No. 678,199.

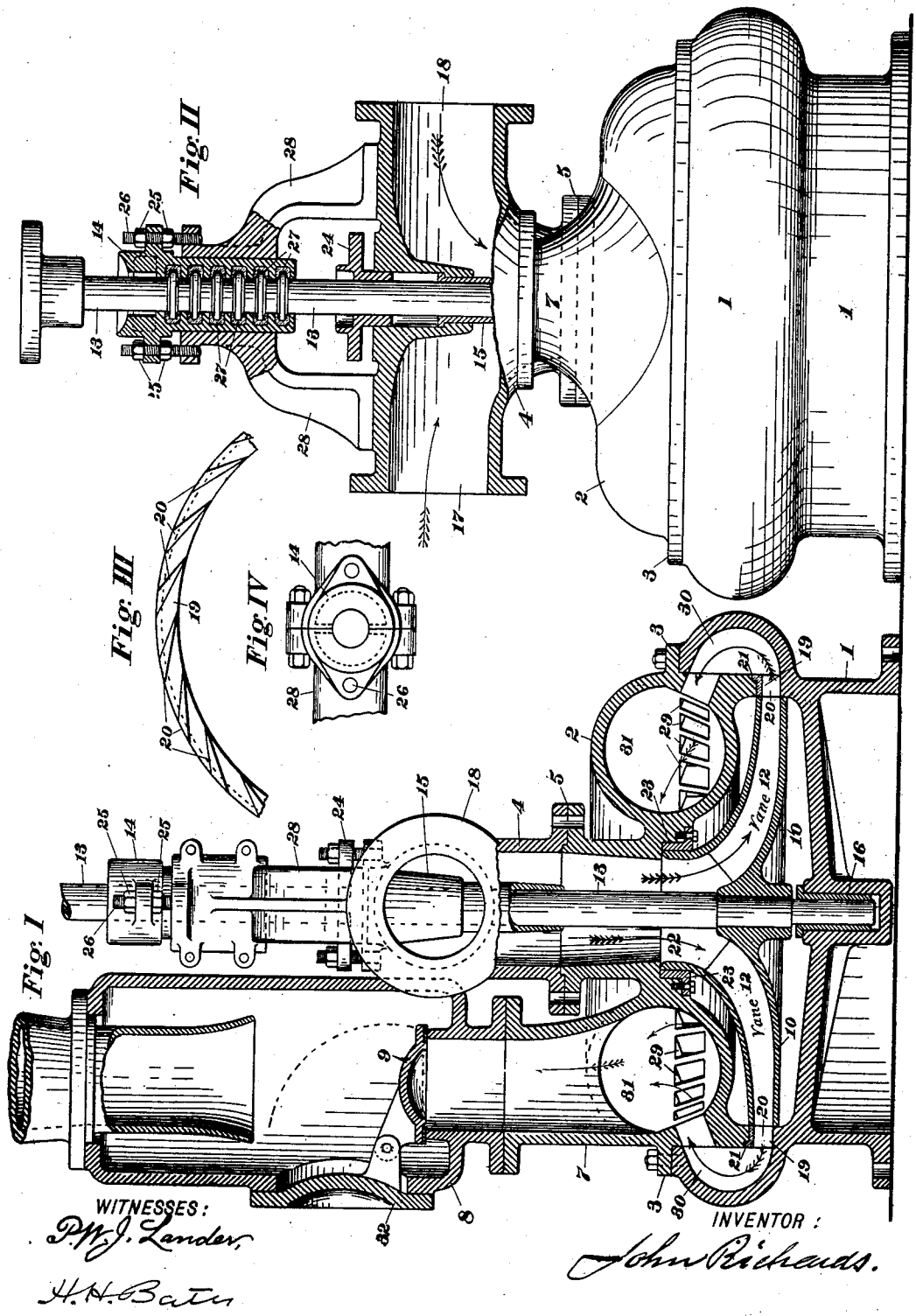
Patented July 9, 1901.

J. RICHARDS.

CENTRIFUGAL PUMP.

(Application filed Feb. 21, 1901.)

(No Model.)



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JOHN RICHARDS, OF SAN FRANCISCO, CALIFORNIA.

CENTRIFUGAL PUMP.

SPECIFICATION forming part of Letters Patent No. 678,199, dated July 9, 1901.

Application filed February 21, 1901. Serial No. 48,357. (No model.)

To all whom it may concern:

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

This invention relates to centrifugal pumps, and especially to those of the vertical class, such as are employed to raise water from pits or shafts, and to certain useful improvements in such pumps.

The improvements consist in constructive features that diminish the extreme lateral dimensions of such pumps, in means to remove and renew perishable parts, a disposition of the discharge-chamber within the diameter of the impeller, and various features of a constructive and operative nature hereinafter fully described, and illustrated by drawings herewith, forming a part of this specification.

The objects of the improvements are to reduce the lateral dimensions of the structure; to permit erection in narrow shafts and pits; to provide a free and curved waterway from the impeller to the discharge-chamber; to adjustably support the impeller and its shaft, so the former can be kept in register with the discharge-throat; to provide renewable diffusing-vanes removable from the top, and to secure ready access to the various parts; also, other objects, as will hereinafter appear.

Referring to the drawings, Figure I represents a central vertical section through a vertical centrifugal pump embodying my improvements. Fig. II is a view of the same pump at a right angle to Fig. I, partially in section and the air vessel removed; Fig. III, a plan view of a portion of the diffusing or throat ring around the impeller, and Fig. IV is a top view of the upper spindle-bearing.

Although the pump illustrated is described as "centrifugal," the manner of its operation is to a great extent by impact, as in the case of a turbine, which demands acute diffusing-vanes around the impeller, acting as guides to direct the water in a way to utilize its tangential energy in the fullest manner possible. The main housing or casing consists of a base part 1 and the superimposed discharge-chamber 2, held together by a bolted flange 3, and the inlet-chamber 4, attached to the part 2 by flanges 5, as shown in Fig. I. The discharge-chamber 2 is provided with a discharge-nozzle 7, an air vessel 8, and check-valve 9, the latter being required in charging the pump by exhausting the air therefrom; also, to prevent the water from running back when the pump is stopped.

10 is the impeller, provided with vanes 12 in the usual manner, and 13 the driving spindle or shaft, supported at the top in the adjustable thrust-bearing 14 by the intermediate bearing 15 and at the bottom in the bearing 16.

Two inlet-nozzles 17 and 18 are provided, so that in drawing water from wells two or more suction-pipes can be connected to these nozzles, the water entering at one or both.

The diffusing-ring 19 has a solid plate at one side and a series of acute vanes 20, that when the ring is inserted fit down upon the base part 1, as shown in Fig. I. Said ring is removable for purposes of renewal. The vanes 20 are wedge-shaped partitions bounded by straight lines and are set at an inclination to the radius of the ring with their points inward to meet with least resistance and their sides divergent, so as to form straight-sided passages between them from the impeller-vanes to the curved passage-way 21, leading to the discharge-chamber, approximating a tangential direction. This diffusing-ring 19 is set to register with the discharge-way of the impeller and is held concentric therewith by means of ledge 21, that fits into a seat around the part 2, by means of which this ring is clamped and held in contact with the base part 1, as shown in Fig. I.

The driving shaft or spindle 13 is made of such a size that its weight with various rotary parts attached thereto will equal at all heads the upthrust upon the impeller 10, equal to the area of the inlet-nozzle 22 multiplied by the discharge-pressure. This upthrust is due to the fact that the running joint at the periphery of the impeller is not and cannot be made a tight one, and consequently the spaces above and below the impeller are filled with water at discharge-pressure.

A renewable ring 23 is fitted around the inlet-nozzle to permit renewal in case of wear,

and a packing-gland 24 is provided to prevent the entrance of air or the escape of water around the spindle 13.

The upper spindle-bearing 14 is provided for vertical adjustment by means of the screw-nuts 25 on the studs 26, is split, as indicated in Fig. IV, and recessed to receive the collars 27 on the spindle 13, as shown in Fig. II, which collars serve to retain the impeller 10 in register with the diffusing-vanes 20. The bearing 14 is held in the brackets 28, mounted on the inlet-nozzles 17 and 18, and each half of this bearing 14 being separately adjustable the collars are prevented from movement upward or downward, one-half of their area being sufficient to resist the thrust, also the weight of the rotary parts, until the pump is started and hydraulic upthrust begins.

The discharge-chamber 2 is placed above and within the circumference described by the impeller 10 and is provided with a series of inlet-passages 29, that register with the annular curved discharge-way 30, leading from the impeller 10 to the chamber 31.

The check-valve 9 is attached to and removable with the cover 32, so as to be conveniently repaired if the seating is worn by sand that is discharged with water drawn from deep wells.

Having thus described the nature and objects of my invention and the manner of its application in practice, I claim as new and desire to secure by Letters Patent—

1. In a centrifugal pump, a base-casing, a central impeller-shaft stepped into and within said casing, a rotary incased impeller on said shaft, in said casing, a central inlet-way to said rotary impeller, an annular discharge-chamber surrounding said inlet-way, outside of said casing, but within the diametral limits thereof, and a curved annular discharge passage-way, surrounding both casing and discharge-chamber, forming a circumferential communication between the discharge-aperture of the impeller and the said discharge-chamber, substantially as specified.

2. In a centrifugal pump, a base-casing, a central impeller-shaft stepped into and within said casing, a rotary incased impeller on said shaft, in said casing, a central inlet-way to said rotary impeller, an annular discharge-chamber surrounding said inlet-way, outside of said casing, but within the diametral limits thereof, a curved annular discharge passage-way surrounding both casing and discharge-chamber, forming a circumferential communication between the discharge-aperture of the impeller and the said discharge-chamber, and a removable annular diffusion-ring having forwardly-inclined passages separated by wedge-shaped vanes or partitions, inserted between the discharge-aperture of the impeller and said curved discharge passage-way, substantially as specified.

3. In a centrifugal pump, a base-casing, a central impeller-shaft stepped into and within said casing, a rotary incased impeller on said shaft, in said casing, a central inlet-way to said rotary impeller, an annular discharge-chamber surrounding said inlet-way, outside of said casing, but within the diametral limits thereof, a curved annular discharge passage-way surrounding both casing and discharge-chamber, forming a circumferential communication between the discharge-aperture of the impeller and the said discharge-chamber, and a peripheral outlet to the said discharge-chamber, on which is mounted an air vessel, containing a removable check-valve, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN RICHARDS.

Witnesses:
J. JEROME LIGHTFOOT,
HENRY H. BATES.