No. 687,852. Patented Dec. 3, 1901.

J. RICHARDS.

WATER IMPELLING APPARATUS.

(Application filed Sept 13, 1900.)

(No Model.)

Fig. III.

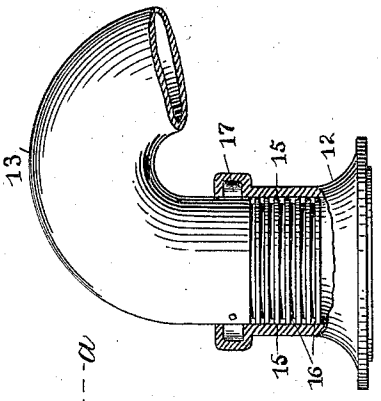


Fig. I.

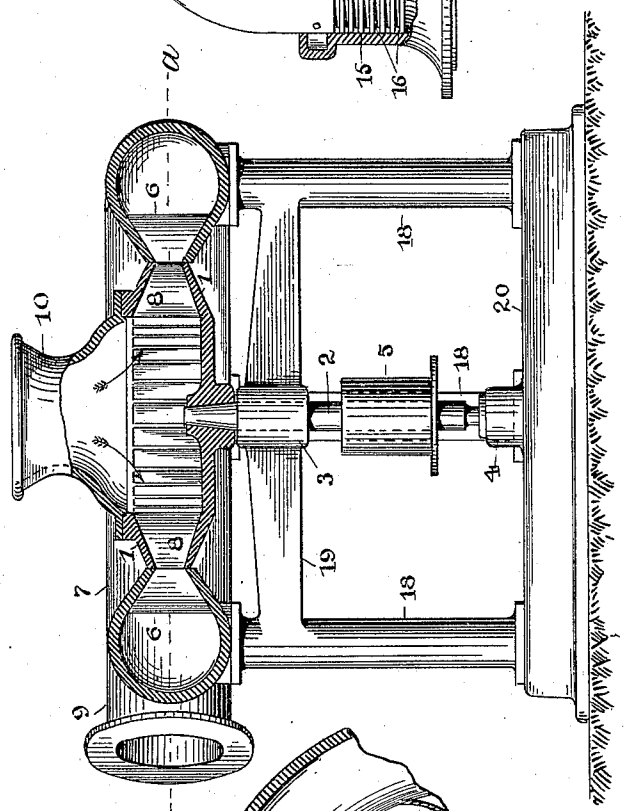
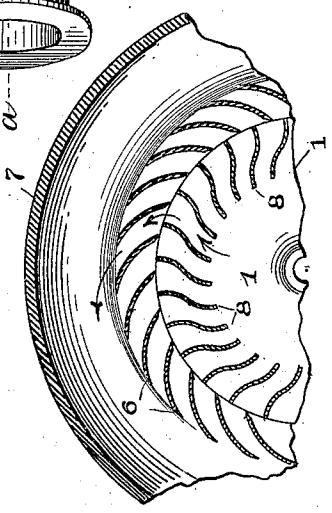


Fig. II.



Witnesses.

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UNITED STATES PATENT OFFICE.

JOHN RICHARDS, OF SAN FRANCISCO, CALIFORNIA.

WATER-IMPELLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 687,852, dated December 3, 1901.

Application filed September 13, 1900. Serial No. 29,882. (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 and State of California, have invented certain new and useful Improvements in Water-Impelling Apparatus; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to water-impelling apparatus operating mainly by impulse or mechanical force applied through rotative means in conjunction with moving and fixed throat-vanes, but aided at considerable or high speeds by centrifugal force.

My invention consists, essentially, in two circular chambers, one fixed and the other revolving, each provided with converging throatways that register one with the other at the points of convergence, in which throatways are located a plurality of vanes that first impel, then guide, intercept, and prevent backflow of water discharged from the rotary into the fixed chamber, corresponding in some features to those of a centrifugal pump and constructively also to a turbine water-wheel, but acting differently from either of these.

The objects of my invention are to adapt rotative pumps of this type to run at variable speeds and at a slower rate than centrifugal pumps, also to operate at low heads or pressures and without inclosing the rotary or impelling chambers by the usual casing, said rotary chamber being either submerged in water or surrounded by air alone, the construction and operation being such that no backflow from the receiving or discharge chamber will take place and no static pressure is required to prevent such backflow. To attain these objects, I provide apparatus, as shown in the drawings herewith, forming a part of this specification.

Figure I represents a side elevation, partly in section, of a machine constructed to embody my improvements. Fig. II is a section on the line *a a* in Fig. I through a portion of the impelling and receiving chambers to show the disposition of the vanes therein. Fig. III is a suction-nozzle to raise water to the impelling-chamber when the supply is at a lower level.

In raising and impelling water by centrifugal force it is well known that the water in revolution must be given a rotative speed in excess of the falling velocity of the fluid produced by the head and pressure to be overcome. For example, a head of twenty-five feet requires a velocity of two thousand five hundred to three thousand feet per minute. It is also known that in machines of this kind depending on centrifugal action alone the impelling wheel or chamber is usually inclosed in a close casing that will sustain the discharge-pressure to prevent backflow of fluid from the discharge-chamber, causing an expensive construction and rendering the operating parts difficult of access. By introducing between the rotary or impelling chamber and the receiving or discharge chamber oppositely-converging throatways, which increase the velocity of the water at that point, and providing in these throatways a plurality of vanes that divide the water into thin sections or streams at that point I am enabled to greatly reduce the velocity of the impelling-chamber below that required in centrifugal pumps, making its action mainly impulsive or mechanical, similarly to a turbine water-wheel acting inversely, and operative, therefore, for normal duty at one-half the falling velocity of the head and at about one-half the speed of a centrifugal pump. At higher velocities the action will remain the same; but the volume of the water discharged will be proportional, and the apparatus will become in a great degree positive in its action. This manner of operating is attained by apparatus as shown.

The revoluble impelling-chamber 1 is mounted on a spindle 2, having bearings 3 and 4, and is driven by a band on the pulley 5 or in any other suitable manner. The interior of the chamber 1 contains a central or collecting space, and around this is an outwardly-converging throatway, in which are a series of curved vanes 8, preferably more than one vane for each inch of the chamber's outside diameter. These vanes set the water in revolution, and when it has reached its maximum velocity, rotary and also radial, I discharge it into the oppositely-converging

throatway of the discharge-chamber 7, with which said impelling-chamber is in running contact. The throatway of the discharge-chamber 7, as shown in Fig. I, which is converged the reverse of that in the impeller 1, is also provided with a series of vanes 6 equal to or more in number than those in the revoluble chamber 1. These vanes 6 guide the water tangentially around the interior of the chamber 7, from which it is discharged by the nozzle 9 in the usual manner. The principal purpose or function of the vanes 6 and 8 is to prevent the backflow of water by resistance of the head or discharge pressure. If there are forty of these in each of the converging throats and the chamber 1 is revolving at a speed of three hundred revolutions in a minute, these vanes pass each other and cut off the streams of water two hundred times in each second and also by their relative position and shape and by the aid of centrifugal force push or impel the water outward without backflow or escape between the chambers 1 and 7, which fit together as nearly as possible to not have actual contact.

The impelling-chamber 1 can be mounted on a vertical spindle, as in the present drawings, or on a horizontal one, to suit the requirements of erection and use, and in the former case when the water-supply is from a head higher than the chamber an inlet-nozzle 10 is attached to this impelling-chamber 1 and revolves therewith.

If the supply-water has to be raised by suction, there is required either a packed or a water-sealed joint between the fixed and running parts of the suction-way. Such a joint is shown in Fig. III, this form being preferable to one having fibrous packing, because there is no frictional resistance between the fixed and moving parts.

In Figs. III, 12 is a nozzle corresponding to 10 in Fig. I, and 13 is a suction-pipe. Water can be led from the pipe 13 through a perforation or perforations for that purpose to supply water in the annular chamber 17 to seal the running-joint at 15 against the entrance of air, and baffling-grooves 16 are formed in either the nozzle 12 or the suction-pipe 13, or in both, to prevent the passage of air or water.

The framing is represented in the present case by a base 20, supports 18, and the girder 19, but may be of any suitable arrangement and design that will support the fixed and running parts and maintain the necessary concentricity and alinement.

In case the rotating or impelling chamber 1 is to be submerged it should be inverted, so that the inlet-nozzle 10 will be at the bottom, in which case the shaft would be above.

While it is difficult to indicate by constructive features the manner of operating herein described, it will be understood that the centrifugal force of the water contained in the chamber 1 is in this device only an auxiliary force, and the rate of revolution is not therefore governed by the head or resistance and fixed, as in a centrifugal pump, but can be varied to suit the volume of water to be raised or impelled or for any other reason.

I am aware that centrifugal pumps have been made with uninclosed impellers and with converging throats having vanes therein, and do not claim such construction; but

What I do claim, and desire to secure by Letters Patent, is—

1. In water-impelling apparatus, a revoluble uninclosed chamber having an inlet-nozzle, an outwardly-converging throatway, and a series of vanes therein, in combination with a surrounding annular receiving or discharge chamber having a similar but oppositely-converging throatway also provided with a series of vanes therein, said throatways being in running contact at the point of convergence, substantially as specified.

2. In water-impelling apparatus, an uninclosed rotary impeller arranged in the air and without pressure on its sides, an inlet-nozzle thereto, a supply-pipe fitting within said nozzle, grooved around its periphery, and an annular chamber on the nozzle around the pipe, for containing water to seal the joint, substantially as specified.

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

JOHN RICHARDS.

Witnesses:
LOUIS C. CHRISTIE,
ELMER WICKES.