(No Model.) 2 Sheets—Sheet 1.

S. HUGHES.

CENTRIFUGAL PUMP.

No. 533,956. Patented Feb. 12, 1895.

Fig. 1.

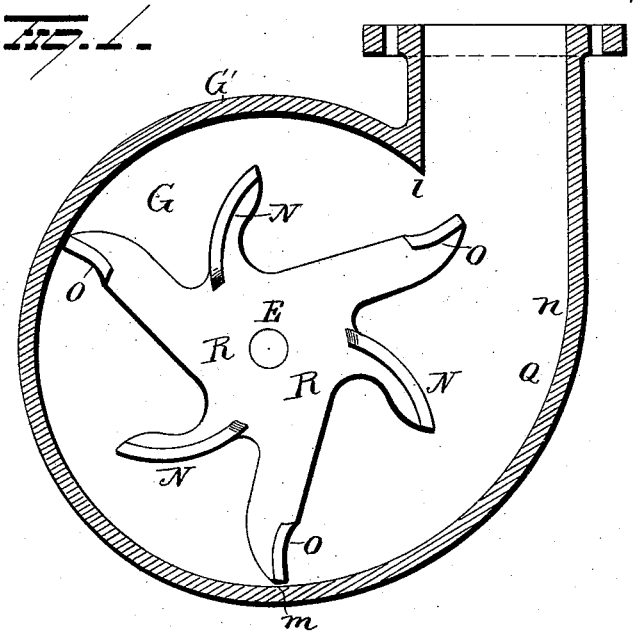
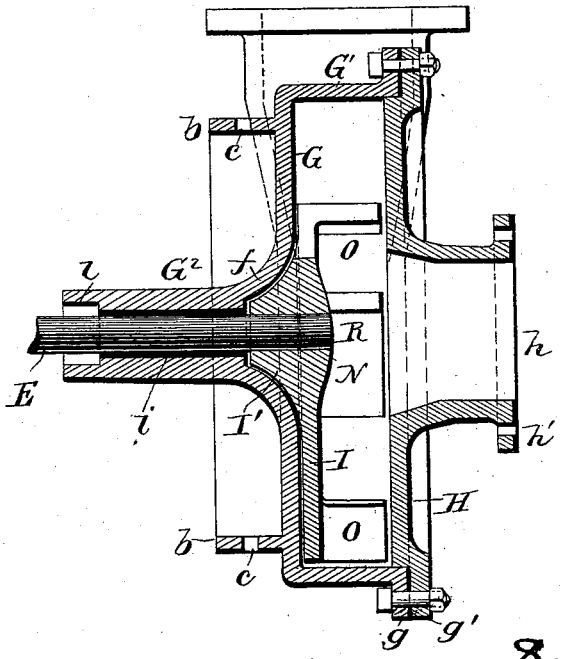


Fig. 2.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

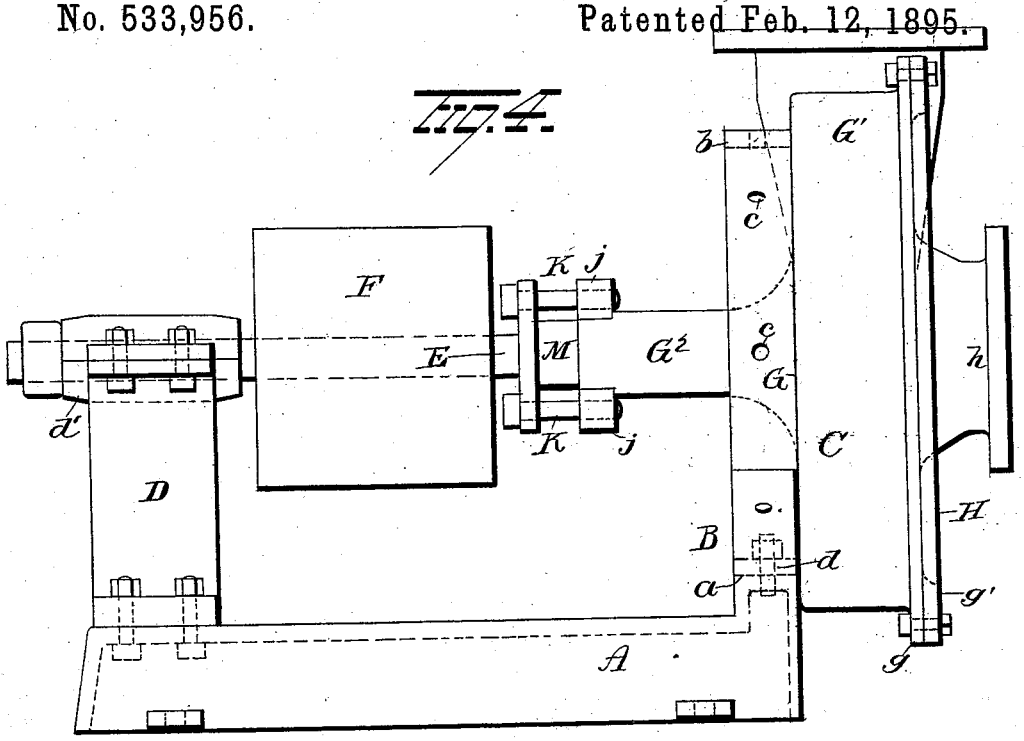
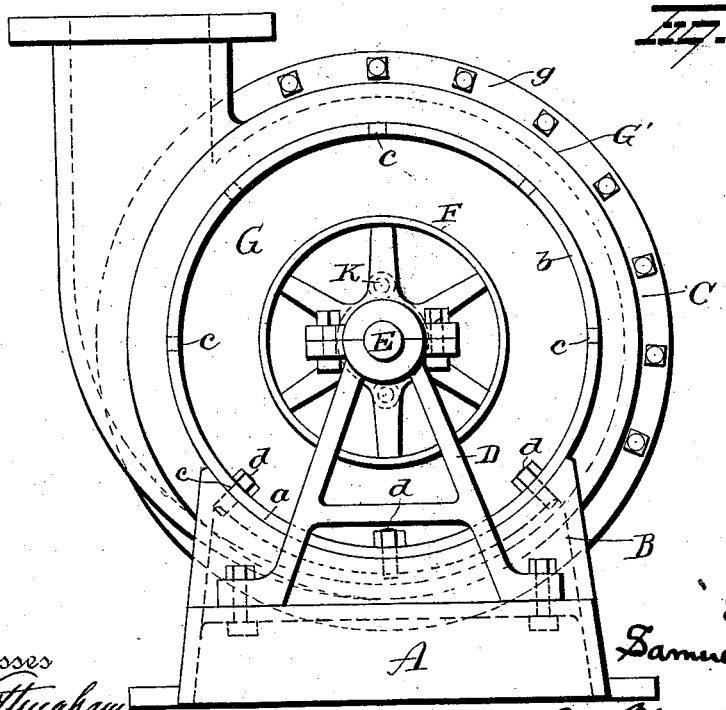


Fig. 3.



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UNITED STATES PATENT OFFICE.

SAMUEL HUGHES, OF CHARLESTON, SOUTH CAROLINA.

CENTRIFUGAL PUMP.

SPECIFICATION forming part of Letters Patent No. 533,956, dated February 12, 1895.

Application filed March 18, 1893. Renewed January 10, 1895. Serial No. 534,491. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL HUGHES, of Charleston, in the county of Charleston and State of South Carolina, 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 an improvement in centrifugal pumps, the object of the invention being to provide a pump which shall be efficient in operation; adapted to allow of the passage through it of obstacles of considerable size without injury to the pump, and to cheapen the cost of construction.

With these ends in view the invention consists in certain features of construction and combinations of parts as will hereinafter be described and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in vertical longitudinal section of my improved pump. Fig. 2 is a view in vertical transverse section taken through the casing. Fig. 3 is a vertical elevation of the pulley side of the casing, and Fig. 4 is a side elevation.

A represents the bed-plate and B a saddle preferably cast integral with the bed plate. Saddle B is formed with a concave bearing *a*. Pump casing C has a projecting annular flange *b* cast integral therewith which is provided with any desired number of bolt holes *c*. Flange *b* is turned down true and is seated on the concave bearing *a* of the saddle and is secured in place by means of bolts *d* passing through the flanges and screwed into the saddle. The bolt holes *c* in the flange are formed so as to register with the holes in the saddle, and thus enable the pump casing to be secured to the saddle so that the discharge branch will be in the position in which it is desired to direct the flow of water. By means of the construction described, the pump casing may be readily secured to the bed plate or base so as to discharge the water either upwardly, downwardly or laterally. In addition to this feature of adjustment, the construction in question insures a firm and reliable bearing for the pump casing.

On the end of the bed plate opposite the saddle is bolted a standard D the upper end of which is furnished with a shaft bearing *d'* for the outer end of the pump shaft E. A band pulley F is fastened to shaft E, between the bearing *d* and the pump casing.

The pump casing comprises the inner head G, periphery G' and extended bearing or journal G^2 all of which parts are preferably cast in a single piece. The periphery G' is formed with an outwardly projecting flange *g* to which is bolted a similar flange *g'* formed on the outer head H. Suitable packing is interposed between these flanges to prevent leakage. Outer head H is constructed with a suction branch *h* which is provided with a perforated flange *h'* for the attachment of a suction pipe.

I represents the disk of the pump wheel which is formed with a hub I' which is securely fastened to one end of the shaft E. In order to accommodate a hub which shall be sufficiently strong and also have an extended bearing on the shaft, without obstructing the passage for the inflow of water, I form the casing with an outwardly flaring central portion *f*, and the hub I' of corresponding shape so that a portion of the latter will extend into the space thus formed in the hub. The bearing or journal G^2 is lined with Babbitt metal *i* which forms a bearing for one end of the shaft. Bearing or journal G^2 has the ears *j* cast thereon on its opposite sides. These ears are perforated and receive the bolts K which serve to secure the stuffing box gland M in place. The outer end of bearing or journal G^2 is constructed with a packing receptacle *l* in which packing is inserted around the shaft for preventing any leakage between the bearing or journal and shaft.

Disk I is constructed with any desired number of wings, six being shown in the present instance. Of this number the three wings N, N, N, are designated as the suction wings, and the three wings O, O, O as the discharge wings. All of these wings are connected at one side with the disk, the outer face of which runs in close proximity to the inner surface of the head, but not in contact therewith. These wings project outwardly from the disk, their outer sides extending nearly to the other head of the pump casing, so that in width the wings

are slightly less than the transverse space between the heads. Wings or blades N are curved rearwardly with relation to the direction of rotation of the wheel and are located about midway between the shaft and perimeter of the casing, so a free and open space is provided between the inner ends of the wings at which point the water is received from the suction branch—and also a free space is provided between the outer ends of the wings and the perimeter of the casing. The wings O are curved in a direction reverse to that of the wings N, their outer ends being located near the perimeter of the casing only a sufficient space being provided between such parts as will prevent actual contact or wear. Wings O are comparatively narrow, their width being about equal to the space between the outer ends of wings N and the perimeter of the casing. Owing to the fact that the wings N are located near the center of the casing while the wings O are located near the perimeter of the casing, the wings O will travel faster and through a greater space than wings N and hence are made of correspondingly less area, the object being to so proportion the relative areas of the wings N and O, and so shape them that the curved wings N N N lift the water after the manner of the action of a heart cam, while the wings O are reversely curved or practically straight and tend to force the water in a direction tangential to the perimeter of the casing imparting the desired centrifugal action to the water. In other words although I have designated the two forms of wings as suction and discharge wings to distinguish them they may both perform both functions more or less, but the so called suction wings N N N alone will only lift the water slightly whereas the discharge wings O O O impart centrifugal force to the water before it leaves the pump and in this way accelerates the velocity of its discharge. The suction wings act as cams to force the water outwardly while the discharge wings give it a whirling motion thereby imparting a centrifugal velocity; and it is by combining these two in a single pump wheel and requiring each to do that portion of the work it is best fitted to do that I get the best results.

By reference to the drawings it will be observed that the interior of the casing is formed concentric with the shaft from the point *l* to the point *m*, while from latter point to the point *n* the casing is gradually enlarged to insure the clearance space Q, while from point *n* to the outer end of the outer wall of the discharge branch, the casing is practically straight. The wings O at all times tend to force the water in a line tangential to the perimeter of the casing and hence the water is forced into the clearance space Q and outwardly along the straight walls of the discharge branch, and in its passage is subjected to the minimum friction and obstruction.

A free and unobstructed space R is provided between the inner ends of wings N which space is opposite the suction branch the diameter of which is greatest at its juncture with the casing. By means of this construction quite large objects may enter and pass through the pump without danger of injuring or breaking the wings or other parts of the pump.

To relieve the end thrust on the pump shaft, the disk is cut away as much as possible, consistent with its strength and durability, whereby its area is reduced and the pressure tending to force the pump wheel laterally toward the suction branch is reduced to the minimum.

By arranging the suction wings intermediate the discharge wings, and so proportioning the areas of the wings that the discharge wings will operate to discharge the water from the casing as rapidly as it is drawn therein by the suction wings, a most uniform and effective operation is insured.

As it is evident that slight changes in the form, relative proportions and the construction of parts might be resorted to without departing from the essence of my invention I would have it understood that I do not restrict myself to the precise construction shown and described, but,

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a centrifugal pump, a pump wheel constructed with curved suction wings adapted to have a cam action upon the water, and reversely curved discharge wings located between the suction wings and outside of the path described by the suction wings, substantially as set forth.

2. In a centrifugal pump, a pump wheel comprising suction wings curved reversely to the direction of rotation of the wheel, and discharge wings located intermediate the suction wings and extending nearly to the perimeter of the casing, said discharge wings curved reversely to the curve of the suction wings, substantially as set forth.

3. In a centrifugal pump, a pump wheel consisting of a disk formed with outwardly projecting long and short arms alternately arranged, one set of arms having suction wings and the other discharge wings, the two sets curved oppositely, the path of one set outside of the path of the other set, substantially as set forth.

4. In a centrifugal pump, a pump wheel consisting of suction wings curved reversely to the direction in which they rotate and discharge wings alternately arranged relative to the suction wings, said discharge wings curved in the direction of the rotation of the wings and traveling in the space between the path of the suction wings and the inner wall of the casing of the pump, substantially as set forth.

5. The combination with a casing of a centrifugal pump, of a pump wheel consisting of

a disk formed with outwardly projecting long and short arms alternately arranged, one set of arms having suction wings curved in one direction and traveling in a path some distance within the wall of the casing and the other set of arms having discharge wings which traverse the inner curved wall of the casing, substantially as set forth.

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

SAML. HUGHES.

Witnesses:
S. G. NOTTINGHAM,
V. E. HODGES.