A. COTOLI.

ROTARY PUMP.

APPLICATION FILED AUG. 13, 1910.

994,573.

Patented June 6, 1911.

2 SHEETS—SHEET 1.

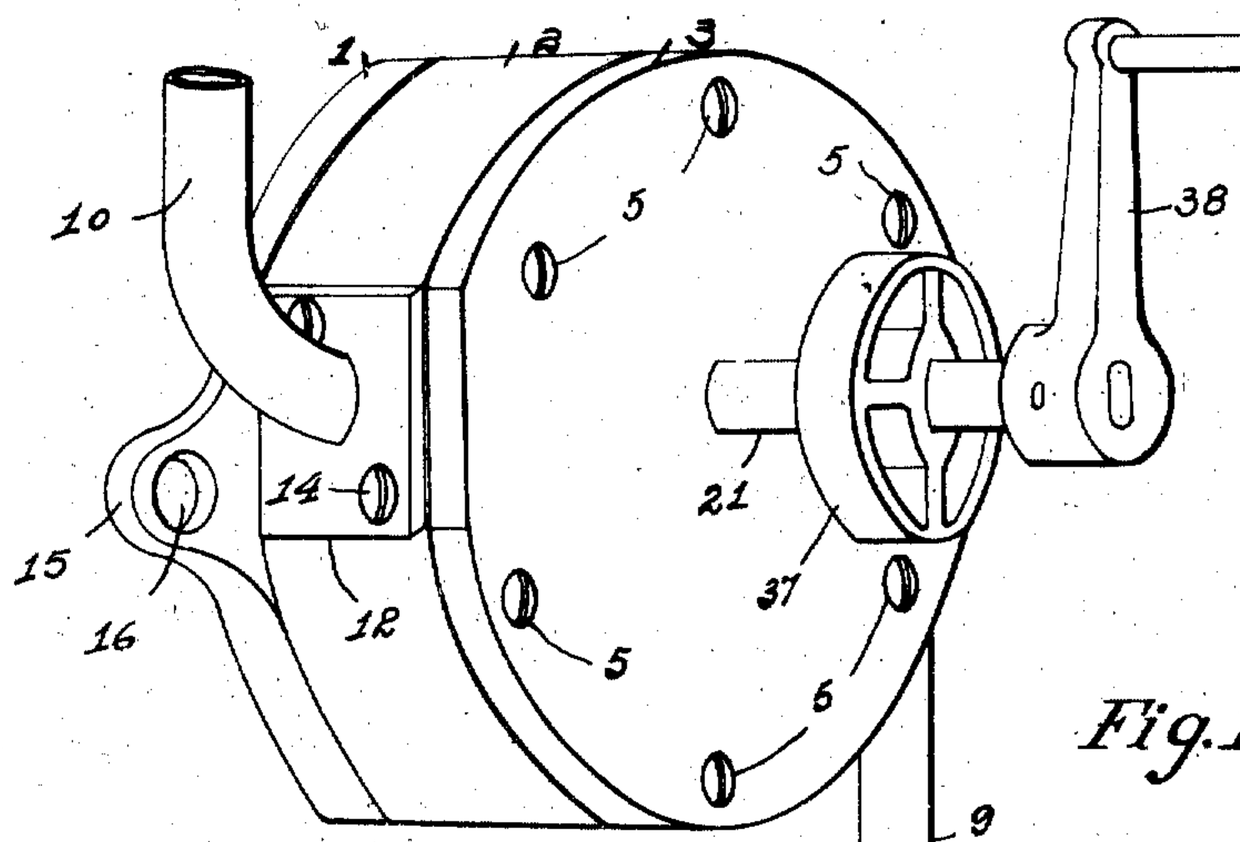

Fig. 1.

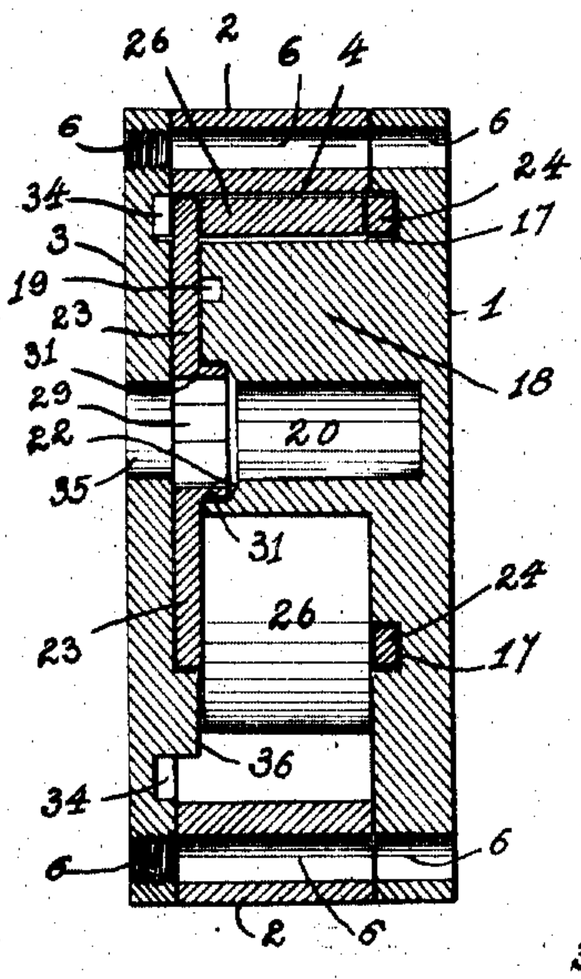

Fig. 3.

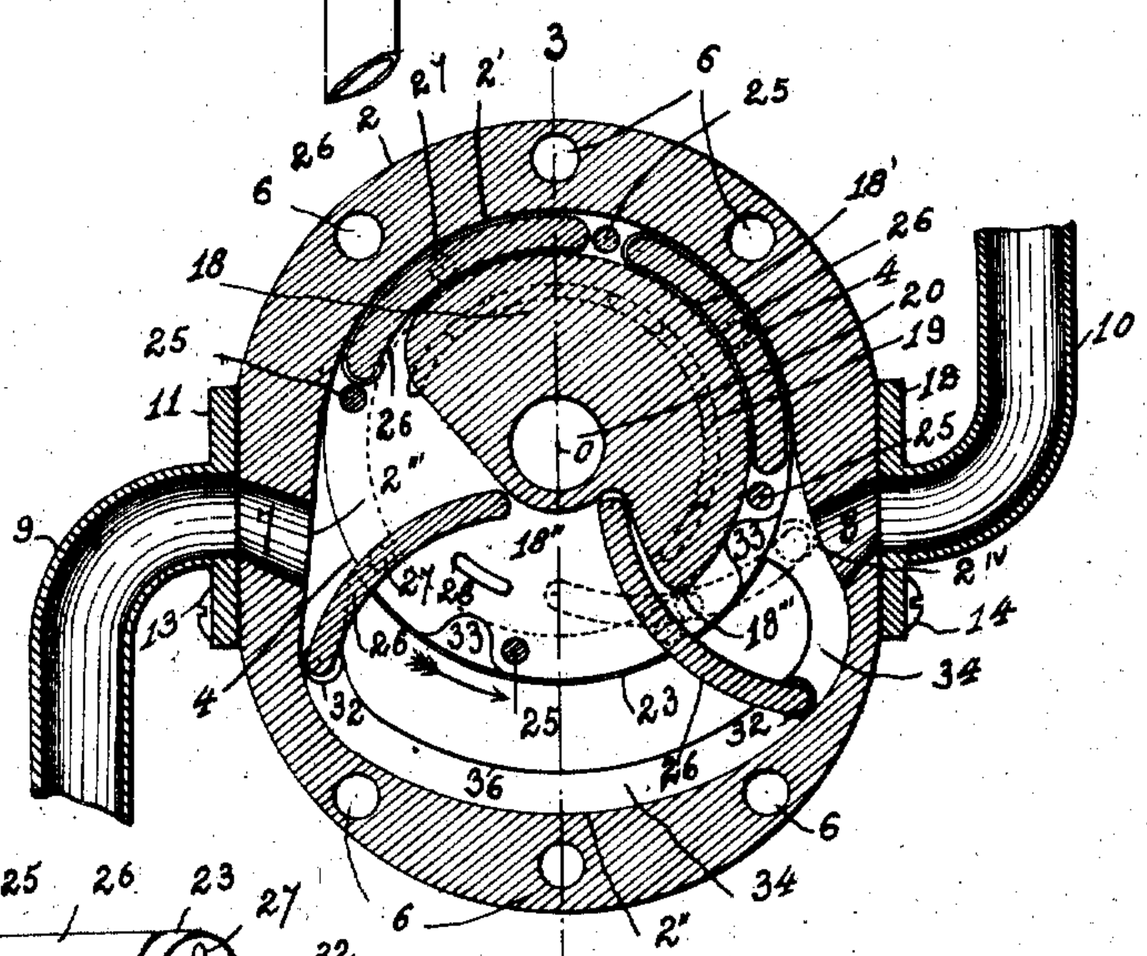

Fig. 2.

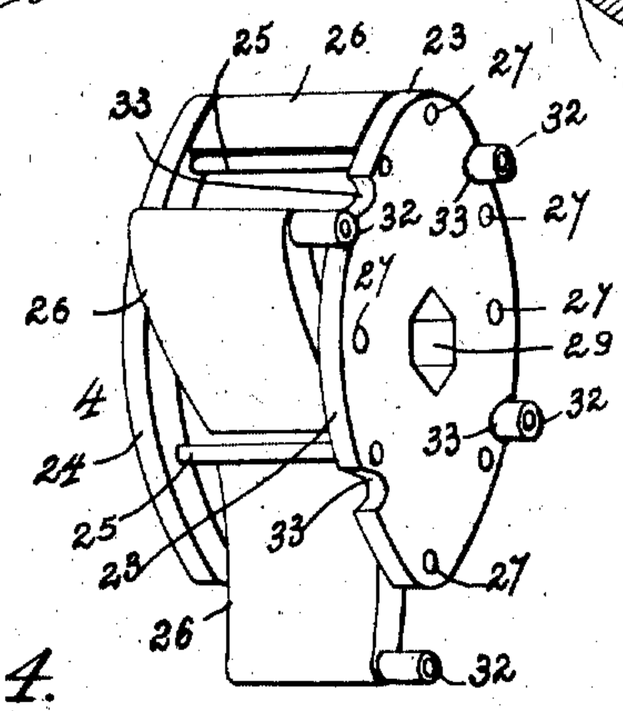

Fig. 4.

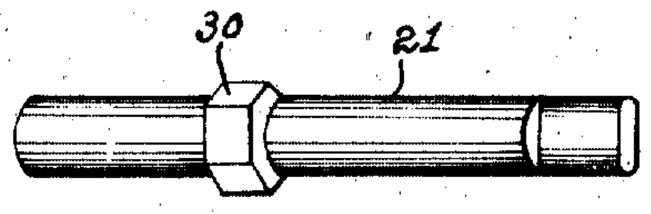

Fig. 5.

Witnesses:

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2 SHEETS—SHEET 2.

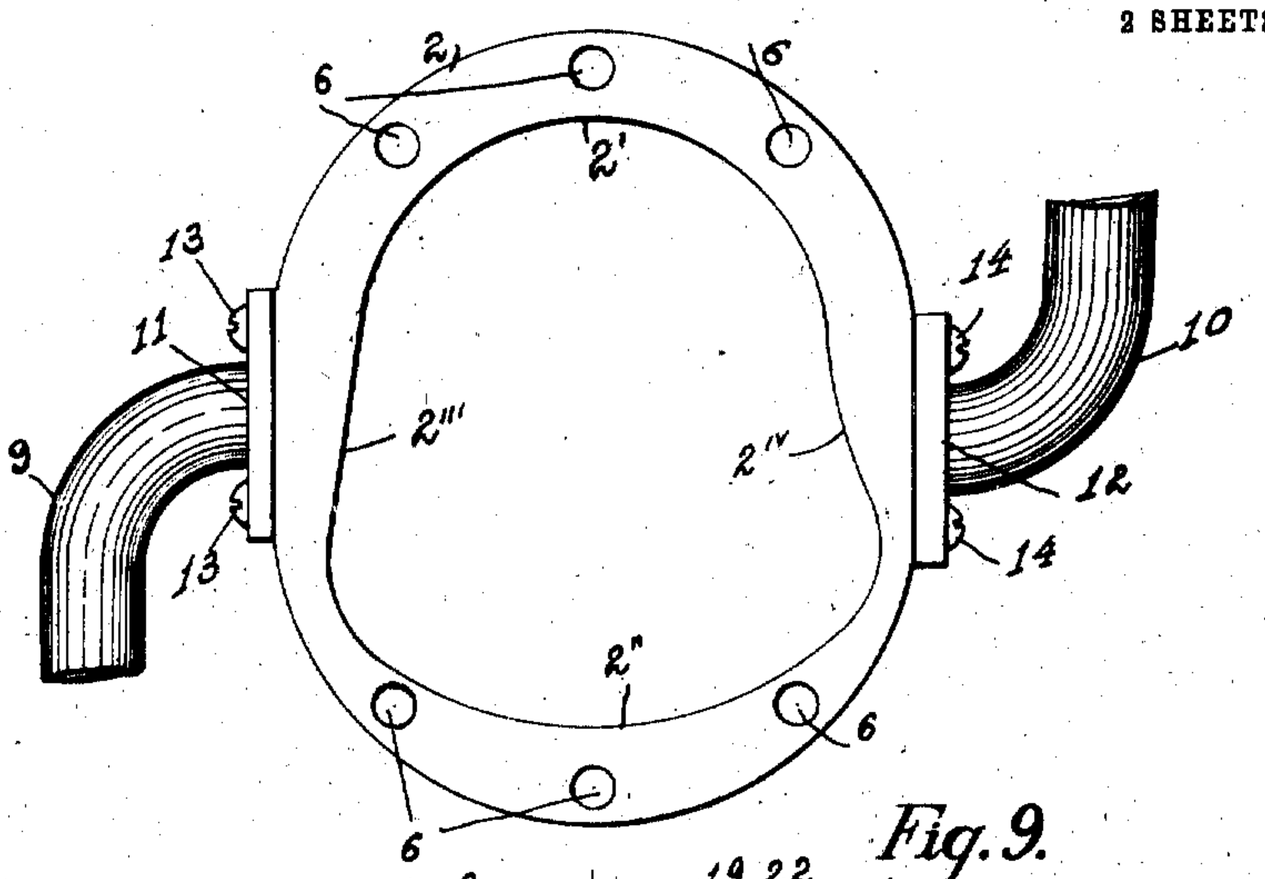

Fig. 9.

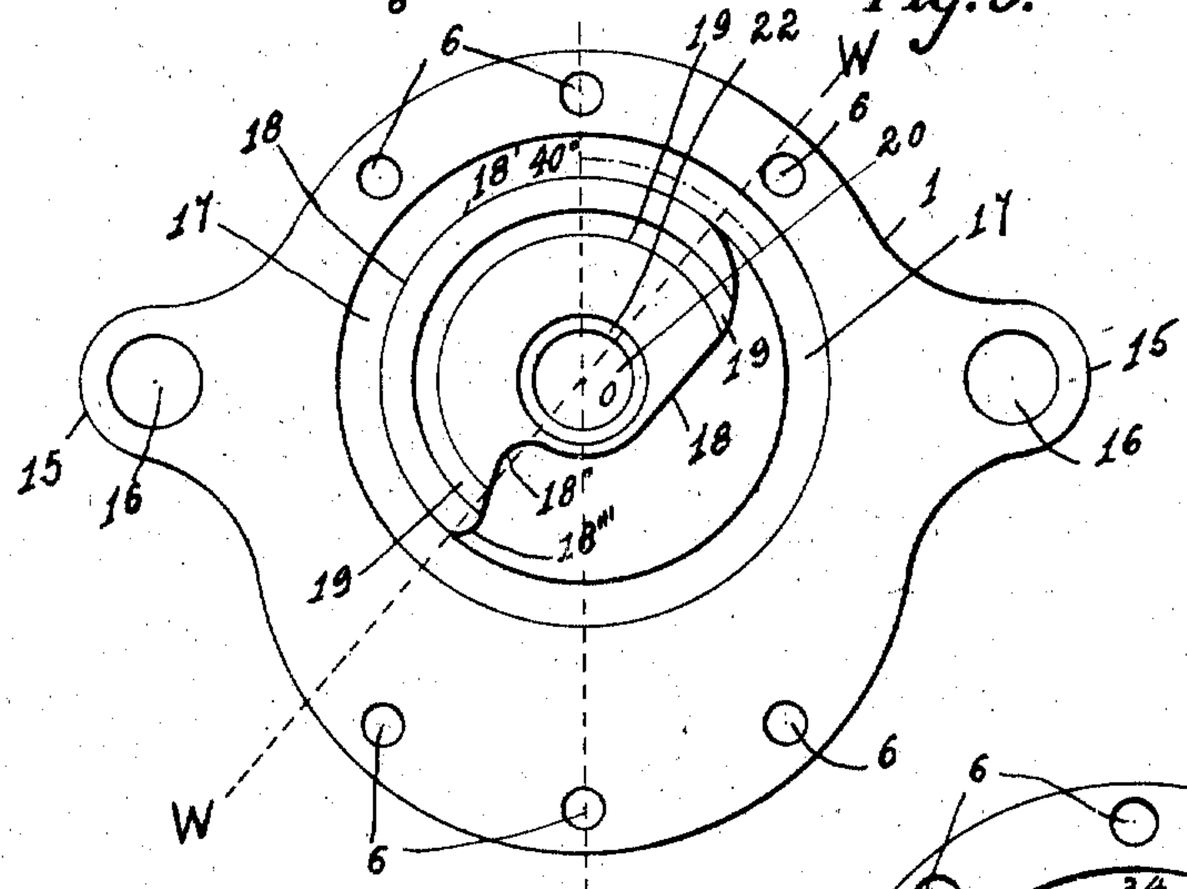

Fig. 7.

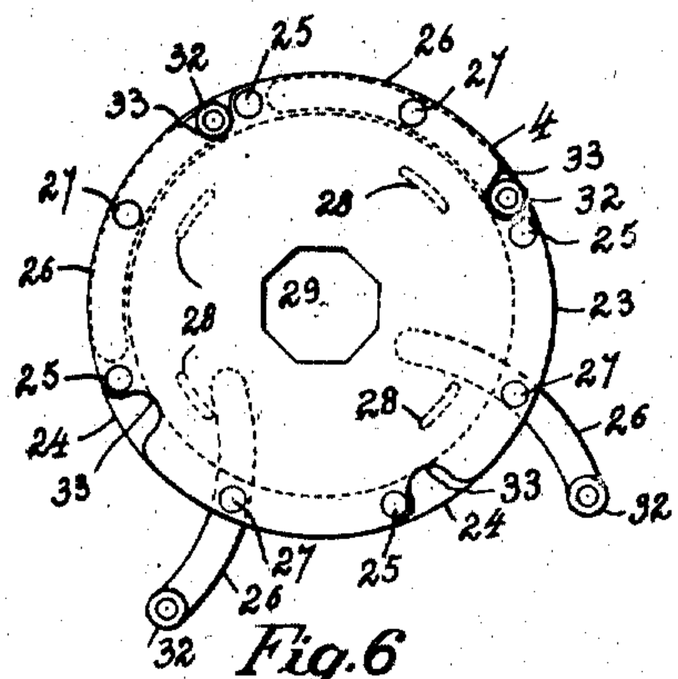

Fig. 6

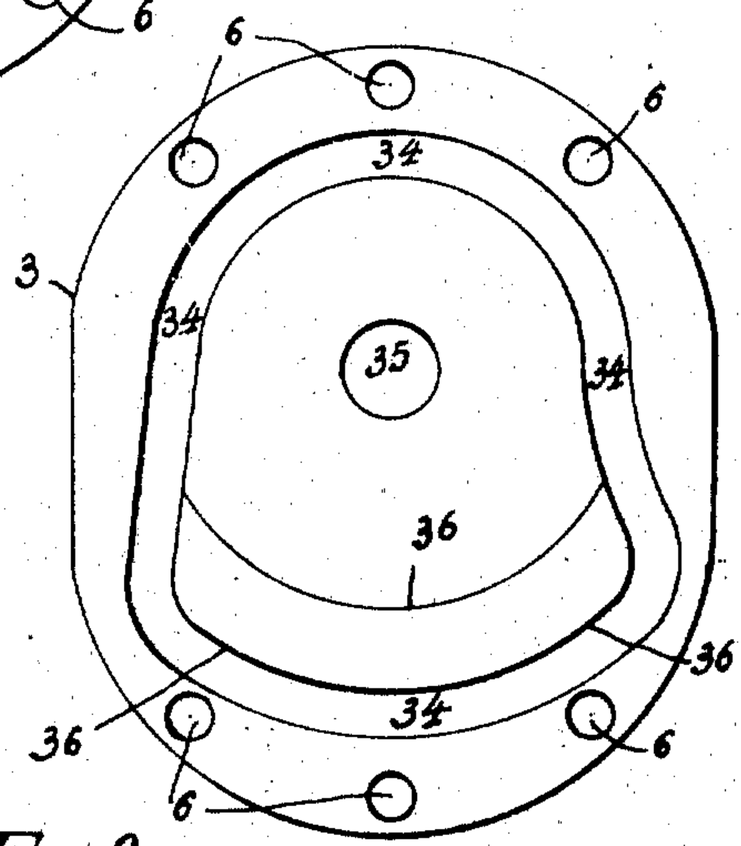

Fig. 8.

Witnesses:

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UNITED STATES PATENT OFFICE.

ANTONIO COTOLI, OF HABANA, CUBA.

ROTARY PUMP.

994,573. Specification of Letters Patent. Patented June 6, 1911.

Application filed August 13, 1910. Serial No. 576,994.

To all whom it may concern:

Be it known that I, ANTONIO COTOLI, a subject of the King of Spain, residing at Habana, Cuba, have invented certain new and useful Improvements in Rotary Pumps, of which the following is a specification.

The present invention relates to improvements in rotary pumps adapted for raising or forcing liquids and for compressing air or other gases, and the primary objects of the invention are to provide a novel pump of this type wherein the inlet and outlet ports of the piston chamber are so located that this chamber may always remain full of liquid or gas when the operation of the pump is interrupted, thereby preventing backflow of the fluid, to provide a pump of this type with pistons which are substantially in the form of shutters which are so mounted that they will open or expand to impel the fluid while each shutter is rotating through its annular path, and these shutter-like pistons will collapse and remain inactive while following the remainder of their annular course with the result that the pump will cause a continuous flow of the fluid with constant and uniform velocity, thereby avoiding losses due to inertia of the fluid and, moreover, according to the present invention, the shutter-like pistons are only exposed to the fluid while they are expanded or opened and are acting on the fluid to impel it, there being no loss of power due to friction between the pistons and fluid while the pistons are following the non-active portions of their course.

To these and other ends, the invention consists in certain improvements, and combinations and arrangements of parts, all as will be hereinafter more fully described, the novel features being pointed out particularly in the claims at the end of the specification.

In the accompanying drawing: Figure 1 is a perspective view of a pump constructed in accordance with my present invention; Fig. 2 represents a section through the pump taken centrally thereof and at right angles to its axis, and showing the interior arrangement of the parts; Fig. 3 represents an axial section through the pump on the line 3—3 of Fig. 2; Fig. 4 is a perspective view of the inner frame which carries the pivoted shutter-like pistons; Fig. 5 is a perspective view of the driving shaft of the pump; Fig. 6 illustrates the frame shown in Fig. 4 in elevation; Fig. 7 represents an inner view of the rear cover plate; Fig. 8 is an inner view of the front cover plate; and Fig. 9 shows in elevation the intermediate ring having the piston chamber and the inlet and discharge pipes connected thereto.

Similar parts are designated by the same reference characters in the several views.

The pump in the present instance is composed generally of a rear cover plate 1, an intermediate ring 2, a front cover plate 3, and an inner revoluble frame or piston carrier 4. The ring 2 is interposed between the rear and front cover plates 1 and 3 respectively, and these parts are firmly united by the screws or bolts 5 arranged in the openings 6 formed in the cover plates 1 and 3 and the interposed ring 2. The ring 2 which is provided with the chamber to contain the pistons has inlet and discharge ports 7 and 8 formed therein at opposite points, these ports being preferably inclined to conform substantially to the direction of flow of the fluid in entering and leaving the pump, and these ports communicate with the suction and discharge pipes 9 and 10 respectively. These pipes may be attached to the pump in any suitable manner, they being provided in the present instance with flanges 11 and 12 which are seated upon the exterior of the ring 2 and are secured in position by the screws 13 and 14. The piston chamber within the ring 2 has a substantially semi-circular portion 2′ toward the top of the pump and this semi-circular portion 2′ is concentric with the axis of the revoluble frame or piston carrier 4. The lower portion 2″ of the piston chamber is also formed as an arc of a circle, but it has a greater radius than the radius of the portion 2′ and it is connected to the portion 2′ by the straight or tangential portion 2‴ at one end and by a somewhat abrupt portion 2^{IV} at its opposite end which is adjacent to the discharge port 8.

The rear cover plate 1 may be provided with suitable means for supporting the pump, it having in the present instance a pair of lateral lugs 15 having apertures 16 to receive screws or bolts by means of which the pump may be secured to any upright support. The inner surface of this rear cover plate 1 is formed with a circular groove or channel 17 which is concentric to the axis of rotation of the frame or carrier 4. This plate 1 also has an inwardly extending projection 18 which is of approximately semi-cylindrical form, it having a concentric and substantially semi-circular peripheral portion 18′ toward its upper side and which is opposed to and parallel with the semi-circular portion 2′ of the piston chamber in the ring 2, and the under side of this extension 18 has a reduced portion 18″ which leads to the peripheral portion 18′ by the sinuous surface 18‴, this portion 18‴ of the periphery of the extension being somewhat abrupt or prominent. The forward face of the extension 18 has a groove or channel 19 formed therein which is concentric with the axis of rotation of the frame or piston carrier 4 and the extension is provided with a bore 20 which forms the axis for the grooves 17 and 19 and the surfaces 2′ and 18′, this bore 20 being adapted to receive the driving shaft 21 for the pump. This bore 20 is also formed toward its outer end with a counterbore 22 for a purpose to be hereinafter described.

The inner rotary frame or piston carrier 4 is composed in the present instance of a disk 23 and an opposed ring 24, the ring and disk being arranged parallel and concentrically and are maintained in proper relation by a suitable number of circumferentially spaced cross-bars 25. The pistons 26 are mounted in the frame or carrier between the cross-bars, each piston being pivoted at an intermediate point to the disk 23 and ring 24 respectively. Each piston 26 is in substantially the form of a shutter having an arc-shaped contour in a longitudinal direction, a pivot 27 being connected to each shutter at a point intermediate its length and being journaled respectively in the disk 23 and the ring 24 whereby the piston-like shutters are permitted to swing about these pivots as axes. The swinging motion of each shutter, however, is limited by an arc-shaped projection 28 which is formed on the inner face of the disk 23, these projections 28 operating freely in the concentric groove or channel 19 in the extension 18 during rotation of the piston carrier. The center of the disk 23 is formed with a hub 31 which is revolubly mounted and supported within the counterbore 22 and it has an angular opening 29 formed therein which coöperates and forms a driving connection with the collar 30 on the driving shaft 21, this collar having a corresponding angular periphery. Each shutter-like piston is provided toward its outer edge with a roller 32 which when the shutter-like piston is in collapsed position is accommodated by the notch 33 in the periphery of the disk 23, but when the shutter-like piston is extended, this roller 32 will operate in a groove or channel 34 which is formed in the inner face of the cover plate 3, these shutter-like pistons being thereby held in expanded relation to their carrier and while in such position they have an impelling action upon the fluid. While the shutters are passing between the concentric surfaces 2′ of the ring 2 and 18′ of the extension 18, they are folded inwardly and occupy a collapsed position with respect to their carrier. After the pistons, however, have passed through the space between the opposed surfaces 2′ and 18′, they are opened or expanded as shown substantially in Fig. 2 by reason of the engagement of the roller 32 toward the outer edge of each shutter-like piston with the groove 34 formed in the cover plate 3, each shutter-like piston fitting the piston space in the lower portion of the pump, and as these pistons revolve in the direction indicated by the arrow in Fig. 2, it is obvious that the fluid will be forced continuously through the pump, being drawn in by the suction pipe 9 and ejected by the discharge pipe 10. The driving shaft 21 extends through a central opening 35 formed in the front cover plate 3, and the exposed portion of the driving shaft may be provided with a belt pulley 37 or a hand crank 38 whereby it may be revolved. The interior wall 36 of the groove 34 coöperates with the rollers 32 upon the outer ends of the shutter-like pistons and thereby retains the pistons in opened position, each roller 32 being thereby caused to follow positively the groove 34.

The operation of the pump may be briefly described as follows: Rotation of the pump shaft or axle either by power applied by a motor to the belt pulley 37 or by hand to the crank 38 will cause the frame or piston carrier to revolve within the pump casing and in the direction indicated by the arrow in Fig. 2. As each shutter-like piston approaches the inlet port 7, the roller 32 at its outer end will leave its respective notch 33 in the rotatable carrier and following the surface 2‴, the outer end of the piston will slide along the outer concentric surface 2″, the roller 32 at this time following the groove or channel 34 in the front plate 3 and the shutter so opened will advance the fluid through the piston chamber and toward the discharge port 8. As the next shutter-like piston opens, the two pistons will form between them a chamber containing the fluid,

and this chamber will advance during the rotation of the piston carrier, toward the discharge port. As soon as each piston reaches a predetermined point while advancing toward the discharge port 8, its inner end will abut against the stationary cam surface 18''' and while the inner end of the piston is held substantially stationary, its outer end will continue to advance and will also move inwardly until the piston occupies a position in collapsed relation to the piston carrier, and further rotation of the piston carrier will return this piston toward the inlet port while the piston moves edgewise between the concentric surfaces 2' and 18'. While the pistons are traversing the space between the surfaces 2' and 18', the roller 32 on each piston will operate in the upper portion of the groove 34, the pistons being thereby held in collapsed position. In this manner the pistons are successively opened and collapsed during each revolution of the piston carrier and as each piston is moving into its collapsed position, the fluid is forced through the discharge port of the pump. While the shutters are returning to the inlet port and between the concentric surfaces 2' and 18', they neither offer any resistance to the fluid nor is the movement of the pistons impeded by the fluid and, moreover, the flow of the fluid into and through the pump is continuous.

I claim as my invention:—

1. In a rotary pump, the combination of a casing having a piston chamber formed with concentric portions of different diameters and provided with inlet and outlet ports which communicate with the piston chamber at opposite points intermediate the concentric portions thereof, a carrier revolubly mounted in the piston chamber, a set of pistons mounted on the carrier and movable to conform respectively to the concentric portions of the piston chamber, the casing having a groove therein embodying concentric portions of different diameters symmetrical with the concentric portions of the piston chamber, and means on the pistons and cooperative with said groove whereby the pistons are opened and collapsed during the rotation of the carrier.

2. In a rotary pump, the combination of a casing having a piston chamber formed with concentric portions of different diameters and provided with inlet and outlet ports which communicate with the piston chamber at opposite points which are intermediate the concentric portions of the piston chamber, a carrier revolubly mounted within the pump casing, a set of pistons pivotally mounted on the carrier, the casing being formed with a groove which is symmetrical with the circumference of the piston chamber, devices on the pistons coöperative with said groove to open the pistons and cause the latter to coöperate with the concentric portion of the piston chamber which is of larger diameter and to collapse while traversing the concentric portion of the piston chamber of smaller diameter, and an extension forming part of the casing and arranged within the revoluble carrier, said extension having a periphery which coöperates with the pistons throughout the revolution of the carrier and prevents retrograde flow of the fluid while the pistons are acting thereon.

3. In a rotary pump, the combination of a casing having a piston chamber therein, one wall of the piston chamber being formed with a circular groove, a piston carrier mounted within the casing and embodying a disk having a set of notches in its periphery and an opposed ring, the disk having means for driving it and the ring being revolubly journaled in the groove in the casing, and a set of pistons mounted on the carrier and operative in the piston chamber, each piston being provided toward its outer edge with a roller which is accommodated by a corresponding notch in the periphery of the disk while the piston is in an inactive position.

4. In a rotary pump, the combination of a casing composed of opposed front and rear plates and an interposed ring, the latter forming a piston chamber, one of said plates having a segmental portion formed integrally thereon and projecting inwardly into the piston chamber and substantially to the opposed plate, said portion having a bore and also a counterbore at one end, a driving shaft journaled in the bore of said inwardly projecting portion, a carrier revoluble within the piston chamber and embodying a disk having a relatively short hub which is journaled in the counterbore of the opposed inwardly projecting portion, said hub also having an angular bore to coöperate and form a driving connection with a correspondingly shaped collar on the shaft, and pistons mounted on the carrier and operative in the piston chamber.

5. In a rotary pump, the combination of a casing composed of opposed front and rear plates and an interposed ring, the latter forming a piston chamber having concentric portions of different diameters, the ring also having inlet and discharge ports arranged at opposite points which are intermediate the concentric portions of the piston chamber, one of the plates having a circular groove and the other plate having a groove which is symmetrical with the circumference of the piston chamber, a carrier revolubly mounted in the casing and embodying a disk and an opposed and rigidly connected ring which is revolubly journaled in said circular groove, pistons mounted on the car-

rier and operative in the piston chamber, and devices on the pistons coöperative with the other groove in the casing which is symmetrical with the circumference of the piston chamber whereby the pistons are automatically caused to follow the contour of the piston chamber.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ANTONIO COTOLI.

Witnesses:
TRINXET MAS,
RICARDO MORÉ.