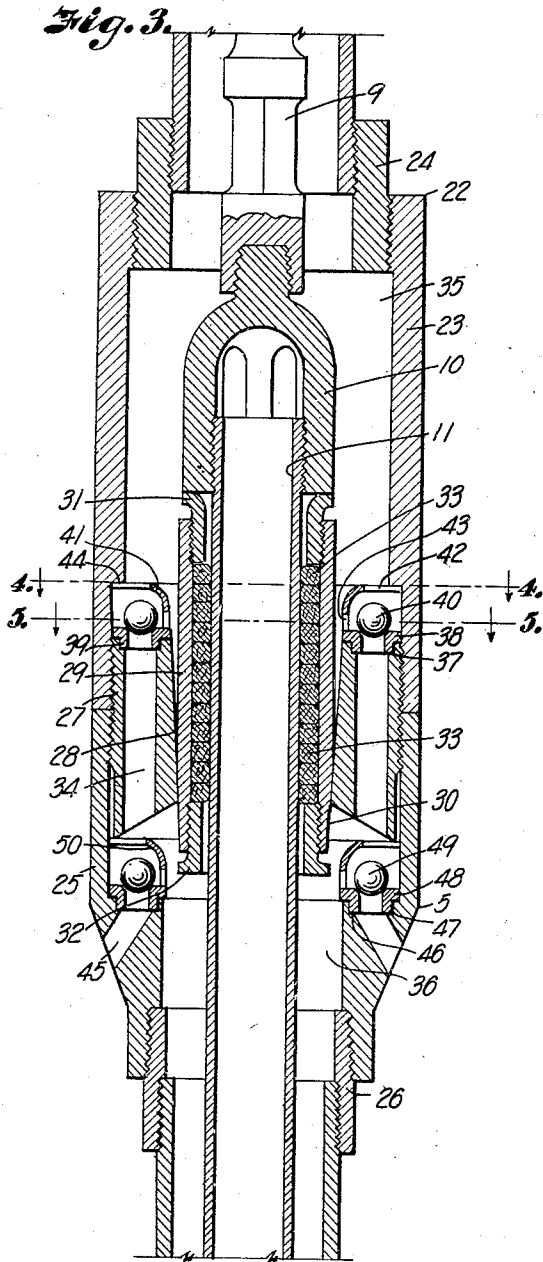
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2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE

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## DOUBLE-DELIVERY PUMP

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My invention relates to pumps and more particularly to pumps for deep oil wells, the principal object of the invention being to deliver oil upwardly into the tubing on both down stroke and up stroke of the plunger.

Further objects are to arrest the downward movement of the oil at a fixed point adjacent the bottom of the sucker rods to permit the head of the oil in the well hole to force oil into the pump barrel above the leather cups, to cause the plunger on downward movement to force oil through itself to a level above a point at which the oil movement is arrested, to adapt the pump head for double delivery pumping, to seal the passage of the plunger through the pump head by means removable by the plunger, and to adapt the plunger for double delivery functioning of the pump.

In accomplishing these and other objects of the invention I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a fragmentary vertical section of my improved double delivery pump and the lower end of an oil well.

Fig. 2 is a vertical section of the two-part pump head and coupling member connected to the tubing and a working barrel, the stuffing box and plunger being removed.

Fig. 3 is an enlarged vertical section similar to the views in Figs. 1 and 2, illustrating the association of the plunger and stuffing box with the pump head and pump head coupling.

Fig. 4 is a cross section on the line 4-4, Fig. 3.

Fig. 5 is a cross section of the pump head on the line 5-5, Fig. 3.

Referring in detail to the drawings:

1 designates an oil well, 2 the cap rock, 3 the oil pocket and 4 tubing supporting my pump generally designated 5 including a working barrel 6 having a standing valve 7 and from which depends a strainer 8 extending into the well pocket.

Sucker rods 9 extend through the tubing and are coupled by a cage-like member 10 to an inner tube or plunger 11 reciprocable in the working barrel, the lower end 12 of the

plunger comprising a cup sleeve member 13 preferably provided with two sets 14 and 15 of leather cups and suitable rings 16, the upper set of cups 14 facing upwardly and the lower set 15 facing downwardly for purposes to be described.

A working valve 17 is preferably located in the lower end of the sleeve and comprises a seat 18 supported by the plunger cap or ball seat nut 19 and a ball valve 20 restrained by cage-like bosses 21 on the inner surface of the sleeve.

The pump head 22 of my pump consists of two parts, and comprises a top collar 23 screw-threadedly engaged with tubing preferably through a reducer 24, and a lower collar 25 engaged with the working barrel 6 through a similar reducer 26. The two head collars adjoin end to end, the adjacent ends being internally threaded and a special internal coupling member 27 being provided to screw-threadedly engage the collars and connect them.

The coupling member 27 is provided with a central conical seat 28 for receiving and supporting a stuffing box 29 comprising a tapering body member 30, upper and lower retaining rings 31 and 32 screw-threadedly engaged with the body, and suitable packing 33 retained by the rings for sealing the plunger reciprocably operating through the box. The coupling member is also provided with longitudinal channels 34 arranged annularly around the seat to provide communication between the working barrel and the tubing through the head whereby liquid may be moved upwardly past the stuffing box. The coupling member divides the head into upper and lower annular chambers 35 and 36 which communicate through the channels.

I provide means for arresting the downward movement of oil through the head at a fixed point adjacent the lower end of the sucker rods, comprising upper special valves 37 consisting of ring seats 38 having flanges received in the upper ports of the channels and balls 40 received by the seats; and an arcuate ball guide annulus 41 having upper slots 42 and side slots 43, the slotted portions comprising cages for the several balls. The

top collar member 23 of the head is provided with a shoulder 44 to engage the ball guide when the head is assembled.

The lower head collar 25 is provided with side ports 45 preferably extending downwardly and outwardly from an annular ledge or shoulder 46 adjacent the lower end of the member, the ports being closed against flow of liquid from the head member outwardly into the area between the pump and the casing by valves 47 comprising seats 48, balls 49 and an arcuate slotted ball guide annulus 50 similar to the ball guide for the upper channels, the annulus constituting a cage member to restrain the balls 49. The ports connect the oil-occupied well area 51 between the casing and the pump and the annular chamber 52 in the barrel above the leather cups.

In ordinary practice with most deep well pumps, oil found in the working barrel above the leather cups of a pump plunger is raised by the cups on up stroke of the plunger and advanced into the tubing, the plunger valve being closed; the same up stroke removing downward pressure from the standing valve and permitting the head of oil outside the working barrel to lift the standing valve and move oil into the barrel to fill the area therebelow of the plunger. On the downward stroke of the plunger, in ordinary practice, the plunger merely moves past the oil previously advanced into the lower end of the working barrel, displacing oil from the space below the cups to that above them; the pressure applied to said oil by the downwardly moving leather cups closing the standing valve and raising the ball of the plunger off its seat to permit the plunger to move through the body of oil. Such operation creates no new oil movement into the tubing; since the areas of the working barrel and head into which oil moves upon the translation of the plunger downwardly is substantially the same as the area of the working barrel into which the downwardly moving plunger advances. The upper level of the oil is substantially the same at the end of the down stroke as at the beginning thereof, the vacant space created between the plunger and the working barrel above the cups being filled by oil overflowing the plunger or moving backward after advancement by the cups.

In using my invention an improved result is obtained, including double delivery of oil into the tubing. My pump is lowered into a well, the liquid of which extends into the area 51 above the pump head and therefore beyond the side ports of the head. The upper cups of my pump lift the oil in the area of the working barrel exterior to the plunger in the usual manner; and, further, cause the oil being lifted by the plunger to pass through the channels of the coupling member, displacing the balls of the valves therein, and

passing into the chamber of the upper end of the head and thence into the tubing on its way out of the well.

In my device, therefore, the oil having once passed through the pump head coupling, is arrested and restrained by the valves from returning downwardly into the working barrel. Incidentally it may be mentioned that the plunger on its up stroke causes pressure of the lifted oil against the valves of the lower head collar to prevent movement of oil outwardly from the working barrel into the area between the barrel and the casing.

During the down stroke, as the weight of the sucker rods causes the leather cups to move down, the weight of oil above the upper special valves closes these ball and seat valves, stopping any downward oil movement from the tubing into the working barrel. As the leather cups move down, the oil pressure above the leather cups decreases and the pressure caused by the head of oil in the well outside the pump raises the balls of the lower special valves in the lower head member, allowing the oil to enter the pump above the leather cups. Coincidentally the downwardly facing leather cups exert pressure against the oil in the lower end of the working barrel to close the standing valve, and to force all the oil from the working barrel through the inner tube valve into the space above the upper special valve and on into the tubing and out of the well.

The downwardly facing cups are here seen to be particularly useful. The oil above the head is restrained from moving downwardly, wherefore the plunger must not only move past the oil in the barrel but must move the column of arrested oil upwardly through the tubing since the arrested oil does not follow the plunger cups, and the oil displaced by the descending plunger can depart only through the plunger into the head and the tubing, to move the entire column of oil towards the tubing outlet.

The oil moved by the leather cups on up stroke of the plunger is oil admitted into the working barrel through the side ports of the head member, while the oil moved upwardly from the head into the tubing upon down stroke of the plunger includes oil drawn into the working barrel through the standing valve upon up stroke of the plunger.

It is apparent, therefore, that each stroke of the plunger causes the oil to be advanced through the tubing and that the same amount of oil will be advanced upon the downward stroke of the plunger as upon the up stroke except for the disparity based upon the relative volumes of the annular chamber of the working barrel and the inner tube or plunger. In practice it is found that the down stroke delivery is about 80 per cent of the up stroke delivery.

When the rods are lowered into the well,

the cup sleeve and cups will pass through the head coupling member and will be followed by the stuffing box which seats in the conical opening of the coupling. The cage member connecting the sucker rods with the plunger constitutes a stop and it may be allowed to fall on the stuffing box to cause the latter to seat securely in the coupling. The length of the inner tube or plunger is such that when the cage seats on the stuffing box, the bottom of the inner tube is spaced from the standing valve as desired, for example, eight inches.

When the sucker rods are pulled, the leather cup ring assembly encounters the stuffing box and may raise the latter off its tapered seat on the coupling and carry the stuffing box while the sleeve and cup pass through the coupling.

What I claim and desire to secure by Letters Patent is:

1. In a double delivery pump, a head having a side port and an internal conical seat provided with longitudinal valved openings, a stuffing box received by said seat, and a tubular plunger slidable through the stuffing box and having a valve at its lower end and cups movable through the seat.

2. In a device of the character described, in combination with a casing, and a pump including a working barrel and a plunger reciprocable therein, a pump head having a valved side port and an internal conical seat provided with longitudinal valved openings, and a stuffing box received by said seat, the plunger being slidable in the stuffing box and movable through the seat.

3. A pump head for deep well pumps comprising in combination with tubing, a working barrel, and a plunger, a tubing collar and a working barrel collar adjoining end to end, and an internal coupling member screw-threadedly engaged with the collars and provided with plunger-receiving means.

4. A pump head for deep well oil pumps including tubular plungers, comprising a tubing collar and a working barrel collar adjoining end to end, and an internal coupling member screw-threadedly engaged with the collars and adapted to receive the pump plunger, the coupling member having valved channels for passage of oil there-through.

5. In a double delivery pump, a head having a conical seat and provided with a valved longitudinal opening and a valved side port, a plunger, and a stuffing box member adapted for reception on the conical seat and removable by the plunger.

6. In a double delivery pump, a head having a conical seat and provided with valved longitudinal openings and valved side ports, a plunger movable through the head, and a plunger sealing stuffing box member carried

by the plunger and adapted for reception on the conical seat.

7. In combination with a well and its casing, tubing, working barrel and sucker rods, a pump head on the working barrel having longitudinal openings, a tubular plunger supported by the rods and provided with a plurality of oppositely facing cups, said plunger and cups being removable through the head, and a working valve in one end of the tubular plunger.

8. In combination with a well and its casing, tubing, working barrel having a standing valve and a side port and sucker rods, a pump head on the working barrel having longitudinal openings, upwardly opening valves at said openings, and a tubular plunger removable through the head and provided with an upper set of upwardly facing cups for supporting oil received through said port and lifting said oil through said head openings and a lower set of downwardly facing cups for forcing oil against the standing valve and upwardly through the plunger.

9. A pump head comprising in combination with a casing, tubing, a working barrel having a standing valve, and a tubular plunger reciprocable in the barrel and having a valve at its lower end and exterior cups slidable in the barrel, upper and lower end-abutting collars attached respectively to the tubing and barrel, a coupling screw-threadedly engaged with the collars for connecting the same and adapted for passage of the cups therethrough, a stuffing box slidable on the plunger, said coupling including a conical seat to receive and support the stuffing box and valved channels for upward movement of liquid past the stuffing box, the head having a valved port below the coupling for movement of liquid into the barrel from the area between the barrel and the casing.

10. In oil pumping apparatus of the character described including a casing, tubing, a working barrel having a standing valve and a side port, a plunger having a valve at its lower end and cups slidable in the barrel, and a head connecting the barrel to the tubing, a stuffing box seat supported by the head and adapted for passage of the plunger and cups therethrough, and a stuffing box slidable on the plunger and including a tapering body adapted for support by said seat, said seat having valved channels for passage of liquid past the stuffing box.

In testimony whereof I affix my signature.

JULIUS M. NAIMAN.