July 22, 1924. 1,502,196

G. C. HICKS, JR

PUMP

Filed June 7, 1922

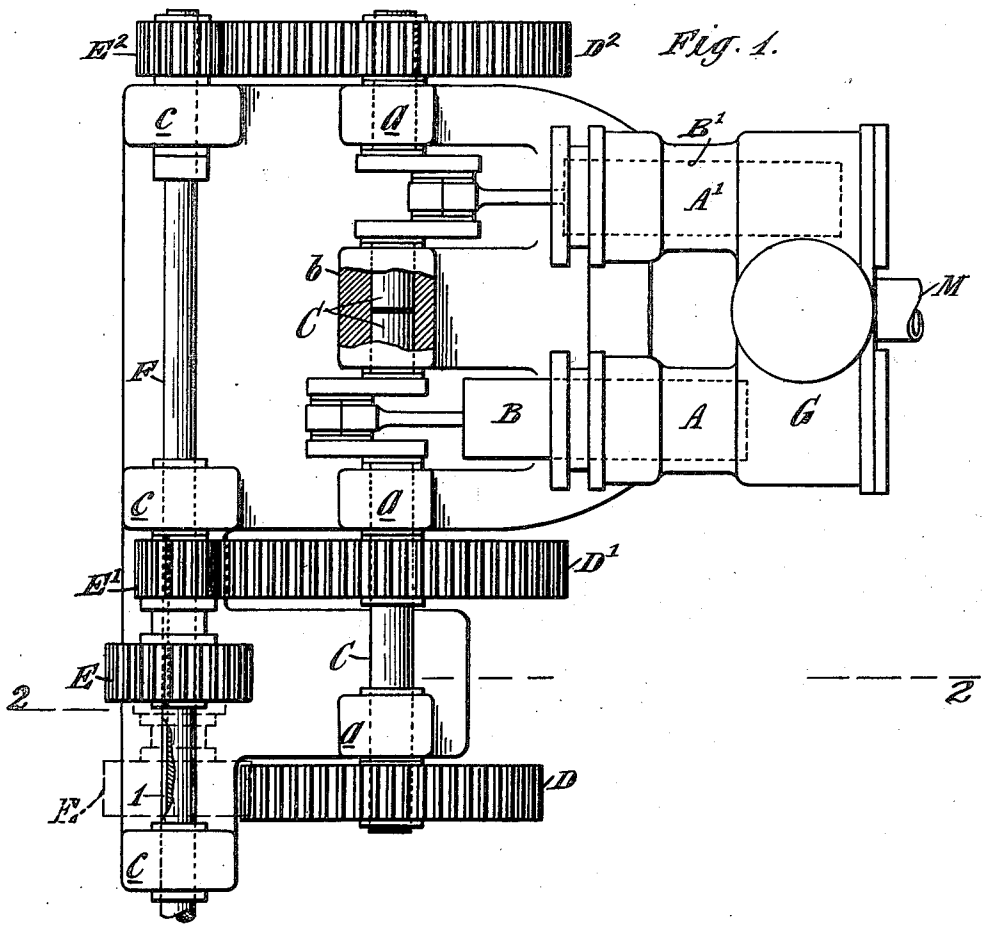


Fig. 1.

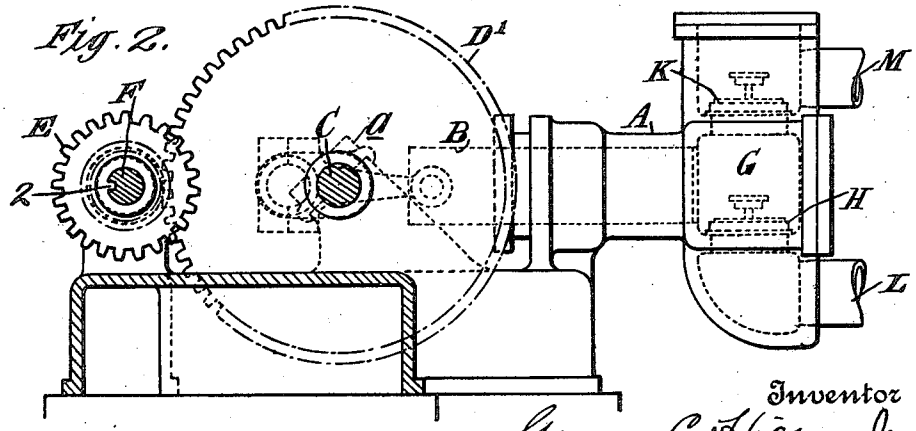


Fig. 2.

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UNITED STATES PATENT OFFICE.

GEORGE C. HICKS, JR., OF ST. LOUIS, MISSOURI, ASSIGNOR TO WORTHINGTON PUMP AND MACHINERY CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF VIRGINIA.

PUMP.

Application filed June 7, 1922. Serial No. 566,487.

To all whom it may concern:

Be it known that I, GEORGE C. HICKS, Jr., a citizen of the United States, residing at St. Louis, county of St. Louis, and State of Missouri, have invented certain new and useful Improvements in Pumps, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to improvements in pumps.

It is the especial object of the present invention to provide improved means for adjusting or varying the strokes of a plurality of pump plungers relatively to each other in variable capacity pumps of that type in which the plungers are arranged to enter and withdraw from a plunger chamber common to all of the plungers, so that a variable quantity of liquid may be displaced by such plungers in the plunger chamber and the volume of the pump discharge thereby increased or decreased to meet varying requirements.

For a full understanding of the invention, the same will now be described in detail in connection with the accompanying drawings showing a preferred embodiment of the device, and the novel features of the invention will then be pointed out in the claims.

In the drawings—

Figure 1 is a top plan view, partially in section, of a two-plunger pump and driving gear therefor;

Figure 2 is a section on the irregular line 2—2 of Fig. 1.

Referring now to the drawings, and particularly to Fig. 1, A, A′ indicate the plunger cylinders; B, B′ cylindrical plungers arranged to be reciprocated therein by direct or other connection with a two-part crank shaft C journaled in bearings *a* and a central bearing *b* arranged to receive the juxtaposed ends of the two part shaft. On the shaft C are mounted gears D, D′, D^2, arranged to be driven by pinions E, E′, E^2, respectively, mounted on a power driven shaft F journaled in bearing *c*. G indicates a plunger chamber common to both plungers B, B′; H, K are the suction and discharge valves, and L, M suction inlet and discharge outlet, respectively. Shaft F is arranged to be driven by direct connection with any suitable power unit (not shown), but obviously may be driven by a gear or belt drive, if desired. With a direct connection, any well known form of flexible coupling may be used.

From the foregoing it will be seen that when the cranks are, as shown, set at 180°, and the gears E′, E^2 in mesh with gears D′, D^2, the plungers B, B′ will be reciprocated in opposite directions at the same speed, so that as one plunger is entering chamber G the other plunger is withdrawing therefrom at the same speed, and the effective liquid-holding area of chamber G thus remains the same, the liquid therein merely flowing from one side to the other as it is displaced by an entering plunger into the space previously occupied by the outwardly moving plunger. With the cranks in the position shown and thus driven, therefore, there will be no delivery. From this position of the cranks, the delivery of the pump may be varied to any desired quantity up to maximum by adjusting the cranks to any point intermediate 180° and a point where they will cause the plungers to reciprocate in unison, when, of course, the maximum displacement of liquid in chamber G will take place at each stroke and the full capacity of the pump be secured. Or a constantly varying capacity may be secured by driving one plunger at a speed different from the other. The means for varying the capacity of the pump comprises a change gearing, which, as shown, consists of pinions E, E′ which are longitudinally movable on the shaft F but splined thereon, as by the longitudinal groove 1 and a spline 2, whereby gear D, and plunger B may be driven by pinion E.

The construction of the device will be clear from the foregoing, and the operation thereof will now be briefly described. When it is desired to maintain a constantly varying delivery, in which the volume varies gradually from zero to maximum, the pinion E′ may be thrown out of engagement with gear D′ and pinion E brought into mesh with gear D. With this adjustment, the part of the crank shaft C controlled by gear D will rotate faster than the part of such shaft controlled by gear D^2, with the result that on a certain number of revolutions of the former crank shaft part, de-

pendent on the relative sizes of the pinions and crank shaft gears, the crank controlling plunger B will pass that controlling plunger B′, and the volume of the delivery will, as stated, vary from zero to maximum, as the angular relation of the cranks gradually varies. If it be desired to have a fixed or constant discharge of predetermined volume, the angular relation of the cranks may readily be changed and the timed relation of the plunger strokes therefore varied to secure such delivery, by stopping the pump and moving pinions E, E′ longitudinally on the shaft F until pinion E′ is out of mesh with gear D′ and pinion E is in mesh with gear D. The pump may then be started and run slowly until the proper angular relation of the cranks is reached, and pinions E, E′ then again be moved longitudinally on shaft F until the pinion E′ meshes with gear D′ and pinion E is out of contact with gear D. The pump will then operate with the discharge desired. It will be understood, of course, that the capacity of the pump may also be varied by throwing pinion E′ out of mesh with gear D′ in the manner above described and adjusting the angular relation of the cranks by means other than the power of the driving connection through pinion E and gear D.

It will be understood that various changes and modifications may be made in the construction shown and described, while still retaining the invention defined by the claims.

What is claimed is:

1. A variable capacity pump, comprising a plurality of plungers, a plunger chamber common to said plungers, a plunger-actuating shaft divided into a plurality of parts, a power shaft, driving connections between said power shaft and each of said plunger-actuating shaft parts, and means for throwing one of said driving connections out of operation to permit the relative timing of the plunger strokes to be varied.

2. A variable capacity pump, comprising a plurality of plungers, a plunger chamber common to said plungers, a plunger-actuating shaft for each of said plungers, a power shaft, separate driving connections between said power shaft and each of said plunger-actuating shafts, and change speed gear connections between said power shaft and one of said plunger-actuating shafts for varying the relative speeds of said latter shafts.

3. A variable capacity pump, comprising a plurality of plungers, a plunger chamber common to said plungers, a plunger-actuating shaft divided into a plurality of parts, a power shaft, and gear connections between said power shaft and each of said plunger-actuating shaft parts, including change gears for varying the speed at which the power shaft drives one of said parts relatively to the other.

4. A variable capacity pump having a common plunger chamber and plungers B, B′, separate shafts C driving said plungers having gears D′, D^2, power shaft F carrying pinions E′, E^2 for driving plungers B, B′ at equal speed through gears D′, D^2, and change gears D, E on one of the shafts C and power shaft F, for driving plunger B at a speed different from plunger B′.

5. A pump having a plurality of plungers, a plunger chamber common to said plungers, a power shaft, and separate driving connections between said power shaft and plungers including means for driving said plungers at different speeds with respect to each other.

In testimony whereof, I have hereunto set my hand.

GEORGE C. HICKS, JR.