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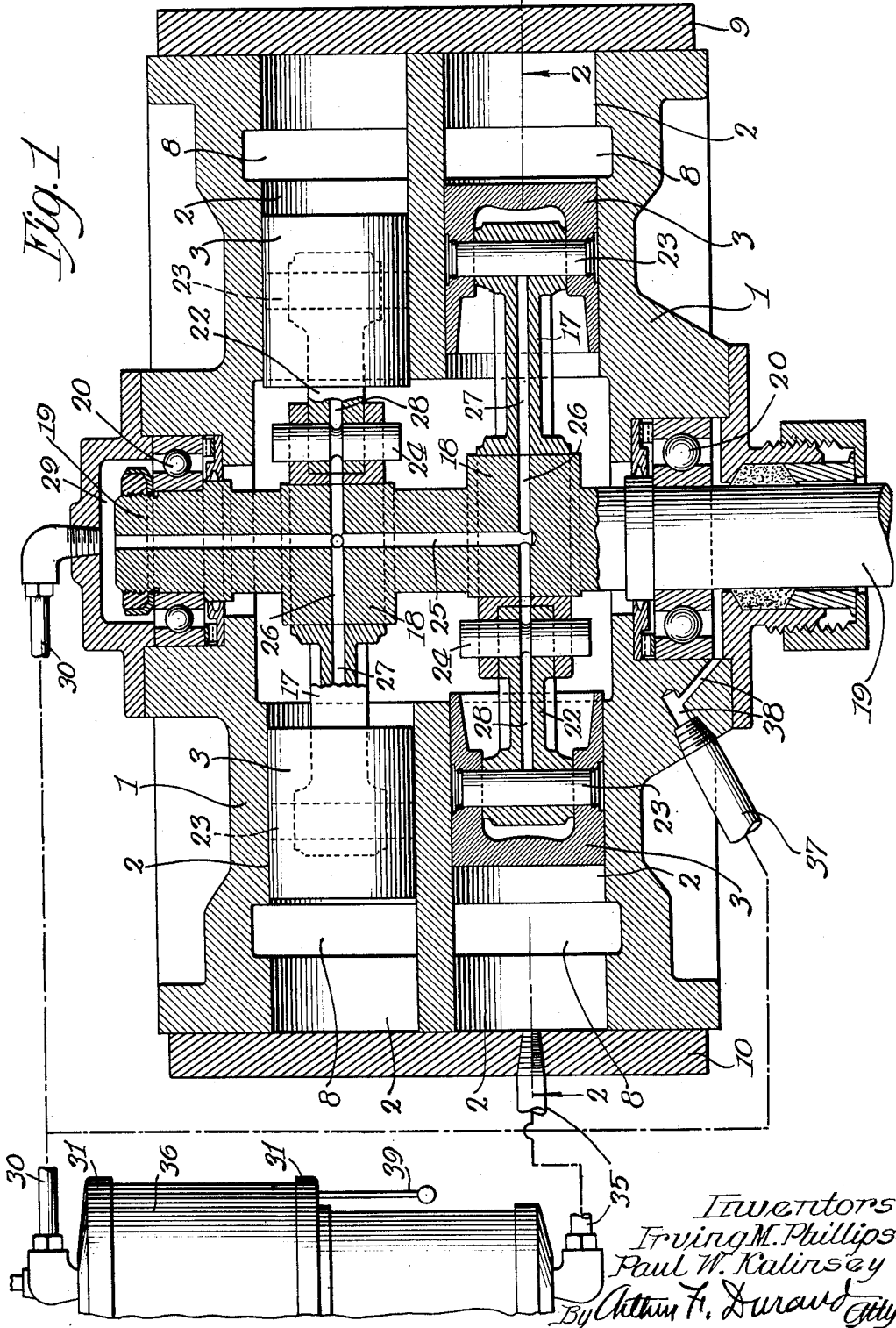
I. M. PHILLIPS ET AL

2,005,107

PUMP PISTON LUBRICATION CONSTRUCTION

Filed July 28, 1932

3 Sheets-Sheet 1



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PUMP PISTON LUBRICATION CONSTRUCTION

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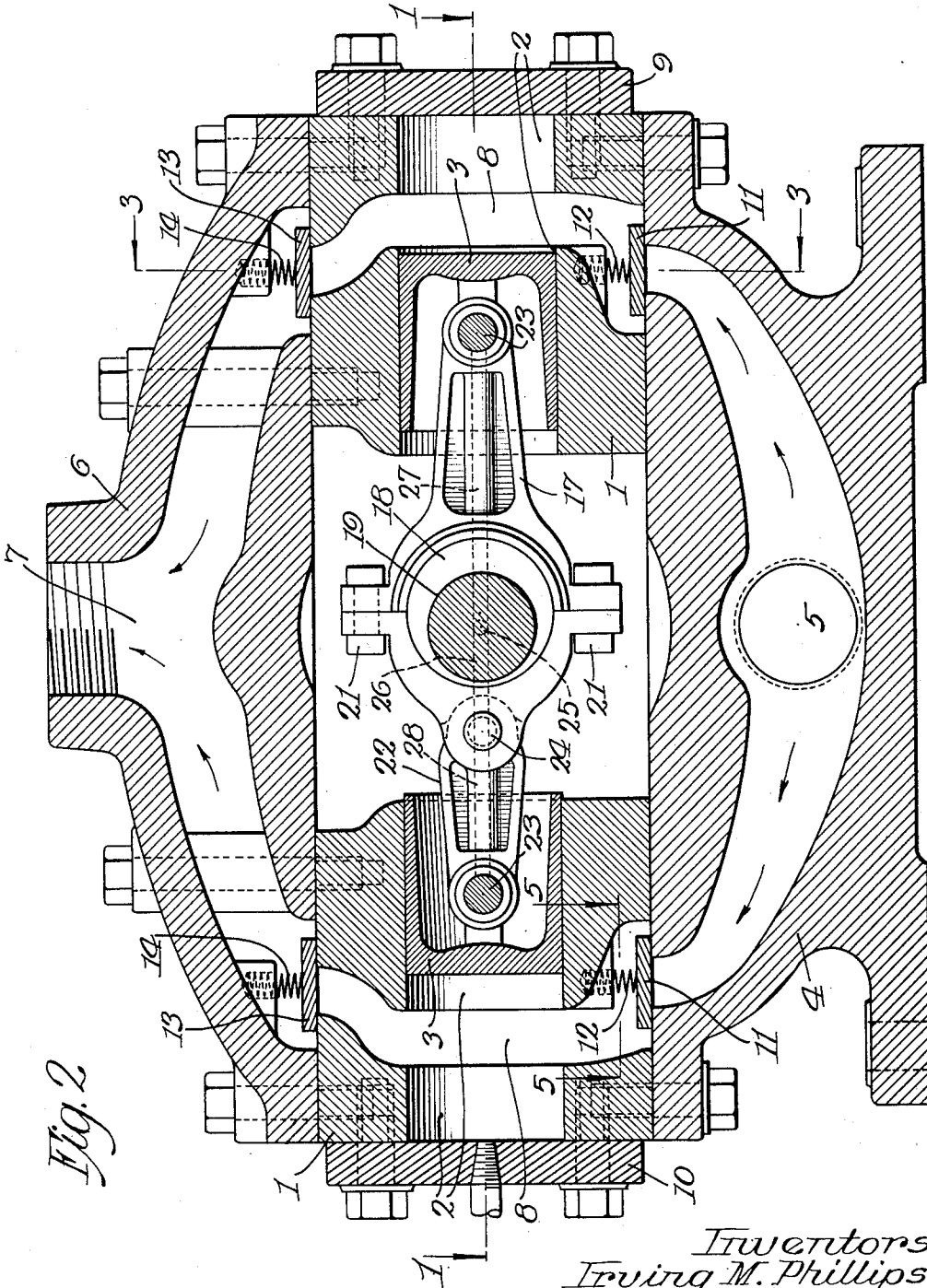


Fig. 2

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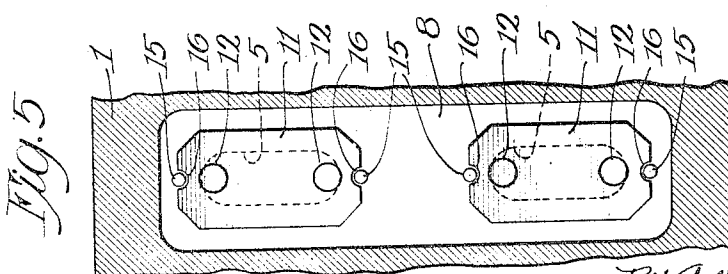
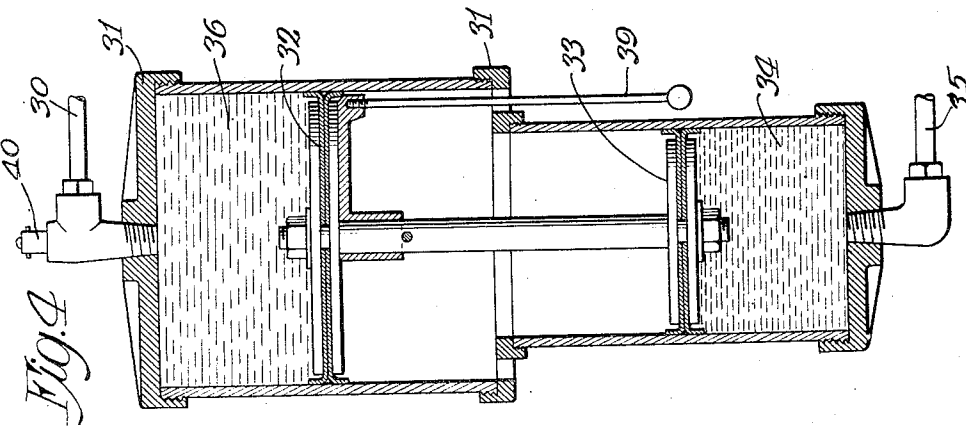
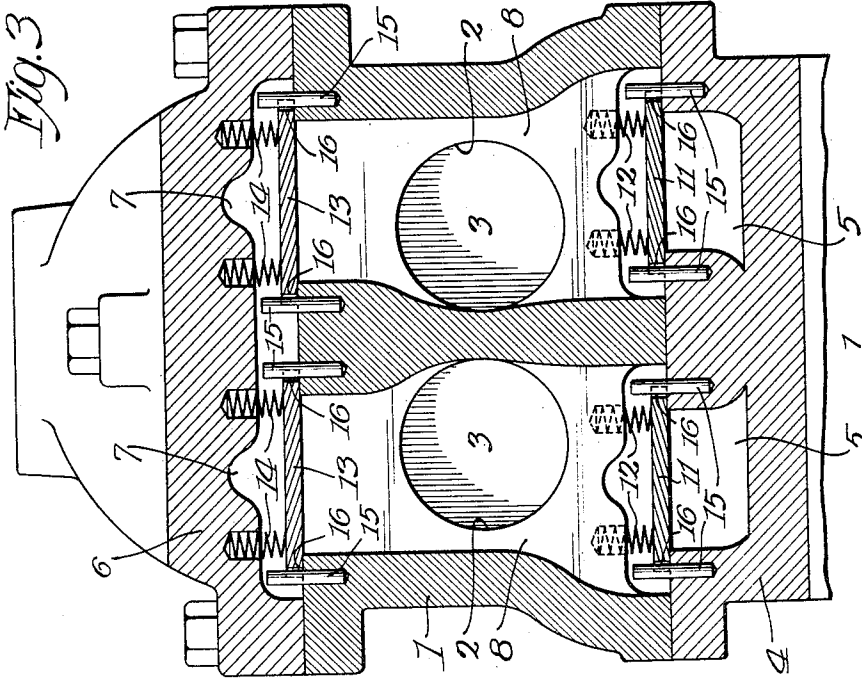
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PUMP PISTON LUBRICATION CONSTRUCTION

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UNITED STATES PATENT OFFICE

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PUMP PISTON LUBRICATION CONSTRUCTION

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6 Claims. (Cl. 103—171)

This invention relates to pumps, and more particularly to reciprocating pumps of the double acting type in which a double piston or plunger is employed, whereby a pumping action is produced for each stroke of the pump.

Generally stated, the object of the invention is to provide a novel and improved construction and arrangement whereby two separate pistons or plungers are employed, at opposite sides of the driving shaft, with means on said shaft for reciprocating said pistons or plungers in unison, although not rigidly connected together.

Another object is to provide a novel and improved construction and arrangement whereby the cylinders are in the form of a block or casting provided with a separate bore for each piston, with recesses and passages therein for the plunger operating means on the shaft, and for the flow of the fluid into and out of the pump.

Another object is to provide a novel and improved construction and arrangement whereby the fluid pressure is advantageously employed to force oil or grease or any other suitable lubricant into the different bearings of the pump, and into the interior thereof, thereby to lubricate the different moving parts.

Another object is to provide a novel and improved construction and arrangement whereby the said pistons and cylinders are employed in duplicate, so that there are four pistons and four cylinder bores, arranged side by side, whereby said shaft is operative to actuate all four pistons or plungers, thereby to more nearly maintain the constant or continuous flow of the fluid into and out of the pump.

It is also an object to provide certain details and features of construction and combinations tending to increase the general efficiency and the desirability of a pump of this particular character.

To the foregoing and other useful ends, the invention consists in matters hereinafter set forth and claimed, and shown in the accompanying drawings in which—

Fig. 1 is a horizontal section on line 1—1 in Fig. 2 of the drawings, showing a pump embodying the principles of the invention.

Fig. 2 is a longitudinal section on line 2—2 in Fig. 1 of the drawings.

Fig. 3 is a transverse vertical section on line 3—3 in Fig. 2 of the drawings.

Fig. 4 is a vertical section of the lubrication feeding device forming a part of the invention.

Fig. 5 is a detail section on line 5—5 in Fig. 2 of the drawings.

As thus illustrated, the invention comprises a cylinder block or casting 1 having the four bores 2 therein, with a piston or plunger 3 adapted to reciprocate in each bore. The said cylinder block is supported on a base 4 having the fluid inlet 5 therein, and a top or cap 6 is bolted to the top of the cylinder block, this cap having the fluid outlet 7 as shown in Fig. 2 of the drawings. The cylinder block is provided with passages 8 which communicate at their upper ends with the fluid outlet 7, and at their lower ends with the fluid inlet 5, as shown more clearly in Fig. 2 of the drawings. Cylinder heads or end plates 9 and 10 are bolted to the opposite ends of the cylinder block, as shown in the drawings, thereby to close the outer ends of the four bores in which the pistons or plungers reciprocate.

Flat inlet valves 11, yieldingly held down by springs 12, admit the fluid from the passage 5 into the passages 8, and similar valves 13, yieldingly held down by springs 14, control the flow of the fluid from the pistons 3 to the outlet 7, in a manner that will be readily understood. As shown more clearly in Figs. 3 and 5 of the drawings, guide pins 15 are provided to engage notches 16 in the ends of the valve plates, thereby to guide the valve plates in the up and down motion thereof.

One of the two alined pistons or plungers 3, for each pair, is connected by a pitman 17 with the eccentric 18 on the shaft 19, which latter is supported in ball bearings 20 at opposite sides of the pump structure. The eccentric strap is made in two parts, and held together by the bolts 21, and at the other side this strap is connected by a link or pitman 22 with the other of the two alined pistons or plungers, in each pair of plungers. The two eccentrics 18, one for each pair of pistons or plungers, are set oppositely, so that one pair of pistons alternates in its reciprocation with the other pair. In this way, there is some movement of the pistons, relatively, toward and away from each other, and a more nearly constant or continuous flow of the fluid into and out of the pump.

It will be seen that the wrist pins 23 of the pistons or plungers, and also the eccentric pins 24, are very easily removed, and the entire structure is easily and conveniently taken apart, when such is necessary or desirable, in order to repair or clean the pump, or to substitute new parts for worn parts.

The shaft 19 has a longitudinal oil duct 25 which communicates with the transverse oil ducts 26 in the eccentrics, and these ducts in

turn communicate with the ducts 27 in the pitman 17, and also with the ducts 28 in the links 22 previously mentioned. In this way the eccentrics and the parts connected thereto are effectively lubricated, by any lubricant forced into the chamber 29 at the end of the shaft. For this purpose, a pipe 30 communicates with said chamber 29, and also communicates with the top portion of the lubricating feed device 31 shown in Fig. 4 of the drawings. This device has a relatively large plunger 32 operated by the relatively small piston 33, the latter being actuated by the fluid 34 forced into the lower end of the device through the pipe 35 from the end of one of the bores 2 of the pump, whereby the pressure of the pump actuates the piston 33 thereby to move the plunger 32 upward and force the oil or other lubricant 36 into the pipe 30 previously mentioned. In addition, another pipe 37 leads from said device to the ducts 38 at one side of the pump cylinder block, thereby to lubricate the bearing 20 at this side of the pump. The gauge 39 moves up and down with the plunger 32, and serves to indicate the quantity of lubricant in the lubricating feed device. In this way, as stated, the fluid pressure of the pump is employed to force lubricating material into the pump, to lubricate the different moving parts thereof, and when the pump is not operating, the lubricating feed device is not in operation.

In operation, it will be understood that the pressure in the space around the shaft between the plungers is substantially less than the pressure at each end of the cylinder, between the cylinder heads and the plunger heads. In this way, the oil for lubricating purposes is easily forced into the pump bearings, through the shaft duct or passage 11, in the manner heretofore described.

It will be seen that the member 39 can also be used as a handle by which to pull the piston and the plunger downward, to permit filling of the fluid chamber above the plunger. Any suitable means can be employed for filling the device, such as a filler 40 at the top of any suitable known or desired character.

Thus the differential between the area of relatively low fluid pressure adjacent the bearings, and between the plunger heads of the pump, on the one hand, and the relatively high area of fluid pressure between the plunger heads and the cylinder heads, is utilized to automatically force the lubricating fluid out of the lubricating device and into the area of relatively low pressure around the bearings. Any suitable means can be employed for causing the relatively low fluid pressure, and the relatively high fluid pressure, the pump element shown and described being an example of how this can be done, and being illustrative of the mode of operation of the lubricating system thus provided.

Thus it will be seen that the pump plungers are arranged in pairs, with the heads of each pair disposed at opposite sides of the shaft 19, and with the eccentrics 18 set oppositely, whereby the plungers of one pair are moving in one direction while the plungers of the other pair are moving in the opposite direction. In this way, a plunger of one pair is forcing the water out of the pump at the same time that a plunger of the other pair at the other side of the shaft is forcing the water out of the pump, whereby each plunger is counter-balanced by the plunger of the other pair. In this way, the pressure on the shaft is balanced,

to some extent, so that objectionable side thrust on the shaft is avoided.

It will be seen that the upward flow chambers 8 are each separate from the others, but that the space or clearance chamber 41 at the middle of the flat one-piece cylinder block is common to the two eccentric devices that operate the plungers, and this clearance chamber can be filled with a lubricant, in the manner explained, to lubricate the pistons in their bores. With reference to the latter, it will be seen that each bore has an axial extension, at the other side of the flow chamber 8, and that these extensions are covered by the removable cylinder heads 9 and 10 previously described.

It will be seen that the bores 2 have their outer ends disposed in vertical planes, and that the valves 11 and 13 extend horizontally in these vertical planes, and that in this way the over-all length of the pump is somewhat less than it might be with the passages 8 formed differently, and with the said valves outside of the said vertical planes, whereby the construction shown and described tends to shorten the pump without any restriction of the upward flow of water in the passages or chambers 8, as the plungers do not enter these flow chambers.

What we claim as our invention is:

1. In a double-acting pump, the combination of a one-piece solid cylinder block having a flat top and a flat bottom and formed with a middle clearance chamber open at the top and bottom thereof, and with flow chambers open at top and bottom in the end portions of said cylinder block, whereby the middle and end chambers are all of the same height, and having axially aligned horizontal bores connecting said middle chamber with said flow chambers, midway between the flat top and bottom surfaces of the block, with the outer ends of said bores in vertical planes, plungers in said bores, mechanism in said clearance chamber for operating said plungers, accessible through the top of said clearance chamber, a fluid intake base secured flatwise to the bottom of said cylinder block, closing the bottom of said clearance space, a fluid outlet cap secured flatwise to the top of said cylinder block, closing the top of said clearance space, an inlet valve for the bottom of each flow chamber, an outlet valve for the top of each flow chamber, said valves being disposed horizontally in said vertical planes, and means for actuating said mechanism, the stroke of each plunger stopping short of the adjacent flow chamber, comprising similar bores and plungers in said cylinder block, parallel with and in the same horizontal plane as said first-mentioned bores and plungers, with said clearance chamber common to all plungers, but with similar separate flow chambers and valves for said last-mentioned bores and plungers, and mechanism in said clearance chamber to actuate said last-mentioned plungers, one pair of plungers operating in one direction while the other pair is operating in the opposite direction.

2. A structure as specified in claim 1, said base having a single intake opening communicating with the lower ends of said flow chambers, said cap having a single outlet communicating with the upper ends of said flow chambers, and said mechanism comprising a horizontal shaft disposed in a plane midway between the horizontal planes of said flat top and bottom.

3. A structure as specified in claim 1, each said mechanism comprising an eccentric cam, a strap on said cam, an arm rigid with said strap

and pivoted on one plunger, and another arm pivoted on the extreme other side of said strap and having pivotal connection with the other plunger, said shaft being removable endwise, and said mechanism parts being removable upwardly

5 by removing said cap, the rigid arm of one mechanism being at one side of the axis of said cams, and the other rigid arm being at the opposite side of said axis.

10 4. A structure as specified in claim 1, said means for actuating said mechanism comprising a horizontal shaft in the plane of said bores and plungers, said shaft having a longitudinal passage extending from one end thereof and having

15 passages extending laterally therefrom to feed a lubricant to the parts of said mechanism, bearings for said shaft, means forming a chamber around the end of the shaft from which the passage extends, and means for feeding a lubricant to said chamber, to lubricate one bearing, and to

supply the lubricant to said passage, and means for feeding the lubricant to the other bearing.

5 5. A structure as specified in claim 1, comprising outer extensions of said cylinder bores, of the same diameter as the latter, at the other side of each separate flow chamber, forming part of each flow chamber capacity, a single plate forming a cylinder head for closing the two extensions at one end of the block, and another single plate forming a similar head for the other end of the

10 block.

6. A structure as specified in claim 1, said outlet valves resting normally on the flat top of said block, and said inlet valves resting normally upon the flat top of said base, together with vertical

15 pins in the top of the block for guiding said outlet valves, and similar pins on the top of the base for guiding said inlet valves.

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