No. 616,397. Patented Dec. 20, 1898.

F. BOVIO.

COMBINED ROTARY PUMP AND WATER MOTOR.

(Application filed Jan. 3, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

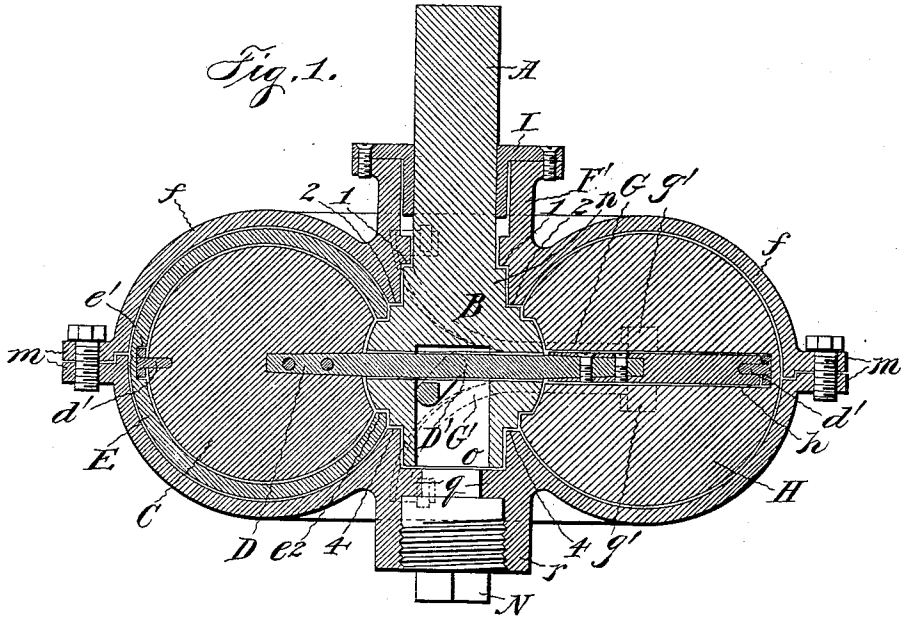
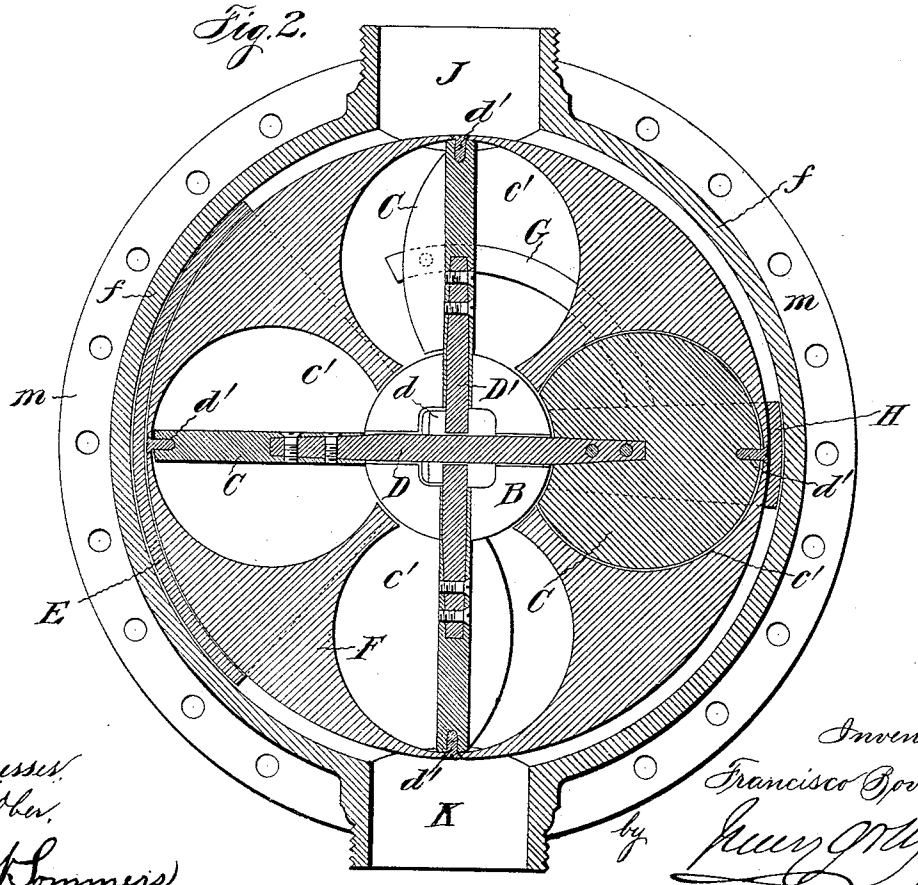


Fig. 2.



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Fig. 3.

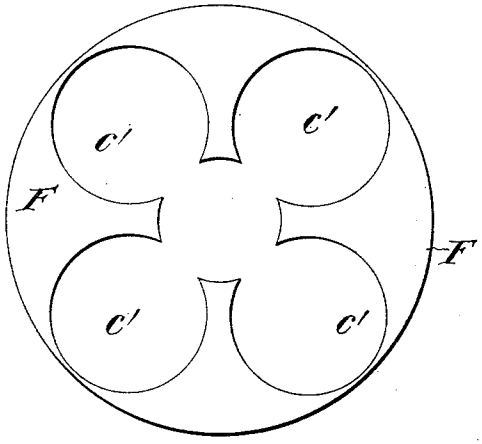


Fig. 12.

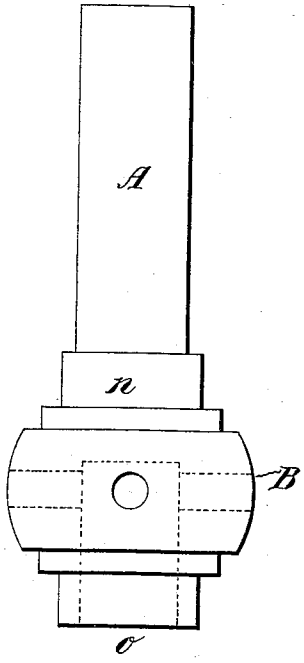


Fig. 4.

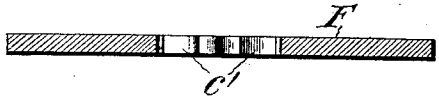


Fig. 5.

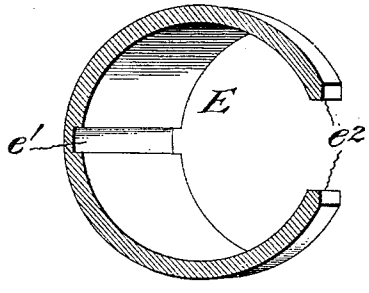
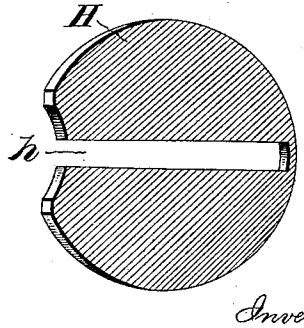


Fig. 6.



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Fig. 7.

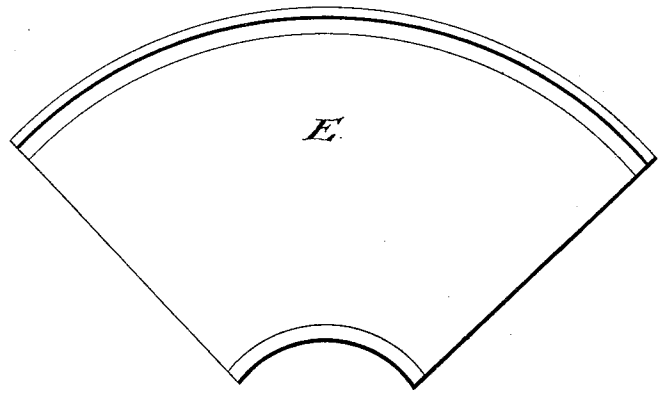


Fig. 9.

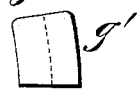


Fig. 9'.



Fig. 8. Fig. 8'.

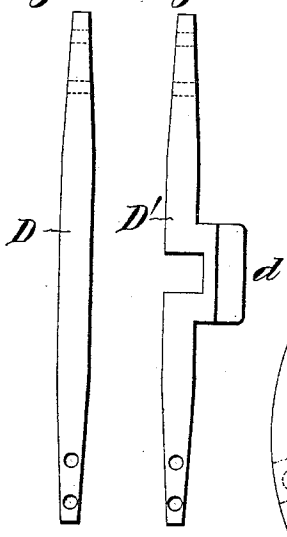


Fig. 11.

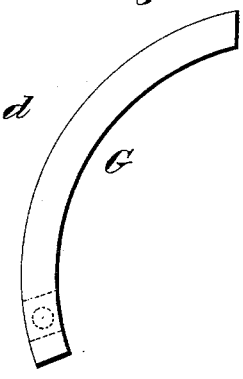


Fig. 11'.

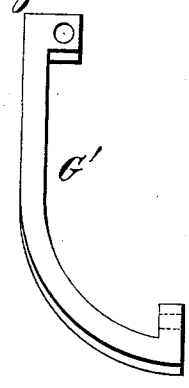
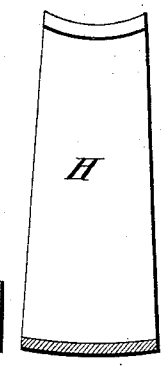


Fig. 10.



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UNITED STATES PATENT OFFICE.

FRANCISCO BOVIO, OF BUENOS AYRES, ARGENTINA.

COMBINED ROTARY PUMP AND WATER-MOTOR.

SPECIFICATION forming part of Letters Patent No. 616,397, dated December 20, 1898.

Application filed January 3, 1898. Serial No. 665,414. (No model.)

To all whom it may concern:

Be it known that I, FRANCISCO BOVIO, engineer, a subject of the King of Italy, residing at No. 496 Calle Viamonte, in the city of Buenos Ayres, Argentina, have invented certain new and useful Improvements in a Combined Rotary Pump and Water-Motor; and I 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.

My invention has relation to a new apparatus for elevating water, which apparatus operates either as a suction and force pump or as a water-motor. In other words, with this apparatus a pressure of water can be produced by means of a motive power, or a motive power can be produced by means of a pressure of water, said motive power being characterized in both cases by a rotary movement.

In the accompanying drawings, Figure 1 is a vertical section of the apparatus. Fig. 2 is a horizontal section of the same. Fig. 3 is a face view of the revolving disk which accompanies the wings or blades in their rotary movement. Fig. 4 is a transverse section of the disk F, Fig. 3. Fig. 5 is a section of the partition or diaphragm shown in Fig. 7. Fig. 6 is a section of the diaphragm H, Fig. 10. Fig. 7 is a partition or diaphragm which divides the principal chamber of the pump or apparatus into two parts in combination with the wings. Figs. 8 and 8′ are the shafts which carry the wings or blades. Figs. 9 and 9′ are a plan view and a section of one of the guides. Fig. 10 is a sectional view of the diaphragm H, Fig. 6. Figs. 11 and 11′ are the principal guides of the wings or blades. Fig. 12 is a view of the principal shaft.

The pump casing or shell *f*, Fig. 1, is of annular shape and of uniform circular cross-section and made of two similar sections or parts, dividing the shell horizontally through the center, each part being provided with bolt-flanges *m*, by which the two sections are bolted together, said shell having on diametrically opposite sides feed and discharge branches J and K, respectively. The upper half of the casing *f* is provided with a stepped internal bearing, forming shoulders or abutments 1 and 2, respectively, and is extended outwardly into a stuffing-box F′ for a gland I, Fig. 1, and the lower half of said casing is provided with a like bearing, forming a shoulder 4, which bearing is extended outwardly into a tubular branch *r*, closed by a screw-plug N, the bore of said branch below the bearing-shoulder 4 being contracted to form a step *q*.

The power-shaft A, which extends through the aforesaid stuffing-box, is provided with a spherical hub B, having on one side a stepped journal *n*, forming shoulders adapted to seat against the bearing-shoulders 1 and 2 in the upper half of casing *f*, and on the other side said hub B is provided with a like journal *o*, stepped on the aforesaid step *q*, the shoulder of said journal seating against the bearing-shoulder 4 in the lower half of casing *f*, said hub having a socket extending from its lower end to a point above its horizontal center.

It will be seen that in the construction described the power-shaft A is secured against end thrust, while means are provided whereby access may be had to the lower part of the shaft and its hub from below through branch *r*.

The socketed hub B has openings in its walls in planes at right angles to each other, which openings form bearings for the piston-shafts D and D′, the latter shaft having within the hub-socket a cranked portion *d*, so as to permit its rotation in its bearings relatively to spindle D through an angle of at least ninety degrees, substantially as described in my application for patent of the United States, Serial No. 658,713, filed November 16, 1897, and as shown in Figs. 1 and 8′.

Dividing the interior of the shell *f* horizontally and revolving with the hub B of shaft A is a disk F, Figs. 3 and 4, which has circular openings *c*′, forming seats for the discoidal pistons C. These openings *c*′ do not extend quite to the periphery of the disk F, but leave sufficient metal to enable the spandrels to meet, thus forming a continuous sheet of metal at the edge of the disk and a support for the pistons C.

The pistons C are secured to their shafts D and D′ at right angles to each other, fit the openings *c*′ in the disk F, and have a concave recess at their inner ends to fit the periphery of the hub B, Figs. 1 and 12, while the outer ends of said pistons are pivoted on a bolt *d*′

in the line of the axis of rotation of the piston-shafts and passed through the edge of the disk F at the junction of the spandrels formed by cutting the openings *c'*.

In the shell *f*, between the feed and discharge and dividing said shell vertically into feed and discharge chambers, is a partition H, Figs. 1, 2, and 6, having a medial slot, Figs. 1 and 10, through which the disk F is adapted to rotate, and diametrically opposite this partition is a partial lining E, Figs. 2 and 5, into which the pistons C closely fit, as shown in Fig. 1, which lining has a groove *e'*, Figs. 1 and 5, in which the disk F rotates and has bearing, said groove and slot *h* serving to maintain the disk horizontal and guide the same.

As shown in Figs. 1 and 6, the circular partition H has in its inner face a concave recess fitting the periphery of hub B of shaft A and a shoulder on opposite sides of said recess having bearing against the aforementioned shoulders 3 3 on either side of said hub, the inner ends of the partial lining E being likewise provided with shoulders e^2, Fig. 5, abutting against said shoulders 3 3 on said hub B, as is also shown in Fig. 1.

On either side of the partition is a curved guide G G', (shown in dotted lines in Fig. 1 and in detail in Figs. 11 and 11',) one in either half of the casing leading from about opposite the feed and discharge ports to opposite sides of the slot *h* in partition H, said guides operating to turn the pistons C and their shafts, so that said pistons will lie within their seats flush with the faces of the disk F, so as to admit of their passage through the slot *h* in said partition H.

In order to insure proper seating of the pistons C, I employ auxiliary guides *g'*, (shown in dotted lines in Fig. 1 and in detail in Figs. 9 and 9',) their arrangement relatively to guides G G' being such as to form a flaring passage leading to the aforesaid slot in partition H, the arrangement and operation being substantially the same as described and shown in my application hereinabove referred to.

Only one of the guides G and G' and one of the smaller guides *g'* are in use at one time, depending on whether the device be used as a pump or a motor, both of which uses are rendered possible by the symmetrical construction and arrangement of the various parts.

The operation is as follows: The position of the various coöperating parts being that shown in Figs. 1 and 2, the pump is practically divided into two water-chambers by the partition H, (the slot therein being closed by the horizontal piston C,) the hub B, the vertical piston C, and removable partial lining E, thus forming a feed-chamber and a discharge-chamber. Water enters by the feed branch K, and in turning the pistons a body of water is carried between two of them and the removable lining E toward the discharge J. When the vertical forward piston is opposite the discharge, it begins to ride along the guide G preparatory to moving to its seat *c* in the disk F in order to pass through the partition H and simultaneously turns the piston opposite mounted on the same spindle at right angles into a vertical position. The piston that is vertical is now carrying the load toward the discharge, followed by a similar piston, which is to take up the load as soon as the one in front strikes the guide G.

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

1. A rotary pump comprising an annular shell circular in cross-section and provided with stepped bearings as described, and with inlet and discharge branches diametrically opposite each other, a circular slotted partition H dividing said shell into feed and discharge chambers, and a partial lining E diametrically opposite said partition; in combination with a power-shaft A provided with a spherical socketed hub having on either side shoulders 3, 3, and stepped journals fitting the stepped bearings in the shell, whereby said shaft is held against endwise thrust or displacement, a disk revoluble with the said hub and guided by the slot in said partition, and a groove in said partial lining, said disk provided with circular openings, the shafts D and D' revoluble in bearings in and extending through the hub at right angles to each other, circular pistons secured to opposite ends of said shafts at right angles to each other and pivotally connected with the disk so as to turn in the openings therein, and suitable guides arranged to turn the pistons as they approach the slotted partition, for the purpose set forth.

2. The combination with the shell *f*, the slotted partition H therein, and the partial lining E; of the shaft A provided with a spherical hub revoluble in bearings in said shell, the disk F revoluble with said hub and provided with four circular openings, the shafts D and D' revoluble in and with said hub and extending therethrough at right angles to each other, a discoidal piston C secured to each end of the shafts G G' at right angles to each other and adapted to seat in the openings in the disk F, said pistons pivoted to the disk in the lines of the axes of their shafts, for the purposes set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

FRANCISCO BOVIO.

Witnesses:
PEDRO A. BREUER,
GUSTAVO W. C. BREUER.