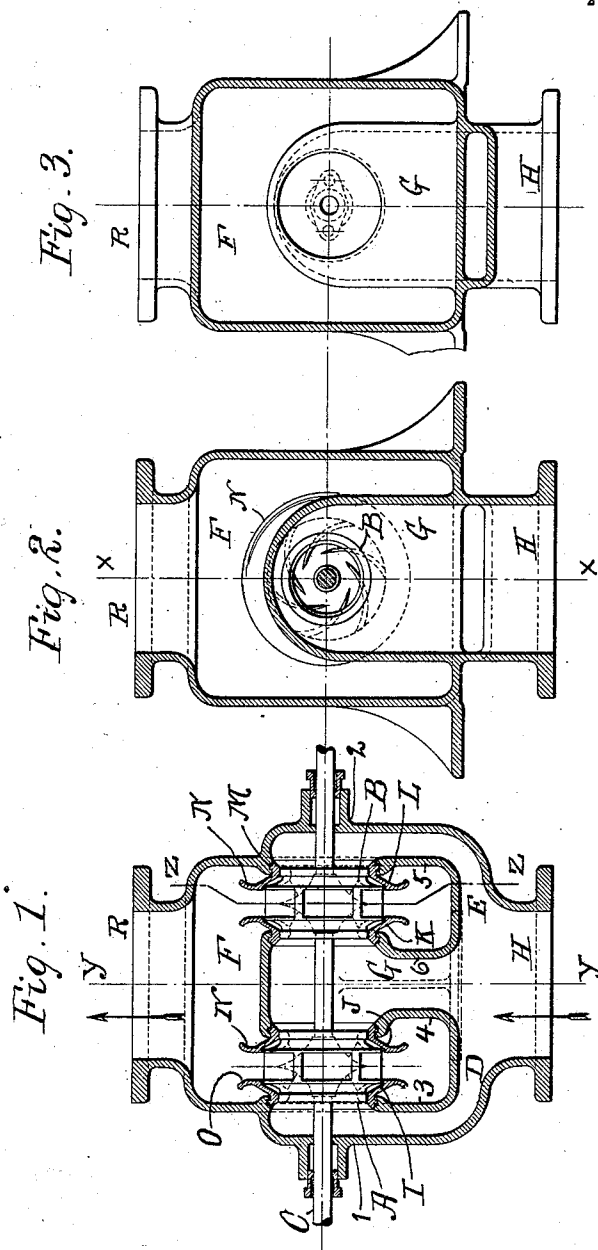


940,871.

A. E. GUY.
MULTIPLE IMPELLER PUMP.
APPLICATION FILED NOV. 13, 1907.

Patented Nov. 23, 1909.
2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 5.

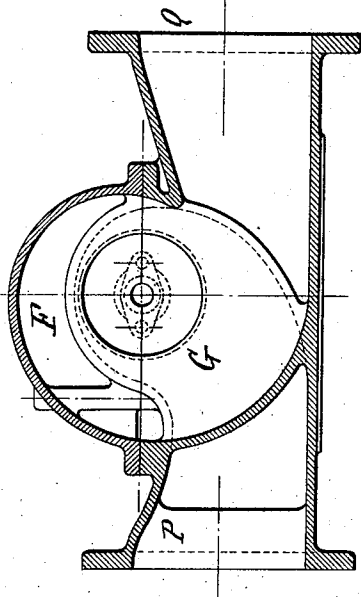


Fig. 7.

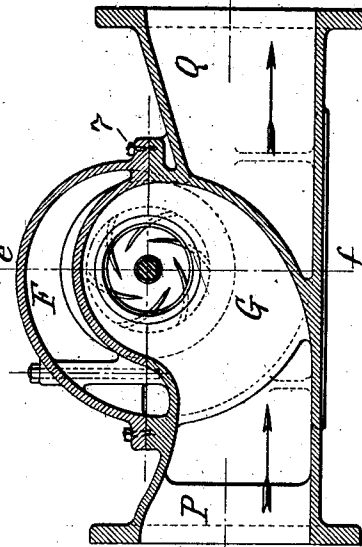


Fig. 4.

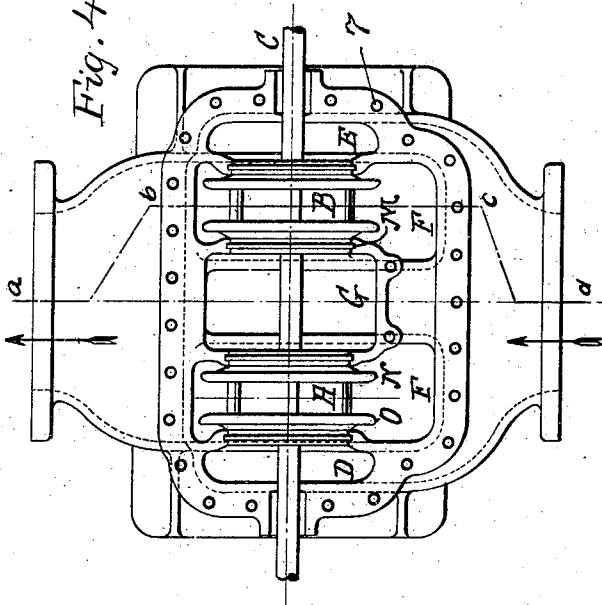
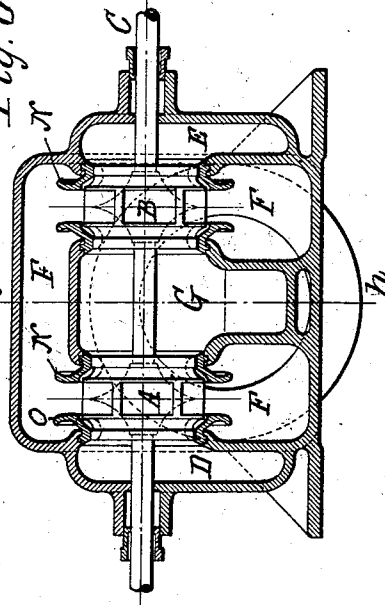


Fig. 6.



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UNITED STATES PATENT OFFICE.

ALBERT E. GUY, OF TRENTON, NEW JERSEY, ASSIGNOR TO DE LAVAL STEAM TURBINE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

MULTIPLE-IMPELLER PUMP.

940,871.

Specification of Letters Patent.

Patented Nov. 23, 1909.

Application filed November 13, 1907. Serial No. 401,930.

To all whom it may concern:

Be it known that I, ALBERT E. GUY, a citizen of the United States, residing at Trenton, in the county of Mercer and State of New Jersey, have invented a certain new and useful Improvement in Multiple-Impeller Pumps, of which the following is a specification.

The invention relates to multiple impeller pumps and consists in the combination in a multiple impeller pump of a plurality of impellers constructed to operate in parallel and having a common suction, a delivery chamber inclosing all of said impellers and receiving their simultaneous discharge and, within said chamber, means for transforming the kinetic energy of said discharge into pressure; also in the various combinations more particularly recited in the claims.

In the accompanying drawings—Figures 1, 2 and 3 represent a simple form of multiple impeller pump embodying my invention: Fig. 1 being a vertical section on the line *x x* of Fig. 2. Fig. 2 a vertical section on the line *y y* of Fig. 1 and Fig. 3 a section on the line *z z* of Fig. 1, the impeller being removed. Figs. 4 to 7 inclusive show a modified and commercially preferable form of the pump. Fig. 4 is a plan view, the upper separable portion of the stationary part being removed. Fig. 5 is a section on the line *a, b, c, d*, of Fig. 4, the impellers and diffuser rings being removed. Fig. 6 is a section on the line *e, f*, of Fig. 7, and Fig. 7 is a section on the line *g, h*, of Fig. 6.

Similar numbers and letters of reference indicate like parts.

Referring first to the form shown in Figs. 1, 2 and 3. The impellers A, B, are mounted upon the shaft C, which is journaled in the walls 1, 2, of the suction ducts D, E. Said ducts are disposed on each side of the delivery box F, which has an outlet at R. Entering said box is a third suction duct G. The three suction ducts D, E, G, form a suction chamber which communicates with the source of supply by the common inlet H. In circular openings formed respectively in the walls 3 of duct D and one wall 4 of duct E are seated two diffuser rings I, J and in said diffuser rings the impeller A is seated and rotates. In circular openings formed respectively in the wall 5 of duct E, and the opposite wall 6 of duct G are seated two diffuser rings K, L, and in said diffuser

rings the impeller B is seated and rotates. The pairs I, J, and K, L, of diffuser rings are alike. Each ring is provided with a circumferential rib M, which is seated in a groove in the opening of the wall of the duct, and with a circumferential flange N. The flanges N N of each pair of rings as I, J, flare outwardly at their inner circumferential edges O, so that an annular flaring space or nozzle is formed between the rings through which the delivery of the impeller passes before entering the box F. The pair of rings thus forms a diffuser which transforms the velocity of the discharge into pressure within the box and so avoids shock.

It will, of course, be understood, that the stationary portion of the machine may be made in removable sections so as to permit of introduction of the diffuser rings to their seats and one way of doing this is shown in Figs. 4, 5, 6 and 7, which illustrate also a preferable form of the apparatus. In this form the suction ducts D, E, G, communicate with the inlet duct P which is here horizontally disposed on one side of the box F, while the outlet duct Q is similarly disposed on the other side. The various fluid passages are curved to reduce friction and direct the flow without shock and the middle suction duct G is cast integrally with the box F. Said box with the suction ducts may be divided horizontally into two flanged parts united by bolts as shown at 7, in order to admit introduction of the rings and impellers.

In Letters Patent No. 907,040, dated December 15, 1908, and issued upon a copending application, I have described and claimed a pump comprising a plurality of double suction impellers arranged to rotate in a single discharge chamber and into which they discharge directly and normally to their axes, such discharge chamber being within a box adapted to receive interchangeable impellers of different design and different diameters to suit different conditions. Therefore I do not claim such invention herein.

It will be noted that the diffusers formed by the rings I and J contain no vanes such as have been commonly employed in diffuser passages heretofore used, my diffusers being entirely unobstructed. I have found that such diffuser vanes are a positive detriment. The several particles of the liquid after leav-

ing the impeller are caused to move in a curved path with a progressively decreasing velocity. If the curvature of the vanes of the diffuser corresponds exactly to this curved path of the stream of fluid such vanes are useless; while if said vanes are of any other curvature, they may, according to design, cause the direction of the water to be modified, but since in practice, pumps generally do not work constantly under fixed conditions of head and discharge, it follows that when these conditions vary the water leaves the impeller at a different angle from that for which the diffusing vanes were designed; thereby producing shock.

I claim:

1. A centrifugal pump comprising in combination a plurality of double suction impellers constructed to operate in parallel, a box having supply passages for said impellers, and having also a single discharge chamber inclosing all of said impellers, and unobstructed diffusers located between said impellers and discharge chamber and arranged to receive the discharge from said impellers radially and to deliver such discharge radially into said discharge chamber, said chamber having a free space outside of said diffusers into which the discharge from said diffusers may pass in a direction normal to the axes of the corresponding impellers, said box adapted to receive interchangeably impellers and diffusers of different design and different diameters to suit different conditions.

2. A centrifugal pump comprising in combination a shaft, a plurality of double suction impellers thereon, and a box having supply passages for said impellers and a single discharge chamber for said impellers and having, between said impellers and discharge chamber, unobstructed diffuser pas-

sages arranged to receive radial discharge from said impellers and to deliver such discharge radially into said discharge chamber, said chamber having a free space outside of said diffuser passages to receive such discharge and being adapted to receive interchangeably impellers and diffusers of different design and diameters to suit different conditions.

3. A centrifugal pump comprising in combination a rotary impeller, and a box having supply and discharge passages, and a diffuser interposed between the impeller and discharge passage comprising two rings each seated in a wall of said casing, each such ring and the corresponding portion of the wall having the one a groove and the other a rib fitted within said groove, whereby the rings are held in place, the space between said rings forming an annular diffuser passage receiving the discharge from the impeller and delivering same to the discharge passage.

4. A centrifugal pump comprising in combination a rotary impeller, and a casing having supply and discharge passages, and a diffuser interposed between the impeller and discharge passage comprising two rings each seated in a wall of said casing, each such ring and the corresponding portion of the wall having the one a groove and the other a rib fitted within said groove, whereby the rings are held in place, the space between said rings being unobstructed and constituting a diffuser passage.

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

ALBERT E. GUY.

Witnesses:

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PARK BENJAMIN, JR.