No. 671,088. Patented Apr. 2, 1901.

J. S. MORTON.

HYDRAULIC PROPELLER.

(Application filed June 3, 1897. Renewed Oct. 18, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

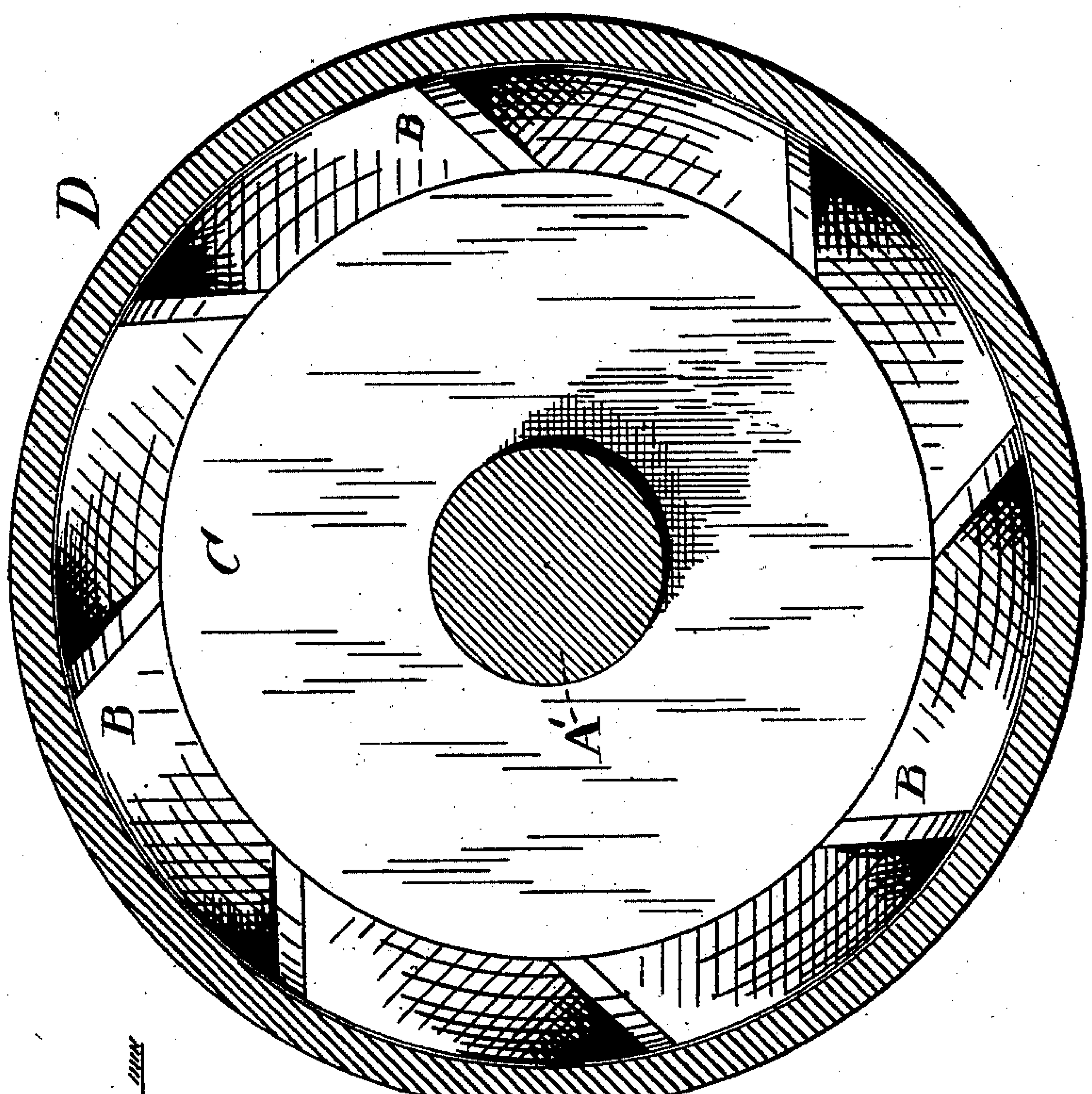
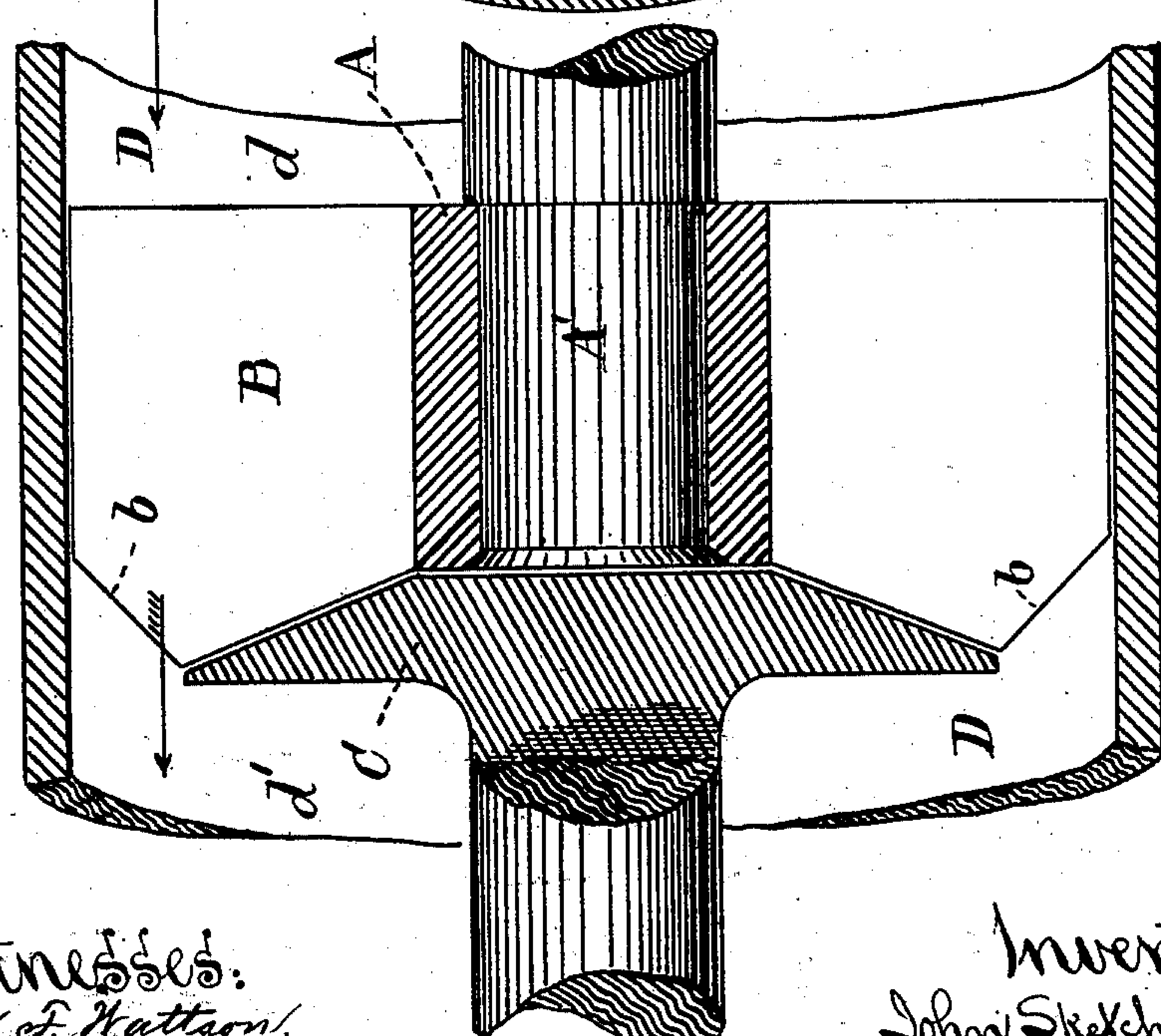


Fig. 1.



Witnesses:
Wm. F. Wattson.
W. A. McKowen.

Inventor:
John Sketchley Morton
By W. X. Smyth, atty.

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

No. 671,088. Patented Apr. 2, 1901.

J. S. MORTON.

HYDRAULIC PROPELLER.

(Application filed June 3, 1897. Renewed Oct. 18, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 4.

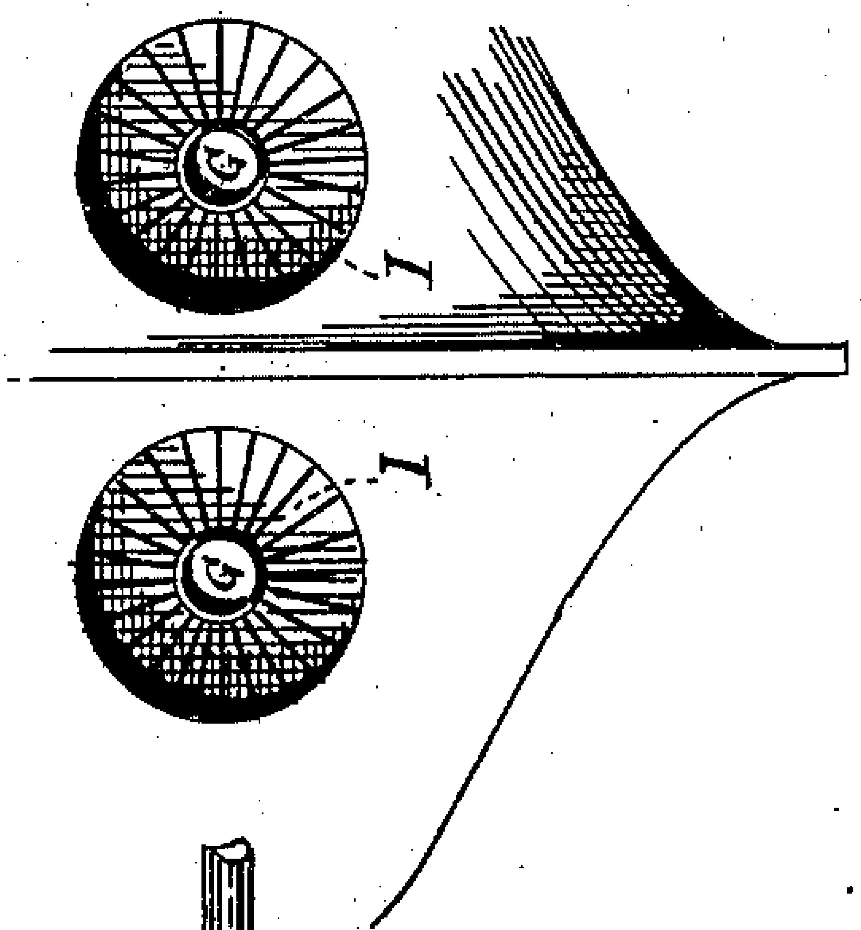


Fig. 6.

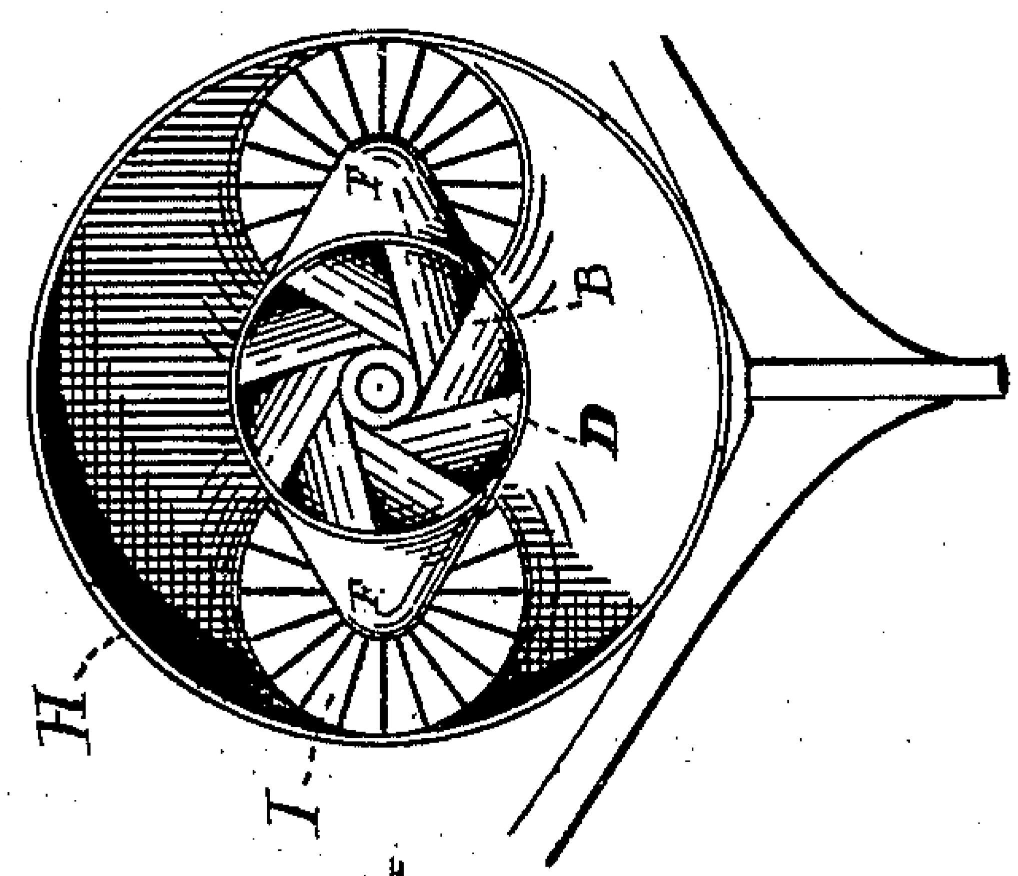


Fig. 3.

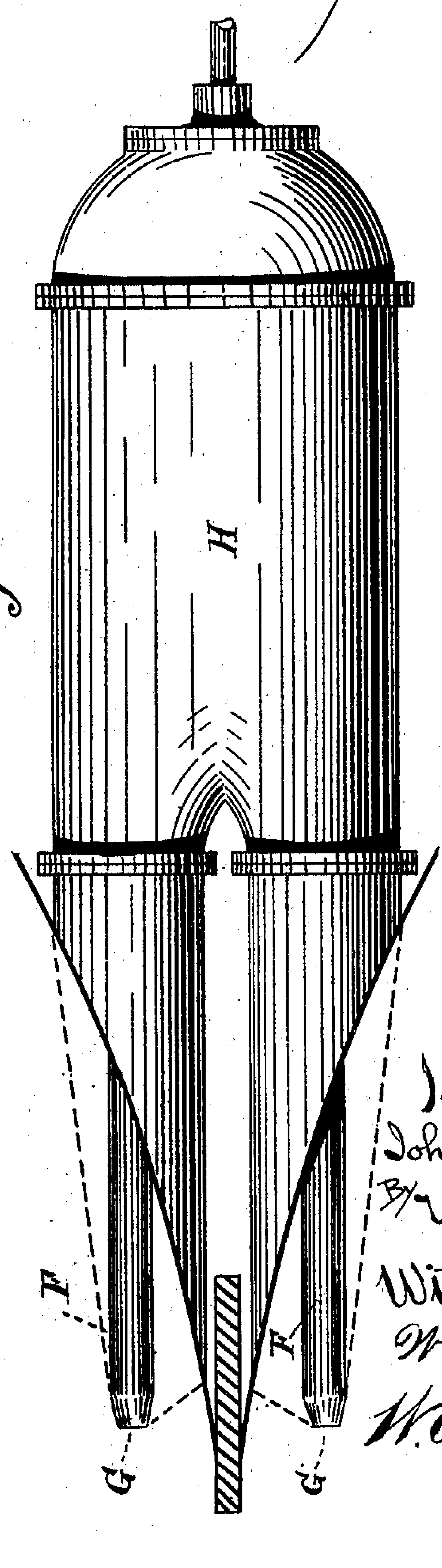
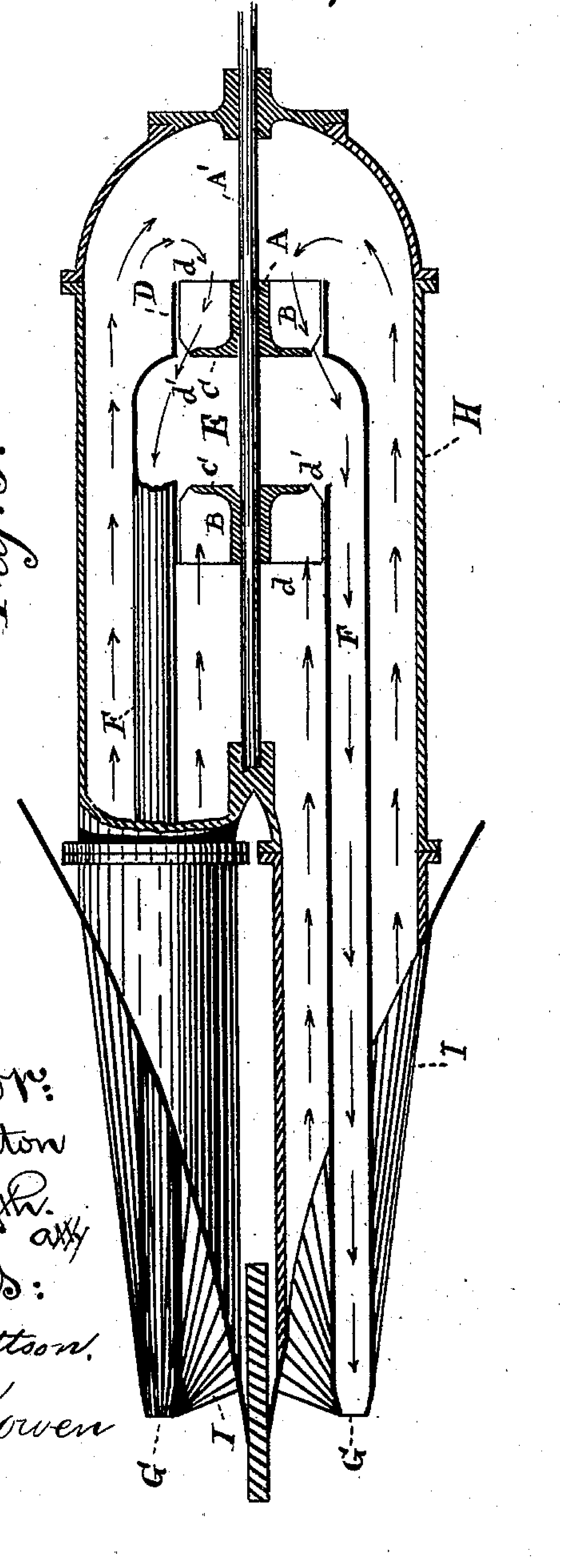


Fig. 5.



Inventor:
John S. Morton
By W. R. Smyth, atty.

Witnesses:
Wm. F. Wattson,
W. A. McKowen

UNITED STATES PATENT OFFICE.

JOHN SKETCHLEY MORTON, OF OAKLAND, CALIFORNIA.

HYDRAULIC PROPELLER.

SPECIFICATION forming part of Letters Patent No. 671,088, dated April 2, 1901.

Application filed June 3, 1897. Renewed October 18, 1900. Serial No. 33,514. (No model.)

To all whom it may concern:

Be it known that I, JOHN SKETCHLEY MORTON, a citizen of the United States, residing in Oakland, in the county of Alameda and State of California, have invented a new and useful Improvement in Hydraulic Propellers, of which the following is a specification.

My invention relates to a device for impelling fluids.

It has for its primary object the propulsion of vessels; but it is applicable to many other uses in which the impelling of fluids or the transmission of power by fluids is involved.

Described generally, it consists in rotary means in a fluid-impeller adapted to effect the travel at equal speeds of all parts in the section of the effluent stream.

I accomplish the objects hereinbefore referred to by means of the devices illustrated in the accompanying drawings, in which—

Figure 1 is a diagrammatic section of one form of my device. Fig. 2 shows an end view. Fig. 3 represents a plan view of a slightly-modified form of my invention as applied to the propulsion of vessels. Fig. 4 shows an end elevation of a portion of a vessel, showing the inlet-opening and nozzle in one form of construction. Fig. 5 represents a similar view to Fig. 3, portions being in section to more clearly show the internal construction of the device. Fig. 6 represents a sectional elevation of the device in position in a vessel.

Referring to the drawings, A is a rotatable hub of any suitable form provided with radial blades, flukes, or vanes B, set at an angle to the length of the hub, forming the impelling device secured upon shaft A'. The degree of angularity of the blades is dependent upon the purpose for which the device is intended. C is a plate, which may be stationary, as shown in Fig. 1, or rotatable, forming an integral portion of the impeller, as shown in Fig. 5. It is concentric and adjacent to the eduction side of the impeller. The diameter of the plate C is smaller than the extreme diameter of the circle described by the blades and is dependent upon the purpose of the device. Commencing at the periphery of plate C, the eduction-corner of each blade is cut away at an angle determined by the relation of the various parts, as will be more fully set forth hereinafter.

The devices just described are set in a surrounding casing D of very slightly larger diameter than the circle described by the blades, as shown in Figs. 1 and 2. The induction side *d* and the eduction side *d'* of the casing are extended to and connected with the water of flotation in the manner to be hereinafter described.

Upon the proportional relations of the various parts of the device depend to a large extent this efficiency. I will therefore give a more detailed description of their construction.

The diameter of the impeller and pitch of the blades are first fixed by relation to speed of the motor. I have found in practice that an angle of forty-five degrees in the blades with relation to the axis of rotation gives good results under ordinary circumstances, the pitch being uniform from hub to periphery. The diameter of the hub is determined merely with relation to structural strength.

The size of plate C is determined by the relation of the available power to the volume of discharge. In other words, the annular opening between the periphery of plate C and the casing must be of sufficient area to admit of the discharge of the impelled fluid at the speed incident to the pitch and speed of rotation of the impeller under the conditions in which the device is operated.

The proper shape of the blades adjacent to the periphery of plate C is of high consideration, as it performs important functions. As heretofore pointed out, the hub portion of the blades controls the peripheral portion—that is, being weakest in capability of generating pressure it is also less capable of sustaining pressure generated by the peripheral portion. This action still remains beyond plate C, and it is therefore essential to so arrange this portion of the blades that from the periphery of plate C to the extreme diameter of the blades fluid shall be impelled with uniform speed—that is, at equal speed at the periphery of plate C to that at the extreme diameter of the blades. This is accomplished by cutting away the corner of each blade, as shown at *b*, or as represented by the following simple formula, in which W equals circumference of C, X equals circumference of blade-circle, Y equals width of impeller-blade, and Z equals desired width of blade at circumference of C. Then

$$\frac{X \times Y}{W} = Z.$$

It will be seen that this construction effects the desired function, for, though the fluid is moved but the width of the impeller during one revolution, it has to travel a distance equal to the angular width of the blade. In other words, the blades at the periphery of plate C are by the proportion above described sufficiently wide to equal an impelling effect of the blade at its radial extremity, as also at all intermediate points. It will thus be seen that by means of the construction described the whole rotative effect of the impeller is to impart to the fluid a forward motion of equal velocity at all points of the sectional area of the discharge, and the question of pressure on the effluent side of the impeller becomes one merely of rotational speed and power applied to the impeller.

In the device as illustrated in Fig. 1 the backward thrust of the impeller must be resisted by some stationary part, as in an ordinary propeller, which is resisted by the thrust-block. To obviate this necessity, I have shown the construction illustrated in Fig. 5, in which two impellers, one having a right-hand pitch and the other a left-hand pitch, are secured upon the same shaft and located in the same surrounding casing at some distance apart, forming between them a pressure-chamber E, from which the eduction-pipes F F lead to the suitably-located nozzles G G. In this form of construction I inclose the whole device in a surrounding exterior casing, preferably made of bifurcated form, as shown in Fig. 5, in which each leg of the outside casing surrounds one of the eduction-pipes, forming an annular induction-conduit open to the water of flotation. This conduit at its entrance is preferably guarded by a suitable grating or strainer I to prevent the admission of foreign substances, as shown at I I, which represent radial bars.

Heretofore it has been the fixed and accepted practice in devices in which water is used as the propelling agent to locate the supply-opening in the forward portion of the vessel, leading backward to the impelling device. This practice is diametrically at variance with natural law. It will be seen by reference to Figs. 3, 4, and 5 and the preceding description that I place the supply-opening in close proximity to the discharge-nozzle, that is in the rear portion leading forward, securing thereby the additional propulsive force due to the direct impact of the inrushing water. This has an ultimate propulsive value of 14.7 pounds per square inch of inlet area or a column of water 32.1 feet head plus the depth of water at which the inlet of water is submerged.

That my construction is scientific and the accepted practice is opposed to natural order will be preceived on proper consideration of the conditions involved. In "suction" pumping the action is one of pushing, not pulling. The impelling device pushes up—that is, lifts a column of atmosphere. As this force is expended in a vertical direction, it has no other direct influence as regards motion if exerted on a floating vessel. Consequently the inrushing water exerts an unbalanced force in the direction of its motion.

Steering and backing may be provided for in this application of my invention to the propulsion of vessels by suitable pipes and valves, as has been heretofore done in other devices in which fluids are used as the propulsive agent, and a duplicate device may be located in the forward part of a vessel, so as to give equal facility and power of moving astern as ahead.

The device may also be applied to various other uses upon the vessel in which the flow of water is involved—as, for instance, the circulating condensing water for the engines—and in emergency of leak the supply may be taken from the hold.

As heretofore intimated, I do not desire to confine this invention to the specific form or uses herein mentioned, as it is evident that it is applicable to many other uses and its form may be modified in many ways without departing from the true essential character of the invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. A device comprising a casing, a rotating fluid-impelling device therein, and a plate located concentrically in said casing abutting the discharge side of the impelling device, adapted to form with the casing and between them a discharge-opening.

2. A fluid-impelling device comprising a cylindrical casing, a rotating device therein, provided with a multiplicity of radial blades set at an angle to the axis of rotation having a portion of their width of uniform radial length and the remaining portion of the width of the blades sloping to a smaller radial length, an induction-opening in the casing adjacent to, and communicating with the blades of an area equal to the circle described by the longer radius of the blade.

3. A device for propelling vessels, comprising a power-driven non-intermittent fluid-impeller, a discharge-nozzle thereto and a supply-aperture to said impeller pointing substantially in the same direction as said nozzle and on the same side of said fluid-impeller.

4. A device for propelling vessels, comprising a power-driven non-intermittent fluid-impeller and a discharge-nozzle thereto, having its supply-aperture surrounding it.

5. A propulsion device for vessels, comprising mechanism adapted to effect and direct a fluid stream against the water of flotation, said mechanism being provided with an inlet and outlet fluid-directing device, consisting of two tubes, one within the other, separating the ingoing from the outgoing stream and adapted to perform their functions simultaneously.

6. A propulsion device for vessels, comprising mechanism adapted to effect and direct a fluid stream against the water of flotation, said mechanism being provided with an inlet-pipe and discharge-nozzle adapted to perform their functions simultaneously and which communicate with the water of flotation adjacent to each other, pointing in substantially the same direction and on the same side of said fluid-impeller.

7. A device for propelling vessels comprising a rotating fluid-impeller in a suitable casing having duplicate induction-apertures and eduction-pipes, a bifurcated casing extending to and communicating with the water of flotation forming induction-pipes around the eduction-pipes.

JOHN SKETCHLEY MORTON.

Witnesses:

WM. F. WATTSON,

W. A. McKOWEN.