J. WILKINSON.
CENTRIFUGAL PUMP.
APPLICATION FILED MAY 29, 1908. RENEWED SEPT. 15, 1911.

1,013,248.

Patented Jan. 2, 1912.

3 SHEETS—SHEET 1.

Fig. 1.

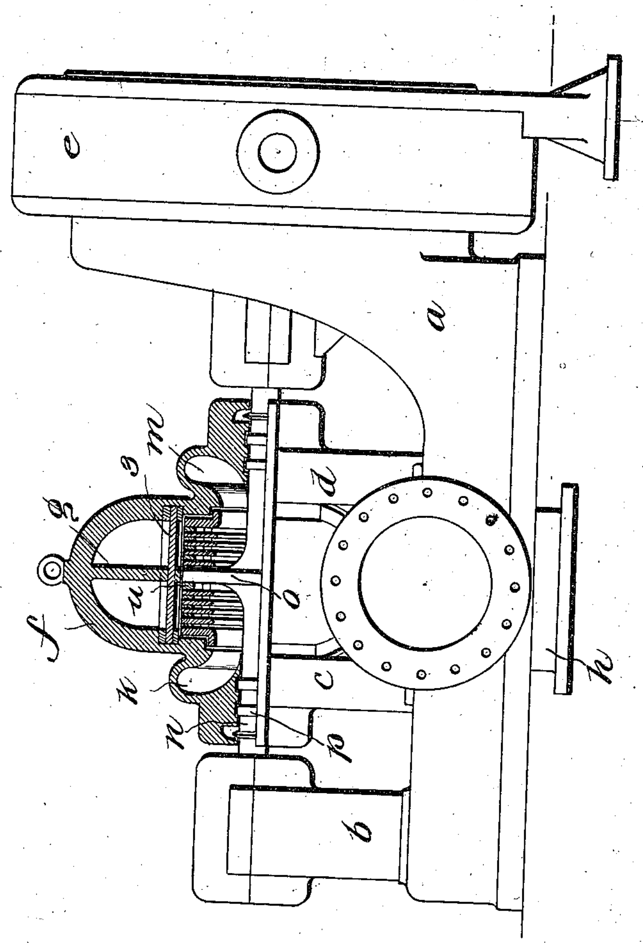
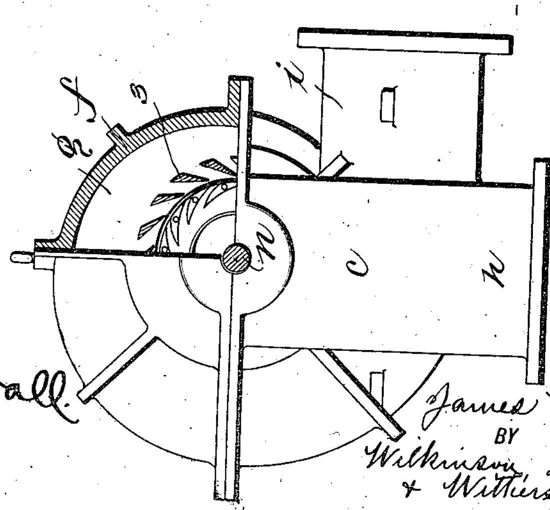


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 4.

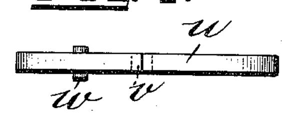


Fig. 3.

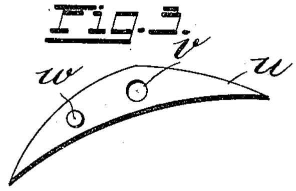


Fig. 6.

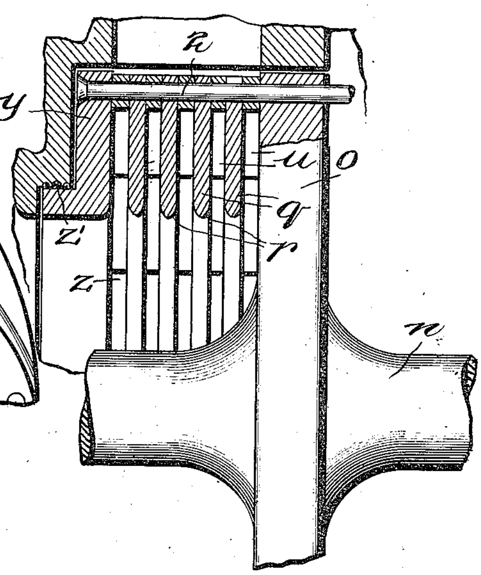


Fig. 5.

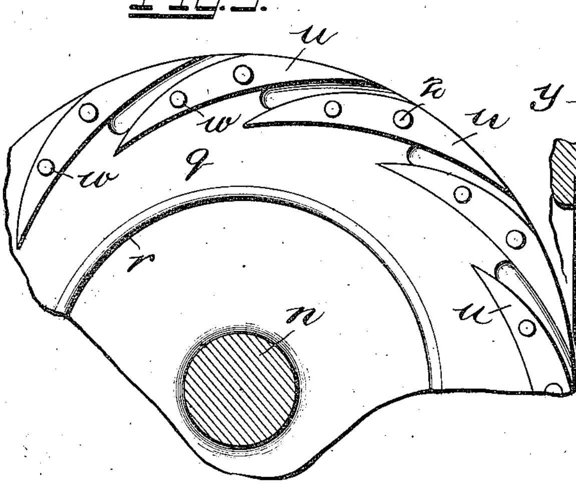


Fig. 7.

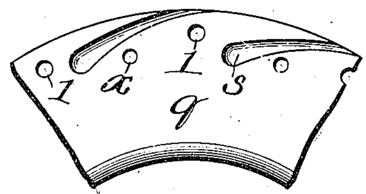
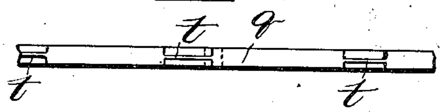


Fig. 8.



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3 SHEETS—SHEET 3.

Fig. 9.

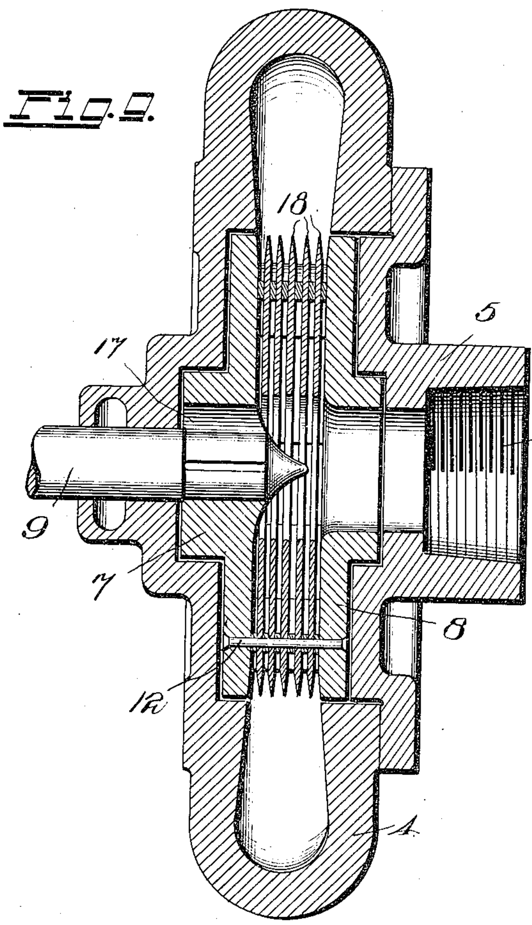
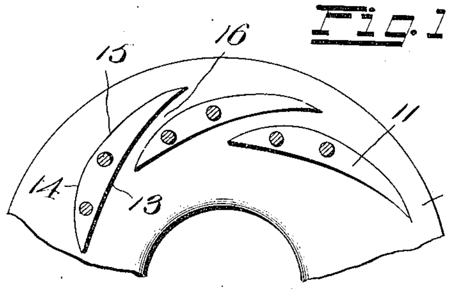


Fig. 10.



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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL PUMP.

1,013,248. Specification of Letters Patent. **Patented Jan. 2, 1912.**

Application filed May 29, 1908, Serial No. 435,714. Renewed September 15, 1911. Serial No. 649,532.

To all whom it may concern:

Be it known that I, James Wilkinson, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Centrifugal Pumps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to centrifugal pumps, and has for its object to provide a pump of simple construction whereby water or other fluid drawn in at the side, will be caused to flow out radially by means of frictional surfaces and vanes which impart said radial motion to the fluid. The initial velocity imparted to the liquid by the friction surfaces before it is acted upon by the vanes, makes it possible to drive the pump at very much higher speeds than has formerly been the case with vanes alone.

With this object in view, my invention consists in the construction and combinations of parts as hereinafter described and claimed.

In the accompanying drawing—Figure 1 is a side view of my improved centrifugal pump, partly in section. Fig. 2 is an end view thereof, partly in section. Fig. 3 is a side view of one of the vanes used also as a spacer between the friction disks. Fig. 4 is an edgewise view of the same showing its dowel pin *w*. Fig. 5 is a broken side view of one of the friction disks, showing arrangement of vanes, the supporting shaft being shown in cross section. Fig. 6 is a section on an enlarged scale of half of the impeller, showing the related parts assembled. Fig. 7 is a side view of a part of one of the friction disks, the vanes being removed. Fig. 8 is an edgewise view thereof. Fig. 9 is a cross section of a modified form, and Fig. 10 is an end view of one of the friction disks showing the vanes located in place on its face.

a represents a casting for supporting the pump and engine for driving it, which is provided with bearings *b* and *c*.

d, *e*, represents an engine for driving the pump, which is preferably a steam turbine adapted to operate at high speed.

f represents the casing of the pump, which, as shown in Fig. 1 is a double casing provided with a central partition *g*.

h represents the inlet pipe and *i* the discharge pipe, said inlet pipe delivering into spaces *k* and *m* on either side of the double impeller.

n represents the shaft of the impeller, provided with a central disk *o* and the usual packing rings *p*.

On each side of the central disk *o* are a number of friction disks *q*, each of said disks being annular in form, and preferably having the inner edge of the ring rounded as shown at *r*, to give maximum capacity for fluid entrance between disks. On each face of each of these disks, are provided grooves *s*, which are nearly parallel to the periphery of the disks, and are shaped as shown in Fig. 7, that is to say, with the inner end larger and deeper than the rest of the groove, and tapering gradually toward the discharge orifice. These grooves are arranged in sets on each side of the impeller disk, being separated by a thin partition *t*, as shown in Fig. 8. If desired, these grooves may be of uniform depth throughout. These disks are separated from each other by means of groups of small vanes which are held in their location by the rivets or bolts 2 and dowels *w*, each of said vanes being provided with a perforation *v* to receive a securing bolt, and with the dowel pin *w*, for locating its angular position. The dowel projects each side of the vane and is located in the holes *x* in the disks.

On each side of the central disk *o* and outside of the impeller disks, is a shouldered ring *y*, made considerably thicker than the disks, and provided with a central annular opening *z*, the ring *y* being L-shaped in cross section, as shown in Fig. 6. A packing *z′* may be provided if desired, between the impeller casing and the pump casing *f*. The disks *q* are perforated as shown at 1, and through these holes 1 and the holes *v* in the vanes through bolts or rivets 2 pass, securing the ring *y*, the vanes, the friction disks, and the central disk all firmly together, making a rotatable impeller structure. Around this impeller structure, I preferably use a diffusion ring composed of vanes 3, triangular in cross section as shown in Fig. 2, which vanes are arranged in a ring. In Fig. 6 the diffusion ring is omitted.

In Figs. 9 and 10, a modified form is shown in which the water or other fluid enters only on one side of the impeller casing. 4 represents the pump casing of the usual shape, having an opening closed by a removable head 5, having a screw-threaded portion 6 in which the pipe containing the water or other fluid supply is adapted to screw. Within this casing is mounted the impeller which is similar to the impeller already described. It consists of two plates 7 and 8 centrally perforated, one of which is mounted on the rotating shaft 9. 10 represents the impeller-friction disks, separated by vanes 11, the grooves in said disks being omitted in this modification. The vanes are of the peculiar shape shown in Fig. 10, and the whole structure is secured together by bolts or rivets 12, as shown in the first described form. The vanes 11 are slightly curved on one side, as shown at 13, and on the other side are provided with two distinct curves 14 and 15, leaving the passages 16 between the dowels smallest in the center with enlarged ends. In this modification the outer parts of the friction or impeller disks are beveled off as shown at 18 in Fig. 9, to permit an increase in area of the working passage and thereby a reduction in velocity of the liquid while passing through the impeller. The impeller structure runs loosely in the pump casing 4, so that the water or other fluid can leak around it and balance the end thrust upon the impeller, passages 17 being provided through the plate 7 for the purpose of permitting this leakage of water.

I claim:—

1. In a centrifugal pump, the combination of a pump casing, a rotatable shaft mounted therein, a series of friction or impeller disks carried by said shaft, curved vanes secured between said impeller disks near the periphery thereof, said vanes overlapping each other but leaving a gradually narrowing space from the center outwardly, said impeller disks having interior rounded edges, and means for fastening the impeller structure together, substantially as described.

2. In a centrifugal pump, an impeller therefor composed of a rotatable shaft, two plates carried thereby, and a series of annular disks supported by said plates, said disks being provided with curved grooves near their peripheries and extending to said peripheries, a series of curved vanes secured to said disks near the peripheries thereof, said vanes leaving between them passages, said passages being located immediately over the grooved portions of the disks, substantially as described.

3. In a centrifugal pump, the combination of a casing, a shaft in said casing, a series of friction disks provided with grooves carried by said shaft, means for securing said disks together at definite distances from each other, and a series of curved vanes located partly over said grooves and attached to said friction plates, substantially as described.

4. In a centrifugal pump, the combination of a casing, a rotary impeller mounted therein and comprising a plurality of flat disks that receive the fluid and by friction impart velocity thereto, tangential over-lapping vanes carried by the disks near their periphery which receive fluid from the spaces between the disks and further increase its velocity, and an inlet and a discharge opening for the casing.

5. In a centrifugal pump, the combination of a casing, a rotary impeller mounted therein and comprising a plurality of flat disks closely associated and occupying planes perpendicular to the axis of the impeller, said disks acting by surface friction to impart velocity to the fluid, overlapping vanes situated between the disks near their outer edges, said vanes being arranged to form tangential passages between them which impart additional velocity to the fluid received from the disks, and an inlet and an outlet for the casing.

6. In a centrifugal pump, the combination of a casing, a rotary impeller mounted therein and comprising a plurality of flat disks closely associated and occupying planes perpendicular to the axis of the impeller, said disks acting by surface friction to impart velocity to the fluid, over-lapping vanes situated between the disks near their outer edges, said vanes being arranged to form tangential passages between them which impart additional velocity to the fluid received from the disks, a diffusing ring that surrounds the disks and receives fluid from the vane passages and converts its velocity into pressure, and an inlet and an outlet for the casing.

In testimony whereof, I affix my signature, in presence of two witnesses.

JAMES WILKINSON.

Witnesses:

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JOSEPH J. KELLY.