A. L. MORTON.

PUMP.

APPLICATION FILED MAY 5, 1915.

1,200,863.

Patented Oct. 10, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

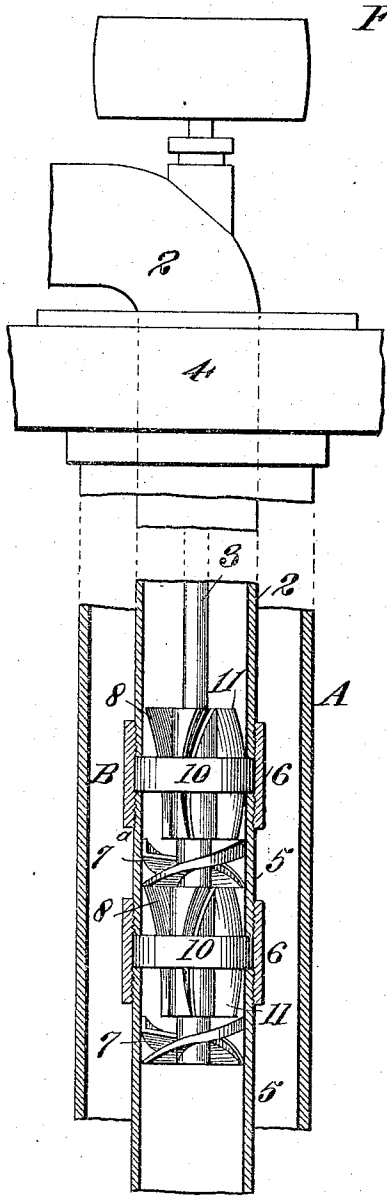


Fig. 3.

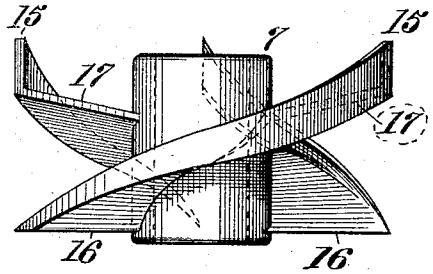
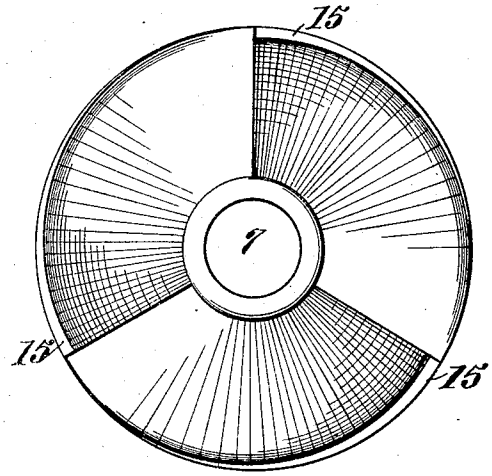


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 4

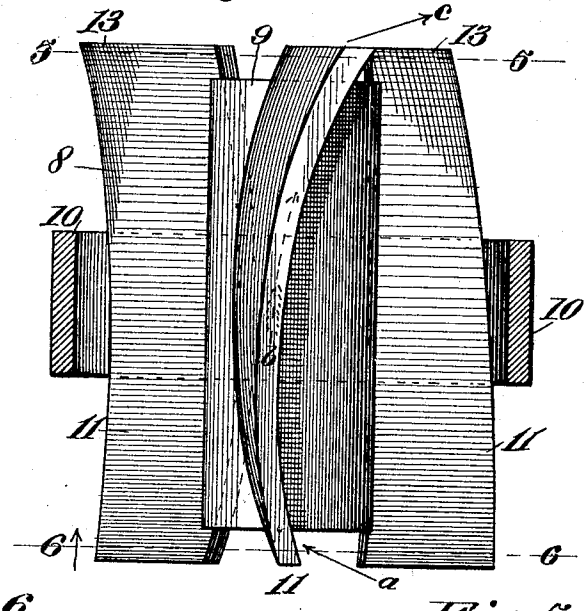


Fig. 6.

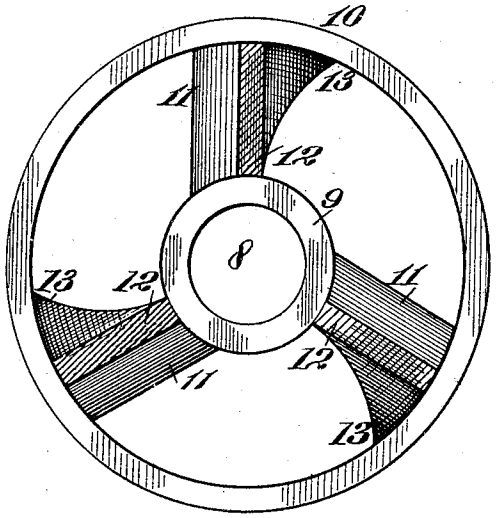
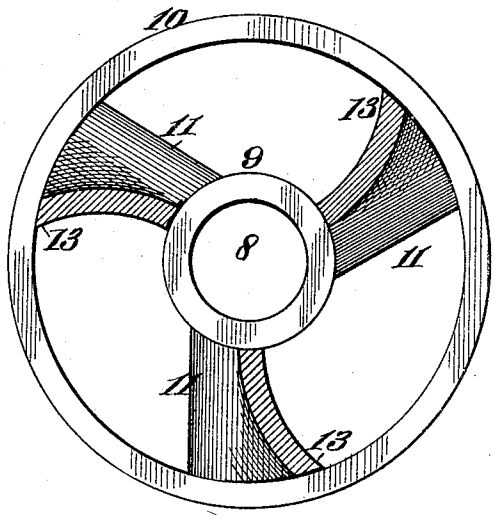


Fig. 5.



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UNITED STATES PATENT OFFICE.

ARTHUR L. MORTON, OF SAN JOSE, CALIFORNIA, ASSIGNOR TO FLORA M. MORTON, OF SAN JOSE, CALIFORNIA.

PUMP.

1,200,863. Specification of Letters Patent. Patented Oct. 10, 1916.

Application filed May 5, 1915. Serial No. 25,955.

To all whom it may concern:

Be it known that I, ARTHUR L. MORTON, a citizen of the United States, residing at San Jose, in the county of Santa Clara and State of California, have invented new and useful Improvements in Pumps, of which the following is a specification.

This invention relates to a deep well pump.

One of the objects of the present invention is to provide a simple, substantial, cheaply manufactured deep well pump, and particularly to provide a novel form of impeller and diffusion member which produces a considerable increase in efficiency.

Another object of the invention is to provide a simple form of casing or housing for each impeller and connected diffusion member which may be built up to permit application of additional units where the head is increased as conditions demand.

Further objects will hereinafter appear.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a vertical, central section showing the installation of the pump. Fig. 2 is a plan view of the runner or impeller. Fig. 3 is a side elevation of same. Fig. 4 is a side elevation of the diffusion ring. Fig. 5 is a horizontal section on line 5—5, Fig. 4. Fig. 6 is a horizontal section on the line 6—6, Fig. 4.

A indicates the well casing, 2 the pump column or tubing through which the water discharged by the pump is elevated, 3 the pump shaft, and 4 the surface frame from which the shaft and pump column respectively are suspended; the shaft being supported by a thrust bearing and driven in any suitable manner (not here shown).

B indicates the pump in general, the casing of which is constructed of short pipe sections 5 which are connected by couplings 6; the pump casing as a matter of fact being nothing more or less than an extension of the main column 2, as it is constructed of pipe sections connected by couplings, said pipe sections and couplings being of the same size as the main column sections.

Mounted interiorly of the pipe fittings or sections 5 is a plurality of runners or impellers, such as indicated at 7, said impellers being suitably secured upon the shaft so as to turn in unison with same, and interposed between each impeller is a diffusion ring, such as indicated at 8. The diffusion ring consists of a central bearing member 9, exteriorly of which is mounted a ring 10, and interposed between the bearing member 9 and ring 10 is a plurality of diffusion vanes 11. These vanes are convex or scoop-like in shape; the lower end of each vane being straight and radially disposed, as indicated at 12 in Fig. 6. The remainder of the vane then gradually assumes a twisted shape, such as indicated at 13, in Figs. 4 and 5. The vanes thus shaped will take the water discharged in the direction of arrow *a* from the impeller mounted just below and reverse its direction.

The impeller running in the same direction as arrow *a* will impart a swirling action to the water which travels in the same direction. This water entering the lower end of the diffusion vane will gradually be changed in direction and will finally be reversed before discharging at the upper end of the diffusion vanes, as the water entering or striking the scoop-shaped vane will gradually turn in the direction of arrow *b* and finally discharge at the upper end in the direction of arrow *c*. The swirling action of the water is thus destroyed and its direction reversed. The scoop-shape of the vanes reverses the direction or flow of the water while the gradual twist provided in the vanes has a tendency to force the water inwardly toward the intake end of the next impeller. The water is admitted as near the center of the impeller as possible and skin friction with relation to the inner face of the casing is reduced to a minimum. The diffusion rings are in this instance placed on top of a pipe section, such as indicated at 5. A coupling 6 is then screwed on to the end of pipe section 5, forming a housing for the ring 10. The second section 5 is then screwed into the coupling sufficiently far to engage the upper edge of the diffusion ring. It is thus thoroughly secured in place, as the lower pipe section forms a seat for the ring, while the upper section acts as a clamping member to secure the ring upon the seat, the coupling thus forming a housing. The impeller, indicated at 7, is

interposed between each diffusion ring and the pipe sections 5 form housings exteriorly of the impellers.

Any suitable number of units may be added to or taken away as conditions warrant, as it is only necessary to add the desired number of impellers, together with the pipe sections and couplings required. The impellers shown in the present instance are provided with three blades, the outer edges of which are flanged, as indicated at 15. The lower intake of each blade is straight, as indicated at 16, while the upper discharge end of each blade is considerably inclined, as indicated at 17. This permits the blade to receive the water discharged from the upper end of the diffusion vanes and the water received will be forced up the blade surface, and as it strikes the inclined upper end it is thrown inwardly toward the shaft of the center of the casing. The flanged edge of each blade also has the same tendency. Skin friction on the interior of the casing is thus considerably reduced.

In operation, referring to Fig. 1, it will be seen that the lowermost pipe section 5 serves as the suction or intake end of the pump. The water is here lifted by the lowermost impeller indicated at 7 and when discharged will immediately enter the lower ends of the diffusion vanes in the direction of arrow *a*. The vanes will then gradually change the direction or flow of the water and finally discharge it at the upper end in the direction of arrow *c*. The water will enter the second impeller indicated at 7^a in a direction opposite to its revolution, which is in the direction of arrow *a*. An efficient action is thus produced, as the water flowing in a direction opposite to the revolution of the impeller is more easily gripped and raised than would otherwise be the case.

The cycle of operation or flow of water from one unit to another is the same as described, the number of units depending upon the head required and other conditions. The upper twisted shape of the diffusion vanes, together with the inclined or angular shape near the upper end of each impeller, has a tendency to increase the efficiency of the pump, as the water is always discharged or thrown toward the center of the casing while passing from one unit to another, reducing skin friction with relation to the interior of the casing and at the same time delivering water at a point where it is more efficiently raised from one unit to another.

A pump constructed as here shown may be exceedingly cheaply manufactured as the exterior casing of the pump is constructed of nothing more or less than pipe fittings screwed one into the other. These sections when screwed one into the other also form seats and clamping members for the several diffusion rings, thereby eliminating any necessity of otherwise securing same, and the bearing members provided in each diffusion ring at the same time serve as an alinement for the shaft and bearings for same.

The materials and finish of the several parts of the apparatus are such as the experience and judgment of the manufacture may dictate.

I wish it understood that various changes in form, proportions and minor details of construction may be resorted to within the scope of the appended claims and that I do not wish to limit myself to the specific design and construction here shown.

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

1. In a pump of the character described, a diffusion member comprising a ring and interior bearing, and a plurality of diffusion vanes interiorly of said ring having a radial lower edge, and an increasing twist to their upper ends.

2. In a pump of the character described, a diffusion member comprising a ring, a bearing member centrally disposed within said ring, and a plurality of diffusion vanes interposed between the ring and central bearing, said vanes having horizontal radially disposed lower edges, and a gradually increasing spiral, terminating in inwardly twisted upper terminal edges.

3. In a pump of the character described, a diffusion member comprising a ring, a bearing member centrally disposed within said ring, and a plurality of diffusion vanes interposed between the ring and central bearing, said vanes having a gradually increasing twist reversely to the direction of the impellers on a line taken through their longitudinal axis, and having their upper ends turned inwardly or twisted, substantially as described.

4. In a pump of the character described, an impeller comprising a hub, a plurality of radially disposed, inclined blades on said hub, the intake end of each blade being straight and radial to the hub, and the discharge upper end inclining upwardly and outwardly, and a flange of gradually increasing height from the base to the top on the outer edge of each blade.

5. In a pump of the character described, an impeller comprising a hub and a plurality of radially disposed, inclined blades on said hub, the intake end of each blade being horizontally disposed with relation to a vertical line through the hub, and the discharge end of each blade being disposed at an upward obtuse angle with relation to the vertical line.

6. A pump comprising cylindrical pipe sections, couplings by which the sections are united in a continuous straight line, diffusion devices consisting of outer rings

clamped between the meeting ends of the pipe section, and interior tubular shaft guides and a plurality of interposed vanes having substantially radial lower edges and a gradually increasing upward axial curvature with an inward terminal twist at the top, a shaft turnable in the central bearing guides, spiral impeller blades with radial horizontal lower edges, and upwardly inclined upper edges, and vertical peripheral flanges increasing in height from the base to the top, and coacting with the diffusion vanes to change the direction of flow through said vanes.

7. In a pump of the character described, means to check the outward whirling motion and peripheral friction of the water, consisting of fixed diffusion vanes with horizontal radially disposed lower edges, said vanes gradually increasing in curvature upward around the axis, and terminating in an inward twist, and rotary impellers having radial straight edges, to which the water is delivered from the diffusion vanes in an opposite direction from its entrance to the vanes.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ARTHUR L. MORTON.

Witnesses:
JOHN H. HERRING,
W. W. HEALEY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."