(No Model.) 2 Sheets—Sheet 1.

C. C. TAYLOR.

WATER WHEEL.

No. 379,741. Patented Mar. 20, 1888.

Fig. 1.

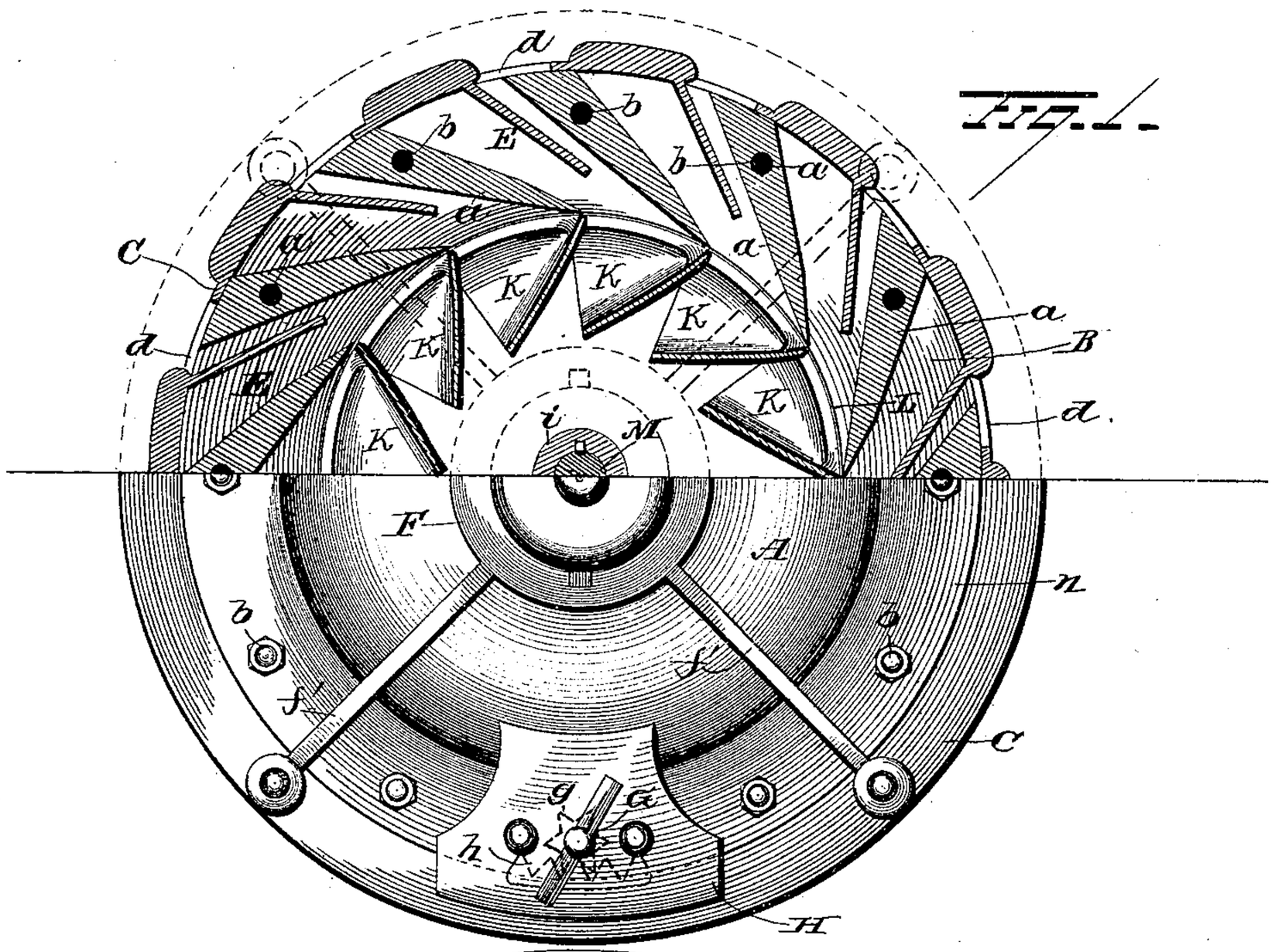
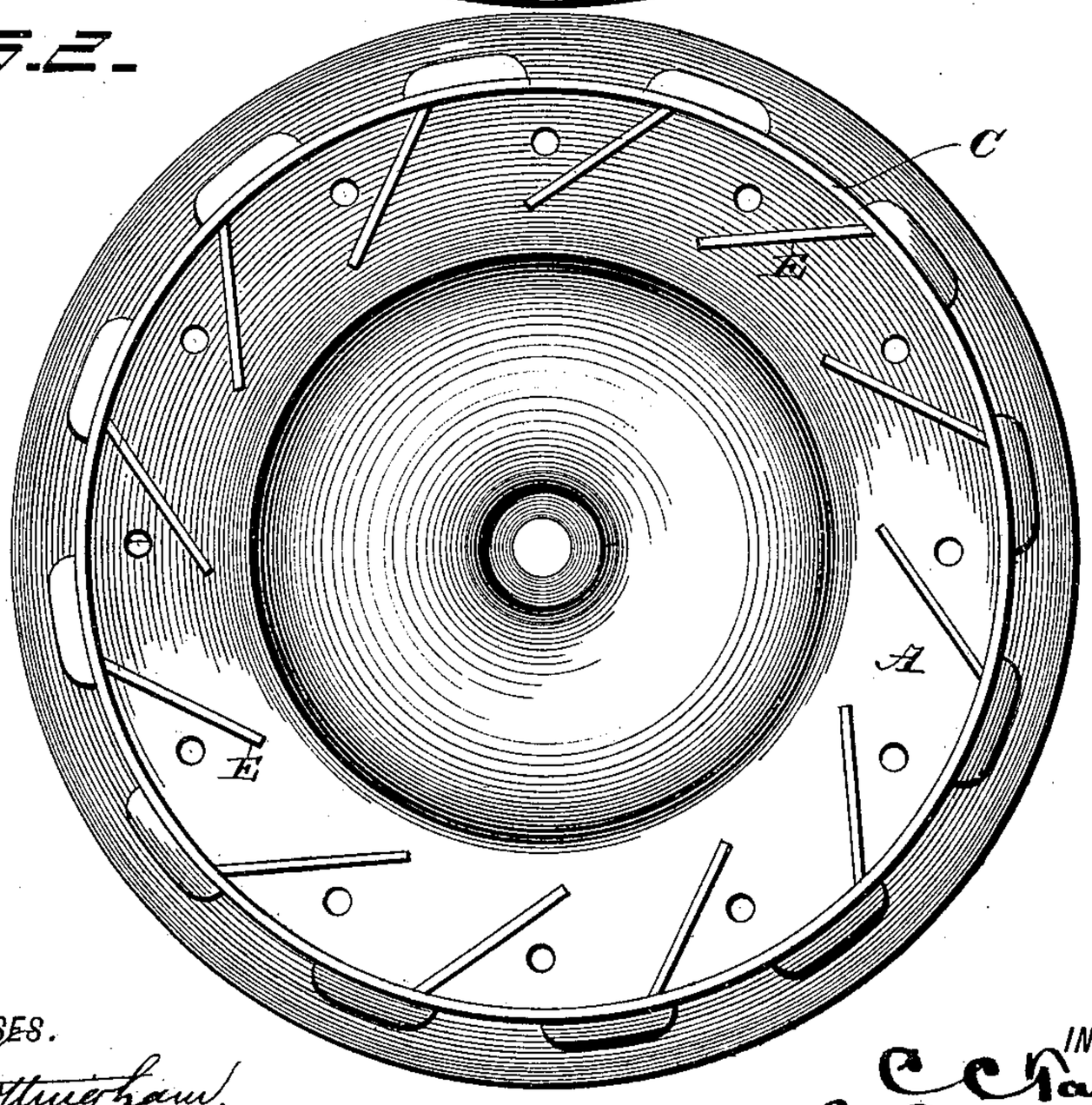


Fig. 2.



WITNESSES.

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(No Model.) 2 Sheets—Sheet 2.

C. C. TAYLOR.

WATER WHEEL.

No. 379,741. Patented Mar. 20, 1888.

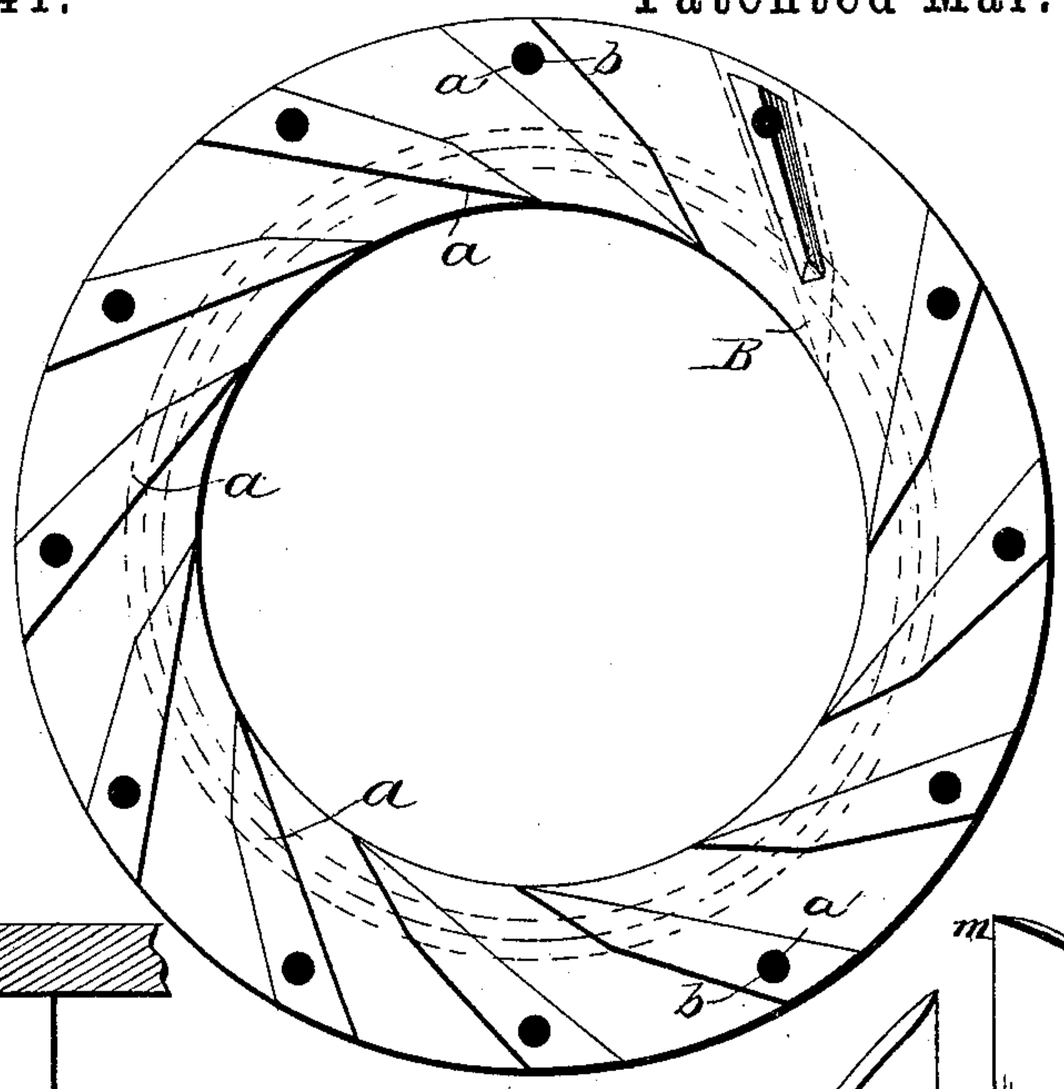

FIG. 3.

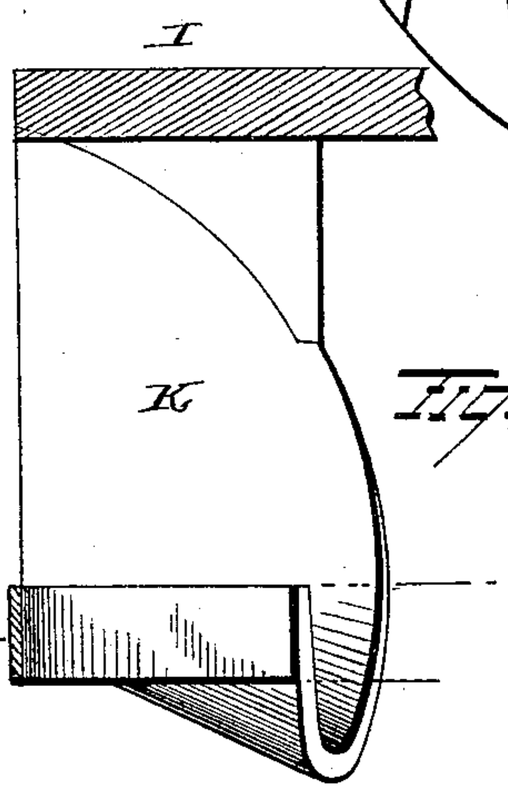

FIG. 5.

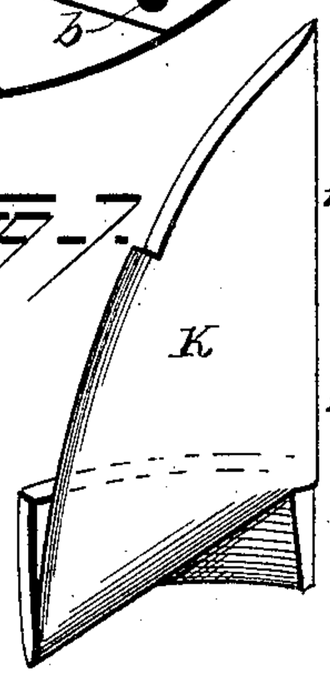

FIG. 7.

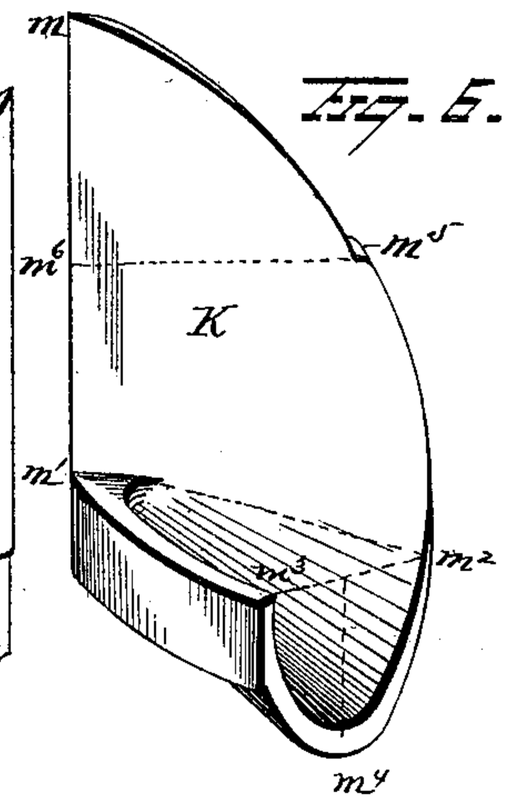

FIG. 6.

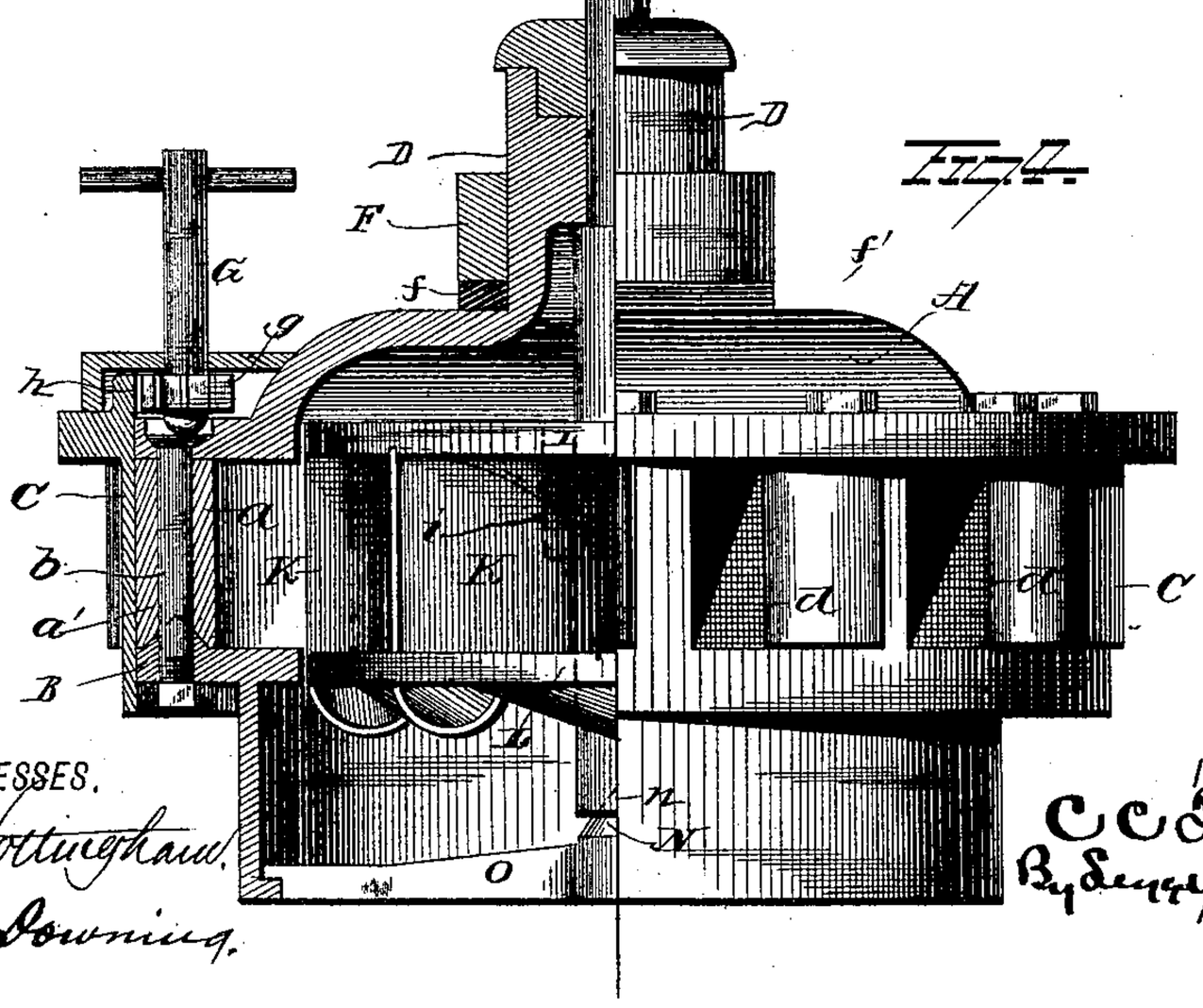

FIG. 4.

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UNITED STATES PATENT OFFICE.

CHRISTOPHER C. TAYLOR, OF APPLETON, WISCONSIN.

WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 379,741, dated March 20, 1888.

Application filed June 19, 1886. Serial No. 205,639. (No model.)

To all whom it may concern:

Be it known that I, CHRISTOPHER C. TAYLOR, of Appleton, in the county of Outagamie and State of Wisconsin, have invented certain new and useful Improvements in Water-Wheels; 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 water-wheels.

The object is to provide an improved gate for admitting water to the blades of a turbine wheel, whereby an even solid sheet or jet of water will be thrown upon the wheel at all the various widths of gate-opening and the gate supported upon bearings which are not liable to rust.

A further object is to provide an improved blade which shall be of such form as to utilize the highest percentage of power, and constructed in accordance with such a rule of measurements that blades of any required sizes may be constructed possessing the same form, and to further construct the blades in such a manner that they may be readily secured to the wheel-frame.

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

In the accompanying drawings, Figure 1 is a plan view of the wheel, partly in section. Fig. 2 is a detached bottom view of the gate and top of the casing. Fig. 3 is a view of the lower section of the casing with the chutes. Fig. 4 is a view in elevation, partly in section, showing the gate-operating mechanism; and Figs. 5, 6, and 7 are detached perspective views of one of the blades in different positions.

A represents the upper section or cover of the wheel-casing, and B the lower section thereof. Between the upper and lower sections of the casing a series of wedge-shaped partitions, *a*, are secured by bolts *b*, which pass through the laterally-extending flanges *n* on the upper and lower sections and through vertical perforations *a'* in the said wedge-sections. To prevent the said wedge-sections from lateral displacement, they are provided with grooves in their lower edges, which receive lugs formed on the flange of the lower section. The partitions *a* form the chutes for directing the water onto the blades of the wheel when the gate is opened.

The gate consists, essentially, of a circular band, C, adapted to fit as snugly as is consistent with a free sliding motion on the outside of the flanges of the upper and lower sections of the casing and the outer ends of the chute-partitions *a*, a four-branch yoke, F, loosely mounted on an upwardly-extending stem, D, forming a part of or rigidly secured to the upper section of the casing, and a series of openings, *d*, formed in the band C and provided with inwardly-projecting lips or guides E. The yoke F is provided with a bushing, *f*, on its lower face, where it rests in contact with the casing, said bushing being composed of Babbitt metal or other material which is not liable to waste by rust when exposed to water. The branches *f'* of the yoke F are secured at their lower ends to the upper edge of the band C and hold the same suspended, thus bringing the entire weight of the gate onto the non-rusting bearing of the yoke.

The lips E, secured to the edges of the openings *d*, project inwardly, conforming nearly or quite to the direction of the wall of the chute, and serve to form one wall of each chute as far as they extend. They may extend into close proximity with the blades of the wheel, or they may stop a short distance back therefrom. They are intended, however, to extend far enough to give the sheet or jet of water passing through the chute a smooth solid form, which will not be broken until it strikes the blade. The lips E may be cast integral with the gate, or they may be provided with smooth flanges at their outer ends and secured to the band C by means thereof. The gate is operated by means of a pinion, *g*, secured to the lower end of an operating-rod, G, the upper end of which is within convenient reach of the operator and provided with a hand-wheel or hand-lever for rotating it. The pinion *g* is inclosed within a box, H, secured to the upper side of the upper section of the casing, near its edge, and is adapted to engage a curved rack-bar, *h*, se-

cured to the rim of the band C. The operating-rod G has a bearing in the casing and at the point where it passes through the box H.

As the rod G is rotated to the right or left, the gate is rotated on its bearings, and the chutes gradually closed or opened by the lips or guides E advancing toward or receding from the opposite walls of the chutes. The tendency of the water to scatter as it enters through a partially-closed gate into a chute larger than the gate-opening is thus obviated, the jet being held compactly together until it impinges upon the wheel, and its momentum is thereby increased and communicated to the wheel.

The lower section of the casing is provided with an opening in its lower face large enough to admit the wheel.

The wheel consists of an upper disk, I, provided with a series of depending blades, K, cast integral therewith or rigidly secured thereto and bound together at their lower ends by an outer band, L. The shape of the blade K is the result of many experiments and careful study, and may be generally described as a curved plate extending from a straight outer edge, $m\ m'$, toward a line midway between the shaft M and the circumference of the wheel. The inner edge, $m\ m^2$, extends on a curve from the upper end, m, of the outer edge to a point, m^2, about one-half the length of the edge $m\,m'$ inside of the circumference, and from this point the edge $m\ m^2$ curves outwardly U-shaped to the point m^3 at the circumference of the wheel. From the point m' to the point m^3 the blade is curved to form the arc of a circle and forms a seat for the band L, which is shrunk on to secure the blades firmly in position.

The exact proportions of the blade which form the basis for increasing or diminishing the size without changing the shape are as follows: The distance from m to m' is one-half the diameter of the wheel; from m' to m^3 is two-thirds the distance from m to m'; from m^3 to m^2 is one-fourth the diameter of the wheel, or one-half the distance from m to m'; from a straight line joining the points m^3 and m^2 to the point m^4 at the bottom of the U-shaped portion is one-half the distance from m' to m^3; from m^2 to a point, m^5, which is the lowest point of attachment of the blade to the disk I, is one-half the distance from m to m'; from m^5 to m^6, the nearest point on the edge $m\,m'$, is one-half the distance from m to m'. The lines $m\ m'$ and $m'\ m^2$ are straight. The disk I is provided with a depending boss, i, centrally located, to form an extended contact-surface with the shaft M. The wheel is secured to the shaft M by feather and groove or other suitable means, and the shaft is provided with a conical recess, n, in its lower end to form a seat for a cone-bearing, N, on a spider, O, located in the lower portion of the casing. As the water first strikes the blade its force acts at right angles thereto, and therefore exerts its full force thereon. After this force is spent, it reacts on an incline plane all the way down the U-shaped portion of the blade, and in so doing its momentum and weight are again introduced as important factors in pushing the wheel forward.

It will be observed that the above construction produces a compact, durable, and very efficient combination adapted to use in connection with all classes of mills or manufactories where a water-power of sufficient head is found.

It is evident that many changes in the form and construction of the parts described might be resorted to without departing from the spirit and scope of my invention. Hence I do not wish to limit myself strictly to the construction herein set forth; but,

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

1. The combination, with the casing provided with the removable wedge-shaped partitions arranged in a circular series and a rotary gate provided with a series of openings corresponding to the said partitions and having the inwardly-extending guide-plates rigidly secured thereto, one at one edge of each opening, of a water-wheel consisting of an upper disk and a series of depending blades secured thereto, said blades each having on its outer face an elongated seat curved in the arc of a circle concentric with the center of the disk and parallel with the side walls of the casing, and a band shrunk around the blades and resting on said curved seats and below the outer edge of the blades, substantially as set forth.

2. The combination, with the upper disk of the wheel, of a series of depending blades, each having on its outer face an elongated seat curved in the arc of a circle concentric with the center of the disk and parallel with the side wall of the casing, and a band shrunk around the blades and resting on said curved seats and below the outer edge of the blades, substantially as set forth.

3. A water-wheel blade having substantially the following proportions, viz: from m to m' equals one-half the diameter of the wheel; from m' to m^2 and from m' to m^3 equals one-third the diameter of the wheel; from m^3 to m^2, from m^2 to m^5, and from m^5 to m^6 equals one-fourth the diameter of the wheel; from a line joining m^3 and m^2 to m^4 equals one-sixth the diameter of the wheel.

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

CHRISTOPHER C. TAYLOR.

Witnesses:

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JOS. KOPPURD.