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E. J. FEENY.

FLUID PACKED PUMP.

APPLICATION FILED MAR. 21, 1905.

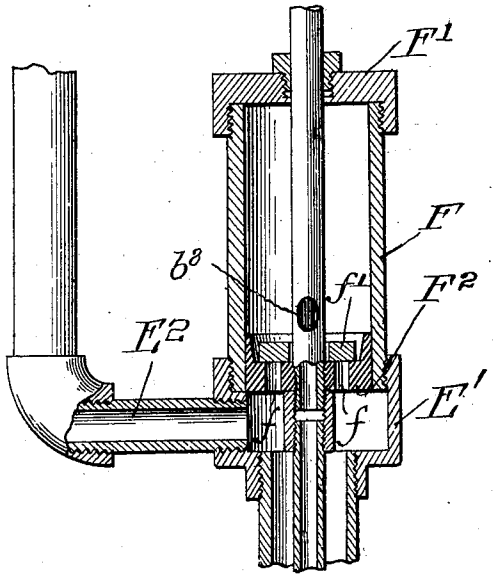


Fig. 1.

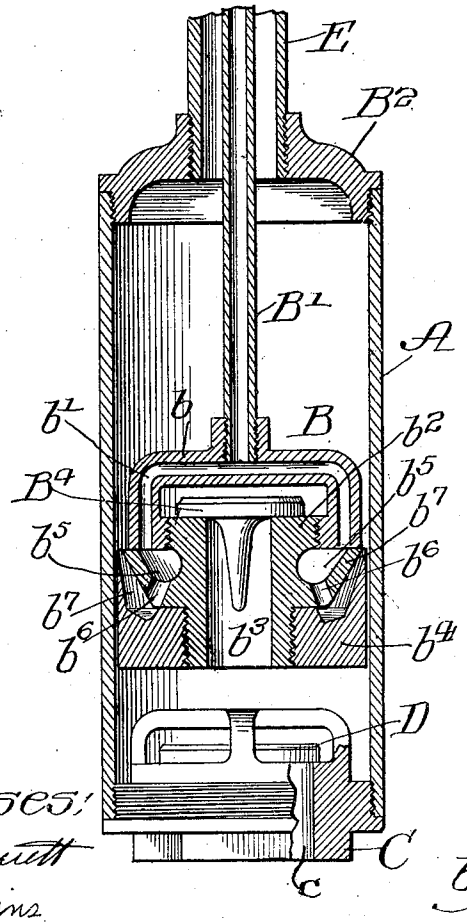
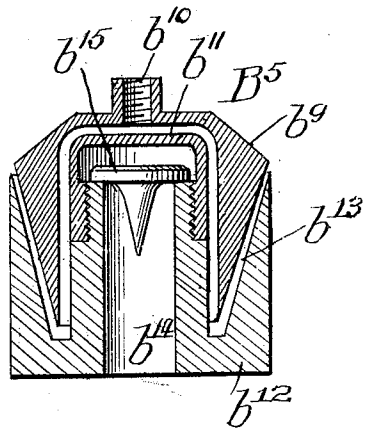


Fig. 2.



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UNITED STATES PATENT OFFICE.

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FLUID-PACKED PUMP.

No. 862,456. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed March 21, 1905. Serial No. 251,244.

To all whom it may concern:

Be it known that I, EDMUND J. FEENY, a citizen of the United States, of Ottawa, in the county of Lasalle and State of Illinois, have invented certain new and useful Improvements in Fluid-Packed Pumps; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in fluid packed pumps or those wherein the plunger fits, without friction, the pump cylinder and the packing between the pump piston and cylinder is afforded by means of an annular jet of fluid projected forcibly against the cylinder wall at such space. Such pumps are especially useful for pumping a fluid mingled with a gritty substance, such, for instance, as crude oil mixed with sand and powdered stone, or in the condition which it leaves the well. The piston may be packed by the same fluid being pumped, inasmuch as the presence of fine particles in the space between the piston and cylinder is not objectionable as it would be in case of a frictional contact between the piston and cylinder.

The invention consists in the matters hereinafter set forth and more particularly pointed out in the appended claims.

In the drawings:—Figure 1 is a vertical, axial section of a pump made in accordance with my invention, the figure being broken away to indicate an indefinite length of the parts between the extreme ends of construction illustrated. Fig. 2 is a modified form of the pump piston.

As shown in the drawings, A designates the pump cylinder or barrel which, in practice, is submerged in, or located near the level of, the liquid to be pumped, and B designates, as a whole, the piston which reciprocates in said barrel or cylinder. Said piston is made of slightly less diameter than the interior diameter of the cylinder thereby eliminating friction between the same. The cylinder A is closed at its lower end by a screw-threaded plug C. Said plug is provided with a port *c* which is controlled by a check-valve D that opens on the up, or working stroke of the piston to admit liquid to the pump cylinder and closes the port during the opposite stroke of the piston. The cylinder may be submerged in the liquid being pumped, or the port *c* may communicate with a pipe that is submerged in said fluid.

B^2 designates the upper end wall of the cylinder consisting, as herein shown, of a screw-threaded plug that is apertured for the passage therethrough of the piston rod B^1 to which the piston B is affixed.

E designates the discharge tube of the pump which, as herein shown, has screw-threaded engagement with the apertured plug B^2 and communicates therethrough with the upper end of said cylinder A. The upper end of said pipe or tube discharges into a chamber E′ near the discharge level of the pump, and from said chamber the liquid is discharged through a pipe E^2. The piston rod extends upwardly through and beyond the discharge pipe, as herein shown. The piston rod is hollow for a purpose hereinafter explained. The said piston, as herein shown (Fig. 1), is of composite structure, it comprising a spider-like top *b* provided with a plurality of passages b^1 which communicate with the hollow piston rod B^1, an annular central or body part b^2 formed with a central bore or passage b^3, and an outer ring b^4, the outer periphery of which constitutes the active portion of the piston, but which is out of contact with the cylinder wall. The said parts have screw-threaded engagement with each other. The passages b^1 open at their lower ends into an annular chamber b^5 formed in the central part b^2 of the piston. Said chamber b^5 communicates through ports b^6 with an annular discharge passage b^7 formed between the parts b^2 and b^4 of the piston. The passage b^3 constitutes the port through which liquid passes from the lower to the upper end of the cylinder during the down-stroke of the piston, and said port is controlled by an upwardly opening check-valve B^4 which seats upon the upper face of the central part b^2 of the valve around the upper end of said opening.

The liquid by which the packing of the piston is effected is delivered under suitable pressure to the passages b^1 through the hollow piston rod as herein shown. The pump herein shown is of that type in which the liquid is lifted by the up-stroke of the piston. During such up-stroke of the piston the liquid is admitted to the lower end of the pump cylinder through the valved port *c* and during the succeeding down-stroke the liquid is transferred through the valved passage or port b^3 of the piston to the part of said cylinder above the said piston. The means for delivering the liquid to the piston, by which the piston is packed during its working stroke, to wit,—the lifting stroke of the piston, of the type of pump herein shown, are so constructed and operated that said liquid is delivered under a pressure to the annular passage b^7 of the piston sufficient to project it upwardly and outwardly at a speed greater than that of the piston. By reason of the flare or inclination of the said annular passage b^7 the liquid is projected therefrom in the form of an annular flaring jet or film which strikes the wall of the cylinder just in advance of the piston, during its working stroke, and, therefore, in advance of the annular space between the piston and cylinder. Moreover, the size of said passage b^7, relatively to the volume of liquid forced therethrough, and the pressure with which the liquid is directed through the passages

of the piston are so proportioned to the weight of the column of liquid being lifted as to prevent such weight overcoming or breaking through the upwardly and outwardly projected jet, thereby constituting an effective packing which prevents the leakage past the piston of the liquid being pumped. The means for furnishing such supply of liquid under pressure for the purpose described are made as follows: F designates a cylinder which is located above the chamber E. The lower end of said cylinder is herein shown as open and having screw-threaded engagement with the upper end of said chamber E. The upper end of said cylinder F is closed by an end wall F^1 provided with a stuffing box outwardly through which the piston rod extends. F^2 designates a piston fixed to the piston rod and reciprocating in the cylinder F in unison with the piston B. The piston F^2 is provided with a plurality of ports f which afford communication between the chamber E and the cylinder F. Said ports are controlled by a check-valve f^1 having the form of a ring that is centrally apertured and has guiding engagement with the piston rod B^1. The piston rod B^1 is provided above the piston F^2 with one or more apertures b^8 through which the cylinder F above its piston communicates with the hollow piston B. The discharge end of the discharge pipe E^2 is above the cylinder F whereby the cylinder F is maintained partially or wholly filled when the piston F^1 occupies its lowermost position. The operation of this feature of the device is as follows: During the working or up-stroke of the piston B, the piston F^2 rises in the cylinder F and by reason of the consequent reduction of the space for the liquid therein, said liquid passes through the perforation b^8 of the hollow piston rod, and downwardly through said piston rod to the hollow piston B, from whence it is directed through the annular passage b^7 of said cylinder in a manner to pack the piston as described. During such upstroke of the piston F^2 the check-valve f^1 is held on its seat and the escape of the liquid through the ports f prevented. During the next down-stroke of the piston F^1, the check-valve f^1 is raised to permit the fluid to enter the cylinder F above the piston F^2 and said cylinder is filled when the piston F^1 reaches the limit of its down-stroke. The speed at which the film of liquid is projected from the annular passage b^7 is regulated by the size of the cylinder F and the area of the said passage b^7; and such regulation is made in each instance to produce the required speed of the liquid to overcome the tendency of the pumped liquid to escape downwardly past the piston, due to the weight of the column of liquid above the piston B.

In Fig. 2 is shown a modified form of pumping piston, designated, as a whole, by B^5. Said piston is made of two parts, to wit,—a part b^9 having a hollow nipple b^{10} adapted for connection with the hollow piston rod, and provided with passages b^{11} communicating with said hollow nipple,—and a part b^{12} provided with an upwardly opening annular recess of V-shape in vertical section adapted to receive the like shaped lower end of the part b^9. Said parts are so constructed and arranged that the annular space b^{13} between said parts, when assembled, constitutes a continuation of the passages b^{11}, and bears the same relation to said piston as the annular passage b^7 bears to the piston B of the principal construction. The part b^{12} of said piston B^5 is provided with a port or passage b^{14} controlled by a check-valve b^{15}. The operation of this piston is essentially like that of the piston B before described.

It is to be understood that the term "fitting without frictional contact therein", meaning the cylinder, is to be interpreted as to cover a piston which operates in the cylinder without a working fit and wherein the fluid packing arrangement herein disclosed operates to produce the operative packing between the cylinder and piston. So far as the structure of the piston is concerned therefore, it is evident that this feature of my invention may be embraced in pistons varying widely from the specific construction herein illustrated.

It will be observed also that further structural details of the pump herein illustrated may be varied within the scope of my invention and I do not wish to be limited to such details excepting as hereinafter made the subject of specific claims.

I claim as my invention:—

1. In a pump, the combination with the reciprocating piston thereof, and a hollow piston rod, of means acting during the working stroke of the piston for delivering fluid through said piston rod and projecting said fluid in the form of an annular jet against the wall of the cylinder during the working stroke thereof.

2. In a fluid packed pump, the combination with the reciprocating piston thereof which fits without frictional contact within said cylinder, and a hollow piston rod, of a source supplying liquid to said hollow piston rod and means for forcibly directing the liquid from said source and projecting it in an annular jet against the wall of the cylinder and obliquely across the space between the piston and cylinder during the working stroke of the piston.

3. In a pump the combination with its cylinder and its reciprocating piston, fitting without frictional contact therein, and its hollow piston rod, of means for delivering liquid through the piston rod to the piston and means whereby the liquid so delivered to the piston is projected in the form of an annular jet against the cylinder wall in a manner to fluid pack the piston.

4. A fluid packed pump comprising a pump cylinder, a reciprocating piston fitting without frictional contact therein, said piston being provided with an interior chamber and with an annular passage leading from said chamber to the circumference of the piston, and means for directing fluid into said chamber and through said passage under pressure whereby it issues in the form of an annular jet from the passage across the space between the piston and cylinder.

5. A fluid packed pump comprising a pump cylinder, a reciprocating piston fitting without frictional contact therein, a hollow piston rod, said piston being provided with a chamber which communicates with said hollow piston rod and at its advance end with an annular discharge passage communicating with said chamber, and discharging liquid obliquely across the space between said piston and the inner wall of the cylinder, and means for supplying liquid under pressure through said hollow piston rod to the said piston chamber.

6. A fluid packed pump comprising a pump cylinder, a reciprocating piston fitting without frictional contact therein, a hollow piston rod, said piston being provided with a chamber which communciates with said hollow piston rod and at its advance end with an annular discharge passage communicating with said chamber, and discharging liquid obliquely across the space between said piston and the inner wall of the cylinder, and means for supplying liquid under pressure through said hollow piston rod to the said piston chamber, comprising a cylinder located a distance above the pump piston and through which the hollow piston rod extends, a piston in said cylinder fixed to said rod, means for admitting a fluid to said upper cylinder, and an opening in said piston rod above the upper piston, whereby, as the piston rises in its cylinder, the liquid is forced through said hollow piston

rod, into the hollow pump cylinder and outwardly therefrom through said annular discharge passage.

7. A fluid packed pump comprising a cylinder, a piston reciprocating and fitting without frictional contact therein, said piston being provided with a chamber and with an annular passage communicating with the chamber and opening at the advance end of the piston near the circumference thereof, a discharge pipe leading from said cylinder, a chamber located near the discharge end of the pump into which the said discharge pipe enters, a cylinder communicating with said chamber, said piston rod extending upwardly through the chamber and the upper cylinder, a piston in the upper cylinder provided with a valved port through which a portion of the pumped liquid is adapted to be diverted into the said upper cylinder, said piston rod being provided above said upper piston with an opening, whereby, during the rise of the upper piston, liquid is forced from said cylinder through the rod to the hollow pumping piston, for the purpose set forth.

8. A fluid packed pump comprising a pump cylinder, a reciprocating piston fitting without frictional contact therein, a source of fluid under pressure located above the said pump piston means for delivering fluid from said source to the piston, and means for forcibly discharging said liquid from the piston against the cylinder wall in a manner to fluid pack the piston.

9. In a pump, the combination with the reciprocating piston thereof, and a hollow piston rod, of means acting during the working stroke of the piston for delivering fluid through said piston rod and projecting said fluid in the form of an annular jet against the wall of the cylinder, and a discharge pipe for said cylinder surrounding said piston rod.

10. In a pump the combination with the cylinder and its reciprocating piston fitting without frictional contact therein, of means for delivering fluid to the piston and means whereby said fluid is projected from the piston, under a pressure independent of the weight of the fluid resting on the piston, against the wall of the cylinder in a manner to fluid pack the piston.

11. In a pump, the combination with a cylinder and its reciprocating piston, said piston in its operative portion being made of smaller exterior diameter than the interior diameter of the cylinder, thereby providing an annular space between the piston and cylinder, said piston being provided with a passage communicating with said annular space, of means for delivering a packing fluid to said passage of the piston under a pressure independent of the weight of the fluid resting on the piston from whence it is discharged against the cylinder wall in a manner to fluid pack the piston.

12. A fluid packed pump comprising in combination with the cylinder and its reciprocating piston fitting without frictional contact therein, of means for delivering fluid to the space between the cylinder and piston, at a pressure independent of the weight of the fluid resting on the piston, in a manner to fluid pack the piston.

In testimony, that I claim the foregoing as my invention I affix my signature in presence of two witnesses, this 13th day of March A. D. 1905.

EDMUND J. FEENY.

Witnesses:
FRANK F. FOLLETT,
M. O'BRIEN.