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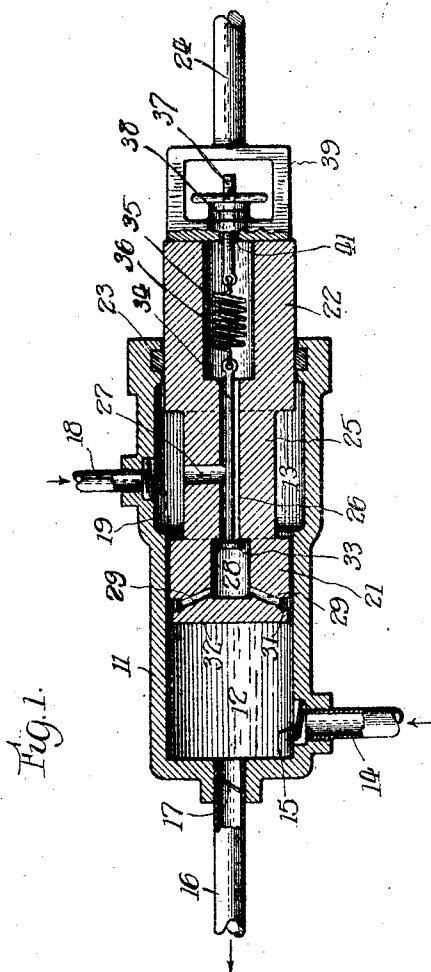
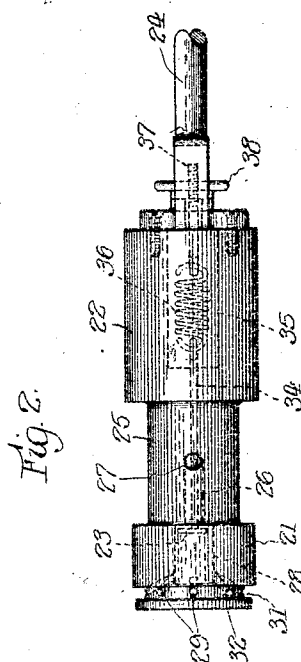
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I. A. WEAVER

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UNITED STATES PATENT OFFICE.

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PUMP.

Application filed September 24, 1923. Serial No. 664,484.

To all whom it may concern:

Be it known that I, IRA A. WEAVER, a citizen of the United States, residing at Springfield, in the county of Sangamon and State of Illinois, have invented certain new and useful Improvements in Pumps, of which the following is a specification.

My invention relates to pumps and similar appliances, and concerns especially those adapted for pumping liquids containing abradant materials such as grit or sand, or containing acids or other ingredients having a tendency to wear or corrode the parts of the mechanism.

One aim of the invention is to provide a structure of this character wherein means are incorporated to prevent the grit, acid or the like from entering the space between the piston or plunger and the cylinder within which it reciprocates, and to this end a suitable liquid under adequate pressure is forced between the two, and since the space or gap is thus occupied by a liquid which has no objectionable qualities, the other liquid and its grit or acid cannot enter and cause the harm or result in the injury referred to above.

Such a pump is of especially valuable use for dealing with oils containing sand, the latter quickly cutting and injuring the metal parts of the usual pumps and rendering them either inefficient or inoperative, the replacement or repair of such parts being a relatively expensive item.

A further purpose of the invention is to supply a pump having the capabilities specified which is simple in structure, which is economical to manufacture, and which operates effectively and efficiently.

In order to enable those skilled in this art to have a full and complete understanding of the invention, and its various structural and functional advantages, in the accompanying drawing, forming a part of this specification, and throughout the views of which like reference characters refer to the same parts, I have shown a desirable and preferred embodiment of the invention, although the latter is susceptible of many other embodiments.

In this drawing,—

Fig. 1 is a central, vertical, longitudinal section through the improved pump; and

Fig. 2 is a plan view of the double piston or plunger employed in the pump.

By reference to this drawing, it will be seen that the pump-cylinder 11 has two parts 12 and 13 of different internal diameter, the former being of slightly less diameter than the latter.

The smaller section of such cylinder is provided with an inlet 14 equipped with a valve 15, and also it is equipped with an outlet 16 supplied with a control valve 17.

The larger-diameter section of such cylinder has an inlet 18 fitted with a valve 19, as is clearly illustrated in Fig. 1.

The double or duplex piston comprises a portion 21 of smaller diameter and a section 22 of larger diameter, the two being connected together by an intermediate part 25 of a diameter smaller than that of the section 22.

The portion 12 of the cylinder accommodates the part 21 of the piston or plunger, and the larger portion 22 of the piston extends out of the end of the cylinder, a pressure-tight connection with the latter being effected by means of a gasket or packing 23.

A rod or shaft 24 connected to any suitable source of power is the means provided for reciprocating the plunger or piston in the two-part cylinder, and such driving means may be of any appropriate type or style.

A passage 26 extends longitudinally through the middle part of the duplex piston, and it has a conduit or opening 27 extended through the side or top thereof, thereby bringing the passage 26 into communication with the part 13 of the cylinder.

Passage 26 connects with a compartment 28 in the portion 21 of the piston, and such chamber, by means of a plurality of holes 29, connects with a groove 31 around the periphery of the portion 21 of the piston near one end thereof, that part of the piston 32 between the groove and the end of the piston being of slightly less diameter than the main body 21.

Chamber 28 accommodates a valve 33 designed to open and close the connection between the passage 26 and the chamber 28, such valve being mounted on the end of a stem 34 extending through the opening 26 into a chamber 35 in the larger part of the piston or plunger, such chamber housing a coiled spring 36 connected at one end to the rod 34 and at its other end to a threaded stem 37 extended out through a passage 41

in the end wall of the piston and being supplied externally with an adjusting nut 38 in a cavity in a yoke 39 forming the connecting means between the rod 24 and the
5 piston proper.

It will be clear therefore that by manipulation of the nut 38 the tension of the spring 36 may be governed, which in turn controls the opening and closing of the valve 33.

10 The operation of this pump occurs practically as follows:

When the double piston is sliding to the right as the parts are viewed in Fig. 1, creating a suction or partial vacuum in the cylinder-chamber 12, the valve 15 opens and permits the sand-laden oil to enter that section of the cylinder.

Also during such right-hand movement of the piston, the valve 19 opens inwardly, admitting an oil or other liquid free from deleterious ingredients into the larger part 13 of the cylinder, this admission of the liquid through the connection 18 being due to the fact that the part 22 of the piston is of greater cross-sectional area than the portion 21 thereof.

During the stroke of the duplex piston to the left, the valve 15 remains closed and the contents of the chamber 12 are forced out through the discharge pipe 16, the valve 17 being automatically opened for this purpose by reason of the pressure in the cylinder.

Also during such travel of the double piston, the larger portion or section thereof, constituting a secondary pump, places on the oil, water or other liquid or fluid in the part 13 of the cylinder a pressure greater than that created by the pumping action in the smaller cylinder section 12, thus causing a part of such liquid to be forced as a sealing medium between the smaller piston section 21 and the corresponding cylinder wall.

If there were no such leakage or similar relief around the packing 23 a tendency to break or rupture the cylinder would be developed.

The valve 33 constitutes a safety valve, and when it opens under the developed pressure it permits a part of the higher-pressure liquid or fluid to discharge through the passages 27, 26, 28 and 29 into the groove 31, from which it finds egress or discharge around the part 32 of the piston into the chamber 12, such delivery tending to scavenge or clean the cylinder wall in advance of the movement of the piston over it.

Thus by these two co-operating means or functions, the liquid and its objectionable ingredients, abradant, corrosive or otherwise, in the cylinder chamber 12 are effectively prevented from access to the space between the piston and cylinder wall, thereby preserving these against damage or injury or excessive wear.

65 Thus this simple, duplex pump mechanism

assures the efficient pumping action of liquids which would otherwise bring about serious wear or corrosion of the parts of the mechanism involved, and although this device has been described in connection with
70 liquids, it is obvious that fluids other than liquids could be satisfactorily used in the appliance.

A pump of this type is of especial value for pumping the heavy slush that is used in
75 drilling oil wells with rotary outfits, such slush containing mud and water at a high pressure which travels down the hollow drill-rods and aids in bringing the cuttings to the surface between the rods and the
80 holes being bored. The object of forcing such slush under pressure is to seal the pores of the soil so that the hole will remain open while the drilling operation is going on and until the casing is set.

Obviously, if there is much grit in the slush used, the packing of an ordinary pump cuts out very quickly and the pump parts themselves wear rapidly.

In the appliance described, owing to the
90 greater pressure imposed on the sealing liquid, it is forced into the space between the piston and cylinder under positive pressure, causing some of the liquid to pass forwardly between the piston or plunger and the cylinder wall, thereby preventing sand and grit from entering such space. If the fit of the plunger were close and the packing gland did not leak, it would be necessary to provide a safety valve for the surplus sealing
100 liquid.

In the present appliance, the safety valve is arranged within the plunger so that an excess amount of sealing liquid may be drawn in at each stroke, the safety valve permitting the discharge of this surplus in the groove directly in front of the main body of the piston, which delivery tends to wash any grit from the cylinder in advance of the plunger or piston.

I claim:—

1. In a pump, the combination of a cylinder, a reciprocatory piston therein, and means to force a sealing fluid between said piston and the cylinder wall during the discharge stroke only of the piston and at a pressure greater than that of the fluid which the piston pumps.

2. In a pump, the combination of a cylinder, a reciprocatory piston therein, means to force a sealing fluid between the piston and the cylinder wall throughout the length of the former, and means to force a sealing fluid between the piston and the cylinder wall at a point near the inner end of the piston whereby such latter fluid tends to clean the cylinder wall in advance of the piston.

3. In a pump, the combination of a cylinder, a reciprocatory piston therein to pump a fluid having qualities tending to produce
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detrimental effects on the pump, means to force a sealing fluid substantially free from such qualities between the piston and the cylinder wall, and means to force a sealing fluid substantially free from said qualities between the piston and the cylinder wall at a point near the inner end of the piston whereby such latter fluid tends to clean the cylinder wall in advance of the piston.

4. In a pump, the combination of a cylinder, a reciprocatory piston therein to pump a fluid having qualities tending to produce detrimental effects on the pump, means to force a sealing fluid substantially free from such qualities between the piston and the cylinder wall, and means to force a sealing fluid substantially free from such qualities between the piston and the cylinder wall at a point near the inner end of the piston whereby such latter fluid tends to clean the cylinder wall in advance of the piston, both sealing fluids being at a pressure greater than that of the fluid which the piston pumps.

5. In a pump, the combination of an open-ended cylinder, a piston reciprocatory therein and projecting out of said open end, packing means between the cylinder wall and the piston, means producing a fluid pressure in the cylinder between said packing means and the inner end of the piston greater than the pressure of the fluid pumped by the piston whereby a portion of such fluid is forced between the piston and the cylinder wall as a sealing medium, and means including an automatic valve for delivering a portion of such fluid under pressure between said cylinder wall and piston at a point near the inner end of the latter, whereby such latter fluid tends to clean the cylinder wall in advance of the piston.

6. In a pump, the combination of an open-ended cylinder, a piston reciprocatory therein and projecting out of said open end, said piston having a groove around its periphery near its inner end, packing means between said cylinder wall and said piston, means producing a fluid pressure in said cylinder between said packing means and the inner end of said piston greater than the pressure of the fluid pumped by said piston, whereby a portion of such greater pressure fluid is forced as a sealing medium between the cylinder wall and the piston, and means including an automatic valve and a passage in said piston to deliver a portion of such fluid under pressure to said groove to clean the cylinder wall in advance of the piston.

7. In a pump, the combination of a cylinder having a smaller diameter section and a larger diameter section, a piston reciprocatory in said cylinder having correspond-

ing smaller and larger diameter portions, valved inlet and outlet for said smaller cylinder section, and a valved inlet for said larger cylinder section, the discharge from said latter section being the space between said smaller diameter cylinder wall and said smaller portion of the piston.

8. In a pump, the combination of a cylinder having a smaller diameter section and a larger diameter section, and a piston reciprocatory in said cylinder having corresponding smaller and larger diameter portions whereby a fluid placed under pressure by the reciprocation of said larger diameter portion of the piston is forced as a sealing medium between the smaller section of the cylinder and the smaller portion of the piston.

9. In a pump, the combination of a cylinder having a smaller diameter section and a larger diameter section, a piston reciprocatory in said cylinder having corresponding smaller and larger diameter portions, valved inlet and outlet for said smaller cylinder section, a valved inlet for said larger cylinder section and a valved connection from said larger cylinder section through said piston to a point between the smaller portion of said piston and the smaller diameter cylinder wall near the inner end of the piston, whereby the discharge of fluid under pressure from said larger cylinder section takes place partly through the space between the smaller diameter cylinder wall and the smaller portion of the piston and to the point specified near the inner end of the piston.

10. In a pump, the combination of a cylinder having two sections of smaller and larger diameters, a piston reciprocatory in said cylinder having two portions of smaller and larger diameters, a groove around the periphery of the smaller section of said piston near the inner end of the latter, said piston having a passage connecting with said groove, a valve in said piston controlling said passage, and means whereby the reciprocation of the large section of the piston forces a fluid through said passage into said groove under a pressure greater than that produced in the cylinder by the movements of the smaller section of said piston, a portion of said fluid being forced as a sealing medium into the space between the smaller part of the piston and the smaller section of the cylinder wall.

In witness whereof I have hereunto set my hand and seal.

IRA A. WEAVER. [L. s.]