Dec. 4, 1923. 1,476,020

V. H. PALM

PUMP

Filed April 15, 1922

FIG. 1

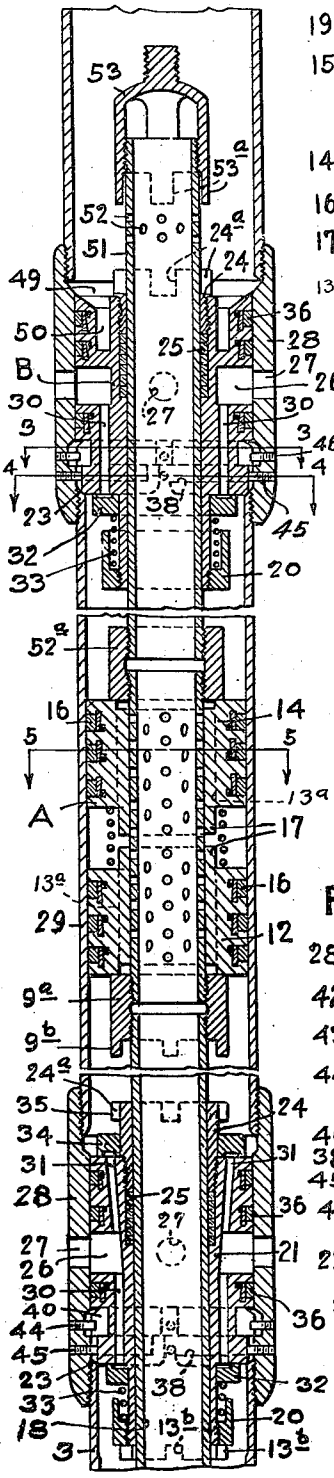


FIG. 2

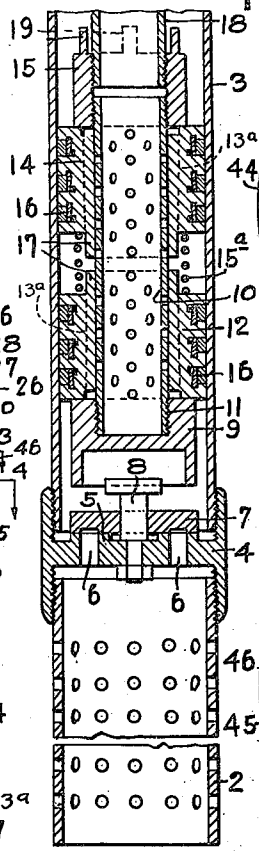


FIG. 3

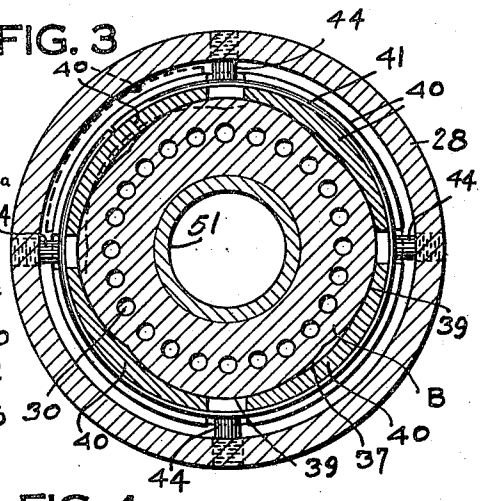


FIG. 4

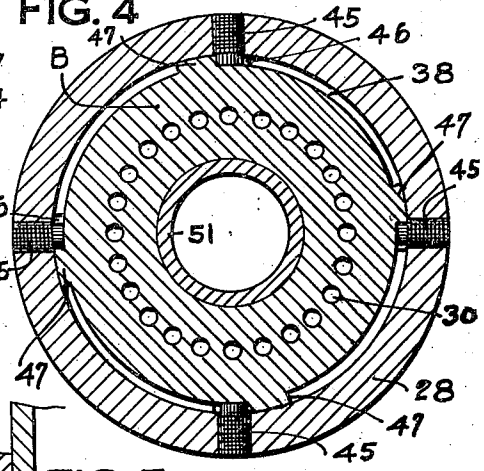


FIG. 6

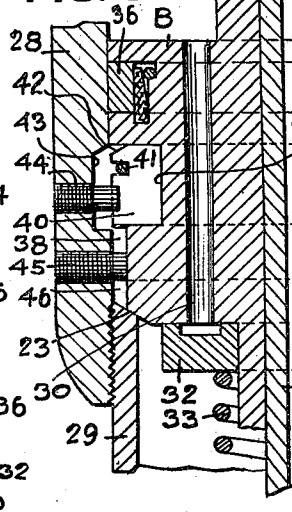
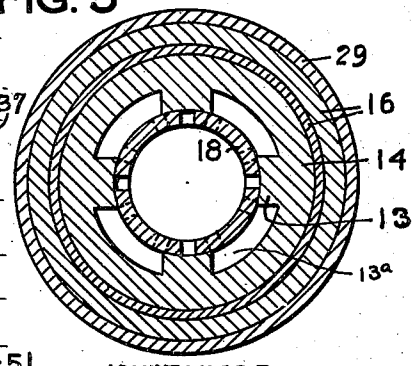


FIG. 5



INVENTOR

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By Ray Arthur Brown

Atty

Patented Dec. 4, 1923. 1,476,020

UNITED STATES PATENT OFFICE.

VICTOR H. PALM, OF BUTLER, PENNSYLVANIA.

PUMP.

Application filed April 15, 1922. Serial No. 552,935.

To all whom it may concern:

Be it known that I, VICTOR H. PALM, a citizen of the United States, and resident of Butler, in the county of Butler and State of Pennsylvania, have invented a new and useful Improvement in Pumps; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to pumps, and more especially to deep-well pumps used for the pumping of oil or water at great depths.

It has been the common practice heretofore in the pumping of fluids from deep-wells, to employ a single-acting pump due to the fact that with such pumps the valve may be pulled without pulling the tubing and working-barrel. The capacity is therefore limited to the size of valves that will go through the tubing.

The object of my invention is to provide a double-acting pump so that the fluid is pumped on the up, as well as on the down stroke, and by putting the second pump above the first I increase the capacity nearly four-fold, while at the same time I am enabled to pull up the valves and other internal parts without pulling the tubing and working-barrels.

If only one working barrel is employed, the top valve-head is used, and the capacity of the pump will be increased nearly two-fold over the single-acting pumps, so that where a single-acting pump is to be worked to its limit to keep the water down, as is the case in some oil-wells, my pump will do the work by a slower motion, and therefore the wear and tear will be reduced and less repair work required, and if one valve gets out of order the other will still keep pumping.

Another object of my invention is to provide a pump of the above character in which the parts are contained within the working-barrels, and there are no pipes exterior of the working-barrels by-passing the fluid from a lower to a higher level.

In the accompanying drawing, Fig. 1 is a vertical section of the upper portion of my improved pump; Fig. 2 is a like view of the lower-portion; Fig. 3 is an enlarged section on the line 3—3, Fig. 1; Fig. 4 is an enlarged section on the line 4—4, Fig. 1; Fig. 5 is an enlarged section on the line 5—5, Fig. 1 and Fig. 6 is an enlarged detail of the upper valve head B and accompanying parts.

In the drawing the numeral 2 designates the ordinary perforated pipe or anchor below the working-barrel 3 connected to the pipe 2 by the coupling 4 of a suitable standing-valve 5. The valve 5 has the openings 6 which are controlled by the disc 7 which is adapted to be moved up and down on the stud-bolt 8, the head of which controls the upward movement of said disc.

A valve-seat 9 is engaged by the lower end of the perforated pipe-section 10 which is screwed into the recess 11 in said valve-seat.

This valve-seat forms a closure for the lower end of the perforated pipe-section 10, and likewise forms an abutment by which the valve 7 may be pumped in case it happens to stick.

The valve-seat 9 forms a seat for the valve-head 12 which is adapted to slide on the perforated pipe-section 10, said head having the wings 13 moving in engagement with said pipe-section 10, the ports 13^a being formed between said wings. This forms the space between the valve head 12 and the pipe, and the communication is thus formed for the full length of the piston, as the perforations in the pipe extend the full length thereof.

A like valve-head 14 also surrounds the pipe-section 10 and in sliding engagement therewith, and a spring 15^a interposed between the valve-heads 12 and 14 normally holds said valves on their respective seats 9 and 15, said valve head 14 having like wings 13 and ports 13^a as described in connection with the valve head 12. The valve-heads 12 and 14 move in opposite directions in seating and unseating, being opposed to each other.

Suitable packing-rings 16 are employed to seal the joint between the barrel 3 and the valve-heads 12 and 14, and when said valve-heads are seated said rings keep the fluid from leaking out of the perforated pipe 10.

The wings 13 of the valve-heads 12 and 14 extend beyond the main body of said heads, as at 17, and act as stops for the valve-heads, and also act to hold the spring 15^a.

The seat 15 is in the form of a collar and screws on to the upper end of the perforated pipe-section 10, as well as to the tube 18. The valve-seat 15 has the outwardly extending projections or lugs 19 engaging the retainer 20 which is screwed on to the

lower end of the valve-head 21, said valve head being seated on the shoulder 23 formed by the upper end of the working-barrel 3. The tube 18 passes through the valve-head 21, and said tube passes through the stuffing-box formed by the gland 24 and the packing 25. The valve-head 21 has the annular groove 26 formed therein and ports 27 in the coupling sleeve 28, which connects the lower-barrel 3 with the upper-barrel 29, communicate with said annular groove.

Passages 30 and 31 are formed in the valve-head 21, said passages communicating with the annular groove 26. A valve 32 controls the passages 30, a spring 33 being interposed between said valve and the seat 20. A valve 34 controls the passages 31, and the flange 35 on the gland 24 acts as a stop controlling the upward movement of said valve 34.

Above and below the annular groove 26 the valve head 21 is provided with suitable packing-rings 36 to keep the fluid from leaking by it and the sleeve 28.

Below the lower packing-ring on the valve-head 21 is formed the groove 37 having its bottom wall formed with the cam-portions 39. The segmental blocks 40 fit into this groove and are held yieldingly therein by the spring-ring 41. The segments are beveled, as at 42, and fit into the groove 43 formed in the sleeve 28 when said segments are expanded by the cam portions 39. The pins 44 are screwed in the sleeve 28 and project in between the segments 41. Pins 45 are screwed into the sleeve 28 and project into bayonet slots 38 formed in the valve head. The vertical portion 46 of the bayonet slot is formed flaring so that the pins 44 and 45 will enter with ease. The slot 38 has stops 47 so that the valve-head 21 can only be turned one way, and when turned back the vertical slot 46 will be in line with the pins 44 and 45, as clearly shown in Figs. 4 and 6.

The sleeve 27 screws on to the upper end of the working-barrel 3, and the upper barrel 29 screws into it except when there is only one barrel used, when the tube screws into the upper end of said sleeve.

When two working-barrels are used, one above the other, the upper one 29 is larger in diameter than the lower one 3, so that the lower one will have the seat 23 for the valve-head 21 to rest on.

The upper duplex valve A is the same as the lower one previously described, and it will not be necessary to describe the same in detail, but the same letters of reference will be used to indicate the same parts, the only exception being that both valve seats 9^a and 15^a are collars, so that the fluid will pass through them.

The upper valve-head B and its accompanying parts are the same as the valve head 21 previously described, and it will not be necessary to repeat the construction in detail, but the same reference numerals will be used to indicate the same parts. The only difference in the two valve-heads is that the valve-head B is cupped at its upper end, as at 49, to form pockets 50 to catch any rivets that may work out of the sucker-rod strap, and said pocket furthermore will catch any sediment and keep it away from the stuffing-box gland 24.

The tube 51 is perforated just below the cage, as at 52, so that the fluids will keep any sediment away from the stuffing-box gland 24. The cage 53 is connected to the ordinary sucker-rods which, in turn, are connected to a walking-beam or other source of power for giving the reciprocating movement to the pump.

To insert the valves and valve-heads into the working-barrels, they are lowered by the sucker-rods until the valve heads rest on their seats 23, whereupon the sucker-rods are turned until the projections 53^a on the cage 53 engage the recesses 24^a formed in the upper stuffing-box gland 24, and the projections 9^b on the valve-seat 9^a engage the recesses 24^a in the lower stuffing-box gland 24. By the turning of the valve-heads with the pins 44 holding the segments 41 from turning, the cam-faces 39 of the valve-heads 21 will force the segments outwardly into the recesses of the sleeves 28, and the said segments, being beveled at 42, will lock the valve-heads tightly in their seats. In case both valve-heads do not tighten at the same time, by raising the sucker-rods just enough so that the valve-seat lugs 9^b will disengage the lower gland 24 the upper gland will still be in engagement with the projections 53^a on the cage 53, due to the fact that said projections 53^a are longer than the projections or lugs 9^b. As a consequence, the upper valve-head can be turned independently of the lower valve-head and a proper seating of both valve-heads can thus be obtained. Where it is desired to adjust the lower valve-head 21 independently of the upper valve-head, the sucker-rods are raised until the projections 19 on the valve-seat 15 engage the recesses 13^b in the valve-stop 20. In the above manner both valve-heads may be turned at the same time or independently of each other, as desired, in order to fix them properly in their seats.

The pump is now ready to operate, and upon the up-stroke the fluid forces the valves 14 from their seats, thereby compressing the springs 15^a, and the fluid passes into the tube 10 through the perforations formed therein, whence it passes up the tube 18 and out through the openings in the cage 53. At the same time, during the up-stroke the fluid enters the valve 7 and the upper valve 34 lets the fluid into the lower end of the

barrel 29, said fluid being admitted by the openings 26 and 27 in the valve-head 21 and sleeve 28, respectively.

On the down-stroke the fluid forces the valves 12 from their seats, the valves 14 being closed by the action of the springs 15^a, and fluid passes through the ports 13^a into the perforated pipe section 10 and thence into the pipe 18 to the cage 53, and thence to the top of the well. By the employment of these ports 13^a greater opportunity is given to let the fluid get away and prevent compression of said fluid between the valve heads 12 and 14.

When it is desired to remove the valve-heads and valves from the barrels, it is only necessary to lower the sucker-rods until the projections 53^a and 9^b enter the seats 24^a in the glands 24, whereupon by turning the sucker-rods the segments 40 are released and permitted to collapse, so that the valve-heads 21 are disengaged from the pins 44 and 45 in the sleeves 28, and by pulling up on the sucker-rods the valve heads are readily withdrawn for purposes of repair or any other reason.

By my invention I provide a double-acting pump in which the fluid is raised by both up and down strokes, and in which the parts are all contained within the barrels, thereby doing away with any outside connections such as pipes for by-passing the fluid which complicate the construction and increase the cost.

Furthermore, by duplicating the parts in the manner illustrated, the capacity is increased nearly four-fold over the ordinary single pump, and yet the valves and intermediate and top valve-heads may be withdrawn without pulling the tubing and working-barrels. But only where one working-barrel is employed and the top valve head is used the capacity of the pump will be increased nearly two-fold over the single-acting pump.

When the fluid is pumped below the upper pump it will then pump the gas that is saturated with the gasoline vapors along with the oil that the lower pump pumps. This gas can be separated in the usual manner and put through a compressor or other means for extracting the gasoline.

What I claim is:

1. In a pump, the combination of a working barrel, a standing-valve, a pumping piston comprising oppositely operating valve heads, a perforated pipe on which said valve heads are slidably mounted, valve seats on said pipe, vertically extending ports formed in said valve heads communicating with the interior of said perforated pipe and normally closed by said valve seats, a stationary valve head in said barrel, means for admitting fluid from the well through said last-named valve head into the working barrel, and a valve in said last-named valve head for controlling the admission of fluid to said working barrel.

2. In a pump, the combination of a working-barrel, a standing-valve, a pumping piston therein comprising oppositely operating spring-actuated valves, a perforated pipe passing through said valves and on which said valves are slidably mounted, seats on said pipe for said valves normally closing communication from said barrel to said pipe, a valve-head in said barrel surrounding said pipe, a seat formed in said barrel for said valve-head, means operated by the turning of said valve-head for holding said valve-head stationary in said barrel, means for admitting fluid through said valve-head into said barrel, and a valve on said valve-head controlling the supply of fluid admitted therefrom to said barrel.

3. In a pump, the combination of a working-barrel, a standing-valve, a pumping piston comprising oppositely operating spring-actuated valves, a perforated pipe passing through said valves, and on which said valves are mounted, valve-seats on said pipe, normally closing communication from said barrel to said pipe, a valve-head on said pipe, a seat formed in said barrel for said valve-head, passages formed in said valve-head for admitting fluid above and below said valve-head, valves controlling said passages, and releasable means for holding said valve-head in said barrel against upward movement when the pump is in operation, whereby the plunger and valve head may be withdrawn from the barrel.

4. In a pump, the combination of a working-barrel, a standing-valve, a pumping piston therein comprising oppositely operating spring-actuated valves, a perforated pipe passing through said valves and on which said valves are slidably mounted, seats on said pipe for said valves normally closing communication from said barrel to said pipe, a valve-head surrounding said pipe, said valve-head having a passage formed therein for admitting fluid to the working barrel, a valve controlling the admission of fluid through said passage, a groove formed in said valve-head, a corresponding groove formed in the walls of said barrel, segmental blocks in said grooves, a spring ring engaging said blocks, and cam-faces formed on said valve-head, where by the turning of said valve-head said segmental blocks are forced into the groove in said barrel to hold said valve-head securely in position therein against upward movement.

5. In a pump, the combination of a working barrel, a standing-valve, a pumping piston therein comprising oppositely operating spring-actuated valves, a perforated pipe

passing through said valves, and on which said valves are slidably mounted, seats on said pipe for said valves normally closing communication from said barrel to said pipe, a valve-head in said barrel, means for admitting fluid through said valve-head into said barrel to points above and below said valve-head, means operated by the turning of said valve-head for bringing said valve-head into engagement with said barrel, whereby the upward movement of said valve-head is prevented when the pump is in operation, and means for bringing said tube into engagement with said valve-head for turning the same by the lowering of said tube.

6. In a pump, the combination of a working barrel, a standing-valve, a pumping piston comprising oppositely operated spring-actuated valves, a perforated pipe passing through said valves and on which said valves are mounted, seats on said pipe for said valves normally closing communication from said barrel to said pipe, a valve-head in said barrel, means for admitting fluid through said valve-head into said barrel to points above and below said valve-head, means operated by the turning of said valve-head for bringing said valve-head into engagement with said barrel, whereby the upward movement of said valve-head is prevented when the pump is in operation, and projections carried by said tube adapted to engage recesses on said valve-head, whereby upon lowering said tube said projections engage said recesses for the turning of said valve-head on the said pipe.

7. In a pump, the combination of working barrels of different diameter, a standing valve, a plurality of pumping pistons comprising oppositely operating spring-actuated valves, a perforated pipe passing through said valves and on which said valves are slidably mounted, seats on said pipe for said valves normally closing communication from said barrel to said pipe, a valve head located above each of said pumping pistons, said valve-heads having passages for the admission of fluid to points in said barrel above and below said valve-heads, valves controlling said passages, means operated by the turning of said valve-heads for bringing said valve-heads into engagement with the working barrels, whereby said valve-heads are held against upward movement, and means for turning said valve-heads independently of each other.

8. In a pump, the combination of working barrels of different diameter, a standing-valve, a plurality of pumping pistons therein, comprising oppositely operating spring actuated valves, a perforated pipe passing through said valves, and on which said valves are slidably mounted, seats on said pipe for said valves normally closing communication from said barrel to said pipe, a plurality of valve-heads arranged one above each of said pumping pistons, said valve-heads having passages formed therein for permitting fluid to said barrels above and below said valve-heads, means operated by the turning of said valve-heads for bringing said valve-heads into engagement with said barrels to prevent the upward movement of said valve-heads, and projections on said pipe adapted to engage recesses on said valve-heads, whereby on the turning of said tube said valve-heads will be turned, the projections for engaging the upper of said valve-heads being longer than those for engaging the lower of said valve-heads.

9. In a pump, the combination of working-barrels of different diameter, a standing valve, a plurality of pistons therein, comprising oppositely operating spring actuated valves, a perforated pipe passing through said valves, seats on said pipe for said valves, normally closing communication from said barrel to said pipe, a plurality of valve-heads arranged one above each of said pumping pistons, passages formed in said valve-heads for permitting fluid to said barrels at points above and below said valve-heads, valves controlling said passages, means operated by the turning of said valve-heads for bringing said valve-heads into engagement with said barrels to prevent the upward movement of said valve-heads, projections on said pipe adapted to engage recesses on the upper valve-head by the lowering of said pipe, and projections on said pipe adapted to engage recesses on the lower valve-head by the raising of said pipe, whereby said valve-heads are turned independently of each other.

10. In a pump, the combination of a working-barrel, a standing-valve, a pumping-piston therein comprising oppositely operating spring actuated valves, a perforated pipe passing through said valves and on which said valves are slidably mounted, seats on said pipe for said valves normally closing communication from said barrel to said pipe, a valve-head surrounding said pipe, said valve-head having a passage formed therein for admitting fluid to the working-barrel, a valve controlling the admission of fluid through said passage, a groove formed in said valve-head, a corresponding groove formed in the walls of said barrel, segmental blocks in said grooves, a spring engaging said blocks, projections on said barrel entering the spaces between said segmental blocks, cam-faces formed on said valve-head, bayonet slots formed in said valve-head with stops, and projections on said barrel entering said slots to engage said stops, said projections on said barrel being in alignment with each other when said

valve-head is released, whereby said valve-head may be withdrawn without interference with said projections.

11. In a pump, the combination of a working barrel, a standing valve, a pumping piston therein comprising oppositely operating spring actuated valves, a perforated pipe passing through said valves and on which said valves are slidably mounted, seats on said pipe for said valves normally closing communication from said barrel to said pipe, a valve head surrounding said pipe, said valve head having a passage formed therein for admitting fluid to a working barrel, a valve controlling the admission of fluid through said passage, a groove formed in said valve head, a corresponding groove formed in the walls of said barrel, segmental blocks in said groove, a spring engaging said blocks, projections on said barrel entering the spaces between said segmental blocks, cam faces on said valve head, bayonet slots formed in said valve head with stops, the vertical portions of said slots being formed with a flaring entrance, and projections on said barrel entering said slots to engage said stops, said projections on said barrel being in alignment with each other when said valve head is released, whereby said valve head may be withdrawn without interference with said projections.

12. In a pump, the combination of a working barrel, a standing-valve, a pumping piston therein comprising oppositely operating spring actuated valves, a perforated pipe passing through said valves and on which said valves are slidably mounted, seats on said pipe for said valves normally closing communication from said barrel to said pipe, a valve head surrounding said pipe, said valve head having a passage formed therein for admitting fluid to the working barrel, a valve controlling the admission of fluid through said passage, a groove formed in said valve head, a corresponding groove formed in the walls of said barrel, segmental blocks in said grooves, said blocks having beveled faces adapted to engage beveled faces formed in said groove in said barrel, a spring engaging grooves formed in said blocks, and cam faces formed on said valve head, where by the turning of said valve head, said segmental blocks are forced into the groove in said barrel to hold said valve head securely in position therein against upward movement.

13. In a pump, the combination of a working barrel, a pumping system, a standing-valve comprising oppositely operating valves having vertical ports extending through the same, a perforated pipe on which said valves are slidably mounted, said tube being in communication with said ports, valve seats on said pipe normally closing communication from said barrel to said pipe, springs interposed between said valves, the lower valve seat on said tube closing the lower end of said pipe, a stationary valve head in said barrel, means for admitting fluid from the well through said valve head into the working barrel, and a valve on said valve head for controlling the admission of fluid to said working barrel.

14. In a pump, the combination of a working barrel, a standing-valve, a pumping piston comprising oppositely-operating winged valves with vertical ports formed between said wings, a perforated pipe on which said valves are slidably mounted, valve seats on said pipe normally closing communication from said barrel to said pipe, extensions on the wings of said valves forming stops, springs surrounding the said extensions and interposed between said valves, a stationary valve head in said barrel, means for admitting fluid from the well through said valve head into the working barrel, and a valve in said valve head for controlling the admission of fluid to said working barrel.

In testimony whereof I, the said VICTOR H. PALM, have hereunto set my hand.

VICTOR H. PALM.