No. 834,569. PATENTED OCT. 30, 1906.

E. J. FEENY.

SELF CLEANING PUMP.

APPLICATION FILED MAR. 21, 1905.

Fig. 4

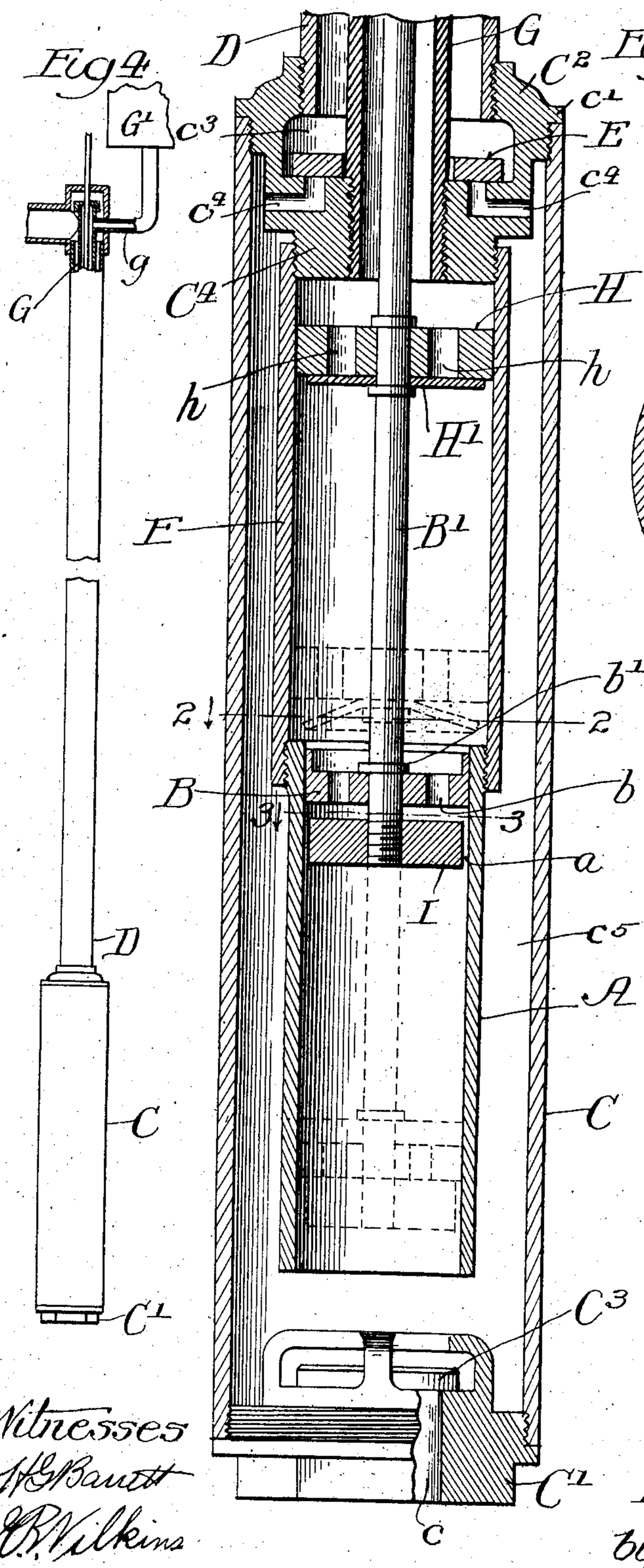

Fig. 1

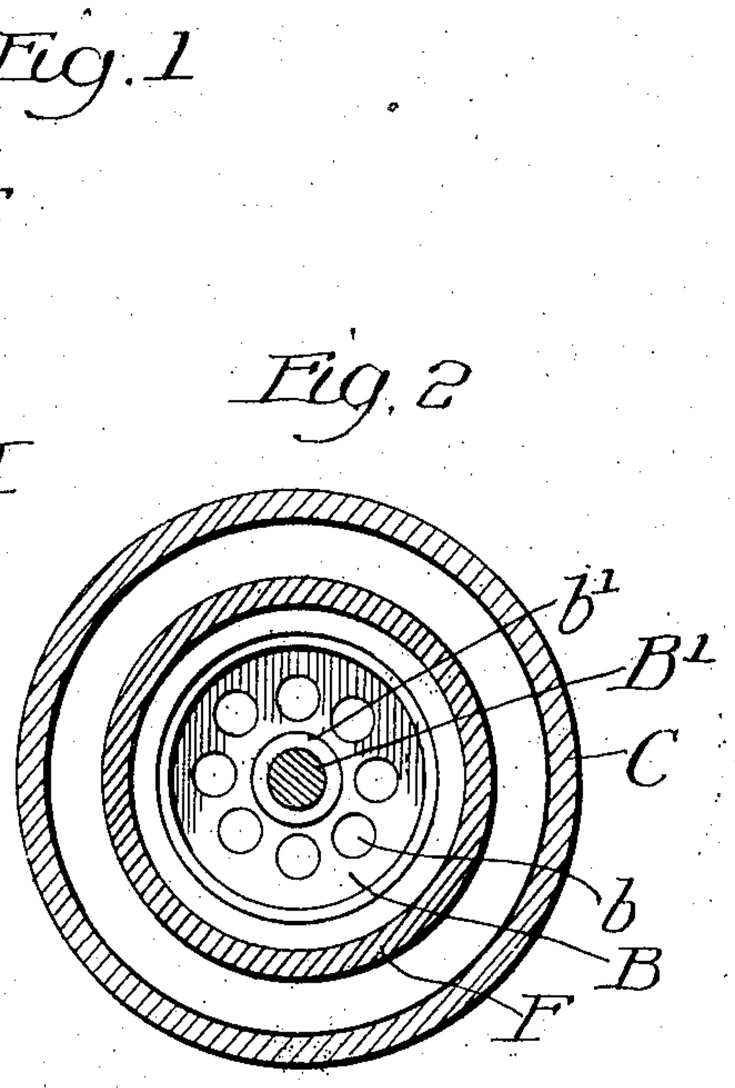

Fig. 2

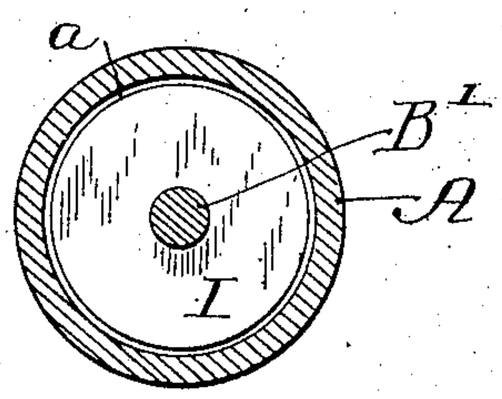

Fig. 3

Witnesses
H. G. Barrett
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Inventor:
Edmund J. Feeny
by Poole & Brown
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UNITED STATES PATENT OFFICE.

EDMUND J. FEENY, OF OTTAWA, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE OTTAWA BANKING & TRUST COMPANY, OF OTTAWA, ILLINOIS, A CORPORATION OF ILLINOIS.

SELF-CLEANING PUMP.

No. 834,569. Specification of Letters Patent. Patented Oct. 30, 1906.

Application filed March 21, 1905. Serial No. 251,245.

To all whom it may concern:

Be it known that I, EDMUND J. FEENY, a citizen of the United States, residing at Ottawa, in the county of Lasalle and State of Illinois, have invented certain new and useful Improvements in Self-Cleaning 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 pumps and refers more specifically to an improved construction and arrangement of the parts of the pump designed to prevent undue wear of the pump-piston and its packing due to the presence of gritty substances in the fluid being pumped. The pump herein shown has been designed more especially for pumping oil from oil-wells, and the specific construction shown has been designed with a view to keep the interior cylindric surface of the pump-cylinder free from sand and particles of stone mingled with the oil, and thereby minimize the wear upon the piston and its packing. To this end a jet of fluid is projected against the inner wall of the cylinder in advance of the piston during the working stroke of the latter in a manner to clear the wall of gritty substances tending to adhere thereto and prevent the same finding their way between the piston and cylinder, and the presence of such fluid may also serve to fluid-pack the piston in the event of wear between said parts to such extent as to cause leakage between the same.

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. Fig. 2 is a transverse section taken on line 2 2 of Fig. 1 looking downwardly. Fig. 3 is a transverse section taken on line 3 3 of Fig. 1 looking downwardly. Fig. 4 is a side elevation of the pump and its discharge-pipe broken away at its center and with the upper or discharge end thereof broken away to show its interior construction.

The invention is herein shown as applied to a single-acting force-pump, but may be applied to other types of pump, as will be obvious.

As shown in the drawings, A designates the pump cylinder or barrel, B the reciprocating pump-piston, and B′ the piston-rod on which the piston is mounted.

C designates a cylindric casing surrounding the pump cylinder or barrel A. Said casing is closed at its lower end by a plug C′, herein shown as having screw-threaded engagement therewith. The casing is closed at its upper end by a screw-threaded plug C^2, through which, as herein shown, the pumped liquid is discharged, as will hereinafter appear. The plug C′, constituting the lower wall of the casing, is made hollow or provided with a port *c*, through which the liquid being pumped passes into the casing, and a check-valve seated on the upper face of the plug controls the admission of liquid to the casing and the pump-cylinder in the usual manner. The casing is adapted to be sunk to or near the level of the liquid being pumped, and the port *c* in the lower wall of the casing may communicate with a pipe or tube (not shown) adapted to be submerged in the liquid being pumped. The plug C^2, constituting the top of the casing, is provided with a radial flange *c′*, that limits its entry into said upper end of the casing. Said plug C^2 is provided at its upper end with a cylindric screw-threaded opening which receives the lower screw-threaded end of the discharge-pipe D of the pump, upwardly through which pipe the piston-rod B′ extends. The said pipe D communicates with a cored-out chamber c^3 in said plug, and said chamber communicates through ports c^4 with the annular space c^5 between the pump-cylinder and casing C. The annular space c^5 between the cylinder or barrel A and the casing C constitutes, in connection with the ports c^4 and chamber c^3, a passage through which the liquid is forced to the discharge-pipe D during the downstroke of the pump. The ports c^4 are controlled by a check-valve E, which, as herein shown, has the form of an annulus and fits upon the lower wall of the chamber c^3 over the discharge ends of said ports.

So far as is concerned the broader features of my invention the passage from the pump-cylinder to the pipe D may be widely varied from that here shown. The construction

shows a practical and approved one and is hereinafter made the subject of specific claims.

The parts of the pump thus far described are the usual parts of a pump of this character and may be made of any preferred construction. In its operation the liquid is admitted to the pump-cylinder and casing C during the rise of the piston, the valve at this time rising, and during the downstroke the valve c^3 closes and the liquid is forced into and through the discharge-pipe D.

In the use of such pumps for pumping oil from oil-wells or pumping any liquid containing solid gritty substance the wear caused by the entrance or presence of such gritty substance between the pump-piston and cylinder occasions great annoyance, loss of time, and expenditure of labor, inasmuch as it becomes necessary to often remove the pump for the purpose of packing the piston. I propose to employ means for forcibly projecting against the inner face of the cylinder in advance of the piston an annular sheet of any suitable fluid that is devoid of such gritty substance, and thereby clear the inner face of the cylinder from gritty substances that tend to adhere thereto. Such clear fluid may be a clean oil or other unobjectionable fluid.

Referring now to the mechanism for effecting this result, the same is made as follows:

F designates a cylinder within the casing above the pumping cylinder or barrel A and having screw-threaded or otherwise fluid-tight connection at its lower end with the upper end of said cylinder A. The cylinder F is made of greater diameter than the cylinder A. The upper end of said cylinder F is closed by a downwardly-projecting part C^4 of the plug C^2. The projection C^4 is made cylindric and is exteriorly screw-threaded to enter and engage interior screw-threads of the upper end of said cylinder F. The cylinder F is thereby held centrally of the casing, and a portion of the passage c^5 before referred to is formed between the cylinder and casing. The extension of the plug C^2 is provided with a through axial opening, into which fits the lower end of a pipe G, that extends upwardly through the discharge-pipe D. The said pipe G therefore communicates at its lower end with the cylinder F. The piston-rod extends upwardly through said pipe G.

The pipe G extends upwardly to the discharge level of the pump and communicates at its upper end with a supply of cleaning fluid for the purpose mentioned. As herein shown, said pipe G communicates through a lateral branch g with a tank G′, (a portion of which is shown in Fig. 4,) from which is supplied the cleaning fluid. The piston-rod, as shown in Fig. 4, extends at its upper end through the upper closed end of the pipes D and G, and in practice suitable packings are provided between said rod and said end walls of the pipes. The discharge-pipe D is provided with a lateral discharge-pipe for directing the pumped liquid away from the device.

H designates a piston which fits closely and reciprocates within said cylinder F and is attached to the piston-rod B′. Said piston is attached to the rod B′ at such distance from the pumping-piston B that when the pumping-piston occupies the upper end of the pumping-cylinder the piston H occupies the upper end of the cylinder F, and vice versa. The piston H is provided with a plurality of ports h, through which communication is afforded between the upper and lower ends of said cylinder. Said ports h are adapted to be closed on the downstroke of the piston H by means of a suitable check-valve H′, herein shown as having the form of a flexible disk fitted centrally to the piston-rod and extending outwardly beneath the ports h.

Rigidly attached to the lower end of the piston-rod B′, below the pumping-piston B, is a disk I. Said disk I is made of slightly less exterior diameter than the interior diameter of the pump-cylinder, thereby providing around the disk an annular space a. The pumping-piston B is provided with a plurality of ports b b, through which the cylinder F communicates with the pumping-cylinder A. The said pumping-piston fits loosely on the piston-rod B′ and is free to slide endwise of the rod between the disk I and a shoulder or collar b' on the piston-rod located a distance above said disk I greater than the thickness of said disk.

The operation of the device is as follows: The check-valve C^3 is raised to admit liquid to the pump-casing and the cylinder during the upstroke of the pump-piston. During such upstroke of the piston the piston rests upon the upper face of the disk and the ports b thereof are closed. During the downstroke of the pump-piston the liquid is forced from the pump cylinder or barrel in a familiar manner to and through the discharge-pipe D. Before the operation of the pump begins the tank G′, which supplies the clear or cleaning fluid through the pipe G to the cylinder F, is filled, and the weight or pressure of said body of fluid acts to open the check-valve H′, so as to admit said cleaning fluid to the cylinder F until the latter is filled. During the downstroke of the parts, which forces the liquid from the cylinder A into the discharge-pipe D, as before stated, the valve H closes so as to prevent the backflow of the cleaning fluid from the cylinder F into the pipe G. In the continued downstroke of the said parts the cleaning fluid is forced through the ports b of the pumping-piston B, said piston being at this time raised from the disk I and the ports b open. The effect of thus de-

creasing the capacity of said space is to force the cleaning fluid downwardly through the ports *b* into the cylinder A and against the disk I. The liquid is thus deflected outwardly in the form of an annular sheet and passes forcibly through the annular space *a* between the disk I and the interior of the cylinder. Owing to the relative diameters of the cylinders A and F, the space between the pistons occupied by the cleaning fluid becomes smaller at each instant of the downward movement of the parts. As a result the speed of the flow of the cleaning fluid is greater than the speed of the piston. Such speed of the cleaning-fluid is also accelerated by reason of the restricted annular space through which the fluid passes. Such forcible flow of the fluid, therefore, has the effect to clear the interior of the cylinder in advance of the piston from gritty particles adhering thereto, and thereby prevent such particles from finding their way between the pump-piston and the cylinder. Furthermore, by reason of the fact that the said annular sheet of cleaning fluid passes between the disk and cylinder at a speed greater than that of the pump-piston an efficient packing is provided which prevents the liquid from passing backwardly through said space and in contact with the piston.

The adaptation of my improvements has been shown as applied to but a single form of pump; but it will be understood that said improvements are capable of adaptation to other forms of pumps and, further, that the improvements themselves are capable of assuming different forms within the scope of the invention.

It will be noted that the cleaning fluid is projected obliquely against the cylinder-wall in advance of the piston and at a speed greater than that of the piston. In the event of the piston or cylinder wearing to such extent as to cause leakage between the same the fluid projected against the cylinder-wall in the manner designated will act to fluid-pack the piston in the same manner as in the construction set forth in my copending application filed of even date herewith, Serial No. 251,244.

I claim as my invention—

1. In a pump, the combination with a reciprocating piston provided adjacent to its center with a through-port, of means for forcibly projecting liquid through said port and means acting upon said liquid after it has passed through the port for deflecting it laterally against the wall of the cylinder in the form of an annular jet.

2. In a pump, the combination with a reciprocating piston provided with a through-port located a distance inwardly from its periphery, of means for forcing liquid through said port during the working stroke of the piston, and a deflecting device located in advance of the piston and separate from the piston throughout the diameter of the latter and made of less exterior diameter than the interior diameter of the cylinder.

3. In a deep-well pump, the combination with a reciprocating piston provided with a through-port located a distance inwardly from its periphery, of a source supplying liquid located above ground, a pipe for delivering liquid from said source and discharging it under pressure through said port in the piston and a deflecting device located in advance of the piston and separated by a space therefrom for deflecting the liquid laterally against the cylinder-wall in advance, and during the working stroke, of the piston.

4. In a deep-well pump, the combination with the pump-cylinder and its reciprocating piston, of a source supplying liquid located above ground, a pipe for directing liquid from said source downwardly through the piston, means for forcing the liquid against the wall of the cylinder in advance of the piston during the working stroke thereof, and an outlet-pipe for the pump-cylinder surrounding the first-mentioned pipe.

5. In a deep-well pump, the combination with the pump-cylinder and its reciprocating piston, of a source supplying liquid located above ground, a chamber located above and made larger than said cylinder, a pipe for directing fluid from said source to said chamber, and a piston in said chamber acting, during the working stroke of the cylinder-piston, for forcing liquid from said chamber against the wall of the cylinder in advance of its piston.

6. In a deep-well pump, the combination with the pump-cylinder and its reciprocating piston, of a source supplying liquid located above ground, a cylinder located above and in communication with the pump-cylinder, a valved piston in said upper cylinder operating in unison with the pump-piston, a port in the pump-piston through which liquid is discharged in the direction of the working stroke of the piston and during said working stroke, and means located in advance of the piston for deflecting the fluid laterally against the cylinder-wall in advance of the piston.

7. In a pump, the combination with the pump-cylinder and its piston, of a disk supported in advance of the piston and movable therewith and made of slightly less diameter than the cylinder, and means for delivering fluid under pressure against the rear face of said disk.

8. In a pump, the combination with the pump-cylinder, its piston, and piston-rod, of a disk fixed to said rod in advance of said piston, and made of slightly less diameter than the cylinder, said piston being provided with a plurality of ports, and means for delivering a cleaning fluid through said ports against said disk.

9. In a pump, the combination with the cylinder, its piston, and piston-rod, of a disk made of slightly less diameter than the cylinder affixed to the piston-rod in advance of the piston, said piston having a limited movement between said disk and a shoulder on the piston-rod, and being provided with a plurality of ports, and means for forcibly delivering under pressure a cleaning fluid through said ports against said disk.

10. In a pump, the combination with the pump-cylinder, its piston and piston-rod, of a second cylinder located above the pump-cylinder, a piston in the upper cylinder attached to said piston-rod and movable in unison with the pump-piston, and means for delivering a jet of fluid from said second cylinder to the inner surface of the pump-cylinder in advance of the pump-piston during the working stroke of the latter piston.

11. In a pump, the combination with the pump cylinder or barrel, its piston and piston-rod, of a cylinder attached to the upper end of the pump-cylinder and of larger diameter than said pump-cylinder, said piston-rod extending through the upper cylinder, a piston in said upper cylinder affixed to said rod and provided with a valved port, means for delivering fluid to the upper end of said upper cylinder, and means acting during the working stroke of the piston for delivering fluid from the upper cylinder to the pump-cylinder and forcibly against the wall thereof in advance of said pump-piston.

12. In a pump, the combination with the pump-cylinder, its piston and piston-rod, of a cylinder of greater diameter than the pump-cylinder, and communicating with the upper end of the pump-cylinder, means for supplying a cleaning fluid to said upper cylinder, a piston in the upper cylinder attached to said piston-rod, said last-mentioned piston being provided with a valved port through which the liquid passes from the upper to the lower end of the upper cylinder, and a disk fixed to the piston-rod in advance of the pump-piston and made of slightly less diameter than the said cylinder, said pump-piston being provided with a plurality of ports through which the cleaning fluid is directed forcibly against said disk.

13. In a pump, the combination with the pump-cylinder, its piston and piston-rod, of a cylinder for cleaning fluid made of greater diameter than the pump-cylinder and attached to the upper end of the pump-cylinder, the piston-rod extending through said upper cylinder, means for supplying a cleaning fluid to said upper cylinder, a piston in the upper cylinder attached to said piston-rod, said upper piston being provided with a valved port through which the liquid passes from the upper to the lower end of the upper cylinder, and a disk fixed to the piston-rod in advance of the pump-piston and made of slightly less diameter than the said cylinder, said pump-piston being provided with a plurality of ports through which the cleaning liquid passes from the upper cylinder against the disk, and said pump-piston having a limited longitudinal movement on the piston-rod between said disk and a shoulder on the rod.

14. In a pump, the combination with a pump-cylinder, its piston and piston-rod, of a cylinder communicating with one end of the pump-cylinder and made of greater diameter than the pump-cylinder, a pipe for delivering fluid to the larger cylinder, a piston in said larger cylinder fixed to said piston-rod and provided with a valved port, and means for delivering the fluid displaced from the larger cylinder, during the working stroke of the pump-piston, against the inner wall of the pump-cylinder in advance of its piston.

15. In a pump, the combination with a pump-cylinder, its piston and piston-rod, of a cylinder communicating with one end of the pump-cylinder and made of greater diameter than the pump-cylinder, a pipe for delivering fluid to the larger cylinder, a piston in said larger cylinder fixed to said piston-rod, and provided with a valved port, means for directing the fluid displaced from the larger cylinder, during the working stroke of the piston, against the inner wall of the pump-cylinder in advance of its piston, and a discharge-pipe for the pump-cylinder, said discharge-pipe surrounding said fluid-delivery pipe and a piston-rod extending upwardly through said delivery-pipe.

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.