Sept. 16, 1930. R. A. SWAINSON 1,775,975

PISTON PUMP

Filed Feb. 2, 1928

FIG. 1.

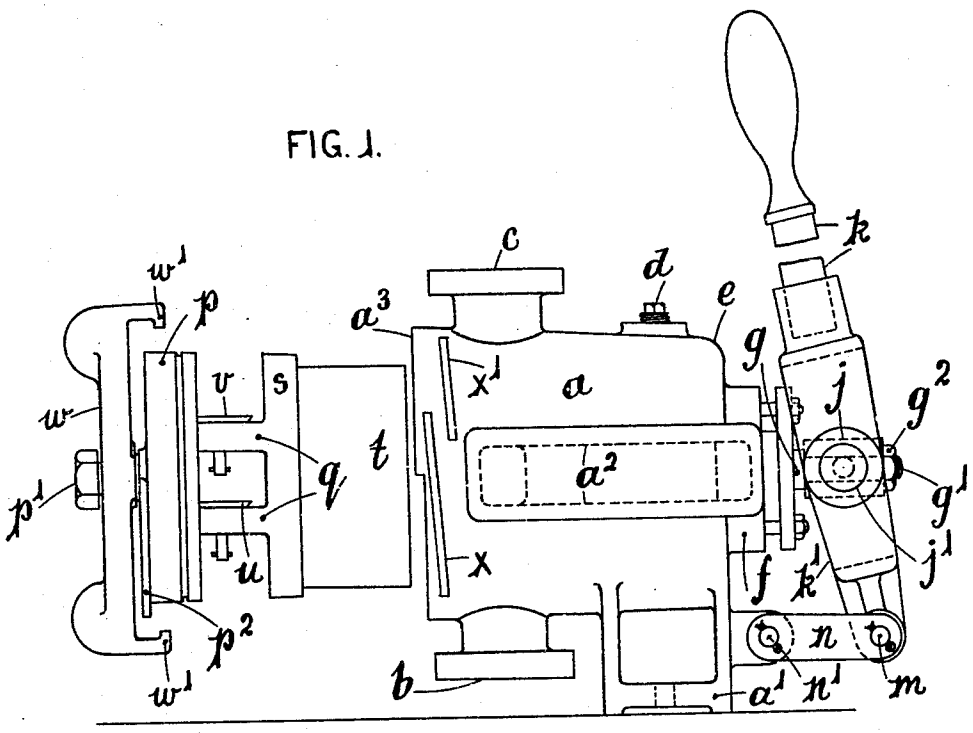


FIG. 2.

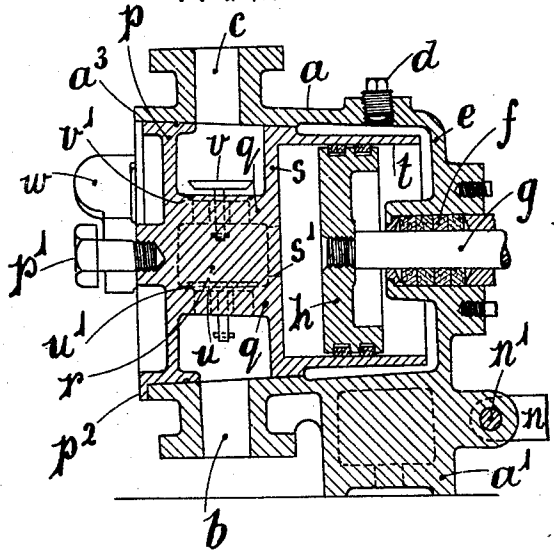
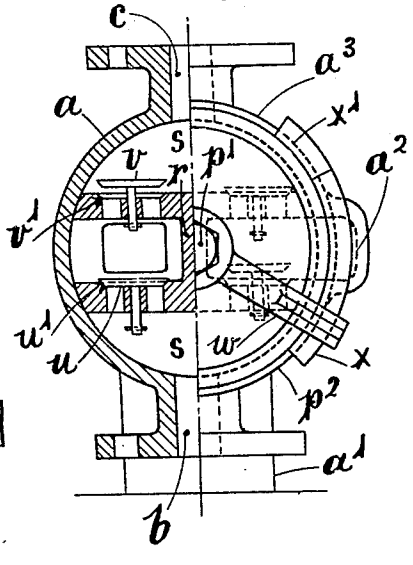


FIG. 3.



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UNITED STATES PATENT OFFICE

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PISTON PUMP

Application filed February 2, 1922, Serial No. 251,371, and in Great Britain February 9, 1927.

This invention relates to piston pumps, either double-acting or single-acting, and has for its object to provide an improved construction.

In a pump in accordance with my invention, the suction and delivery valves and their seats, the dividing partitions, and the valve chamber cover form a plug adapted to be inserted into and removed from the pump barrel as a unit, the arrangement being such that said plug constitutes one end of the pump barrel and is inserted into and removed from the barrel in an axial direction. Preferably the liner of the pump barrel also forms a part of said removable plug, but, if desired, it may be a separate fitting or may be dispensed with. The plug is slightly tapered to make a tight joint without the use of packing, and is retained in position, after insertion in the barrel, by any convenient clamping device. In a double-acting pump, the end of the barrel remote from the valves communicates with one of the two valve chambers through a passage formed in the wall of the barrel. The suction and delivery valves may be of any convenient type, and the pump may be operated by hand or power.

The accompanying drawings illustrate a double-acting pump in accordance with my invention. In the drawings, Figure 1 is a side elevation showing the plug withdrawn from the pump barrel, Figure 2 is a central longitudinal section with the plug in position in the barrel, and Figure 3 is a half vertical section through the valve chamber and a half end elevation.

Referring to the drawings, in the example therein illustrated, the pump comprises a barrel a which is slightly tapered internally and is provided at its larger end with a suction inlet b and a delivery outlet c and at its smaller end with a screwed plug d for priming.

The larger end of the barrel a is open, and the other end is closed by a wall e provided centrally with a gland f through which passes the piston rod g on which is mounted the piston h. The outer end of the piston rod is reduced and threaded at g^1 and on it is mounted a block j which is retained by a nut g^2. The block j has projecting pins j^1 which are journalled in the side walls k^1 of a slot in a handlever k mounted on a pivot m carried by a pair of links n pivoted at n^1 to the base a^1 of the barrel a. Oscillation of the lever k about the pivot m reciprocates the piston h in the barrel.

The open end of the barrel a forms a tapered valve chamber which receives a tapered plug comprising a valve chamber cover p, transverse partitions q, a central partition r perpendicular thereto, a disc s which forms the partition between the pump barrel and the valve chambers, and a cylindrical extension t which forms a liner for the pump barrel within which the piston h reciprocates. The peripheries of the cover p and partition s and the edges of the partitions q are tapered to correspond with the internal taper of the barrel a. The transverse partitions q carry the suction valves u and the delivery valves v and the seats u^1 and v^1 therefor. The space between the partitions q is divided into separate valve chambers by the partition r; the chamber on one side of the partition r communicates through an aperture s^1 in the partion s with the inner end of the barrel a, and the chamber on the other side of the partition r communicates through a passage a^2 in the wall of the barrel a with the gland end of the barrel.

The cover p carries a locking device comprising a clamp w pivoted on a stud p^1 mounted centrally of the cover. The clamp is formed with inturned projections w^1 at its ends which coact with part spiral threads x, x^1 on the exterior of the barrel a.

In operation, the plug having been inserted in the barrel a and locked therein by the clamp w, when the lever k is operated to move the piston h towards the partition s, liquid is drawn through the inlet b, the right-hand (Fig. 3) suction valve u and the passage a^2 into the barrel a behind the piston and is simultaneously forced through the aperture s^1, the left-hand delivery valve v to the outlet c, and, when the piston is moved towards the gland f, liquid is drawn through the inlet

b, the left-hand suction valve u and the aperture s^1 into the barrel a and simultaneously forced through the passage a^2 and the right-hand delivery valve v to the outlet c.

To dismantle the pump for cleaning, the clamp w is swung round to disengage the threads x and the plug withdrawn from the barrel as shown in Fig. 1. The withdrawal of the plug is facilitated by the threads x^1 which coact with the projections w^1 to "start" the withdrawal of the plug. When inserting the plug, correct positioning is ensured by the registering of a semi-cylindrical flange p^2 on the cover p with a semi-cylindrical extension a^3 of the pump barrel a. The piston h can be removed by detaching the nut g^2 on the piston rod g, when the block j can be removed therefrom, and withdrawing the piston and its rod from the open end of the pump barrel.

While I have illustrated, by way of example, a double-acting pump, it will be seen that, if the passage a^2 and the partition r are omitted, the pump becomes a single-acting pump alternately drawing the liquid into and delivering it from the end of the barrel next the partition s through the aperture s^1. In this case only a single pair of valves need be fitted. Instead of using mushroom valves u and v as illustrated, I may employ ball, hinged flap or other suitable valves as the suction and delivery valves.

My improved pump is particularly adapted for rapid and inexpensive production, high efficiency in operation since it has no packed joints, and long life since, where the liner t is provided, no part of the pump barrel is subjected to wear. It is especially suitable for use where skilled attendants are not available, as the state of the valves, liner and piston may be readily inspected by withdrawing the plug, and, where a spare plug and piston are available, the whole of the interior of the pump can be renewed without the use of a single tool.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A piston pump comprising a pump barrel, a liner therein, a piston in said liner, means for reciprocating said piston in said liner, a suction inlet to said barrel, a discharge outlet to said barrel, a plug which can be inserted into and removed from one end of said barrel in an axial direction as a unit, said removable plug comprising an end cover and longitudinal and transverse partitions forming a valve chamber independent of the pump barrel, suction and delivery valves and their seats in said valve chamber carried by said partitions, a communication between said valve chamber and the interior of the liner in the pump barrel, and means for retaining said plug in position in the pump barrel.

2. A piston pump comprising a pump barrel, a liner therein, a piston in said liner, means for reciprocating said piston in said liner, a suction inlet to said barrel, a discharge outlet to said barrel, a plug which can be inserted into and removed from one end of said barrel in an axial direction as a unit, said removable plug comprising an end cover and longitudinal and transverse partitions forming a pair of separate valve chambers independent of the pump barrel, suction and delivery valves and their seats in each of said valve chambers carried by said partitions, independent communications between said valve chambers and the interior of the liner in the pump barrel, and means for retaining said plug in position in the pump barrel.

3. A piston pump comprising a pump barrel, a liner therein, a piston in said liner, means for reciprocating said piston in said liner, a suction inlet to said barrel, a discharge outlet to said barrel, a plug which can be inserted into and removed from one end of said barrel in an axial direction as a unit, said removable plug comprising an end cover and longitudinal and transverse partitions forming a pair of separate valve chambers independent of the pump barrel, said liner being carried by said plug, suction and delivery valves and their seats in each of said valve chambers carried by said partitions, independent communications between said valve chambers and the interior of the liner in the pump barrel, and means for retaining said plug in position in the pump barrel.

4. A piston pump comprising a pump barrel, a liner therein, a piston in said liner, means for reciprocating said piston in said liner, a suction inlet to said barrel, a discharge outlet to said barrel, a plug which can be inserted into and removed from one end of said barrel in an axial direction as a unit, said removable plug comprising an end cover and longitudinal and transverse partitions forming a pair of separate valve chambers independent of the pump barrel, said liner being carried by said plug, suction and delivery valves and their seats in each of said valve chambers carried by said partitions, independent communications between said valve chambers and the interior of the liner in the pump barrel, said communications comprising an aperture in the transverse partition between one valve chamber and the interior of said liner, and a passage in the wall of the pump barrel leading from the other valve chamber to the end of the pump barrel remote from said valve chamber, and means for retaining said plug in position in the pump barrel.

5. A piston pump comprising a pump barrel, a liner therein, a piston in said liner, means for reciprocating said piston in said liner, a suction inlet to said barrel, a discharge

outlet to said barrel, a plug which can be inserted into and removed from one end of said barrel in an axial direction as a unit, said removable plug comprising an end cover and longitudinal and transverse partitions forming a pair of separate valve chambers independent of the pump barrel, said liner being carried by said plug, suction and delivery valves and their seats in each of said valve chambers carried by said partitions, independent communications between said valve chambers and the interior of the liner in the pump barrel, said communications comprising an aperture in the transverse partition between one valve chamber and the interior of said liner, and a passage in the wall of the pump barrel leading from the other valve chamber to the end of the pump barrel remote from said valve chamber, said pump barrel being tapered and said plug being tapered to suit, and means for retaining said plug in position in the pump barrel.

6. A piston pump comprising a pump barrel, a liner therein, a piston in said liner, means for reciprocating said piston in said liner, a suction inlet to said barrel, a discharge outlet to said barrel, a plug which can be inserted into and removed from one end of said barrel in an axial direction as a unit, said removable plug comprising an end cover and longitudinal and transverse partitions forming a pair of separate valve chambers independent of the pump barrel, said liner being carried by said plug, suction and delivery valves and their seats in each of said valve chambers carried by said partitions, independent communications between said valve chambers and the interior of the liner in the pump barrel, said communications comprising an aperture in the transverse partition between one valve chamber and the interior of said liner, and a passage in the wall of the pump barrel leading from the other valve chamber to the end of the pump barrel remote from said valve chamber, said pump barrel being tapered, and said plug being tapered to suit, and means for retaining said plug in position in the pump barrel, said means comprising a rotatable clamp on said plug, inturned projections at the ends of said clamp, and parts spiral threads on the exterior of the pump barrel with which said inturned projections coact.

7. A piston pump comprising a pump barrel, a liner therein, a piston in said liner, means for reciprocating said piston in said liner, a suction inlet to said barrel, a discharge outlet to said barrel, a plug which can be inserted into and removed from one end of said barrel in an axial direction as a unit, said removable plug comprising an end cover and longitudinal and transverse partitions forming a pair of separate valve chambers independent of the pump barrel, said liner being carried by said plug, suction and delivery valves and their seats in each of said valve chambers carried by said partitions, independent communications between said valve chambers and the interior of the liner in the pump barrel, said communications comprising an aperture in the transverse partition between one valve chamber and the interior of said liner, and a passage in the wall of the pump barrel leading from the other valve chamber to the end of the pump barrel remote from said valve chamber, said pump barrel being tapered, and said plug being tapered to suit, and means for retaining said plug in position in the pump barrel, said means comprising a rotatable clamp on said plug, inturned projections at the ends of said clamp, and part spiral threads on the exterior of the pump barrel with which said inturned projections coact, and means for ensuring correct positioning of the plug in the pump barrel.

In testimony whereof, I affix my signature.

ROBERT A. SWAINSON.