

May 5, 1931.

D. A. HARNER

1,803,705

PUMPING DEVICE

Filed Jan. 25, 1930

Fig. 1.

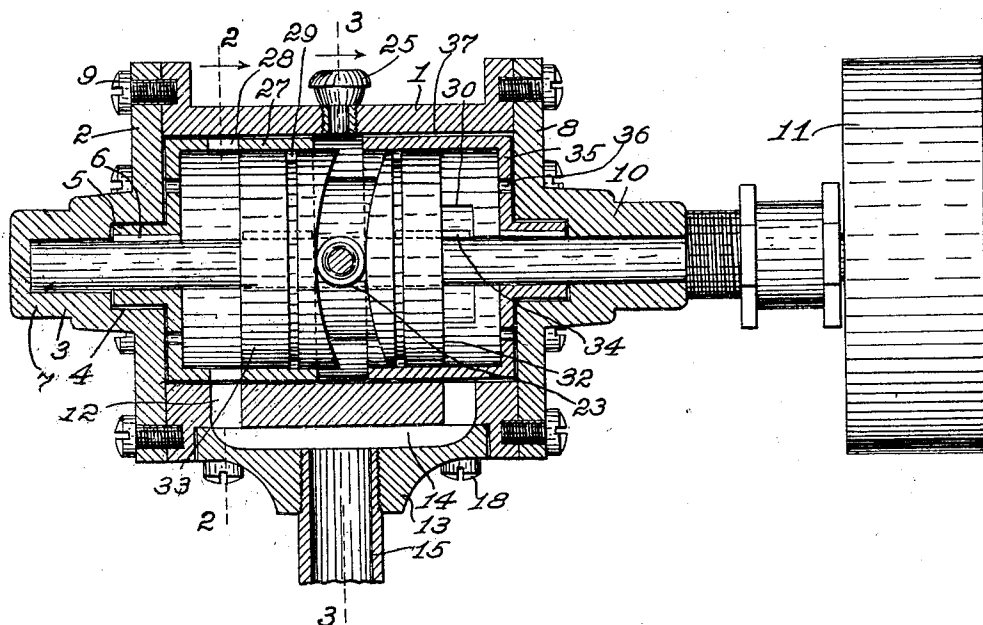


Fig. 2.

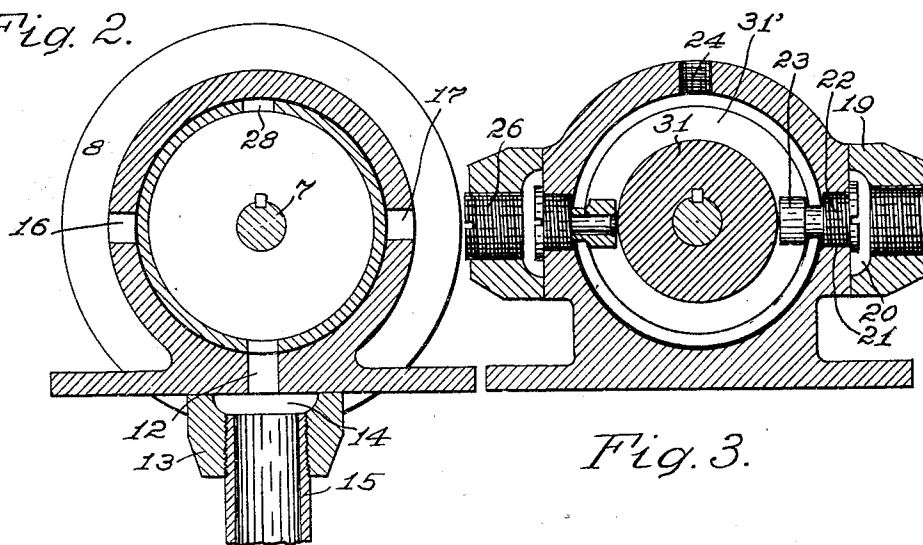


Fig. 3.

INVENTOR
David A. Harner.
BY
G. E. Kennedy.
ATTORNEY

UNITED STATES PATENT OFFICE

DAVID A. HARNER, OF CEDAR FALLS, IOWA

PUMPING DEVICE

Application filed January 25, 1930. Serial No. 423,482.

My invention relates to improvements in pumping devices, and the object of my improvement is to provide a pump of an inexpensive, simply constructed character, and which in operation saves power as compared with other such devices.

Another object is to supply in the pump coacting devices for alternately opening and closing different sets of inlet and outlet ports, to minimize pulsations in the delivery.

Another object is to coordinate said coacting devices as to eliminate most of the noises usually incident to operation.

Another object is to arrange the elements of the invention relatively to permit of substituting one operating element for another therein, whereby the force and quantity of fluid delivered in a given time may be varied without changing the other associated and related elements.

I have successfully accomplished these objects in actual practice by the means which are hereinafter described and claimed, and which are illustrated in the accompanying drawings, in which Fig. 1 is a vertical longitudinal axial section of the cylinder of my pumping device, with other parts or elements shown in elevation or broken away. Fig. 2 is a cross section of the pump taken on the broken line 2—2 of said Fig. 1, and Fig. 3 is another cross section of the device taken on the broken line 3—3 of Fig. 1.

My invention is not restricted to the precise construction and arrangement of parts herein shown and described, nor to the various details thereof, as the same may be modified or rearranged in various particulars without departing from the spirit and scope of my invention, one practical embodiment of which has been herein illustrated and described without attempting to show all of the various forms and modifications in which my invention might be embodied.

My pumping device has a cylinder body 1 with opposite separable heads 2 and 8 secured thereon by machine screws 9. There are two sets of cylinder inlet and outlet ports 12 and 16—17 respectively, of which there is one pair of longitudinally spaced inlet ports 12 of oblong shape in the basal part of the

cylinder, and two pairs of similarly shaped and longitudinally spaced outlet ports at 16 and 17, positioned at opposite sides of the cylinder. In practice but one pair of outlet ports on one side of the cylinder are used, the opposite pair being plugged by removable threaded screws 26 as shown in Fig. 3. Either set of outlet ports may be used at times, as hereinafter described.

The inlet ports 12 are inclosed by a block 13 fastened by the screws 18 removably, the block containing a cavity 14 leading medially into a supply pipe 15, the ends of this cavity being in communication with the ports 12. The outlet ports 16 and 17 are inclosed by like hollowed blocks 19, whose cavities of like shape at 20 likewise communicate with said ports at the ends. An outlet or delivery pipe not shown may be in communication with either one of these side blocks 19.

The opposite cylinder heads 2 and 8 have respectively axial hollowed bosses 3 and 10 projecting oppositely outwardly, the boss 3 having a bearing socket 5 of two diameters as does the other boss, except that the boss 10 has its central bearing opening extending therethrough to receive the rotatable shaft 7 driven by a belt-wheel 11, the other end of the shaft being seated in the socket in the boss 3.

The numerals 27 and 35 denote like but reversed cups of cylindrical shape fitted loosely in the chamber 37 of said cylinder 1 and secured fixedly on opposite parts of the shaft 7 in spaced relation longitudinally, and have diminished end parts 5 keyed at 6 on the shaft and seated in the wider portions of the hollows of the bosses 3 and 10 respectively. The cylinder 1 may have an aperture served by an oil-cup 25 at the top. The cups 27 and 35 have in their circumferential walls opposite oblong ports 28 and 30 for occasional communication with the cylinder outlet ports 16 and 17 and the inlet ports 12, but the ports in the cup 35 are positioned midway circumferentially relative to the like ports in the other cup 27, while both cups have small holes 36 in their end walls for a purpose to be disclosed.

The numeral 31 denotes an elongated

cylindrical solid body centrally axially apertured and splined at 34 on the shaft 7, serving as a double-ended plunger, and divided into two parts 33 and 32 by a circumferential medial cam-groove 31'. The plunger is less in its length than the distance between the end walls of the cups 27 and 35, and at each side of the cam-groove 31' these parts have annular oil receiving grooves 29. The plunger is slidable on the shaft.

Midway of opposite sides of the cylinder 1 are threaded holes 21 to receive headed screws 22 directed radially, and having within the chamber 37 diminished stems on which are mounted the anti-friction rollers 23. These rollers project into the cam-groove 31' at opposite sides slightly spaced from its walls.

When the shaft 7 is rotated, the cups 27 and 35 rotate with it, the ports 28 and 30 of the cups passing into communication with ports 16 and 17, also ports 12 in turn during each rotation. Simultaneously the stems 22 and their rollers 23, as the cylindrical member 31 also rotates with the shaft, compel the member 31 to move slidingly along the shaft to one limit of movement, the cam groove returning the member to an opposite limit, to alternately in part or wholly cover or uncover the cup ports in thus controlling the cylinder ports in succession, according to the longitudinal length of stroke of the cylinder 31 as determined by the relative curvatures of said cam groove. Suction thus engendered in opposite inclosed hollows of the cups 27 and 35 in alternation draws liquid from the inlet-pipe 15 thereinto to be delivered in turn into the outlet ports, as at the unplugged outlet 20. The placing of the respective cup ports 28 and 30 at relatively alternated positions respectively in the cups causes the general delivery at 20 to be practically free from pulsations.

As the cup ports 28 and 30 are spaced from the end walls of the cups, liquid normally remains to fill these hollows, serving as dash-pots for the plunger in minimizing shock and vibration of operation of the pump, hence lessening disagreeable noises.

The holes 36 in the cup end walls permit small quantities of the liquid to enter the chamber 37 at the ends and circumferentially which act as sealing medium around the working parts, without loss of efficiency, and to balance end pressure upon the cups, which saves power.

The pump elements are smoothly constructed, needing but little machining, hence promote economy in manufacture. The cups and plunger may be removed easily, and reversed upon the shaft 7, to reverse the operation of the pump, when the plug 26 has been relocated.

In Fig. 1 the reciprocable cylinder 31 is shown as not completely closing the cup

ports at the ends of its stroke, but this is immaterial, as the pulsation caused is in any event very small and does not render the delivery of the pump ineffective, only variable according to the conditions. That is, if it is desired to vary the force of delivery to cause the device to become a force-pump, the cylinder-head 2 may be removed together with the end cap 27 and the cylinder plunger 31, and another like cylinder 31 substituted having a flatter cam groove 31' which causes a shorter stroke of this cylinder than the other. Then the shaft 7 with the cups 27 and 35 and the substituted cylinder 31 is given increased speed of rotation, whereby the pulsation is diminished, greater force given to the fluid or liquid delivered, and with a larger quantity delivered during a given time. The interior arrangement of the cylinder 1, the cups 27 and 35, and the cylinder plunger 31 relatively, is such as to facilitate the above function.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is:

1. A pumping device, comprising in combination, a relatively stationary cylinder having removable heads provided with shaft bearings, a rotatable shaft seated in said bearings, said cylinder having a pair of longitudinally spaced inlet-ports and also a pair of longitudinally spaced outlet-ports circumferentially at an angle to said inlet-ports, a block removably secured on the cylinder across said inlet-ports, and a block removably secured on the cylinder across said outlet-ports, both blocks having longitudinal passages in communication at their ends with said inlet- and outlet-ports respectively, and both blocks having ports communicating medially with said passages, spaced facing cups splined removably on said shaft and having ports alined circumferentially with both said inlet- and outlet-ports, an imperforate piston splined slidably on said shaft within and fitting said cups and spaced from the inner end walls thereof, said piston having a medial circumferential cam groove, and a roller carrying pin mounted in said cylinder wall to traverse the interspace between said cups and enter said cam groove.

2. A pumping device, comprising in combination, a relatively stationary cylinder having removable heads provided with shaft bearings, a rotatable shaft seated in said bearings, said cylinder having a pair of longitudinally spaced inlet-ports and also a pair of longitudinally spaced outlet-ports circumferentially at an angle to said inlet-ports, a block removably secured on the cylinder across said inlet-ports, and a block removably secured on the cylinder across said outlet-ports, both blocks having longitudinal passages in communication at their

ends with said inlet- and outlet-ports respectively, and both blocks having ports communicating medially with said passages, spaced facing cups splined removably on
5 said shaft and having ports alined circumferentially with both said inlet- and outlet-ports, an imperforate piston splined slidably on said shaft within and fitting said cups and spaced from the inner end walls
10 thereof, said piston having a medial circumferential cam groove, the cylinder having a threaded opening in communication with the block passage over said outlet-ports, a cam-pin having a threaded end
15 seated removably in said threaded opening and having a cam roller thereon traversing the interspace of said cups and extending into the cam-groove of the piston, the end heads of said cups having small apertures
20 therein to pass a fluid through to the end interspaces of the cups and the cylinder-heads, and said piston having circumferential oil-receiving grooves at each side of its cam-groove.

25 In testimony whereof I affix my signature.
DAVID A. HARNER.

30

35

40

45

50

55

60

65