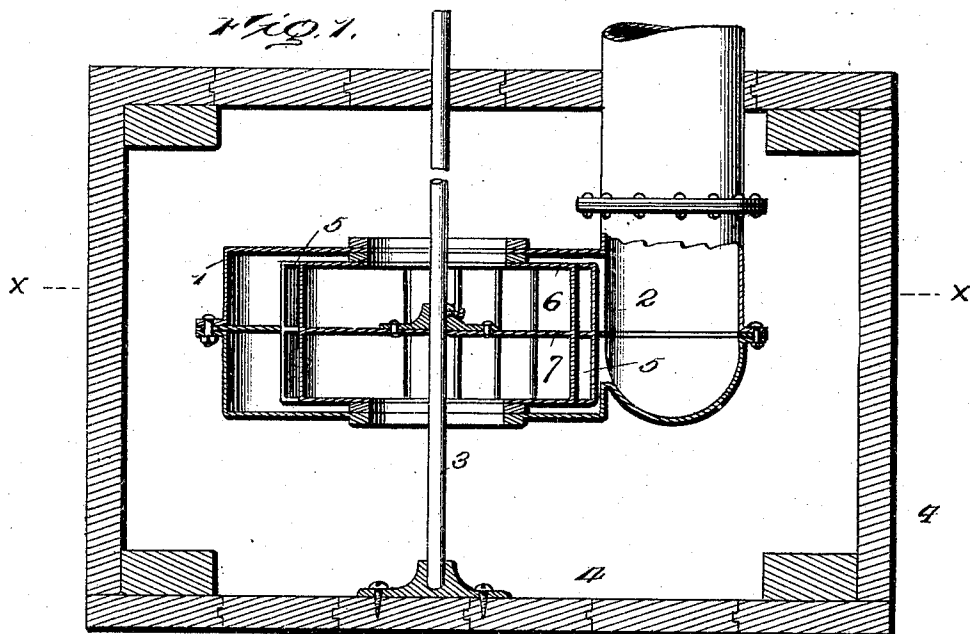
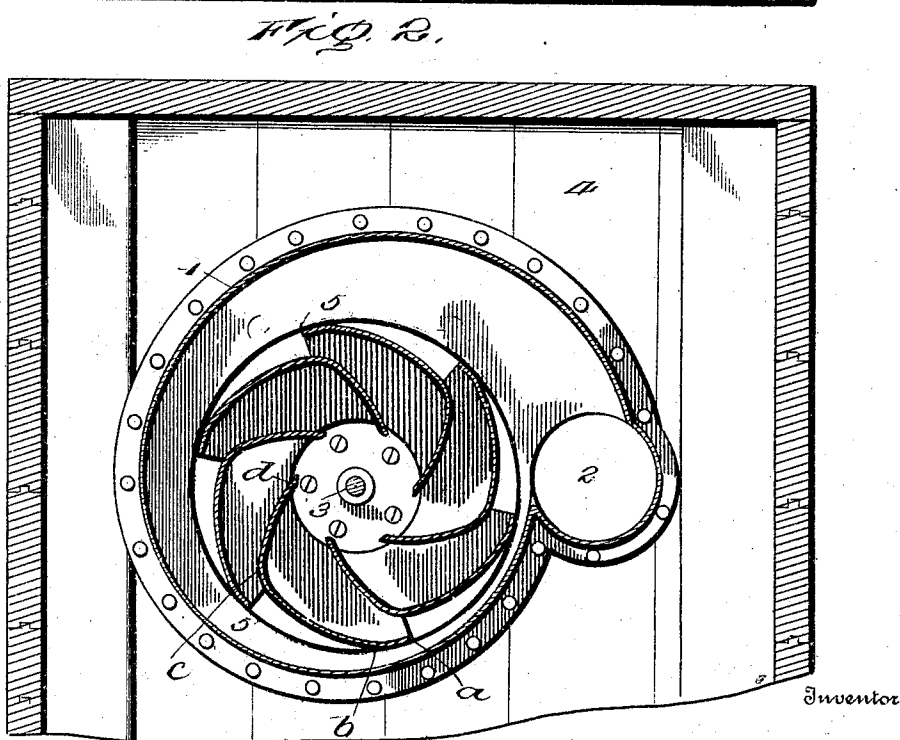


No. 782,343.

PATENTED FEB. 14, 1905.

J. M. KING.
CENTRIFUGAL PUMP.
APPLICATION FILED AUG. 8, 1903.

2 SHEETS—SHEET 1.



Witnesses

W. H. Hoodson

James M. King,

By

R. A. Lacey, Attorney.

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2 SHEETS—SHEET 2.

Fig. 3.

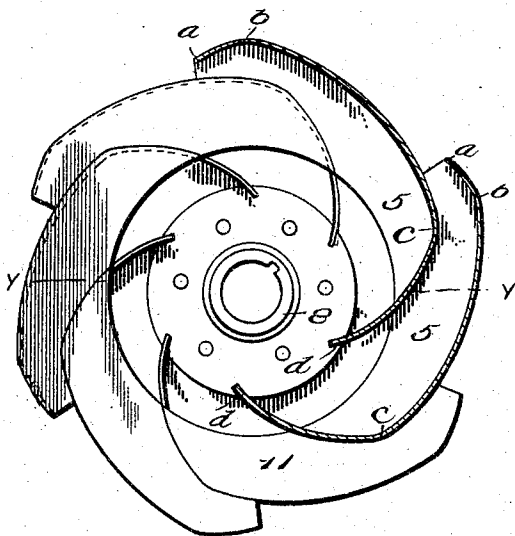


Fig. 4.

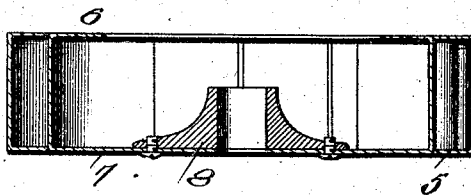


Fig. 6.

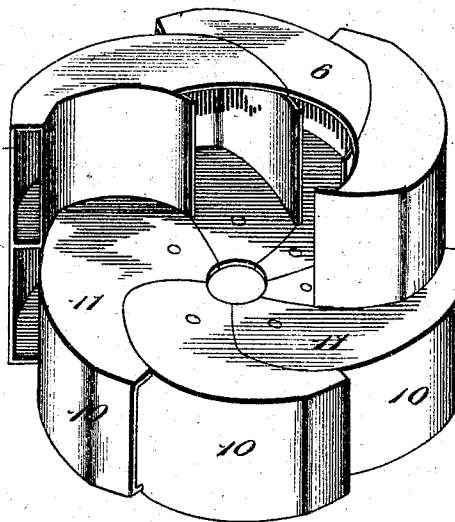


Fig. 5.

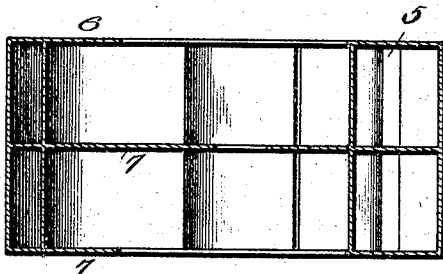
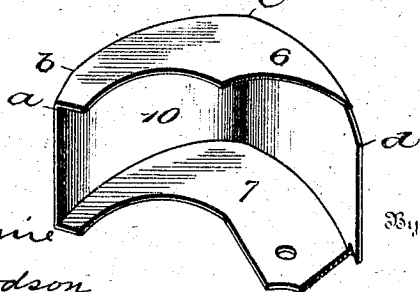


Fig. 7.



Witnesses

James M. King
H. H. Woodson

Inventor

James M. King.

By

R. H. Macey, Attorneys

UNITED STATES PATENT OFFICE.

JAMES M. KING, OF ROCHESTER, MINNESOTA.

CENTRIFUGAL PUMP.

SPECIFICATION forming part of Letters Patent No. 782,343, dated February 14, 1905.

Application filed August 8, 1903. Serial No. 168,818.

To all whom it may concern:

Be it known that I, JAMES M. KING, a citizen of the United States, residing at Rochester, in the county of Olmsted and State of Minnesota, have invented certain new and useful Improvements in Centrifugal Pumps, of which the following is a specification.

This invention relates to mechanism primarily designed for raising liquids, such as water, by centrifugal action, but which may be used for any purpose to which devices of this class are adapted.

The machine comprises a wheel and casing therefor, and the novelty resides in the peculiar formation of the wheel, which may be single or in series or involve an integral or sectional construction.

For a full description of the invention and the merits thereof and also to acquire a knowledge of the details of construction of the means for effecting the result reference is to be had to the following description and drawings hereto attached.

While the essential and characteristic features of the invention are susceptible of modification, still the preferred embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical central section of a centrifugal pump embodying the invention. Fig. 2 is a horizontal section on the line X X of Fig. 1. Fig. 3 is a top plan view of a modified form of wheel embodying the invention, parts being broken away. Fig. 4 is a transverse section on the line Y Y of Fig. 3. Fig. 5 is a section similar to Fig. 4 of a further modification, showing two wheels in coaxial alinement and having a head or partition common to each. Fig. 6 is a detail perspective view of the form of wheel shown in Fig. 5, the rear portion of the topmost wheel being omitted. Fig. 7 is a detail perspective view of one of the sections comprising the type of wheel involving a sectional construction.

Corresponding and like parts are referred to in the following description and indicated

in all the views of the drawings by the same reference characters.

The curb or casing is illustrated at 1 and is of scroll formation, the discharge-pipe 2 communicating therewith at the largest point, so as to carry off the liquid thrown out by centrifugal action. The wheel is mounted upon the shaft 3, which passes centrally through the same and to which the power is applied in any manner for operating the wheel when the same is in active service. Inasmuch as the machine is primarily designed for raising liquids, it is shown submerged in a tank or reservoir 4, whereby the liquid has free access to the interior of the wheels through openings formed in the heads thereof. The wheel may be variously constructed and comprises chutes which may be arranged to extend either to the right or to the left, according to the desired rotation of the wheel when in operation. Moreover, the component parts of the wheel may be of integral formation or sectional construction, as found most advantageous and according to the size and special work for which the wheel is designed. Figs. 3 and 4 show a single wheel composed of separate sections secured to a central hub or collar, and Figs. 1, 5, and 6 show a construction comprising two wheels arranged in series and having an intermediate wall or partition common to both. Whether the wheel is used singly or in series the construction and operation are substantially the same. The wheel comprises a plurality of chutes, grouped about the axial line of rotation and made tapering toward their delivery ends, which are disposed about at right angles to the radii of the wheel or, in other words, have a tangential arrangement and discharge. The chutes 5 are formed between four walls, two of which correspond to the heads of the wheel and the other two arranged to subdivide the space formed between the heads, so as to form the chutes. To avoid confusion and enable the different chute-walls to be readily distinguished, the subdividing-walls are designated hereinafter and in the claims as "flights" and

the walls in the plane of rotation of the wheel as the "head-walls". The flights are designated by the reference-letters *a*, *b*, *c*, and *d* and the head-walls by the numerals 6 and 7. Each flight is composed of three parts, the inner part *d c*, the outer part *a b*, and the intermediate part *b c*. The part *d c* curves outward more rapidly than the intermediate part *c b* and starts at a distance from the center of the wheel. The intermediate part *c b* curves slightly from the line of motion, whereas the part *b a* curves inward toward the extremity *a*, whereby the delivery end of the chute is contracted. One head of the wheel is cut away at the center to provide an opening for the inflow of the liquid in the operation of the pump. The chutes 5 are of like formation, and their inner or receiving ends are large, whereas their outer or delivery ends are contracted. The chutes curve outwardly and rearwardly, the delivery end portions being approximately tangential to their path of motion, whereby a minimum resistance is offered to the discharge of the liquid. The inner portion of the flights—that is, from *d* to *c*—is within the circumference of the wheel, whereas the parts *c b* and *b a* are exposed and constitute the outer wall of the chutes and wheel's periphery.

In constructing the wheel it has been the sole aim to embody in its formation a minimum amount of material and a maximum number of chutes or flights, while at the same time having as little resistance as possible and utilizing the greatest amount of energy possible in the performance of work. By having a portion of the flights common to adjacent chutes economy of material and space is attained. The curvature of the chutes in an outward and rearward direction facilitates discharge of the water or other liquid and enables the wheel to be run by a comparatively small force relative to the work performed. The abrupt deflection near the outer ends of the chutes insures a tangential discharge of the water practically wholly within the circular path of the outermost portion of the wheel, with the result that the discharge is effected by centrifugal force and by suction. The abrupt curve at *c* is necessary to reduce the delivery end of the chute in order to gain all the advantages aforesaid. By having the inner ends of the chutes large and the outer ends contracted or tapered throughout their length the resistance due to the passage of the water through the chutes is diminished, so as not to perceptibly detract from the power expended to operate the wheel.

In the event of the wheel being cast the component parts may be of integral formation, or, if preferred, the wheel may be constructed of sections each corresponding to a chute element or otherwise and when assembled se-

cured either by soldering, brazing, or by means of fastenings—such as bolts, machine-screws, rivets, and the like. As shown in Fig. 6, the sections when assembled are brazed or soldered, whereas Figs 1, 2, 3, and 4 illustrate the sections secured to the outer flange of a hub 8. A section of the wheel comprises head walls or plates 6 and 7 and a connecting-wall *a d*, the latter being common to adjacent sections when the latter are assembled. Under some conditions the wheel may be advantageously operated singly; but the work may be increased without adding to the diameter of the wheel by providing the wheels in duplicate, as indicated most clearly in Figs. 1, 5, and 6, in which case the upper and lower heads are centrally apertured to admit of the inflowing of the liquid and the intermediate wall continues so as to prevent the liquid drawn in by one wheel interfering with that drawn in by the other. The chutes of the upper and lower wheels curve in the same direction, whereby the wheels act in unison to effect a positive circulation of the liquid or fluid with which the wheel is arranged to cooperate.

Having thus described the invention, what is claimed as new is—

1. A wheel comprising a series of chutes of like formation curved outwardly and rearwardly and having their delivery ends arranged wholly within and approximately at a tangent to the circumference of the wheel to discharge parallel with its circular path, substantially as set forth.

2. A wheel comprising a series of chutes of like formation outwardly and rearwardly curved and tapered and having their delivery portions contracted and arranged tangentially to the circumference of the wheel to discharge parallel with its circular path, substantially as specified.

3. A wheel comprising a series of chutes of like formation and consisting of head-walls and flights, each of the latter formed of an intermediate and end portions, the inner portion curving outwardly and rearwardly, the intermediate portion curving slightly to the circumference and the outer portion curving inward toward its extremity, whereby the delivery portion of the chutes is contracted and arranged tangentially to and wholly within the circumference of the wheel, substantially as set forth.

4. A wheel composed of a series of sections grouped about a central point, each section being of like formation and comprising a flight and head-walls, the inner portion of the flight closing the open side of the adjacent section when the sections are assembled, substantially as set forth.

5. A wheel comprising a hub and a series of chute-sections secured to the hub, each sec-

tion comprising a flight and head - walls, the open side of each section being closed by the inner portion of the flight of the adjacent section, substantially as set forth.

5 6. In combination, a series of wheels having a wall common to subjacent wheels and each of the latter comprising a series of chutes of like formation and curved and tapered outwardly and rearwardly and having their outer

portions arranged approximately at a tangent to the circumference of the wheel, substantially as set forth.

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

JAMES M. KING. [L. S.]

Witnesses:

C. E. CALLAGHAN,
GEO. W. GRANGER.