

March 8, 1932.

C. D. STEPHENS

1,848,441

PUMP

Filed Aug. 30, 1930

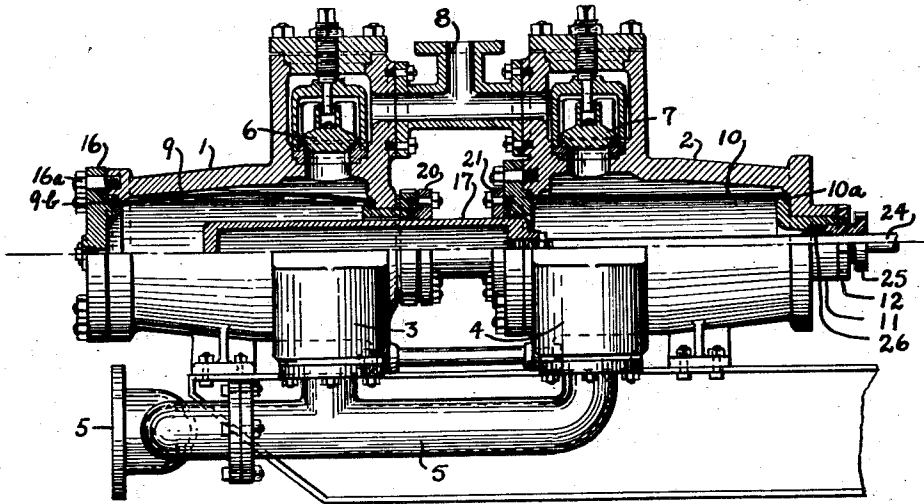


Fig. 1

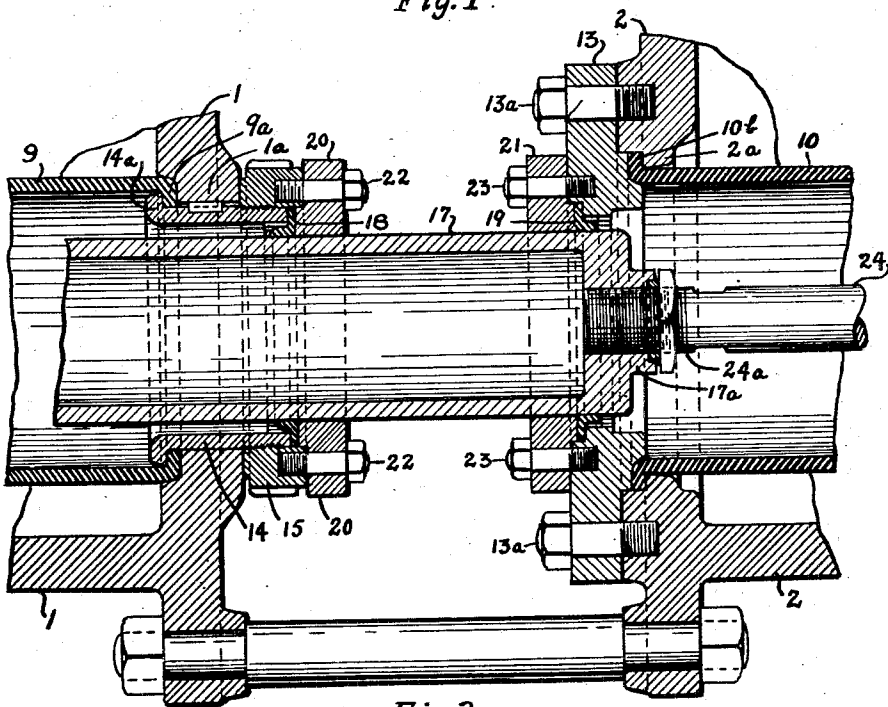


Fig. 2

Charles D. Stephens.
INVENTOR.

by *Vincent Martin*
ATTORNEY.

UNITED STATES PATENT OFFICE

CHARLES D. STEPHENS, OF SAN ANTONIO, TEXAS, ASSIGNOR TO STEPHENS PUMP COMPANY, OF DOVER, DELAWARE, A CORPORATION OF DELAWARE

PUMP

Application filed August 30, 1930. Serial No. 478,878.

This invention relates to pumps.

In my pending application, filed January 18th, 1930, Ser. No. 421,651, Patented Nov. 17, 1931, No. 1,832,258, I have disclosed and claimed a pump of the type hereinafter illustrated embodying hollow expansible members containing fluid actuated by a piston whereby the members are intermittently expanded and permitted to contract to expel the fluid to be pumped from and to draw a new charge thereof into the barrels of the pump in which the members are disposed. At the outset, a predetermined quantity of fluid is placed in each of the expansible members. By-passing of fluid about the piston from one member to the other has resulted in one member having too much fluid therein, the other too little. This invention has for one of its objects the provision of a new and improved pump embodying new and improved means to prevent by-passing of fluid about its piston.

Another object of this invention is to provide a new and improved construction of said barrels to prevent wear of the said members, and to effect a free circulation of the fluid to be pumped.

Other objects will hereinafter appear.

The preferred embodiment of the invention is illustrated by the accompanying drawings, of which Fig. 1 is a partly sectional elevation of the pump; and Fig. 2 is a detail sectional view of the packing means and associated parts.

The pump comprises a pair of substantially frusto-conical barrels 1 and 2 which are spaced and aligned so that their base ends are adjacent each other. The barrel 1 has an intake valve 3 and an exhaust valve 5; the barrel 2, an intake valve 4 and exhaust valve 7. The intake valves 3 and 4 permit the entrance into the barrels of fluid from the common intake pipe 5; and prevent the escape of fluid from the barrels into the intake pipe 5. The exhaust valves 6 and 7 permit the expulsion of fluid from the barrels into the common exhaust pipe 8; and prevent the passage of fluid into the barrels from the exhaust pipe 8.

Mounted within and co-extensive with the barrels 1 and 2 are the normally cylindrical expansible members 9 and 10.

The member 10 has an internal annular flange 10a at its outer end which is compressed by and held between the clamp 11 and the outer end wall of the barrel. The clamp 11 is held by the nut 12 on the exterior of the barrel. The inner end of member 10 has an external annular flange 10b (Fig. 2) which is held by and compressed between the internal annular flange 2a, which defines an opening in the inner end of the barrel 2, and by the member retaining ring 13, which is removably held in place by bolts 13a.

The inner end of the member 9 has an internal annular flange 9-a (Fig. 2) compressed by and held between the internal annular flange 1a, which defines an opening in the inner end of the barrel 1, and by the flange 14a of the clamp 14. Engaging the clamp 14 on the exterior of the inner end of barrel 1 is a nut 15. The member 9 has on its outer end (Fig. 1) an external annular flange 9b which is compressed between and held by the outer end wall of the barrel 1 and the head 16. The head 16 is removably held in place by the bolts 16a.

The new and improved arrangement provided by this invention to prevent by-passing of the actuated fluid about the piston 17 will now be described.

The piston 17 is disposed between and extends into the openings in the adjacent ends of the spaced barrels and the open ends of the members 9 and 10. By-passing of fluid about the piston from one member to the other cannot take place in view of the disposition of the piston; and any leakage may readily be detected. Packing rings 18 and 19, the first of which is compressed between and held by clamp 14 and the ring 20, and the last of which is compressed between and held by the retaining rings 13 and 21, prevent the escape of fluid from the members. These packing rings are substantially L-shaped in cross-section, as shown. The ring 20 is removably held on the nut 15 by the bolts 22; the ring 21 on the ring 13 by bolts 23.

The piston rod 24 is connected to the pis-

ton 17 and extends through the expansible member 10 and gland 25 outwardly to the conventional power means not shown. The rod 24 is sealed by the packing 26 compressed by the gland 25.

The members 9 and 10 may be filled with actuating fluid by any suitable means, not shown. For example, ducts may be provided in the head 16 and ring 13. The piston 17 is moved to the right, and the member 9 is then filled. Then the piston is moved to the left and the member 10 is filled.

The members 9 and 10 having been filled with actuating fluid, the operation of the pump is as follows:

As shown by Fig. 1, when the piston is at its forward position the member 9 is expanded; the member 10, in its normal cylindrical shape. Now when the power means, not shown, moves the piston on its return stroke, the member 10 is expanded by the fluid therein displaced by the piston 17 and the member 9 is contracted by the withdrawal of the piston therefrom. Upon expansion of member 10, the inlet valve 4 is closed; the outlet valve 7, opened; and the fluid in barrel 2 forced through the exhaust pipe 8. Meanwhile, the contraction of member 9 has closed outlet valve 6, opened inlet valve 3 and drawn a fresh charge of fluid through the intake valve 5 into the barrel 1.

A reverse operation occurs upon forward movement of the piston. The piston displaces the actuating fluid in the member 9 and withdraws from member 10. Consequent expansion of member 9 effects closure of the inlet valve 3, opening of outlet valve 6, and expulsion of fluid from the barrel 1 through the exhaust pipe 8. Simultaneous contraction of member 10 effects closure of outlet valve 7, opening of inlet valve 4, and suction of fluid through intake pipe 5 into barrel 2.

The alternate expansion and contraction of the expansible members 9 and 10 is radial, and the intake and exhaust ports are in the large or base ends of the barrels, so that there is sufficient clearance between the expansible members and the walls of the barrels adjacent said ports. The expansible members are, therefore, not forced into wearing contact with the barrel walls and a free circulation of the fluid to be pumped is insured.

The packing rings 18 and 19 may readily be removed and replaced without disturbing the connection of the expansible members 9 and 10 to the barrels. This may be accomplished by disconnecting the rod 24 from the power means, not shown, and moving the piston and rod to the left until the connected ends 17a and 24a thereof are disposed between the barrels. The rod 24 may then be screwed out of the piston 17, the bolts 22 and 23 removed, and the rings 20 and 21 and packing rings 18 and 19 taken away from the

pump. New packing rings may then be substituted for the packing rings removed and the other parts remounted.

It will be noted that while the piston packing means may be removed and replaced without disturbing the connection between the barrels and the expansible members, the removable and adjustable parts connecting the latter are accessible from the exterior of the pump.

The invention is not limited to the preferred embodiment herein illustrated. Various changes may be made within the scope of the following claims:

I claim

1. In a pump, a pair of spaced barrels, a hollow expansible member in each of said barrels, a piston between said barrels and extending into said members, and removable packing means in the adjacent ends of said barrels and about said piston.

2. In a pump, a pair of spaced barrels, a hollow expansible member in each of said barrels, a piston between said barrels and extending into said members, a rod connected to said piston, and removable packing means in the adjacent ends of said barrels and about said piston, the connected ends of said piston and rod being movable to a point between said barrels, said piston and rod being then separable to permit the removal and replacement of said packing means.

3. In a pump, a barrel having an opening therein, a hollow expansible member in said barrel and having an open end adjacent said opening, a piston extending through said opening in said barrel and into said open end of said member, and removable means to connect and seal said end of said member to said barrel and to pack said piston, said means being accessible from the exterior of said barrel.

4. In a pump, a pair of spaced barrels, each of said barrels having an opening in its end adjacent the other of said barrels, a hollow expansible member in each of said barrels and having an open end adjacent the opening in said barrel, a piston between said barrels and extending through said openings in said barrels and into said open ends of said members, and adjustable and removable means to connect and seal said ends of said members to said barrels and to pack said piston in said openings in said barrels, said means being accessible from the exterior of said barrels.

5. A pump having a frusto-conical barrel, an intake port and an exhaust port in the walls of said barrel adjacent the base end thereof, a normally cylindrical expansible member within and co-extensive with said barrel, and means to expand said member.

6. In a pump, a pair of spaced barrels, a hollow expansible member in each of said

barrels, and a piston between said barrels and extending into said members.

7. In a pump, a pair of spaced barrels, inlet and outlet means associated with said barrels, a hollow, expansible member in each of said barrels, a piston between said barrels and extending into said members to cause expansion and contraction of said members to draw fluid into said barrels through said inlet means and to force it out of said barrels through said outlet means, and removable packing means in the adjacent ends of said barrels and about said piston.

8. In a pump, a pair of spaced barrels, inlet and outlet means associated with said barrels, a hollow expansible member in each of said barrels, a piston between said barrels and extending into said members to cause expansion and contraction of said members to draw fluid into said barrels through said inlet means and to force it out of said barrels through said outlet means, a rod connected to said piston, and removable packing means in the adjacent ends of said barrels and about said piston, the connected ends of said piston and rod being movable to a point between said barrels, said piston and rod being then separable to permit the removal and replacement of said packing means.

9. In a pump, a barrel, inlet and outlet means associated with said barrel, said barrel having an opening therein, a hollow, expansible member in said barrel and having an open end adjacent said opening, a piston extending through said opening in said barrel and into said open end of said member to cause expansion and contraction of said member to draw fluid into said barrel through said inlet means and to force it out of said barrel through said outlet means, and removable means to connect and seal said end of said member to said barrel and to pack said piston, said means being accessible from the exterior of said barrel.

10. In a pump, a pair of spaced barrels, inlet and outlet means associated with said barrels, each of said barrels having an opening in its end adjacent the other of said barrels, a hollow, expansible member in each of said barrels and having an open end adjacent the opening in said barrel, a piston between said barrels and extending through said openings in said barrels and into the open ends of said members to cause expansion and contraction of said members to draw fluid into said barrels through said inlet means and to force it out of said barrels through said outlet means, and adjustable and removable means to connect and seal said ends of said members to said barrels and to pack said piston in said openings in said barrels, said means being accessible from the exterior of said barrels.

11. In a pump, a pair of spaced barrels, inlet and outlet means associated with said barrels, a hollow, expansible member in each of said barrels, and a piston between said barrels and extending into said members to expand and contract said members to draw fluid into said barrels through said inlet means and to force it out of said barrels through said outlet means.

12. In a pump, a pair of spaced barrels, a hollow expansible member in each of said barrels, actuating fluid in said members, a piston between said barrels and reciprocable within both of said members, means intermediate the expansible members and surrounding the piston and adapted to prevent escape of actuating fluid from either of said expansible members, a piston rod connected to one end of the piston and extending through one of said expansible members, and means surrounding said piston rod to which the proximate end of the expansible member is secured for closing said proximate end and preventing escape of actuating fluid from said expansible member around the piston rod.

13. In a pump, the combination of walls forming two opposed chambers open at both ends and arranged in axial alignment, the opposing ends of said chambers being separated to permit access thereto from the exterior, a reciprocating piston extending in the space between and operating within said chambers, a tubular diaphragm in each chamber dividing the chamber into inner and outer compartments and arranged to expand radially with respect to the axis of said reciprocating piston, removable means accessible from said space between said chambers for closing the opposed ends of both compartments, removable means at the outer end of one of said chambers for closing the outer ends of both compartments, and a piston rod extending through said outer removable means and diaphragm end and connected to said piston.

In testimony whereof, I hereunto affix my signature.

CHARLES D. STEPHENS.