A. E. GUY.

CENTRIFUGAL PUMP.

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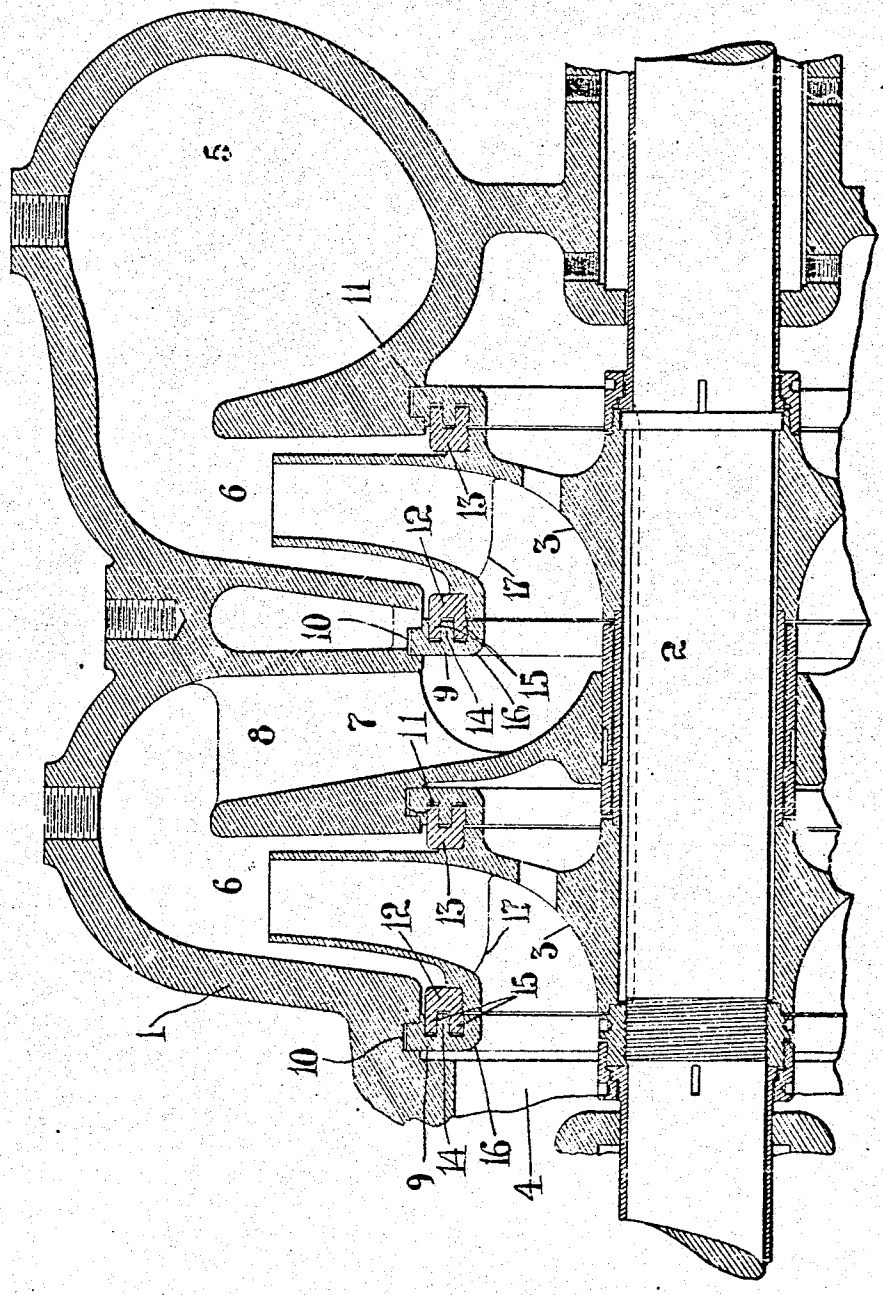
972,366. Patented Oct. 11, 1910.



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CENTRIFUGAL PUMP.

972,366. Specification of Letters Patent. Patented Oct. 11, 1910.

Application filed April 10, 1909. Serial No. 489,187.

To all whom it may concern:

Be it known that I, ALBERT E. GUY, a citizen of the United States of America, and a resident of Trenton, county of Mercer, State of New Jersey, have invented certain new and useful Improvements in Centrifugal Pumps, of which the following is a specification.

My invention relates to improvements in centrifugal pumps and particularly to improvements in the wearing rings of such pumps; and my invention comprises wearing rings on the external wall of the inlet portion of the impeller and complementary wearing rings in the corresponding portion of the pump casing, said rings having intermeshing flanges coacting to reduce leakage.

My invention also comprises a novel construction of stationary wearing rings, whereby the same serve as nozzles to conduct the liquid to the impeller, with a minimum of fluid resistance, fluid friction, etc.

Other features of my invention are hereinafter described and pointed out in the appended claims.

The object of my invention is to improve centrifugal pumps, and particularly to increase the efficiency of such pumps.

I will now proceed to describe my invention with reference to the accompanying drawing, in which I have shown a fragmentary axial section of a centrifugal pump embodying my invention.

In the said drawing, 1 designates the pump casing, 2 the shaft of the pump, and 3, 3 impellers mounted on said shaft. The number of these impellers is immaterial to the present invention, and the pump may be constructed in one or in as many stages as may be desired; the particular pump illustrated being a two-stage pump. The pump may be understood to have the usual admission duct, of which 4 in the drawing indicates the inner portion.

5 designates the usual discharge duct.

The impellers 3 are of substantially the usual construction. The pump casing comprises passages 6 into which the two impellers discharge, the first of these passages 6 leading to a return bend passage 7 which in turn leads to the inlet of the second impeller; while the second passage 6 leads to the discharge duct 5. The particular structure shown embodies features set forth in my application Sr. No. 444,345, filed July 20, 1908, in that the chambers 6 into which the impellers discharge, are of materially greater cross sectional area than the discharge area of their impellers, respectively, such passages increasing progressively in area from the impeller outward, and being unobstructed; the purpose of this construction being that the kinetic energy of the liquid discharged from the impeller shall be converted into potential energy with as little churning of the liquid as possible, the velocity of the liquid being low by the time such liquid has reached the point where the passage changes direction. In the return passage 7 I provide the usual stationary vanes 8.

Numerals 9 designate stationary wearing rings seated in suitable grooves 10 in the casing and located just in advance of the impeller entrances; and numerals 11 designate similar stationary wearing rings located at the backs of the impellers and likewise seated in grooves in the pump casing.

Numerals 12 designate rotary wearing rings mounted upon the external walls of the inlet portions of the impellers, on the entrance sides thereof, and numerals 13 designate similar rotary wearing rings mounted on the rear sides of the impellers. The rings 9 and 12 have intermeshing flanges 14 and 15 respectively, forming tortuous passages which restrict and reduce to a minimum leakage of liquid. The stationary wearing rings 9 have substantially the same internal diameter as that of the entrances of the impellers, and are located just in advance of these impellers, and hence serve as nozzles to lead the liquid to the impellers. These wearing rings 9 also have rounded edges 16 serving to reduce friction of the water moving to the impellers, to a minimum.

I am aware that heretofore wearing rings have been provided upon the external walls of the inlet portions of impellers, such rings coacting with other rings surrounding such impeller rings and the said inlet portions of the impellers. Such construction has important disadvantages as compared with the structure herein illustrated and described, certain of these disadvantages being that the inlet portion of the impeller is necessarily somewhat long and in its rotation produces churning of the water, shock, skin-friction, etc., to a far greater extent than in the construction shown and described herein; and a further objection to the prior construction

referred to, as compared with the construction herein illustrated and described, is that in such prior construction the wearing rings must fit very closely in order to prevent excessive leakage, whereas in the construction herein illustrated and described, owing to the labyrinthine nature of the passage between the two wearing rings the clearance between the rings may be greater without leakage exceeding the permissible minimum, and for this reason the impeller has greater freedom and there is less wear between the rings. I am also aware that it has been proposed heretofore to provide wearing rings in the sides of the chamber in which the impeller rotates, and to provide corresponding wearing rings on the adjacent rotating faces of the impeller; the disadvantages of such prior construction, as compared with the construction herein illustrated and described, being that the wearing rings are larger, for corresponding dimensions of pumps, and hence require more metal, and wearing surfaces are of greater area and the relative velocity between the wearing rings is greater, these conditions all causing greater friction and greater expense. Furthermore, such prior constructions as referred to, preclude the use of the stationary wearing rings as means for leading the liquid to the impellers, and hence for this reason the liquid is not led as easily to the impellers and with as little friction, churning, etc., as in the structure herein illustrated and described. It is quite desirable that as little rotation be imparted to the water as possible, prior to the water encountering the impeller vanes, which vanes are designated by numerals 17 in the accompanying drawing, hence the portion of the impeller through which the water passes before reaching such vanes should be very short; and the arrangement of wearing rings herein illustrated and described permits the introductory portion of the impeller to be very short.

A further advantage of the structure illustrated and described herein, as compared with that in which wearing rings are provided in the sides of the chamber, coacting with the side of the impeller or with wearing rings provided on the side of the impeller, is, that the impeller rings being smaller, for corresponding dimensions of pump, in the structure herein illustrated and described, the spaces for leakage are smaller and hence the leakage is less.

The impeller rings 10 and 13 are of similar form and dimensions to the rings 9 and 12 respectively, and, with respect to the prevention of leakage perform substantially the same functions, on the rear sides of the impellers, as are performed on the front sides of the impellers, by the rings 9 and 12.

In another application, filed June 10, 1909, Sr. No. 501,301, I have claimed certain features of the construction of the pump herein illustrated and described, which features are not herein specifically described or claimed, and relate to certain sleeves on the impeller shaft, and associated parts.

What I claim is:—

1. A centrifugal pump comprising in combination a casing, a rotary impeller therein having an inlet portion extending axially from the main portion of the impeller, a removable and renewable labyrinthine wearing ring mounted upon the external wall of the said inlet portion of the impeller, and another removable and renewable labyrinthine wearing ring carried by the casing and located in proximity to the end of the said inlet portion of the impeller and in proximity to the side of the wearing ring carried on said inlet portion.

2. A centrifugal pump comprising in combination a casing, a rotary impeller therein having an inlet portion extending axially from the main portion of the impeller, a removable and renewable labyrinthine wearing ring mounted upon the external wall of the said inlet portion of the impeller, and another removable and renewable labyrinthine wearing ring carried by the casing and located in proximity to the end of the said inlet portion of the impeller and in proximity to the side of the wearing ring carried on said inlet portion, said wearing rings provided with intermeshing flanges forming a tortuous passage between the rings to reduce leakage.

3. A centrifugal pump comprising in combination a casing, a rotary impeller therein, having an inlet portion extending axially from the main portion of the impeller, a wearing ring mounted upon the external wall of said inlet portion of the impeller, and another wearing ring carried by the casing and located in proximity to the end of said extended inlet portion of the impeller, and in proximity to the side of the wearing ring on such extended inlet portion, said casing comprising, in advance of the wearing ring, an admission space, the bore of said wearing ring of the casing of less diameter than said admission space and forming substantially a continuation of the entrance of the impeller, said wearing ring therefore serving as a nozzle to lead liquid to the impeller.

4. A centrifugal pump comprising in combination a casing, a rotary impeller therein, and an anti-leakage ring carried by the casing and located in proximity to the inlet portion of the impeller, said casing comprising an admission space in advance of said ring, the bore of said ring of less diameter than said admission space and forming substantially a continuation of the entrance of the impeller, and serving as a nozzle to direct liquid therein.

5. A centrifugal pump comprising in combination a casing, a rotary impeller therein, having an inlet portion extending axially from the main portion of the impeller, and an anti-leakage ring carried by the casing and located in proximity to the end of said inlet portion of the impeller, said casing comprising an admission space in advance of said ring, the bore of said ring of less diameter than said admission space and forming substantially a continuation of the entrance of the impeller, and serving as a nozzle to direct liquid therein, said bore being of tapering form to lead the liquid gradually to the impeller.

6. A centrifugal pump comprising in combination a casing, a rotary impeller therein having on its rear side an axially extending flange, a removable and renewable labyrinthine wearing ring mounted upon the peripheral wall of said flange, and another removable and renewable labyrinthine wearing ring carried by the casing and located in proximity to the side of said impeller wearing ring and coacting therewith.

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

ALBERT E. GUY.

Witnesses:
H. M. MARBLE,
FRANK E. RAFFMAN.