No. 619,736. Patented Feb. 21, 1899.

J. EDWARDS.

CENTRIFUGAL PUMP.

(Application filed Apr. 14, 1898.)

(No Model.)

FIG. 1.

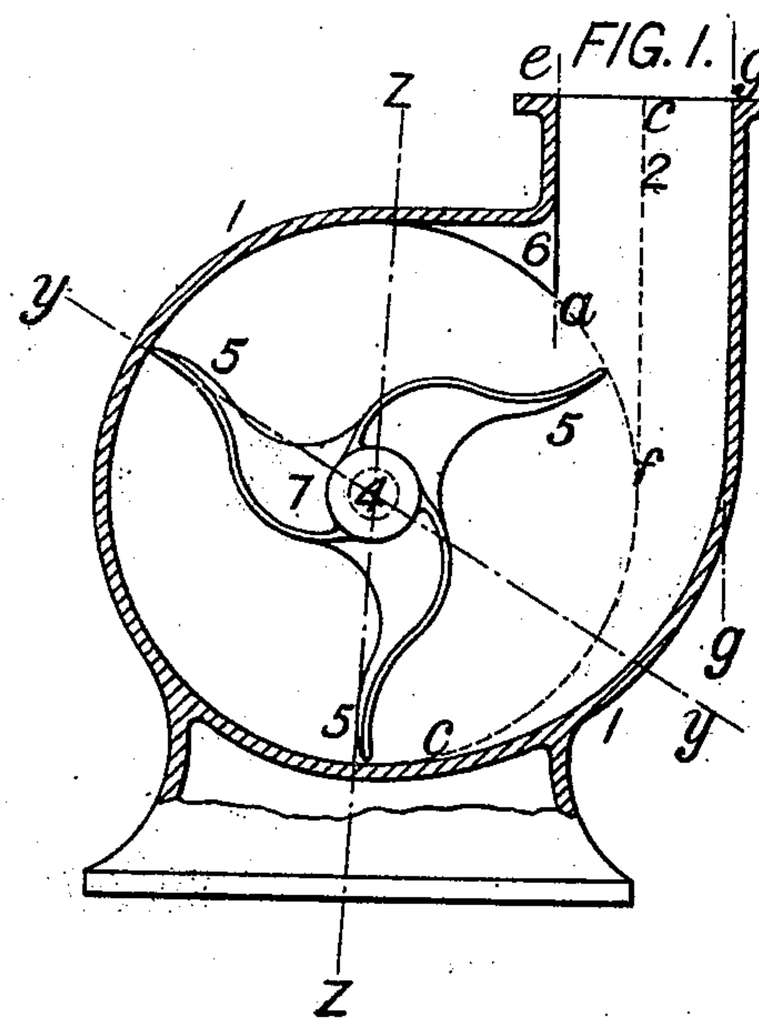


FIG. 2.

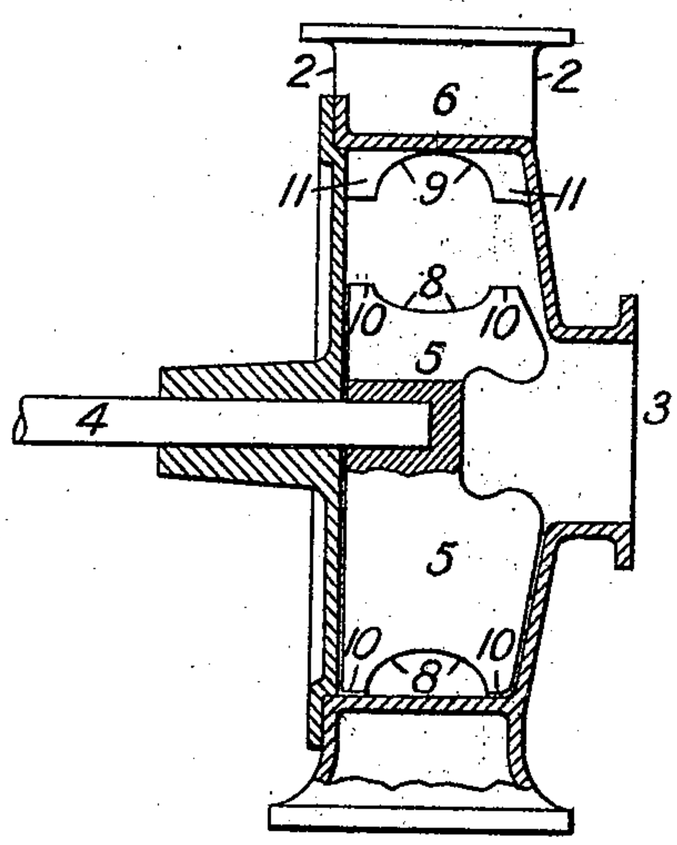


FIG. 3.

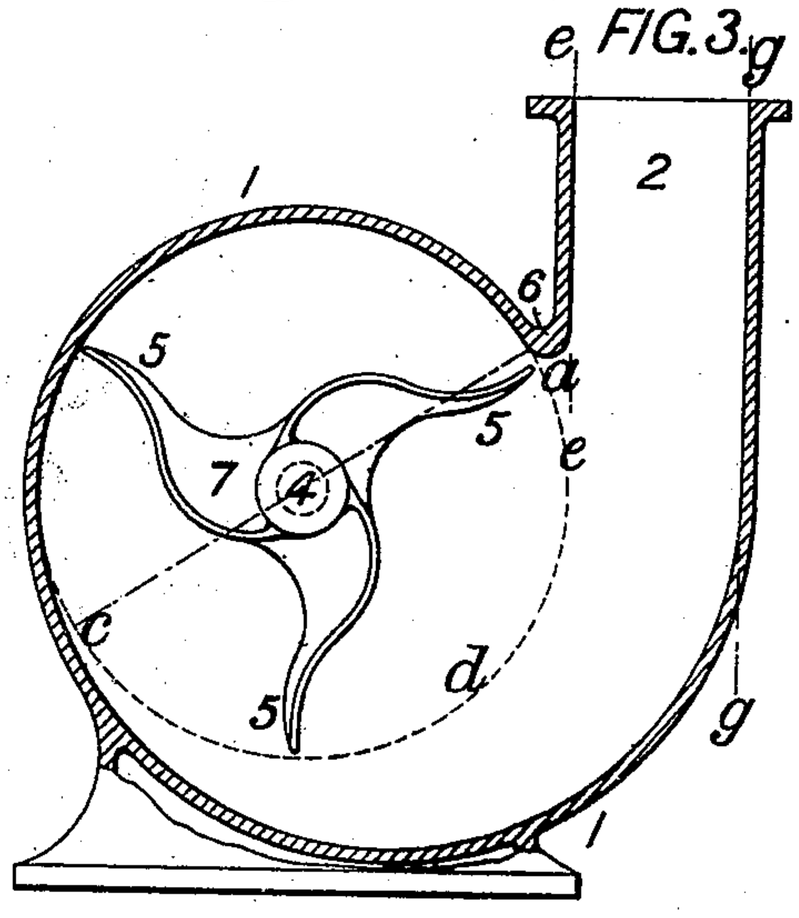


FIG. 4.

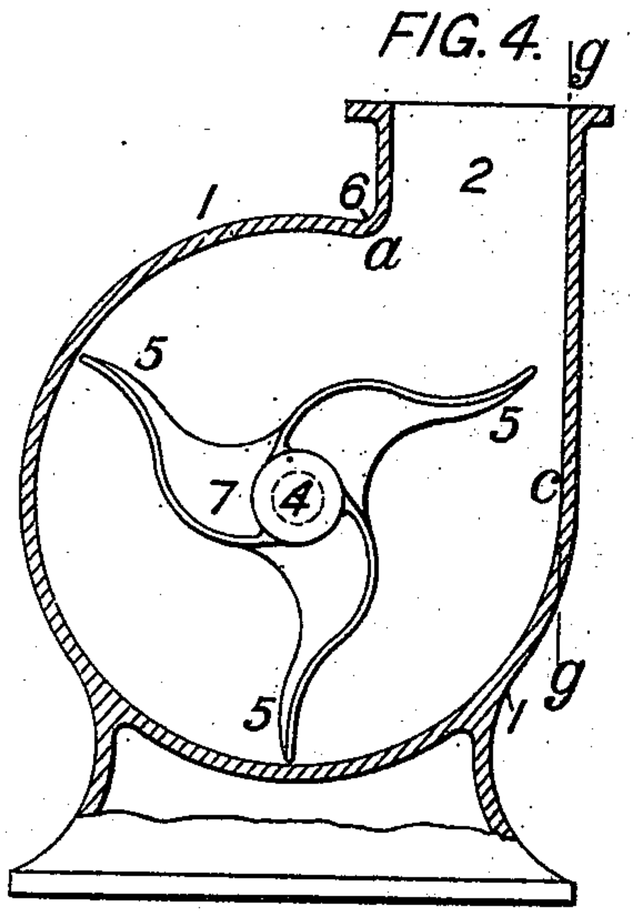


FIG. 5.

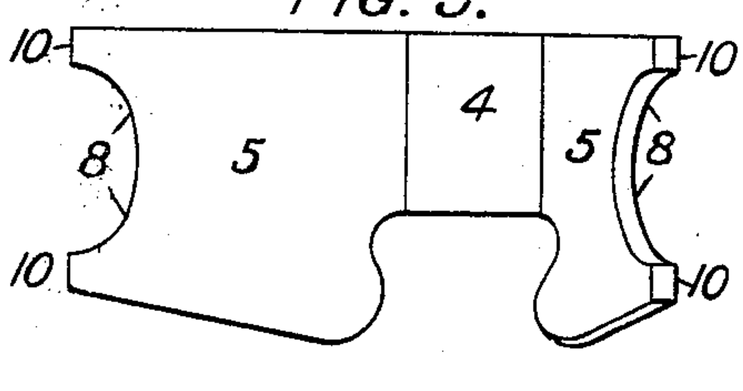
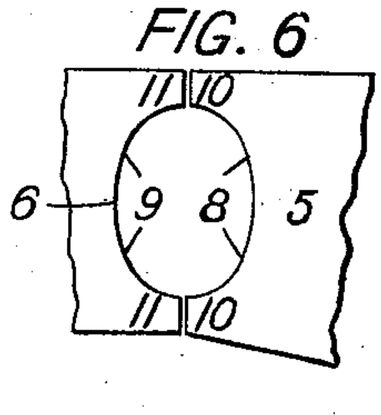


FIG. 6



WITNESSES

Charles F. Edwards

Wayburn A. Birch

INVENTOR

Joseph Edwards

BY

Frank G. Johnson

Atty

UNITED STATES PATENT OFFICE.

JOSEPH EDWARDS, OF NEW YORK, N. Y.

CENTRIFUGAL PUMP.

SPECIFICATION forming part of Letters Patent No. 619,736, dated February 21, 1899.

Application filed April 14, 1898. Serial No. 677,528. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH EDWARDS, a citizen of the United States, residing in the borough of Brooklyn, in the city and State of New York, have invented a new and useful Improvement in Centrifugal Pumps, of which the following is a specification.

My invention relates to an improvement in that class of centrifugal pumps which are employed for dredging and wrecking purposes and for lifting, with water, rough, coarse, and heavy materials, as sand, gravel, cobblestones, coal, and often pieces of iron, as cannon-balls, fragments of anchors, and anchor-chains, &c. Therefore the two most indispensable features in pumps for this purpose are the strongest possible suction to lift such heavy materials and the greatest possible clearance to pass the larger and more resistant pieces thereof without liability of breaking the pump. My experience with such pumps, especially in my work on the improvement of New York harbor, where I excavated upward of five millions cubic yards of such materials, I find that the swifter the current of water conveying such crude materials through the suction pipes and pump the less liability there is to the injury and breaking of the pump owing to the concentric action of the current, which causes the heavy materials to pass through the suction pipes and pump without coming in contact with the surfaces thereof, except when the pieces are extra large and heavy, when they are liable to break the ends of the wings or blades. To limit as far as possible the damage to the pump from this cause, I provide removable tips to the blades—that is, such as would be knocked off by resistant objects—as shown in Figures 4 and 5 of Patent No. 427,060, granted to me and J. R. F. Kelly, May 6, 1890.

The objects of my improvement as set forth in this specification are to increase the force of suction and provide a clearance for large pieces to pass through such pumps without liability of any injury to the same. These objects I attain by the mechanism illustrated in the accompanying drawings, in which—

Fig. 1 is an end view showing the blades of the pumps and the relation of these to the cylinder or shell of the pump, as well as to the discharge-pipe; Fig. 2, a vertical section through the center of Fig. 1 on the line *z z;* Fig. 3, an end view showing a different relation or position of the discharge-pipe to the shell and blades of the pump than that shown in Fig. 1; Fig. 4, also an end view showing still a different relation or position of the discharge-pipe to the shell and blades from that shown in either Figs. 1 or 3; Fig. 5, a downward view of a couple of the blades of the pump as seen on the line *y y* of Fig. 1, and Fig. 6 a view of the end of one of the blades and the throat of the shell at their point of juncture.

Similar letters and numerals of designation refer to similar parts throughout the several views.

1 1 is the shell of the pump, which is cylindrical in form; 2, the discharge-pipe; 3, Fig. 2, the inlet of the pump. As shown in the drawings, the depth or length of the shell is equal to the width of the blades or wings 5 5 and the diameter of the discharge.

4 is the shaft, to which is keyed the hub 7 of the wings and by which they (the wings) are propelled.

6 is what I will term the "throat" of the pump.

Before further describing the parts of my device embracing my improvement, and to make clear what I claim, I will first allude to the difference in the form of the shells, as represented by Figs. 1, 3, and 4.

In Fig. 4 the outer edge *g g* of the discharge-pipe is tangent to the circle of the shell, in which form or combination between the shell and discharge-pipe the pump has the greatest possible power of suction, as the ends of the wings sweep close to the inner surface of the shell nearly or quite the entire circumference thereof, (from *a* around to *c*.) Therefore in respect to power of suction this is the best form of shell; but as to freedom of discharge of coarse and resistant pieces, as stones, lumps of iron, &c., this is the worst form of the shell, as such objects catch in between the throat 6 and the ends of the blades and cause breakage and great wear of these parts.

Referring to Fig. 3, it will be seen that the inner side *e e* of the discharge-pipe is tangent to the circle of the shell, in which form or combination between the shell and discharge-pipe the pump has the freest delivery for

coarse material, but the feeblest suction power, for the reason that the sweep of the blades near to the inner surface of the shell occurs only half-way around the circumference of the shell, only from *a* around to *c*, and from *c* to *a* they recede more and more, as indicated by the dotted line *c d e*, until they reach again the throat of the shell at the point *a*, which greatly weakens the force of suction.

By now referring to Fig. 1 it will be seen that the center of the discharge (represented by the line *f f*) stands tangent to the circle of the shell of the pump, which is a compromise between the forms shown by Figs. 3 and 4. This form yields satisfactory suction-power, but it does not satisfactorily discharge the coarser pieces of material which the pump in this form is capable of raising.

With the foregoing explanations relating to the relative position of the shell and discharge and the respective advantages attained by these different relative positions of these parts I can now make clear the nature and special object of my improvement.

Instead of making detachable tips to the wings of the pumps, as shown in Patent No. 427,060, above referred to, I make the ends of the wings 5 5 in a peculiar form and also give the throat 6 of the shell a corresponding form, which prevents the larger pieces of the pumped materials from being caught between the ends of wings and the throat of the shell.

Referring to Figs. 2, 5, and 6, it will be seen that 8 represents the half of an oval section cut out of the ends of the blades, and 9 the half of a corresponding oval section cut out of the throat 6 of the shell. The major diameter of the oval sections removed is about two-thirds of the width of the blades, thus leaving the outer portions 10 10 of the blades 5 5 to extend to near the inner surface of the shell and the outer portions 11 11 of the throat 6 of the shell to extend to near the sweep of the extended portions 10 10 of the wings, so that at the point where the ends of the wings pass the throat of the shell, as shown in Fig. 6, there will be a complete oval opening between them—that is, between the ends of the wings and the throat of the shell. Now as the current of water which carries the coarse materials is powerfully concentric in its action and carries the coarse materials centrally through the suction pipes and pump, the coarser pieces instead of being caught between the ends of the wings and throat of the shell will pass through the oval opening formed between the ends of the wings and the throat of the shell.

I do not limit myself to any particular eccentricity of the oval, as the opening between the ends of the wings and throat of the shell can be varied from the form of a circle to an oval, as shown. Neither do I limit myself to a concave semicircular or a concave semioval form of the ends of the wings in combination with a similarly-formed throat of the shell, as the advantages of my improvement can be partially attained by forming the ends of the wings as specified without giving a similar form to the throat of the shell, and also by giving the throat of the shell the form specified without giving a similar form to the ends of the wings, though it is by far preferable to give both the wings and throat the form set forth.

Having pointed out the construction of my device and explained its operation and advantages, what I claim as new and useful, and desire to secure by Letters Patent, is—

1. In centrifugal dredging and wrecking pumps, wings 5 5 having the central portion of the outer ends thereof in the form of a concave semioval 8, substantially as and for the purposes set forth.

2. In centrifugal dredging and wrecking pumps, a circular shell having the central portion of the throat 6 thereof in the form of a concave semioval 9, substantially as and for the purpose described.

3. In centrifugal dredging and wrecking pumps, wings 5 5, having the central portion of the outer ends thereof in the form of a concave semioval 8, in combination with a circular shell having the central portion of the throat 6 thereof in the form of a concave semioval 9, whereby at the point of juncture of the end of the blades and the throat of the shell there is formed between the blades and the throat an oval opening, substantially in the manner and for the purpose set forth.

JOSEPH EDWARDS.

Witnesses:
CHARLES H. EDWARDS,
MAYBURY W. BIRCH.