No. 739,207. PATENTED SEPT. 15, 1903.

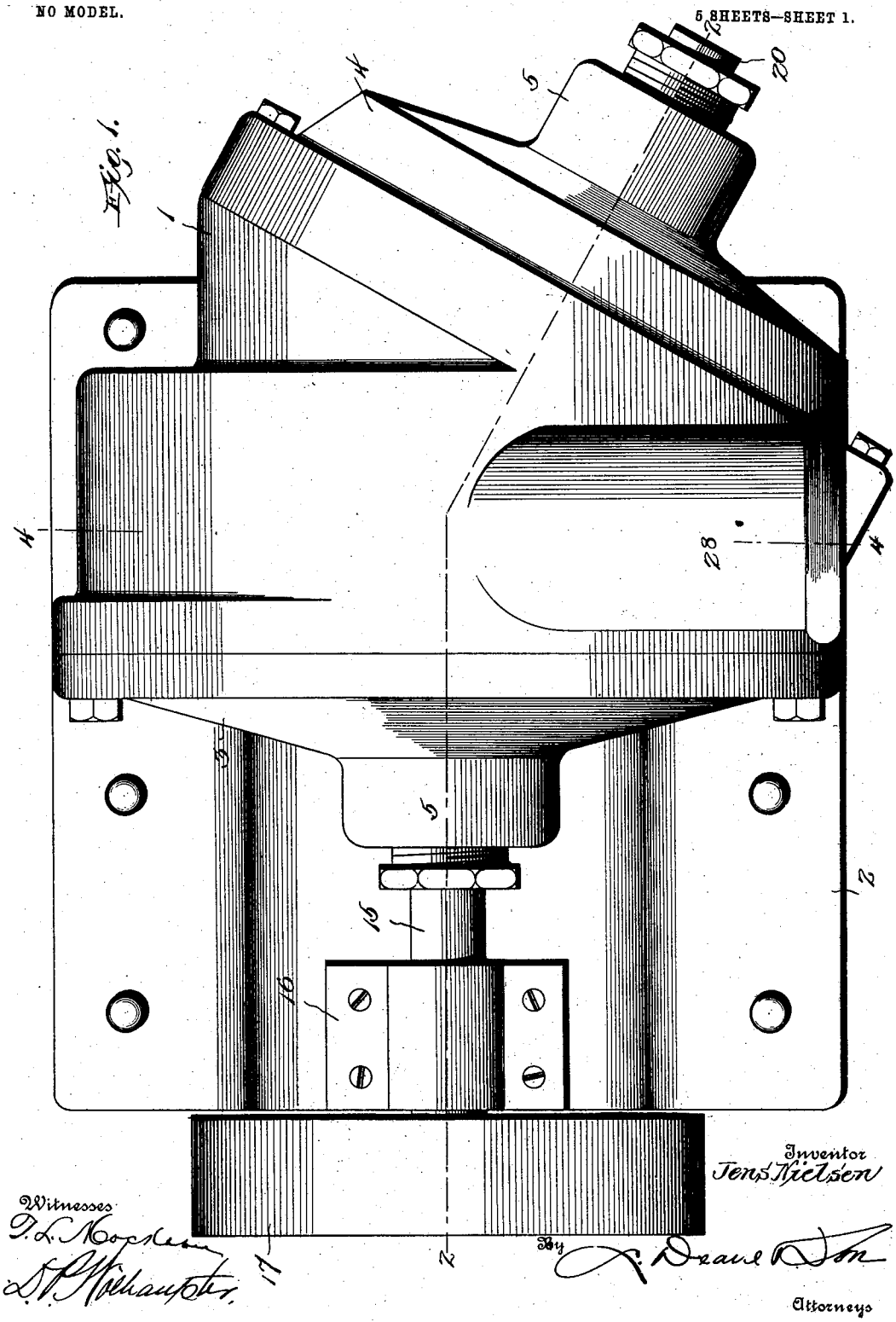
J. NIELSEN.

ROTARY PUMP.

APPLICATION FILED MAY 28, 1902.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1.



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NO MODEL. 5 SHEETS—SHEET 2.

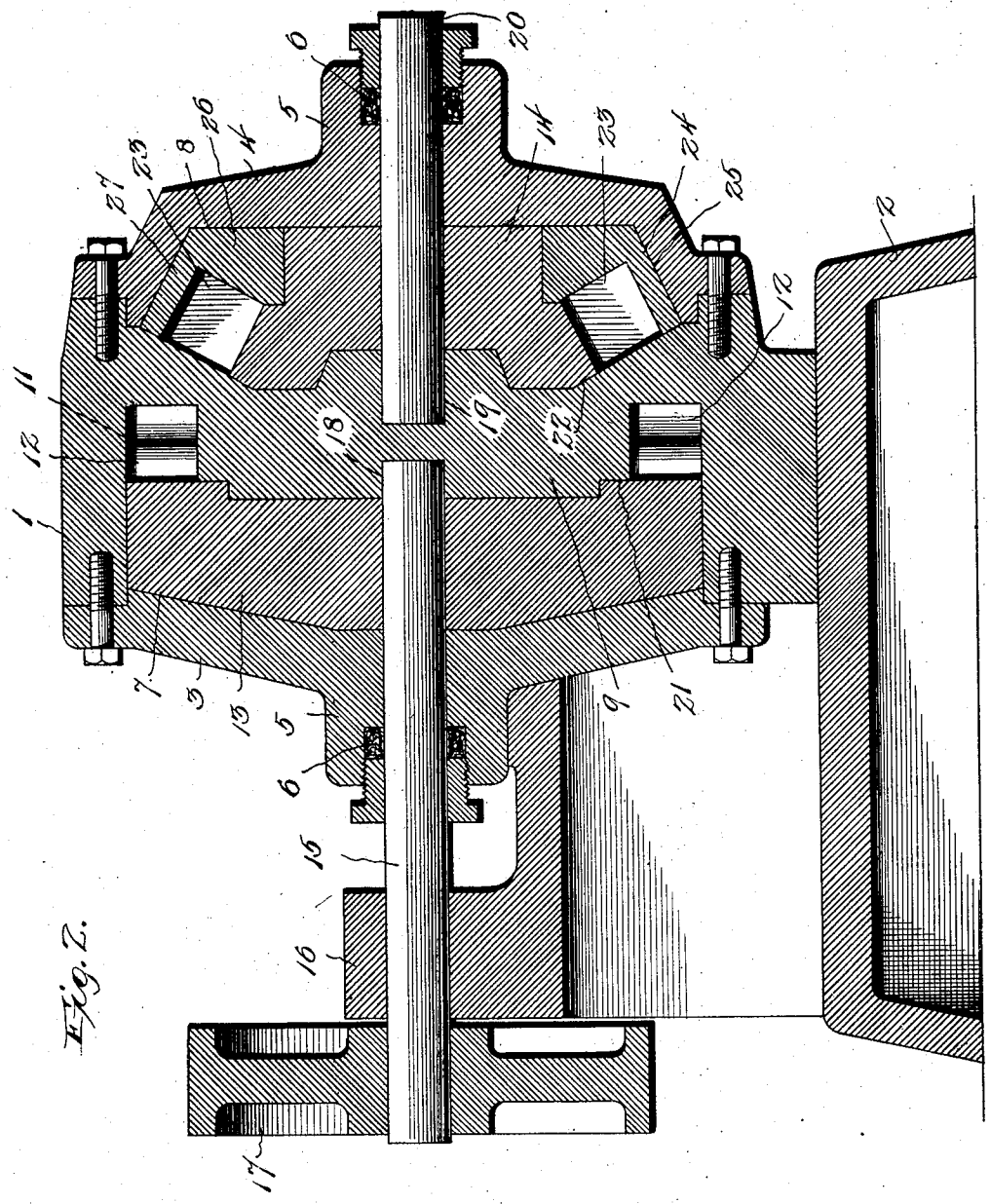


Fig. 2.

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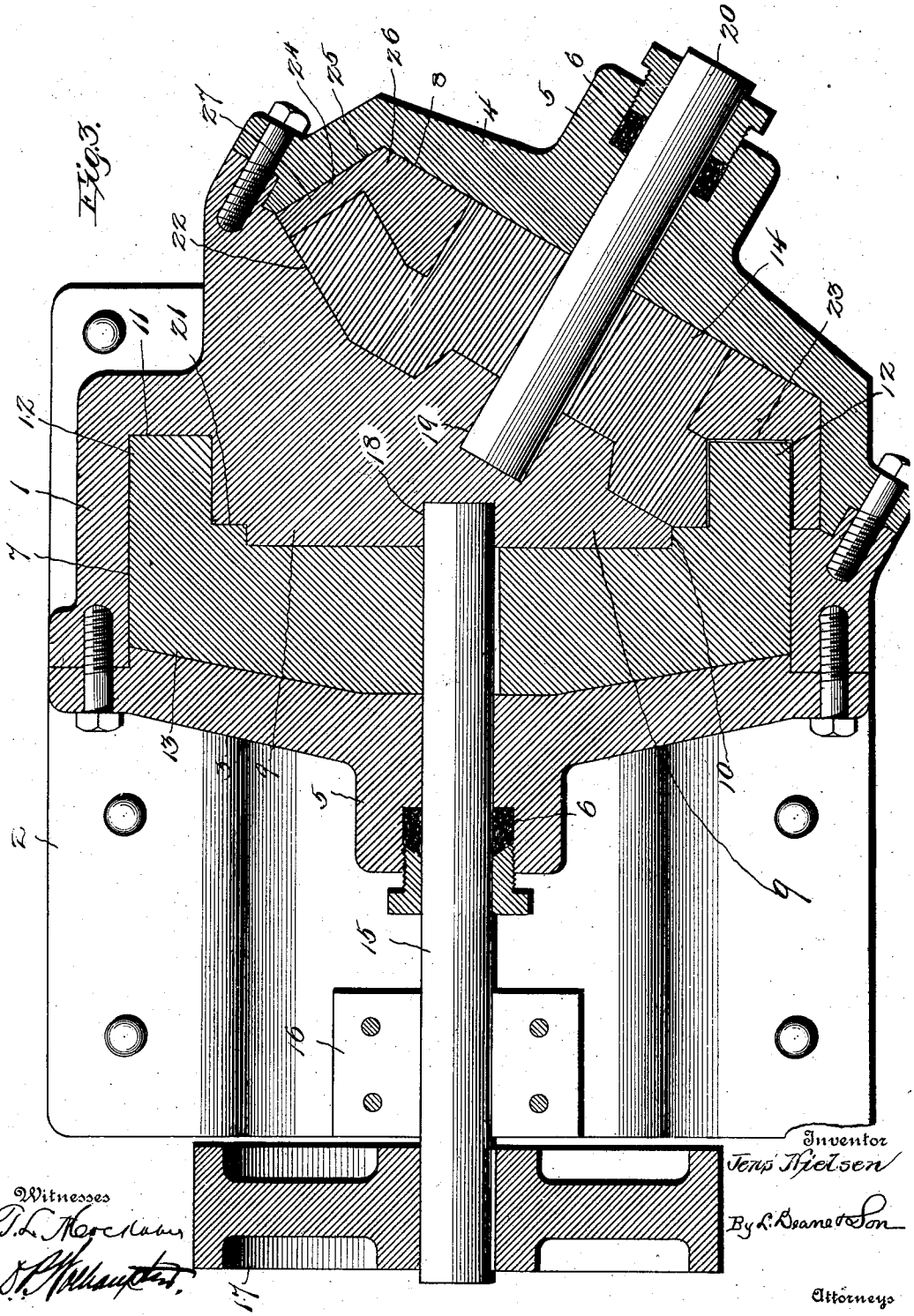
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NO MODEL. 5 SHEETS—SHEET 3.

Fig. 3.



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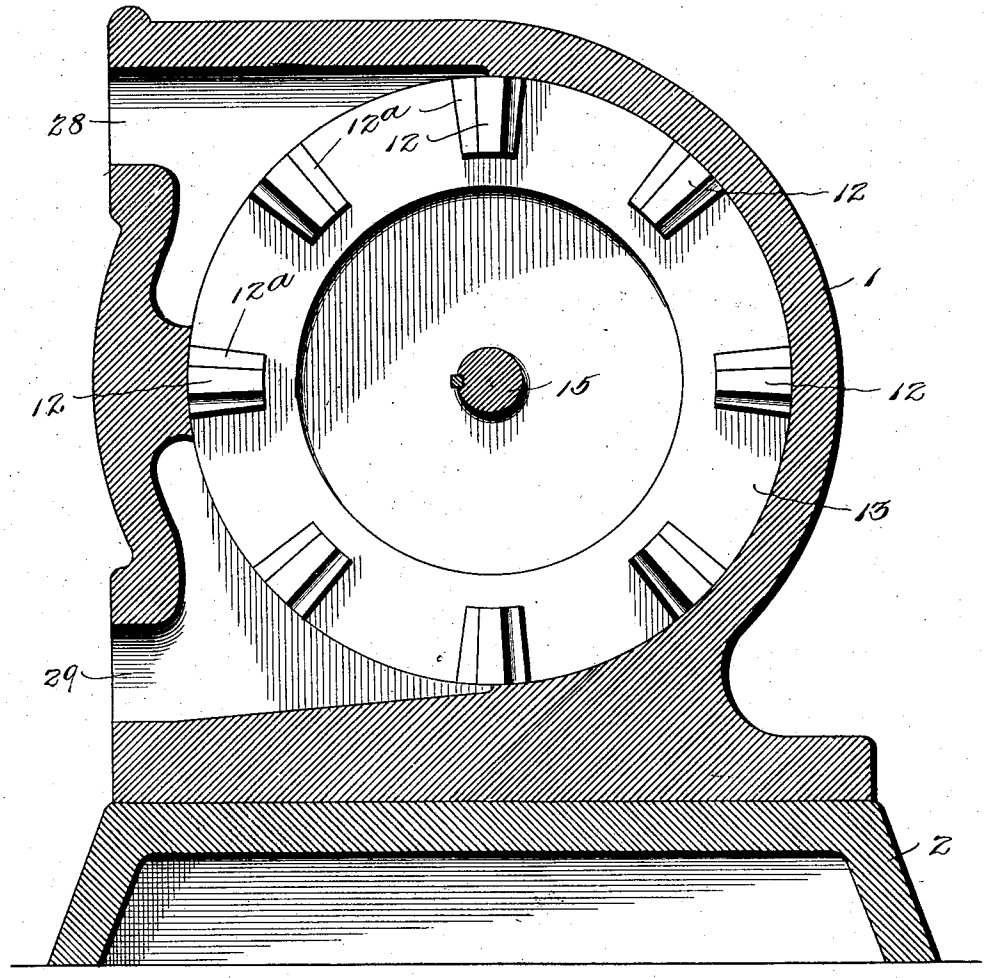
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NO MODEL. 5 SHEETS—SHEET 4.

Fig. 4.



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ROTARY PUMP.

APPLICATION FILED MAY 28, 1902.

NO MODEL. 5 SHEETS—SHEET 5.

Fig. 5.

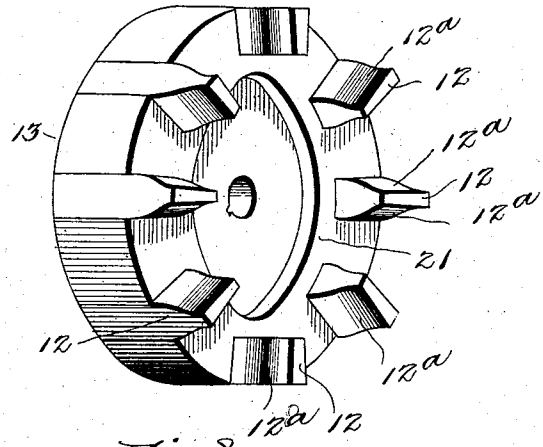


Fig. 6.

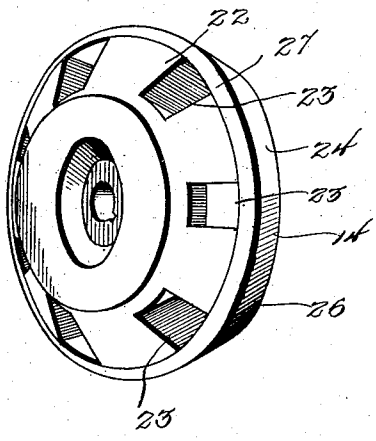


Fig. 8.

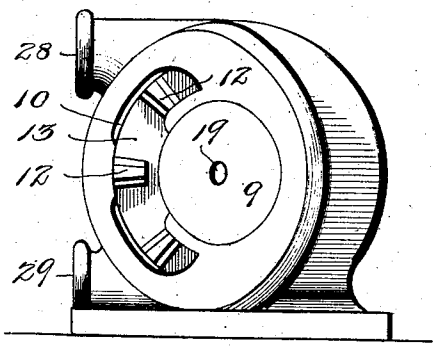
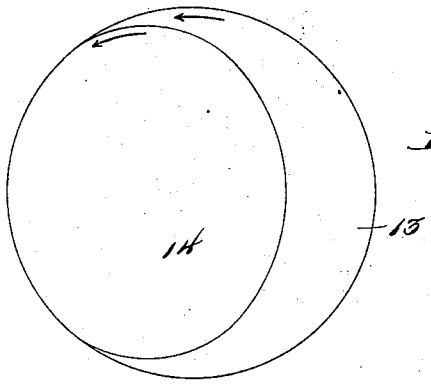


Fig. 7.



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No. 739,207. Patented September 15, 1903.

UNITED STATES PATENT OFFICE.

JENS NIELSEN, OF CEDARFALLS, IOWA.

ROTARY PUMP.

SPECIFICATION forming part of Letters Patent No. 739,207, dated September 15, 1903.

Application filed May 28, 1902. Serial No. 109,351. (No model.)

To all whom it may concern:

Be it known that I, JENS NIELSEN, a citizen of the United States, residing at Cedarfalls, in the county of Blackhawk and State of Iowa, have invented certain new and useful Improvements in Rotary Pumps, of which the following is a specification.

This invention relates to pumps of the rotary type involving the employment of a rotating piston or wheel constituting the working member for securing a pumping action.

To this end the invention contemplates certain novel and practical improvements in that class of pumps or motors in which the rotating piston essentially comprehends separate driving-wheel and follower-wheel members having a loosely-interlocked connection so as to be compelled to rotate in unison and having their axes disposed at an angle to each other. In this peculiar form of construction the machines which have heretofore embodied the same have been inoperative or impracticable by reason of an improper relation as to size and disposition between the driving and follower wheel members of the piston, and also by reason of the loosely-interlocked connection between the separate members being such as to positively interfere with the free action thereof and also preventing the proper circulation of the fluid. These mechanical and practical difficulties are overcome by the present invention through the medium of a construction involving an accurate and properly-related mounting of the separate members of the piston, as well as by preserving a proper proportional relation between the sizes of the said members.

Other objects secured from the structural improvements contemplated by the present invention will more readily appear as the nature of the same is better understood, and while the construction contemplated possesses special utility as a rotary pump the same may be utilized as a motor or as a blower without material change.

In its functions as a pump the machine secures a steady continuous stream at any reasonable speed, that the same may be run and will act as a suction-pump up to the usual limit. Also the machine will act as a force-pump or both as a suction and force pump at the same time, and, furthermore, will operate in any position that it can be placed. Again, the construction is such that either port may be the inlet or outlet.

With these and many other objects in view, which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts, as will be hereinafter more fully described, illustrated, and claimed.

The essential features of the invention as above indicated are necessarily susceptible to considerable modification without departing from the spirit or scope of the invention; but a preferred embodiment of the latter is shown in the accompanying drawings, in which—

Figure 1 is a top plan view of a rotary pump embodying the present invention. Fig. 2 is a vertical longitudinal sectional view on the line 2 2 of Fig. 1. Fig. 3 is a longitudinal horizontal sectional view showing plainly the proportionate size of the wheel members of the piston in their proper operative relation. Fig. 4 is a vertical transverse sectional view on the line 4 4 of Fig. 1, showing a preferred relation of the inlet and outlet ports of the casing. Figs. 5 and 6 are details in perspective, respectively, of the preferred construction of driving and follower wheel members constituting the complete rotating piston. Fig. 7 is a view illustrative of the relative motion of the peripheries of the two wheel members of the piston. Fig. 8 is a detail elevation of the follower-wheel side of the casing with the follower-wheel and cover-plate removed.

Like numerals of reference designate corresponding parts throughout the several figures of the drawings.

The preferable form of casing as utilized in carrying out the invention is illustrated in the drawings and designated by the numeral 1. This casing usually surmounts any suitable form of supporting-base 2 and in its preferable construction is provided with opposite open sides covered by the removable cover-plates 3 and 4, respectively, each provided with a central bearing 5, having at its outer end an ordinary stuffing-box 6 for receiving the shaft-section turning therein, as

will be presently explained, and at this point it will be observed that the casing 1 is of an approximately triangular shape in horizontal cross-section, thereby disposing the opposite sides thereof, covered, respectively, by the plates 3 and 4, at an acute angle to each other, as may be plainly seen from Figs. 1 and 3 of the drawings.

A distinctive and important feature of the present invention resides in the formation of the casing 1 with separate interior wheel-chambers 7 and 8, which are designed, respectively, to receive the separate wheel members of the piston hereinafter referred to and which are completely separated and divided from each other through the medium of a solid transverse partition-wall 9, which divides the interior of the casing transversely and also tapers transversely in correspondence to the tapered or triangular cross-sectional form of the casing itself.

The opposite angularly-related faces of the interior transverse tapering partition-wall 9 respectively coöperate with the separate covers 3 and 4 to entirely close in the separate wheel-chambers 7 and 8, and the only communication that is provided between the two chambers 7 and 8 of the casing is through the clearance-opening 10, formed at what might be properly characterized as the "apex" of the tapering partition-wall 9. The said clearance-opening 10 does not provide communication between the separate wheel-chambers in the sense of permitting the circulation from one chamber to the other, but performs a dual function—namely, that of providing a space within which the separate members of the piston may come into interlocking engagement and pass out of such engagement, and also providing for the proper inlet and outlet of fluid to and from the interlocked parts of the separate members of the piston, as well as from the individual parts of the said separate members of the piston. These functions of the clearance-opening, which is of a segmental form, will hereinafter more fully appear.

Another important feature of the invention resides in forming the wheel-chamber 7 of a greater diameter than the wheel-chamber 8, and also within the circular plane of the segmental clearance-opening 10 the transverse partition-wall 9 is provided in the side constituting one of the inclosing walls of the wheel-chamber 7 with an annular water-channel 11, which extends entirely around the inner periphery of the chamber 7 and receives therein the laterally-projecting impact-cogs 12 of the driving-wheel member 13 of the rotating piston. As already indicated, this rotating piston essentially comprehends a driving-wheel member 13 and a follower-wheel member 14, completely housed, respectively, in their own containing-chambers 7 and 8 and having a loosely-interlocked connection solely within the segmental clearance-opening 10, and by reason of the cross-sectional shape of the casing said members being also necessarily disposed at an angle to each other.

The driving-wheel member 13 snugly registers within its own containing-chamber 7, being concentrically disposed within said chamber and of a greater diameter than the follower-wheel member 14, which has been found to be important to successfully and practically operate a rotating piston consisting of separate driving and follower wheel members. The said driving-wheel member 13 is keyed or otherwise suitably secured to the inner end portion of a shaft-section 15, extending through the bearing and stuffing-box of the cover 3 and having its outer end supported in a suitable exterior bearing or bearing-stand 16, located outside of and beyond the pump-casing, and the outer end portion of the shaft-section 15, carrying the driving-wheel member 13, may have mounted thereon a pulley or gear wheel 17, according to the manner in which it is desired to utilize the machine.

To insure a firm bracing of the parts and steadiness in motion, the inner extremity of the shaft-section 15 is mounted in an interior bearing 18, formed in one side of the transverse partition-wall 9 and corresponding to a similar bearing 19, formed in the opposite and angularly-related side of the partition-wall 9 and receiving the inner extremity of the shaft-section 20. This shaft-section 20 carries the follower-wheel member 14 and turns in the bearing and stuffing-box of the cover or cover-plate 4.

In connection with the mounting of the driving-wheel and follower-wheel members upon their respective shaft-sections 15 20 it is to be observed that the said shaft-sections are disposed at an obtuse angle to each other and may be said to diverge from a common center—or, in other words, since the follower-wheel member 14 is practically a frustum of a cone the apex of the frusto-conical side of the follower-wheel, coöperating with the driving-wheel member, may be said to be located at a common center with the axial center of the face of the driving-wheel member 13.

In constructing the driving-wheel member 13 the same is provided at the side thereof next to the follower-wheel member with a working face 21, disposed at right angles to the axis of rotation and from which are laterally projected the impact-cogs 12. These impact-cogs are disposed in parallelism to the axis of rotation and are preferably arranged at or contiguous to the periphery of the body of the driving-wheel member, while at the same time occupying a radial disposition in reference to the shaft. These cogs are of a width equaling only a fraction of the radii of the driving-wheel member 13 and do not occupy the full width of the working face 21, thus leaving the inner edge portion of said working face exposed as a shoulder to contact with the conical surface 22 of the follower-wheel member 14.

The impact-cogs 12 are spaced an equal distance apart from each other and are preferably constructed of a tapering form toward their points with compoundly-curved side faces 12^a to insure their free movement into and out of the cog sockets or recesses 23, formed in a circular series within the conical bearing-face 22 of the follower-wheel member and disposed at right angles to such face in order to become properly alined with the impact-cogs 12 within the segmental clearance-opening 10 at one side of the casing.

The follower-wheel member 14 is beveled or tapered from its periphery inward toward the driving-wheel member 13 for a distance to allow the said face of the follower-wheel member to fit close against the working face 21 of the driving-wheel member at the point where the two wheels are in contact or interlocked, and by reason of this construction the said follower-wheel may be properly described as being "frusto-conical" at the side coöperating with the driving-wheel member. Also in the construction of said follower it may be preferable to form the same with a beveled outer side portion 24, registering in a correspondingly-shaped bearing-seat 25, formed at the inner side of the cover or cover-plate 4. It may also be found desirable in the formation of the follower-wheel to construct the same in two parts—namely, of a solid body portion and an outer rim-section 26, dovetailed into the body of the wheel and having its flange 27 overhanging and completely closing in the outer sides of the cog sockets or recesses 23.

The cog sockets or recesses 23 are the same distance apart as the impact-cogs 12 of the driving-wheel member; but there is necessarily a less number of said sockets than of the cogs, by reason of the follower-wheel member being of a smaller diameter than the driving-wheel member. The object in making the follower-wheel smaller in diameter than the driving-wheel member is to cause the impact cogs and recesses to describe as nearly as possible the same circular path or arc during the time they are in interlocked engagement within the segmental clearance-opening 10. While the periphery of the driving-wheel member will describe a circular path, the periphery of the follower-wheel member will necessarily describe an elliptical path in reference to the working face of the follower-wheel member, as indicated by the diagram in Fig. 7 of the drawings, but the proportionate size of the two wheel members will secure the movement of the interlocked portions thereof within the same circular plane, as shown. This is necessary to provide a thoroughly practical and effective operation.

While the impact-cogs 12 are of a tapered form, as described and shown, the sockets 23 receiving the same are not necessarily the same shape, inasmuch as they are only required to be formed sufficiently large to permit of the cogs freely entering and leaving the same at an angle. The casing 1 may be formed with an inlet and outlet at any suitable point; but in the preferable construction the fluid-inlet 28 is formed tangentially in the casing contiguous to and communicating with the upper end portion of the segmental clearance-opening 10, while the fluid-outlet port 29 is formed in a corresponding position contiguous to and communicating with the lower end of the segmental clearance-opening 10.

In using the machine as a pump if found necessary the same may be first primed by introducing the fluid therein in any suitable manner, and assuming that the uppermost port 28 is the inlet-port with a proper pipe connection therewith and the lower port 29 is the outlet-port, as indicated, and which also has a proper pipe connection, the driving-wheel member 13 is rotated in a direction wherein the cogs 12 along the upper portion of the wheel will travel away from the inlet-port and into the fluid or water channel 11 in rear thereof. Inasmuch as the impact-cogs 12 are of a size closely filling the cross-sectional area of the fluid or water channel 11 the said cogs necessarily divide the channel into a multiplicity of separate chambers between the several cogs, and as the water in these several chambers is compelled to follow the moving impact-cogs as they travel through the fluid-channel 11 toward the lower outlet-port 29 a suction is necessarily created through the inlet-port, so as to maintain a pumping action. It is impossible for the water to follow the impact-cogs past the lower outlet-port 29, for the reason that at this point the solid portion of the follower-wheel between the cog sockets or recesses 23 completely fills the space between the impact-cogs, thus forcing the water to seek a discharge through the outlet provided therefor. It should also be observed in the action of this machine as a pump that when the impact-cogs leave the sockets or recesses 23, near the inlet-port, the said sockets or recesses are filled with water, which is carried around to the outlet, where the cogs in entering the said sockets or recesses force out a part of the water contained therein, thus adding materially to the quantity of water actually carried around from the inlet to the outlet.

In the use of the machine as a blower the action is the same as already indicated, and in reference to the action of the machine as a motor it may be noted briefly that the water entering through the inlet-port fills the space between the two wheel members and the casing up to the first impact-cog that closes the adjacent portion of the fluid or water channel 11. The water will then press or impinge with nearly equal force on all sides or walls of the space within which it is inclosed. When the water-pressure is sufficient to overcome the friction, the impact-cog which the water abuts against will move into the fluid or wa-

ter channel, for the reason that that particular cog is the only part of the space inclosing the water which can be moved. As this first impact-cog is moved into the adjacent fluid or water channel the next succeeding cog will enter the mouth of said channel and receive the pressure of the fluid, which action continues for the successive cogs, thus causing the wheel members of the piston to continue to turn. Of course in the use of the machine some of the water will necessarily be carried around to the outlet in the sockets or recesses of the follower-wheel, but in a motor this occurs without affecting the general action of the machine.

From the foregoing it is thought that the construction, operation, and many advantages of the herein-described rotary pump will be readily apparent without further description, and it will also be understood that various changes in the form, proportion, and minor details of construction may be resorted to without departing from the spirit of the invention or sacrificing any of the advantages thereof.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In a machine of the class described, the casing having separate angularly-related wheel-chambers, and a transverse partition-wall between said chambers and provided with a single clearance-opening, and a rotating piston consisting of separate angularly-related wheel members of different diameters and having a loose cogged connection within the said single clearance-opening.

2. In a machine of the class described, the combination of the casing having separate angularly-related wheel-chambers and a transverse partition-wall between said chambers provided with a clearance-opening, and a rotating piston consisting of separate wheel members of different diameters and having a loose cogged connection within said clearance-opening, each wheel member also having a shaft-section journaled in an exterior bearing and also in the partition-wall, substantially as set forth.

3. In a machine of the class described, the casing having an interior transverse partition-wall dividing the same into two chambers and provided with a single clearance-opening therein, said casing being further provided within one of its chambers with an annular water-channel encircling the partition, and the rotating piston consisting of separate wheel members having a cogged connection within the clearance-opening.

4. In a machine of the class described, the casing having separate interior angularly-related wheel-chambers, a transverse tapering partition-wall pierced at its apex by a segmental clearance-opening, an annular water-channel within one of said chambers and in communication with the said clearance-opening, an inlet and outlet port likewise in communication with the said clearance-opening, and the rotating piston consisting of driving-wheel and follower-wheel members having their axes disposed at an angle to each other, the driving-wheel member being provided at one side with a working face disposed at right angles to its axis and having a series of impact-cogs projecting laterally from the said working face and substantially registering within said water-channel, and the follower-wheel member having a conical bearing-face coöperating with the working face of the driving-wheel member and provided therein with a series of cog sockets or recesses having an interlocked engagement with the impact-cogs solely within the said clearance-opening.

5. In a machine of the class described, the casing having separate angularly-related wheel-chambers and a transverse partition-wall between said chambers, and a rotating piston consisting of separate driving-wheel and follower-wheel members housed respectively in the separate chambers and having a loosely-interlocked operative connection, each of said wheel members having a shaft-section journaled in exterior bearings and also in the said partition-wall.

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

JENS NIELSEN.

Witnesses:
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HENRY JOHNSON.