

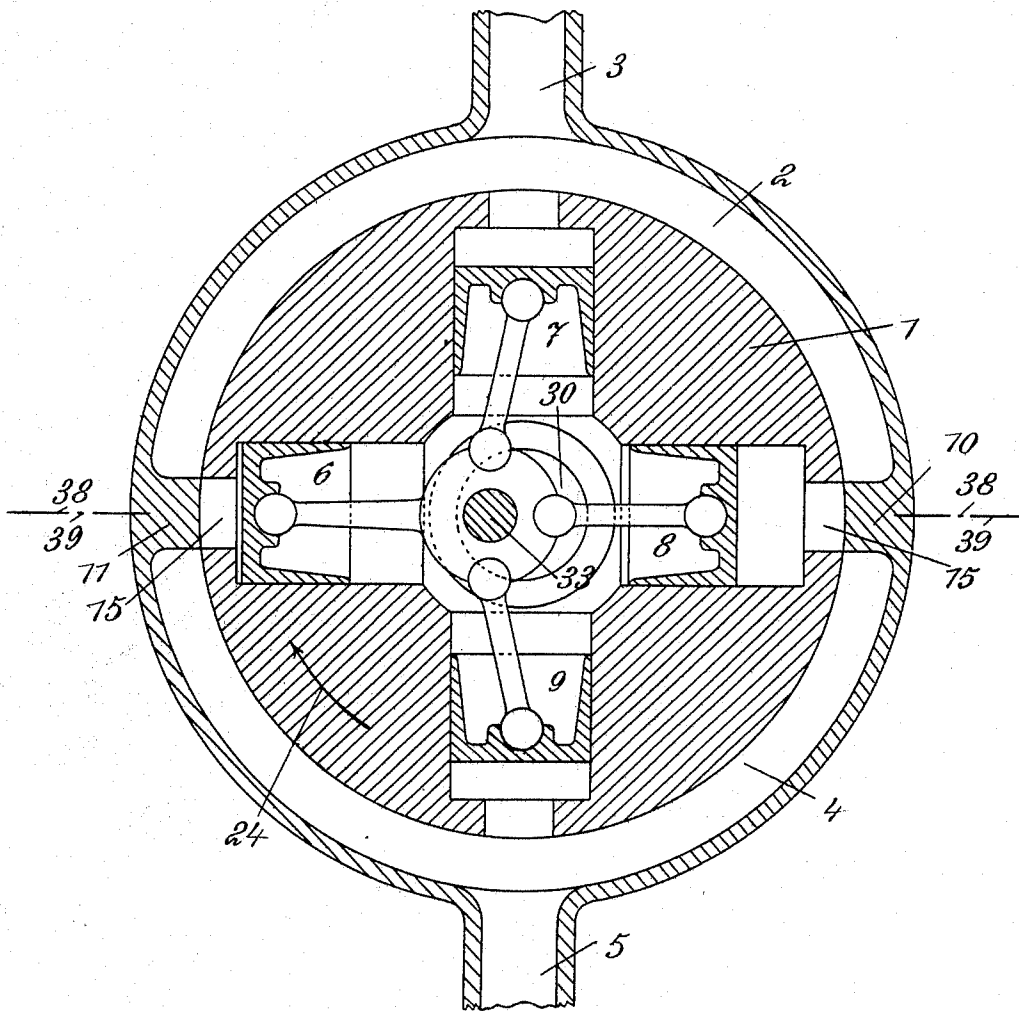
M. BERTRAND & C. MENDIZABAL.
 ROTARY PUMP OF VARIABLE FLOW.
 APPLICATION FILED APR. 27, 1911.

1,051,306.

Patented Jan. 21, 1913.

5 SHEETS—SHEET 1.

Fig. 1.



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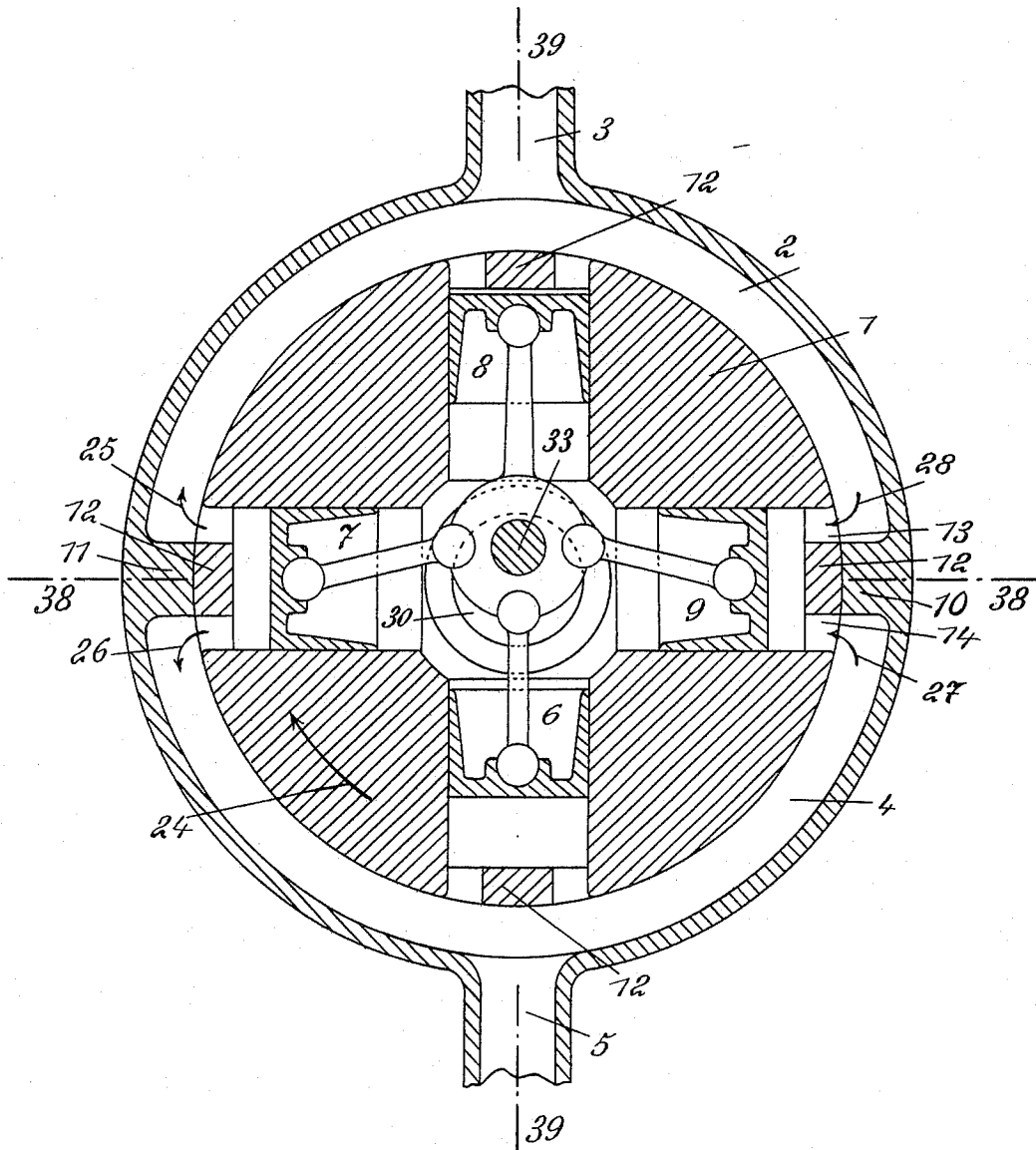
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5 SHEETS—SHEET 2.

Fig. 2.



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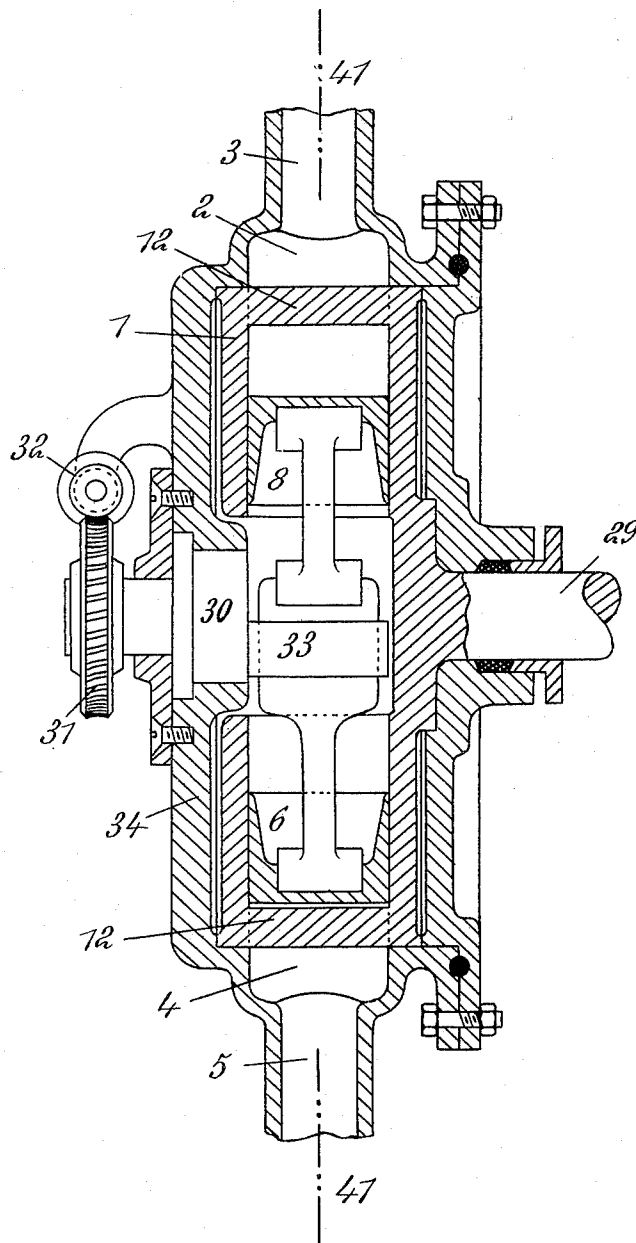
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5 SHEETS—SHEET 3.

Fig. 3.



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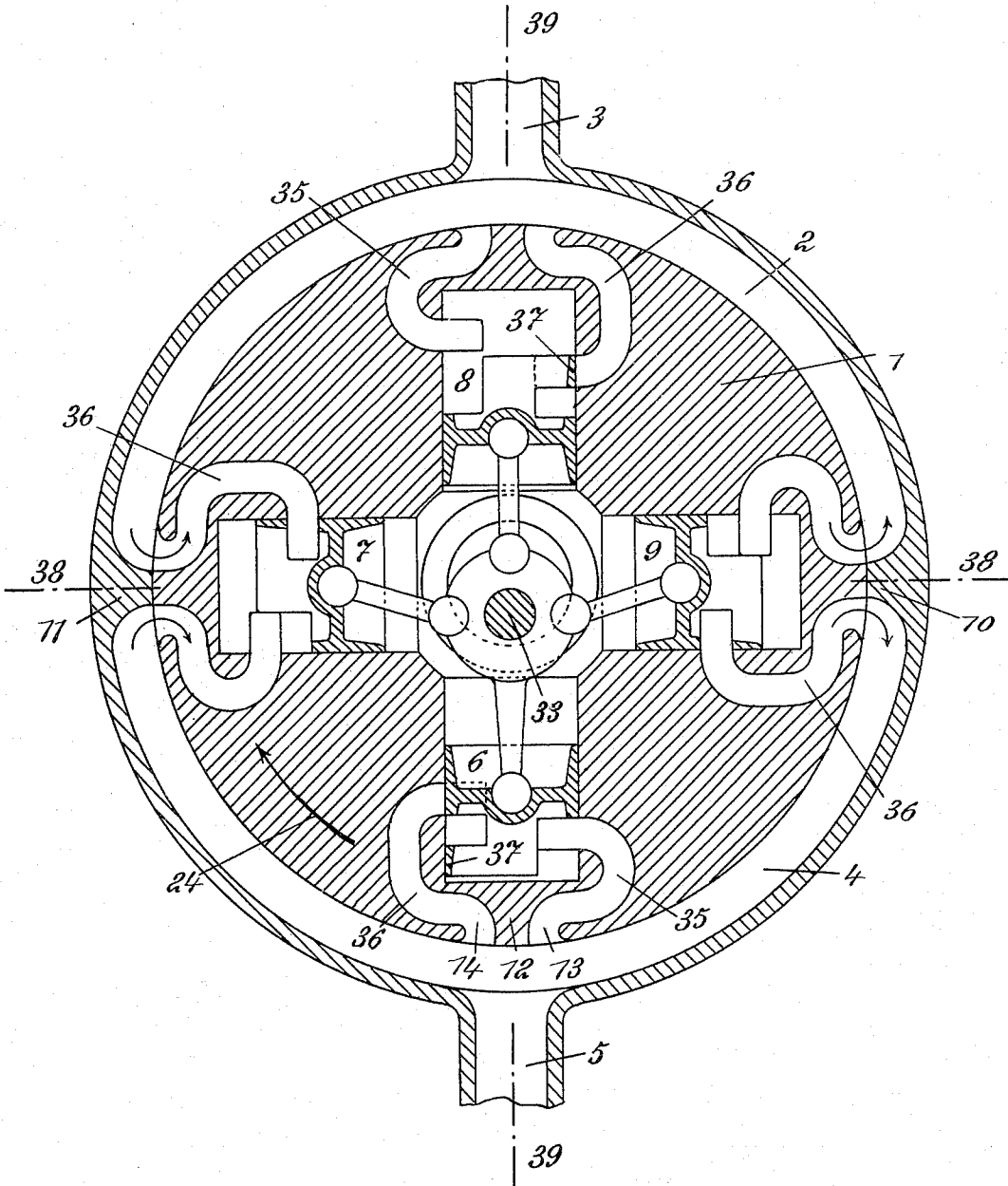
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5 SHEETS—SHEET 4.

Fig. 4.



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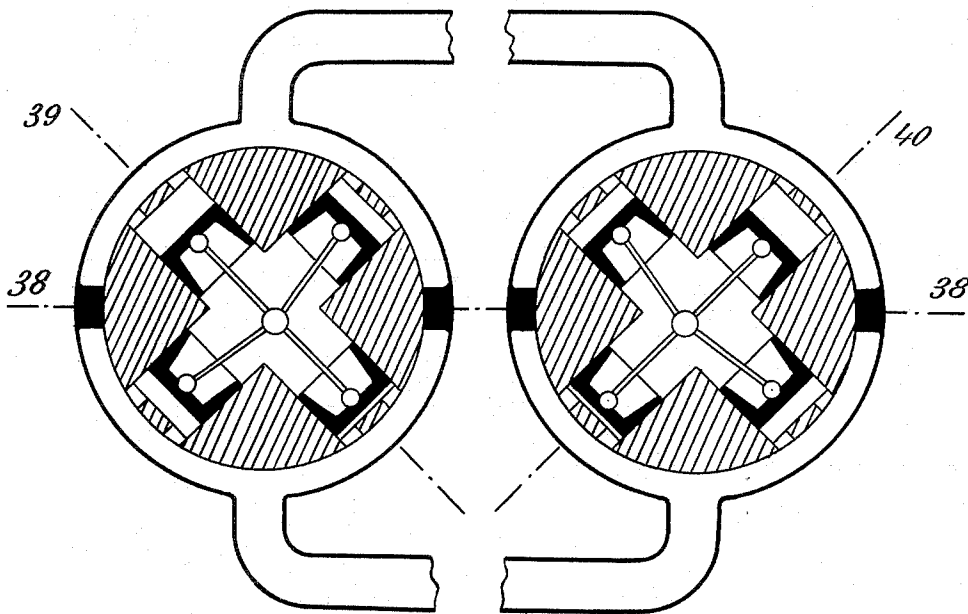
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5 SHEETS—SHEET 5.

Fig. 5.



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UNITED STATES PATENT OFFICE.

MANUEL BERTRAND, OF BARCELONA, AND CARLOS MENDIZABAL, OF SARAGOSSA, SPAIN.

ROTARY PUMP OF VARIABLE FLOW.

1,051,306.

Specification of Letters Patent.

Patented Jan. 21, 1913.

Application filed April 27, 1911. Serial No. 623,793.

To all whom it may concern:

Be it known that we, MANUEL BERTRAND and CARLOS MENDIZABAL, subjects of the King of Spain, residing at Trafalgar No. 50, Barcelona, Province of Barcelona, Spain, and Avenida de Hernau Cortes No. 27, Saragossa, Province of Saragossa, Spain, respectively, have invented certain new and useful Improvements in Rotary Pumps of Variable Flow; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to improvements in a rotary pump consisting in the combination of several cylinders rotarily mounted around a shaft within an annular distributor made of two sections, one of which is intended to supply the fluid corresponding to the suction of the pumps and the other is intended to receive the fluid corresponding to the discharge. All the pistons are caused to move by the action of an eccentric of variable position relatively to the axis of rotation of the pump; and each cylinder is furnished with an opening which leads to the distributor.

This invention has for its object to vary the flow of the pump from zero to a positive maximum or to a negative maximum, by changing the position of the eccentric which moves the pistons, without changing the direction of the rotary motion. Thus, when the eccentric is in one position, all the suction takes place through one of the passages of the distributor and the discharge takes place through the other passage, and when the eccentric is in another position, a part of the suction and a part of the discharge will take place in the same conduit, which causes a diminution of the efficiency or a diminution of the flow of the pump. Thus, not only the outflow of the pump may pass from a maximum to zero, but the action may be reversed, namely the exhaust conduit may become the suction one, and vice-versa. A single opening is sufficient to connect each cylinder with the distributor; but in the positions near to a null flow, when the opening passes beyond the separator of the distributor conduits, the stream is suddenly cut off and this may produce a strong counter-pressure on the crank shaft. To avoid this inconvenience, each cylinder is

provided with two openings and between them there is a separator with a length at least equal to the separation of the sections of the distributor. Thus it will result that during the passage of one opening on the separation of the distributor, the other opening will remain free, and will give passage to the fluid so that no excessive counter-pressure can take place. There is, however, a moment at which an extra flow of fluid may take place from the exhaust conduit to the suction conduit across the cylinder. To prevent this fact, said openings are arranged so as to communicate with the cylinder at different points, in order that one of said openings will be always free and the other closed when the piston reaches the dead points.

In the accompanying drawings we represent our improved rotary pump.

Figure 1 is a sectional view of the pump with four cylinders and only one passage for each cylinder; Figs. 2 and 4 are sectional views taken on line 41 of Fig. 3 which is a sectional view taken on line 39 of Fig. 2, of a modified form of pump; and Fig. 5 is a diagrammatical view of two pumps coupled together.

The pump is composed of a cylinder 1 revolubly mounted within an annular distributor formed by two conduits 2, 4 separated from each other by two partitions 10, 11 and communicating with the pipes 3, 5, said conduits being open at the face of contact with the cylinder 1. This cylinder contains the pumps, four in number, for example, as shown in Fig. 1 of the drawings, having their pistons 6, 7, 8, 9 communicating through openings 15 with the conduits 2, 4 of the distributor. The rods of said pistons 6, 7, 8, 9 are caused to revolve about a shaft 33 eccentrically placed relatively to the shaft 29 of the revolving cylinder 1. The eccentric 33 is mounted on a shaft 30, that has fixed thereon a worm gear wheel 31 meshing with a screw gear 32. The eccentric 33 is adapted to be actuated by said screw and worm gear 31 and 32. The dead points of the pistons are always on the plane of the division line 39, which line 39 also passes through the center of the cylinder 1 and the center of the eccentric 33, said line 39 also coincides at two positions of the cylinder with the plane of the division line 38 of the distributor, and the dead points correspond

to the passage of the openings before the partitions 10, 11 of the distributor.

Fig. 2 represents a modification which consists in having in each cylinder two ports 13, 14 separated from each other by a part 12 equal to the distance between the chambers 2, 4 of the distributor, so that when said parts 12 pass before the partitions 10, 11 of the distributor, one of them will remain always open and will not be liable to produce a strong counterpressure which would injure the apparatus.

Fig. 4 represents another modified form of apparatus in which the ports 13, 14, do not communicate directly with the bottom of the cylinder, as in Fig. 2, but they communicate with the channels 35 and 36 at different points. The piston is also modified in that it elongates toward the bottom of the cylinder, to form a tail-piece 37 to close the channel 36 of the port when the piston is at the inner dead point, as in piston 8, in this view, and the same channel 36 will be closed by the piston when it is at the outer dead point, as in piston 6 of this view. The channel 35 of the port 13 is always free to communicate directly with the cylinder.

In the position of the pistons 7 and 9, their respective channels 36 are open and permit the cylinder to communicate with the corresponding annular conduits. According to the position of the pistons shown in Figs. 2 and 4, the effect of the pump is null, as the cylinders will suck during a half stroke into one conduit and will discharge into the same conduit during the other half stroke. Referring now to Fig. 1, if the cylinder 1 is caused to rotate with the shaft 29 in direction of the arrow 24, the shaft 33 and the distributor 2, 4 remaining stationary the pistons will receive a reciprocating motion within said cylinders, and will suck in a charge when each cylinder travels in the channel 2 and will exhaust when the cylinder runs in the channel 4. If now we place the plane 39 forming an angle with the plane 38, the flow of the pump will be lessened, as each piston will perform in the same conduit part of the suction and part of the discharge, the effect being just the difference between them. In Fig. 2, the plane 38 and the plane 39 form right angles and consequently the pistons cause suction to take place from the position of the piston 6 to the position of the piston 8, as shown by the arrows 26, 25; and cause the fluid to be discharged from the position of the piston 8 to the position of the piston 6, as shown by the arrows 27, 28. Thus it will be seen that in each conduit one half of the suction and one half of the discharge take place, and thus the effect is null. When the angle which both planes are placed to one another exceeds 90° the flow will be reversed, or its direction changed accordingly, that is to say, that the suction con-

duit will become the exhaust one and vice-versa. When the fluid to be sucked and discharged by the pump is not compressible, as are practically all the liquids, the diminution of the flow does not cause a loss of energy, as the fact that a part of the liquid contained in the cylinders, instead of being sent to 2 be restored to 4, does not involve a loss of working effect, as the latter develops only when the liquid is thrown against the pressure existing in 4. The working of the apparatus as described, takes place also in case the cylinders develop more than one cycle at each revolution of the body 1, but in this case the distributor must be furnished with so many pairs of conduits 2, 4, as cycles are developed by the cylinders at each revolution of 1.

It will be possible to couple two of these pumps of variable flow, one of them acting as a motor engine and the other as a receiving engine. If when coupling these pumps, Fig. 5, the planes 38 are made to coincide and the planes 39, 40 are placed at right angle when one of these pumps rotates the other will be immediately put in motion, thus constituting a liquid transmission which will act as follows: If the plane 38 of both pumps is a bisector of the angle formed by the planes 39, 40 (Fig. 5), the flow of the motive pump will be equal to the capacity of the receiving pump, both corresponding to effective arcs of 90° for the suction and for the discharge. Under these circumstances the speed of the receiving pump is equal to that of the motive one. If, for instance, we change the positions of the planes 39, 40, and in the receiving pump we increase the angle which is formed with the plane 38, this angle will decrease in the motive pump and the flow of the latter will decrease accordingly, whereas the capacity of the receiving pump will be increased and the ratio of speeds will decrease for both reasons. If the planes 39, 40 turn in opposite directions, the motor flow will increase, the capacity of the receiver will decrease, and the ratio of speeds will increase for the two reasons hereinbefore stated. In all cases, the relation will be indicated by a fraction the numerator of which will be the flow per revolution of the generating pump, and the denominator will be the capacity of the receiving pump.

Having thus described our invention, we declare that what we claim and desire to secure by Letters Patent, is:

1. In a pump of variable flow, the combination of an annular distributor having an inlet and an outlet with a semi-circular conduit extending from each and constructed with opposed partitions separating said conduits, a disk rotatably mounted in the distributor and provided with a plurality of cylinders, pistons in the cylinders,

the disk having ports adapted to establish communication between the cylinders and the conduits, an eccentric connected to the pistons, means for rotating the eccentric, and means for changing the position of the eccentric with relation to the axis of the disk, substantially as described.

2. In a pump of variable flow, the combination of an annular distributor having an inlet and an outlet with a semi-circular conduit extending from each and constructed with a pair of opposed partitions separating said conduits, a disk rotatably mounted in the distributor and provided with a plurality of cylinders, pistons in the cylinders, the disk having ports leading from each cylinder separated by a part equal to the partition between said conduits and adapted to establish communication with the conduits, an eccentric connected to the pistons, means for rotating the eccentric, and means for changing the position of the eccentric with relation to the axis of the disk, substantially as described.

3. In a pump of variable flow, the combination of an annular distributor having an inlet and an outlet with a semi-circular conduit extending from each and constructed with a pair of opposed partitions separating said conduits, a disk rotatably

mounted in the distributor and provided with a plurality of cylinders, pistons in the cylinders having each a projecting slotted portion, the disk having ports leading from different points relative to the bottom of each cylinder and separated by a part equal to the partition between the conduits adapted to establish communication with the conduits on either side of said partitions, an eccentric connected to the pistons, means for rotating the eccentric, and means for changing the position of the eccentric relative to the axis of the disk, whereby the pistons will close one of the ports leading to each cylinder at different points and open both of the ports when at other points of their strokes, substantially as described.

In testimony whereof, I affix my signature, in presence of witnesses.

MANUEL BERTRAND.

Witnesses:

W. STAKES,
HARRY A. McBRIDE,
CONSTANTINE LEEPER.

In testimony whereof, I affix my signature in presence of two witnesses.

C. MENDIZABAL.

Witnesses:

JOAQUIN CONCAS,
NICOLÁS DE OCHOA.