E. MARQUET.

ROTARY PUMP.

APPLICATION FILED JAN. 24, 1920.

1,404,625.

Patented Jan. 24, 1922.

2 SHEETS—SHEET 1.

Fig 1

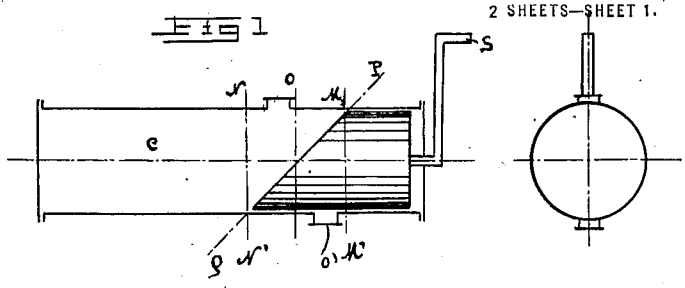


Fig 2

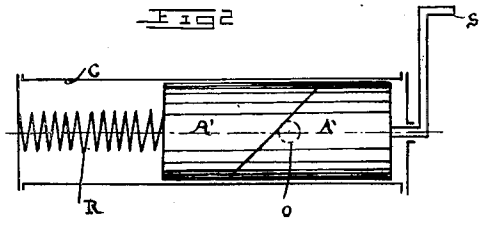


Fig 3

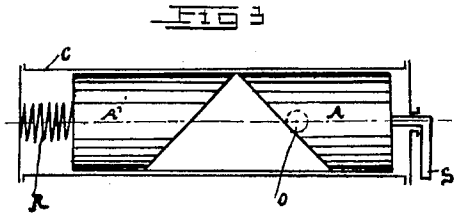


Fig. 4

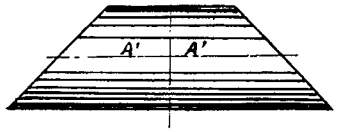
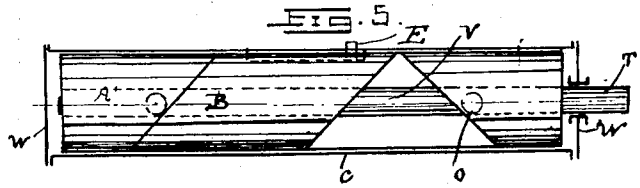


Fig. 5



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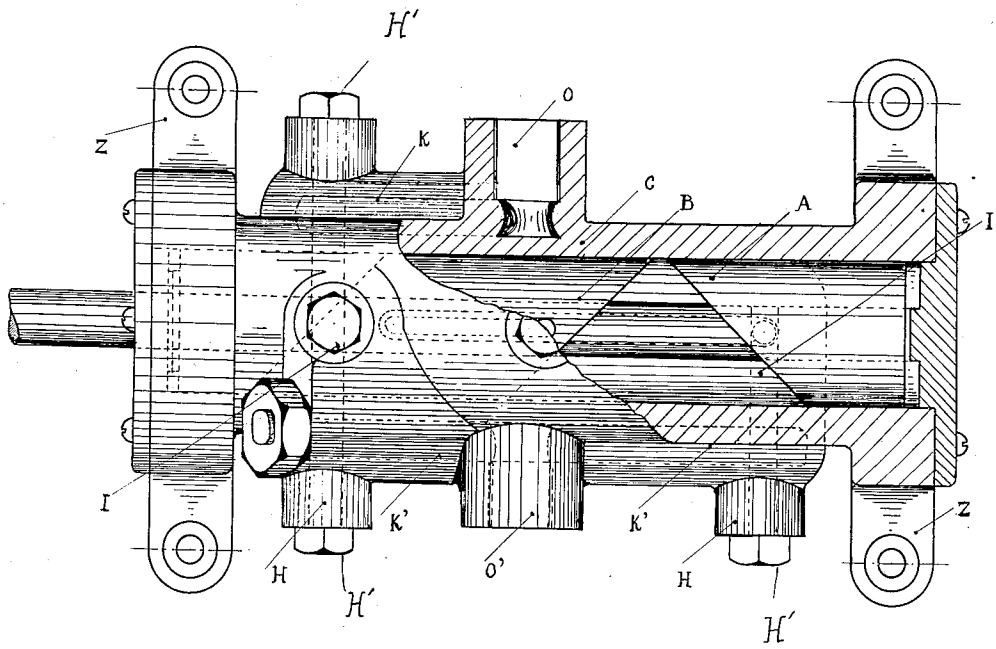
2 SHEETS—SHEET 2.

Fig. 6.



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UNITED STATES PATENT OFFICE.

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ROTARY PUMP.

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Application filed January 24, 1920. Serial No. 353,854.

(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

To all whom it may concern:

Be it known that I, EUGENE MARQUET, a subject of the King of Belgium, residing at Herstal, Belgium, have invented certain new and useful Improvements in Rotary Pumps, (for which I have filed an application in Belgium on the 23rd of August, 1918,) of which the following is a specification.

This invention relates to an improved rotary pump, the object of the invention being to provide an improved pump of this character so constructed as to operate without the use of valves, and which is extremely simple in construction and effective in operation.

A further object of the invention is the provision of a pump of the character set forth, comprising a cylinder having inlet and outlet ports, and a piston rotatable within the cylinder and adapted to alternately open and close said inlet and outlet ports.

A further object of the invention is the provision, in a pump of the character set forth, of a rotatable piston and a reciprocable piston in contact with said rotatable piston, the contact surfaces of said pistons being such that the rotation of the rotatable piston will automatically cause longitudinal displacement of the reciprocable piston, thereby to open and close the inlet and outlet ports in proper sequence.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention consists in the novel features of construction and combination of parts which will be more fully set forth hereinafter and particularly pointed out in the claims.

In the drawings accompanying and forming part of this specification,

Fig. 1 illustrates diagrammatically in side and end views a cylinder provided with a single rotary piston showing the principle of the present invention;

Fig. 2 is a diagrammatic view of a cylinder provided with both a rotary and a reciprocable piston, said pistons being shown with their contiguous end surfaces in engagement;

Fig. 3 is a view of the cylinder and pistons shown in Fig. 2, but illustrating the end surfaces of the pistons separated;

Fig. 4 is a side view of a modified form of reciprocable piston;

Fig. 5 is a diagrammatic view of a double acting pump constructed in accordance with the present invention; and.

Fig. 6 illustrates in sectional side elevation a practical embodiment of the double acting pump shown in Fig. 6.

The same characters of reference designate the same parts in the different figures of the drawings.

Referring especially to Fig. 1, C designates the pump cylinder provided with inlet and outlet ports O and O′ respectively, and within which cylinder is disposed a rotatable piston A, the diameter of which is such as to snugly fit within the cylinder for rotation therein by means of a crank S secured to said piston and having a bearing in the cylinder head. It will be understood that any other suitable means may be employed for rotating the piston. The piston A is cut at an oblique angle to its axis, as illustrated at PQ in Fig. 1, and is incapable of longitudinal movement in the cylinder. It will thus be evident that during rotation of the piston, the portion of the inner surface of the cylinder comprised between the planes M, M′ and N, N′ is traversed by the angular portion of the piston A, so that the openings or ports O, O′ are alternately covered and uncovered during such rotation. It will also be observed that the time during which the openings are covered depends upon their location with relation to the planes M, M′ and N, N′. In other words, the nearer the openings are to the plane N, N′, the shorter will be the time during which they are covered, and therefore, in the example shown in Fig. 1, the port O will be uncovered for a longer time than the port O′. Consequently, it follows that, if the ports are placed diametrically opposite each other and at equal distances from the planes N, N′ and M, M′, each of the ports will be uncovered during half a revolution of the piston and closed during the other half revolution, one being closed while the other is open. To avoid both ports being partially uncovered at the moment when the covering portion of the piston is passing from one port to the other, it is necessary merely to locate the ports nearer the plane M, M′.

Referring now to Figs. 2 and 3, in addition to the rotatable piston A, a reciprocable piston A′ is located within the cylin-

der C and is provided at the end thereof adjacent to the piston A with an angular surface similar to that of said piston A, a spring R being provided for maintaining the piston A′ in contact with the piston A, the piston A′ being intended to be held against rotation by a key and slot connection with the cylinder, as shown for instance at E in Fig. 5, or by any other suitable means. By means of this structure, it will be seen that with the ports located diametrically opposite each other and somewhat nearer the plane M, M′ that the plane N, N′, as above described, when the piston A is in its position of rest shown in Fig. 2, the oblique surfaces of the pistons will be in complete contact and both of the openings will be closed. Upon rotation of the piston A in either direction, however, the covering portion of said piston will pass from one of said openings while still covering the other. At the same time, the oblique surface of said covering portion acts on that of the reciprocating piston and forces it back against the tension of the spring R, thus forming an unoccupied space between the pistons, which space increases in volume until the pistons have reached the position shown in Fig. 3, which position is reached after half a revolution of the piston A, when the covering portion has again covered the port that was uncovered. Upon further rotation in the same direction the port which had so far remained covered, will be uncovered, while the piston A′, under the action of the spring R will return toward the piston A until their oblique surfaces are again in complete contact.

From the foregoing it will be seen that by connecting the first port with a suitable reservoir (not shown) containing a fluid, the vacuum produced in the space formed between the pistons when the piston A′ moves away from the piston A, will cause said fluid to be sucked into said space, and upon the return of the piston A′ toward piston A the fluid will be forced out through the second port. It will thus be obvious that the rotary motion of the piston A produces the same result as the alternating motions of the piston of a single acting pump.

A double acting pump can be obtained by placing in the same cylinder a double system of the kind above described. Such a pump is illustrated in Fig. 5, wherein a pair of rotatable pistons A are provided, one at each end of the cylinder, said piston being connected by means of a shaft T passing through the pistons and to which they are secured in concentric relation. Thrust blocks W may be provided at each end of the cylinder to prevent lateral displacement of the pistons A and shaft T. A reciprocating piston B is disposed between the pistons A, said reciprocating piston having at each end an oblique surface for cooperation with the oblique surfaces of both rotatable pistons A and is prevented from rotating with the shaft T by means of a lug or key E which is slidable in a longitudinal slot in the cylinder, the said slot being of a length at least equal to the longitudinal displacement of the piston B. In the structure illustrated, the pistons A are connected by a member V, which may be either a solid rod or a tubular member, passing concentrically through all of the pistons. In this form of the device, the use of springs may be avoided if the pistons are so assembled that when the oblique surface at one end of the piston B is in full contact with one piston A the oblique surface at the opposite end is out of contact with the other piston A, as shown in Fig. 5, whereby the piston B is alternately reciprocated by the rotation of the pistons A in a manner which will be readily understood. It is, however, necessary, in order to accomplish the reciprocation of the piston B in this manner, that each of the oblique surfaces of the pistons A and B be provided with a suitable chamfer, thereby to prevent wedging of the piston B, while permitting the pistons A to cover and uncover the ports in proper sequence.

In some instances, it may not be desirable to have the oblique surfaces of the piston A′ shown in Figs. 1 to 3 parallel with each other, and it is to be understood that my invention is not limited thereto, since these surfaces may be formed at any desired angle to each other. As an illustration, I have shown them in Fig. 4 as converging, this arrangement having the characteristic of permitting double ports for inlet or outlet to be placed on the same generatrix of the cylinder C. It will be observed that with this construction the alternate opening and closing of the outlet and inlet ports will be maintained.

In Fig. 6 I have illustrated a practical embodiment of the invention in the form of a double acting pump. In this structure, the inlet and outlet ports O and O′ are in communication with channels K and K′ respectively, and which channels are in turn in communication with conduits I into which merge the ports which may be in communication with some source of fluid supply, and which ports are in position to be successively uncovered by the pistons A, as shown in dotted lines. The tubes H are intended to facilitate the cleaning of the pump. They communicate at their inner ends with the channels K and K′, and are normally closed at their outer ends by removable plugs H′.

The cylinder is shown in Fig. 6 as provided with perforated ears Z for permitting it to be secured to a suitable foundation or base.

While I have shown and described the reciprocating piston located between two rotatable pistons, it will be readily understood that this arrangement may be reversed without departing from the spirit and scope of my invention as set forth in the claims appended hereto.

Having thus described my invention, what I claim is:

1. A rotary pump, comprising a cylinder provided with inlet and outlet ports, a rotatable piston in said cylinder and having means for alternately opening and closing said ports in sequence during the rotation of the piston, and a reciprocable piston having means cooperating with said last means for sliding said reciprocable piston in one direction when the inlet ports are open.

2. A rotary pump, comprising a cylinder provided with inlet and outlet ports, a rotatable piston in said cylinder and having means for alternately opening and closing said ports in sequence during the rotation of the piston, a reciprocable piston having means cooperating with said last means for sliding said reciprocable piston in one direction when the inlet ports are open, and means for sliding the reciprocable piston in the opposite direction when the outlet ports are open.

3. A rotary pump, comprising a cylinder having an inlet port and an outlet port, a rotatable piston in said cylinder and provided with an oblique surface at one end whereby said piston during its rotation alternately opens and closes said ports in sequence, a reciprocable piston having an oblique surface cooperating with the oblique surface of said rotatable piston for sliding said reciprocable piston in one direction during the rotation of said rotatable piston, and means for sliding said reciprocable piston in the opposite direction.

4. A rotary pump, comprising a cylinder provided with inlet and outlet ports, a pair of pistons rotatable together within said cylinder and each provided with an oblique surface at one end thereof for alternately opening and closing said inlet and outlet ports in sequence during the rotation of the pistons, and a reciprocable piston between said rotatable pistons and provided at each end thereof with an oblique surface cooperating with the oblique surfaces of the rotatable pistons for reciprocating said reciprocable piston during rotation of said rotatable pistons.

5. A rotary pump, comprising a cylinder provided with inlet and outlet ports, a pair of pistons rotatable together within said cylinder and each provided with an oblique surface at one end thereof for alternately opening and closing said inlet and outlet ports in sequence during the rotation of the pistons, a reciprocable piston between said rotatable pistons and provided at each end thereof with an oblique surface cooperating with the oblique surfaces of the rotatable pistons for reciprocating said reciprocable piston during rotation of said rotatable pistons, and means for preventing rotation of said reciprocable piston.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

EUGENE MARQUET.

Witnesses:
J. GRAU,
CURTIS T. EVERETT.