

(No Model.)

2 Sheets—Sheet 1.

J. RICHARDS.
CENTRIFUGAL PUMP.

No. 359,096.

Patented Mar. 8, 1887.

Fig. 2.

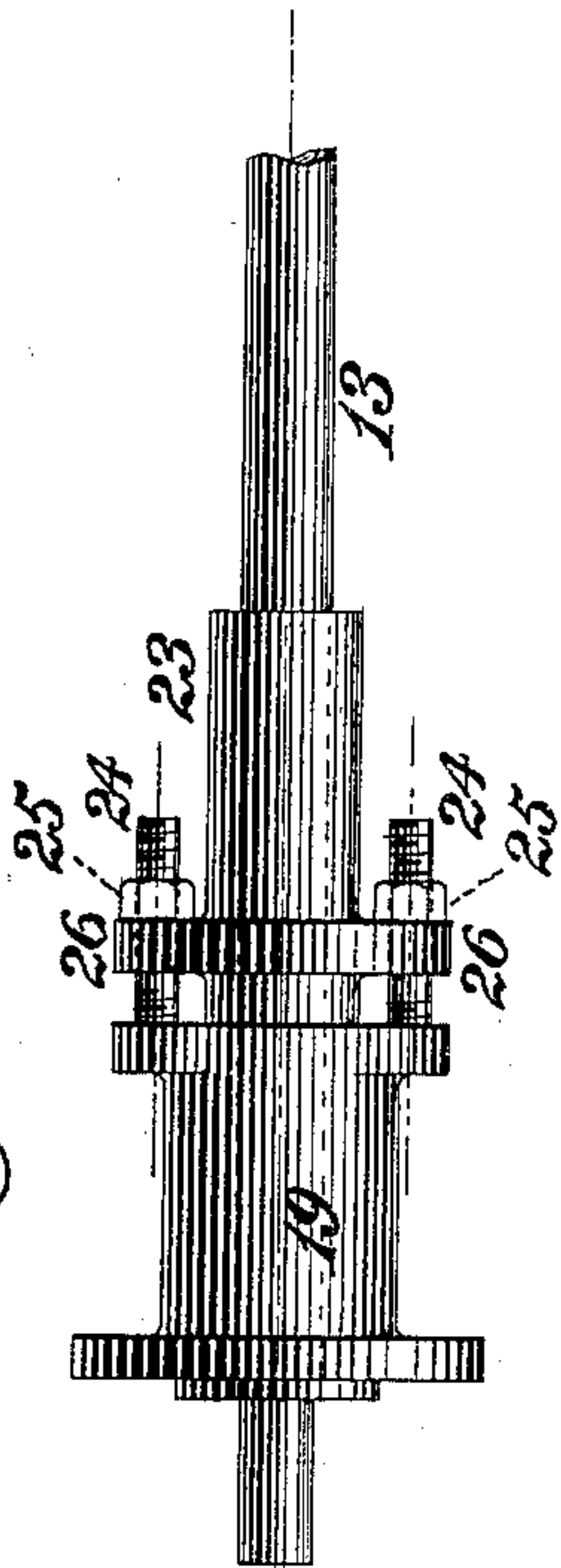
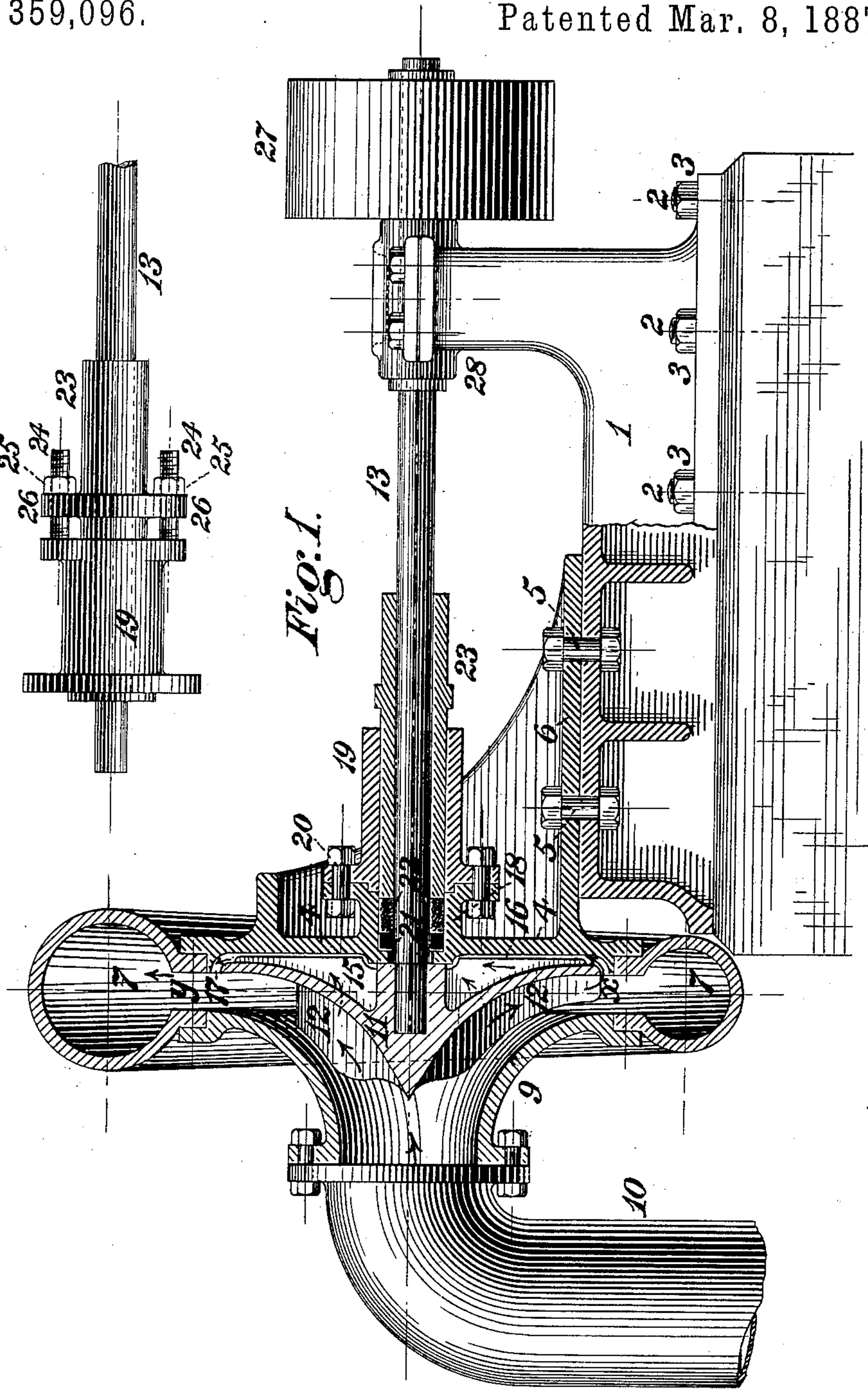


Fig. 1.



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Fig. 3.

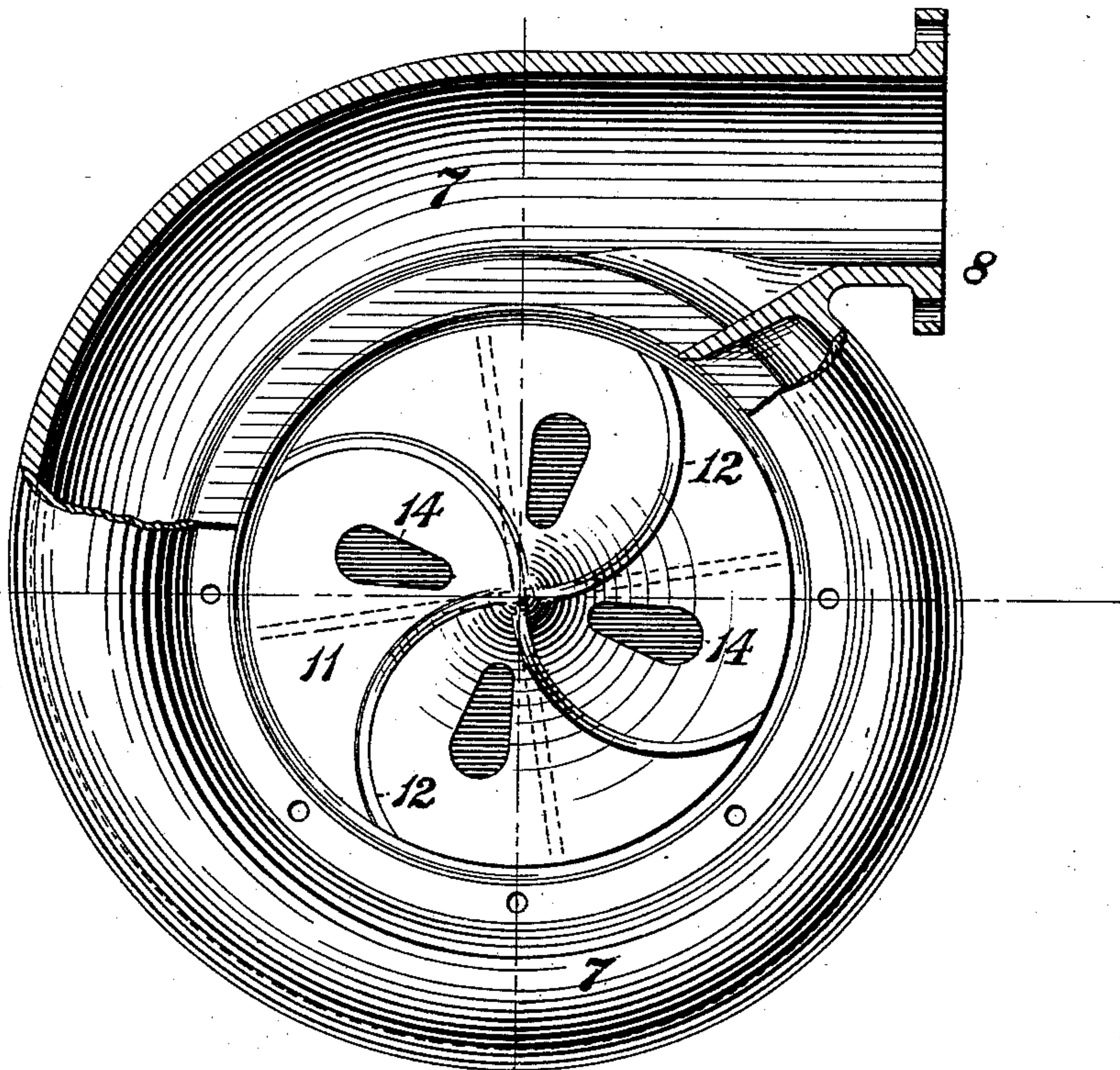
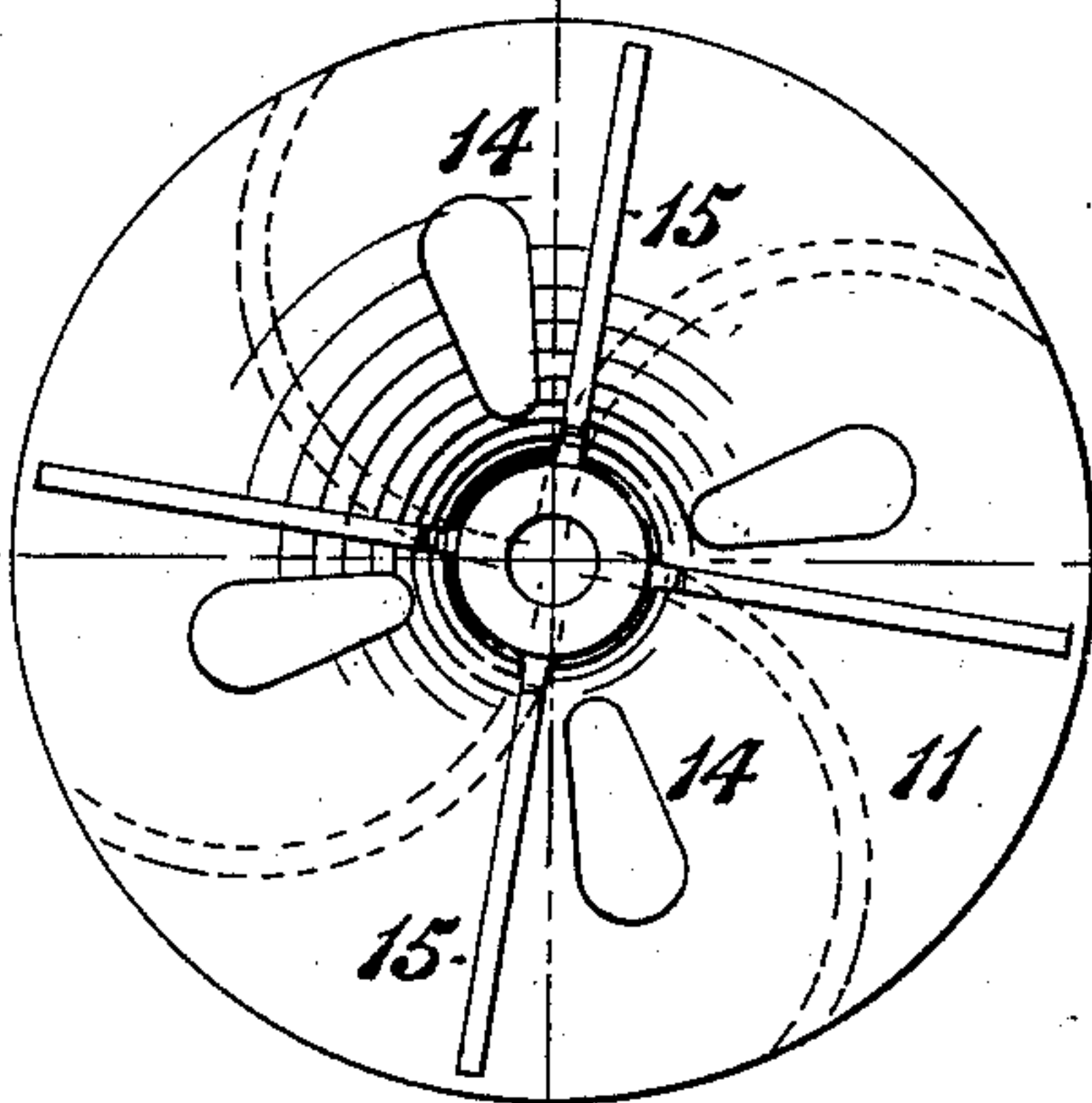


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN RICHARDS, OF SAN FRANCISCO, CALIFORNIA.

CENTRIFUGAL PUMP.

SPECIFICATION forming part of Letters Patent No. 359,096, dated March 8, 1887.

Application filed April 27, 1886. Serial No. 200,299. (No model.)

To all whom it may concern:

Be it known that I, JOHN RICHARDS, residing at San Francisco, in the county of San Francisco and State of California, a citizen of the United States, have invented or discovered certain new and useful Improvements in Centrifugal Pumps, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a side view, partly in longitudinal central section, of a centrifugal pump embodying my invention; Fig. 2, a plan view of the main bearing of the runner-shaft and its supporting-sleeve; Fig. 3, a side view, partly in section, of the pump-casing and wheel or runner with the inlet-cover removed; and Fig. 4, a view in elevation of the wheel as seen from the opposite side.

My invention relates to centrifugal pumps for raising liquids; and its object is to effectually prevent side-thrust upon the wheels or runners thereof, as well as to protect the shaft-bearings from sand, grit, or other foreign matter passing through the pump which is of such character as to tend to injure the bearings.

To these ends my invention, generally stated, consists in a pump-wheel formed of a continuous conical disk or body having a series of blades or vanes on each of its sides, and perforated to admit of the passage of a portion of the water upon which it acts from one of its sides to the other; also, in an improved main bearing consisting in a divided shell or socket having a packing-chamber adjoining the wheel-casing, and an annular bearing-sleeve fitting adjustably in the socket, and serving both to support the shaft or spindle and to compress the packing in the chamber. The improvements claimed are hereinafter fully set forth.

In centrifugal pumps constructed under my invention the water is permitted to enter the pump-casing upon one side of the wheel or runner, and is deflected to the periphery of the casing without causing side-thrust on the wheel. The body of the wheel is substantially continuous from its eye or hub to its periphery, and is conical in form, so that the water on entering the casing is directed by its wings or blades in easy curves from the cen-

ter outwardly. Perforations in the disk or body allow the passage of a portion of the water from its inlet or outer side to its opposite side, which is likewise provided with blades, so that a simultaneous and practically equal centrifugal action is induced on both sides of the disk with unequal volumes of liquid, the quantity passing through the perforations of the disk being only sufficient to balance the wheel without impairing or interfering with the free movement of the main volume of water, which is deflected in an easy course on the inlet side of the wheel. In this manner the action of the wheel is balanced without the necessity of the usual double inlets, one at each side of the pump, and the liability to obstruction from roots, grass, and other débris is greatly reduced, while the various parts are rendered more accessible. I further provide a construction by which bearings for the pump-spindle on the suction side are avoided, and ample bearing-surface well protected from access of the liquid passing through the pump and the foreign matters contained therein is afforded.

In the practice of my invention I construct a substantial base or bed plate, 1, adapted to be fixed by holding-down bolts 2 and nuts 3 to any suitable foundation. The pump-casing is composed of a vertical plate or disk, 4, secured by bolts 5, passing through its bottom flange, 6, to the bed-plate 1, and a volute-formed channel or passage-way, 7, having a flanged end, 8, to which the delivery or discharge pipe is bolted, and connected to the periphery of the vertical casing-plate 4. The opposite side of the casing is closed by an inlet-cover, 9, of dished or conical form, having a central opening communicating with the inlet or suction pipe 10.

The wheel or runner 11 of the pump is in the form of a curved or dished plate or disk, which is substantially continuous from its eye or hub to its periphery, and is curved conformably with the inlet-cover 10, in order that its blades or wings may more perfectly deflect outwardly the water entering from the suction-pipe through the central opening of the inlet-cover, and to prevent the impingement of the water against any obstruction to the

line of its movement. A series of blades or vanes, 12, is formed or fixed upon the side of the runner nearest the inlet-cover, by the action of which upon the water in the rotation of the runner a rotary motion is given to the water, which is thrown out into the volute passage 7, and discharged from the delivery end thereof with such force as may be determined by the speed of the pump. In addition to its function of properly directing the movement of the entering water, the continuous curved body of the runner serves to support and strengthen the vanes 12, which might otherwise be broken by obstructions caused by solid matter drawn from time to time into the casing, as is frequently the case when the so-called "wing" or open runners are employed.

The runner is fixed upon one end of a horizontal shaft or spindle, 13, which passes freely through the vertical casing-plate 4, and is supported in bearings located on the opposite side thereof, as presently to be described. A series of openings or perforations, 14, is formed in the body of the runner, through which a portion of the water may pass from the inlet to the opposite or rear side of the runner, which carries a series of supplemental blades or vanes, 15, working in the space or chamber 16 behind the body of the runner, and between the same and the casing-plate 4.

The diameter of the runner is slightly less than that of the inner face of the casing-plate, so that a narrow discharge-aperture, 17, is provided between the periphery of the runner and said plate. That portion of the water which passes through the perforations 14 into the chamber 16 is there acted upon by the rear vanes, 15, and passes thence through the discharge-aperture 17 into the volute channel 7, and therefrom to the general discharge, as in a double-inlet pump, with the difference that in this case the major portion or main volume of the water passes directly from the vanes of the inlet side of the runner into the passage 7, as before stated, and a plate or disk runner, which is balanced as against lateral thrust, is provided.

The action of the water on the rear side of the runner in effecting such balancing thereof may be understood by reference to Fig. 1. It will be seen that if the runner were not perforated the water would pass around its periphery at x into the chamber 16, which would become charged with water at the same pressure as the volute discharge-passage 7. With a runner of twenty-four inches diameter and the pump working against a head of twenty feet, the back of the runner would be subjected to a pressure of four thousand pounds, which would induce an end-thrust too great to be well resisted by the spindle-bearings. Where, however, the water is allowed to enter through openings in the body of the runner, as described, a centrifugal action is instituted in rear as well as in front of the runner, as indicated by the arrows, the intensity being the same on

both sides, but the volume being regulated by the area of the discharge at 17. If this space be made one-sixteenth of an inch in width its area with a runner twenty-four inches in diameter will be approximately five inches, and if the main discharge at y into the channel 7 equals one hundred inches area, then one-twentieth of the water would pass to the rear of the runner and nineteen-twentieths follow the curve at its front or inlet side, passing directly into the passage 7. The lateral thrust upon the wheel or runner is thus balanced by instituting similar centrifugal action upon different volumes of liquid on both sides of the runner, the amount passing through the same being limited to that requisite for a proper balance.

The shaft or spindle 13 of the runner is supported in bearings which are fully protected from exposure to the water or other liquid which is being pumped, and are thus exempt from liability to injury by contact with the same or with contained foreign matters. To this end a nipple or socket, 18, which serves both as a bearing-support and a packing-chamber, is cast centrally upon the rear side of the casing-plate 4, and a removable sleeve or socket, 19, which forms an extension of the socket 18, is secured firmly thereto by bolts 20, passing through end flanges on the sockets 18 and 19. A narrow collar, 21, is fitted around the spindle adjacent to the plate 4, to support the spindle at this point when the main bearing is withdrawn, and the space within the socket 18 on the rear side of the collar 21 is filled with any suitable packing, 22, for the purpose of preventing the leakage of water outwardly from the pump-casing or the inlet of air thereto.

A long sleeve or tubular main bearing, 23, fits around the spindle 13 within the socket 19, and performs the additional function of a gland for compressing the packing 22, being made longitudinally adjustable by clamping-bolts 24, fixed in an end flange on the socket 19, and provided with nuts 25, bearing against lateral flanges 26 on the main bearing. It will be seen that the interposition of the packing between the pump-casing and main bearing obviates the wear and deterioration of the latter resultant upon the access of water or sand and grit carried therewith. The main bearing and its supporting-socket can be readily removed and replaced, as desired, for the insertion of packing. The spindle carries a suitable driving-pulley, 27, and its outer end is supported in a bearing, 28, on the bed-plate.

I am aware that centrifugal pumps having their inlets on one side were known prior to my invention; but as heretofore constructed they have either been provided with open runners or, if disks were employed, the latter were subject to end-thrust equal to the duty of the pump. Open runners are objectionable for the reason that the water passes between the vanes and impinges against the cas-

ing, and the area of the water-duct being increased at this point the water gives off its air, which causes irregular working. In the case of inclosed runners, as set forth in Letters Patent No. 314,878, granted and issued to me March 31, 1885, the lateral thrust on the runner can be utilized or counteracted by the weight of a driving-shaft when the runner rotates in a horizontal plane; but such result is not attainable in pumps having a horizontal shaft.

The provision of an inlet upon one side of the casing admits of ready access to its interior, and it is obviously desirable to avoid extending the spindle across the suction-pipe and providing a bearing in the removable plate or pipe.

I claim herein as my invention—

1. In a centrifugal pump, a wheel or runner having a curved or dished perforated body and a series of blades or vanes on each side thereof, substantially as set forth.

2. In a centrifugal pump, the combination of a wheel or runner having a perforated body and a series of blades or vanes on each of its sides and a casing having an inlet on one of its sides, substantially as set forth.

3. In a centrifugal pump, the combination of a wheel or runner having a perforated body and a series of blades or vanes on each of its sides, a casing having an inlet on one of its

sides, and a discharge-passage communicating with the casing on the inlet and the rear sides of the runner through passages of larger and smaller areas, respectively, substantially as set forth.

4. In a centrifugal pump, the combination of a casing having a suction-pipe connected to one of its sides, a wheel or runner secured upon a shaft passing through the opposite side of the casing, an external socket or chamber fixed upon the casing, a removable sleeve or socket connected to the outer end of the fixed socket, and a main bearing surrounding the shaft and fitting within the removable socket, substantially as set forth.

5. In a centrifugal pump, the combination of a casing, a suction-pipe connected to one side thereof, an external socket or chamber fixed upon the opposite side thereof and composed of two sections connected by bolts, a main bearing fitting in said socket and connected adjustably to the outer section thereof by clamping-bolts, and a wheel or runner fixed on a shaft passing through the casing and main bearing, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JOHN RICHARDS.

Witnesses:

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R. H. WHITTLESEY.