

No. 629,457.

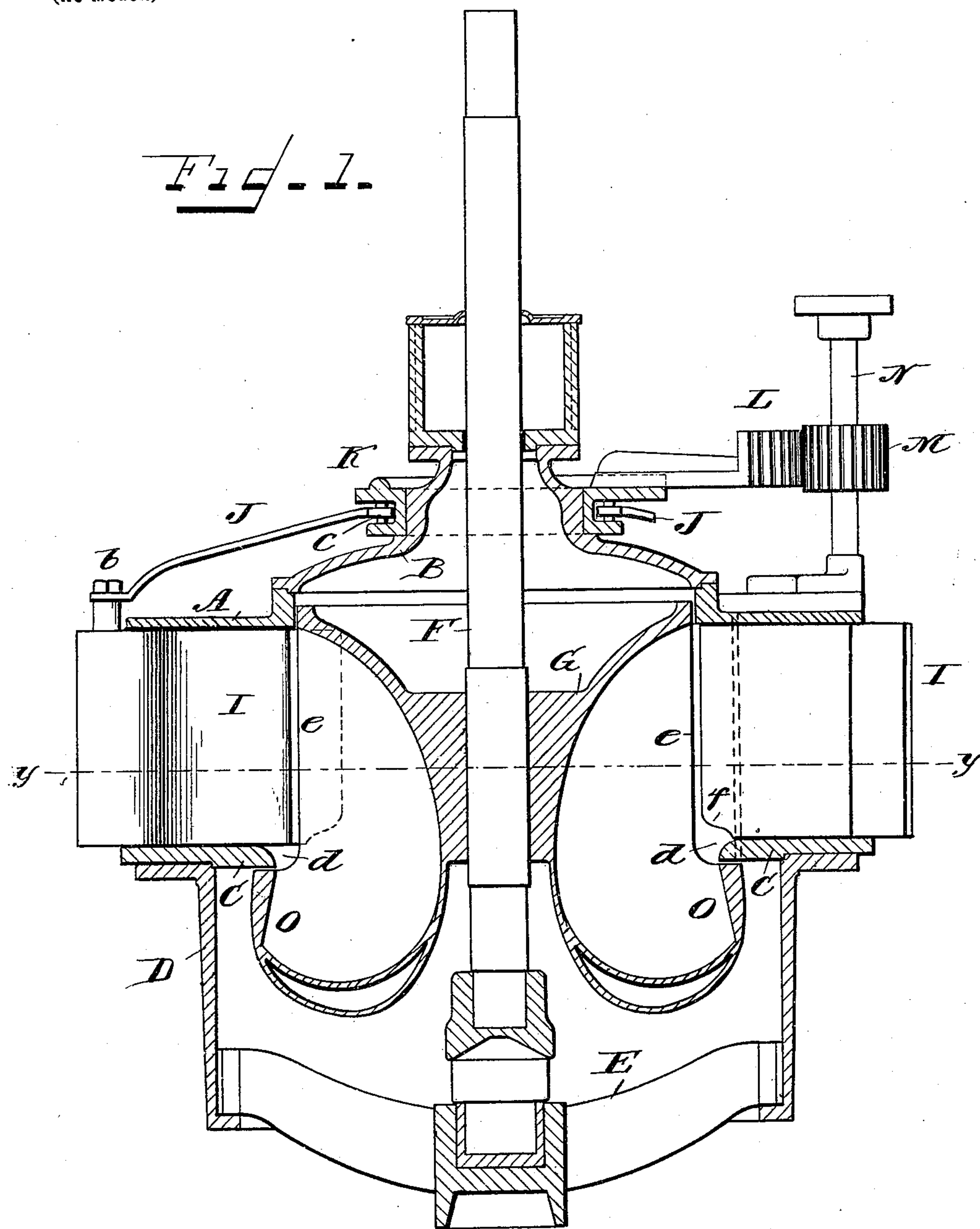
Patented July 25, 1899.

W. M. MILLS.  
TURBINE WATER WHEEL.

(Application filed Feb. 21, 1896.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

*William J. Veck.*  
*William A. Gay.*

INVENTOR:

*William M. Mills*  
*by Chas. M. Beck*  
*his atty.*

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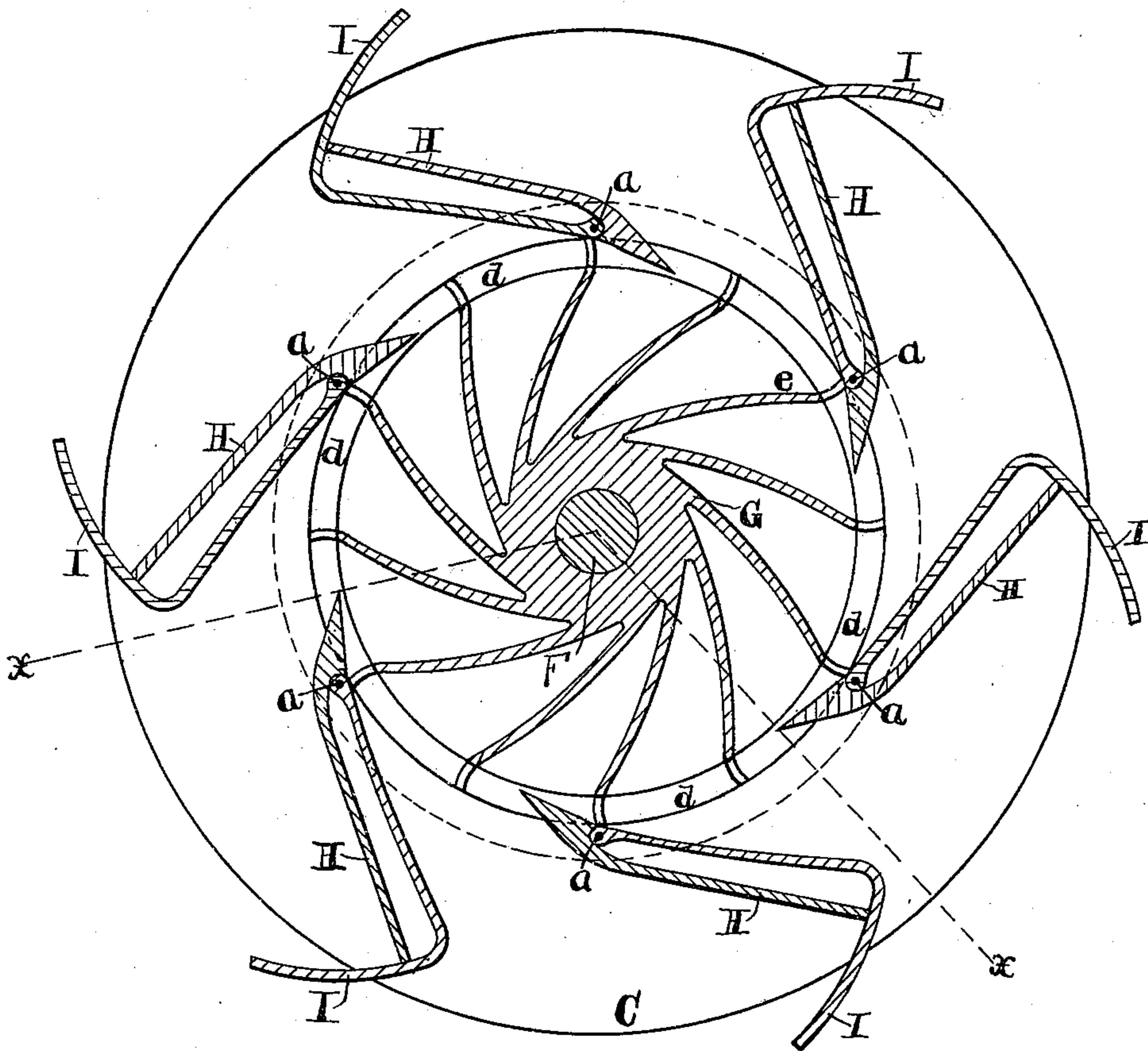


Fig. 2.

WITNESSES:  
*William J. Reek.*  
*William B. Fay.*

INVENTOR:  
*William M. Mills*  
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# UNITED STATES PATENT OFFICE.

WILLIAM M. MILLS, OF DAYTON, OHIO.

## TURBINE WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 629,457, dated July 25, 1899.

Application filed February 21, 1896. Serial No. 580,258. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM M. MILLS, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Turbine Water-Wheels, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to turbine water-wheels of the class illustrated and described in my prior patent, No. 293,904, of February 19, 1884, upon which it is an improvement; and it has for its object such a construction of the parts as to greatly increase the power and velocity of the wheel for any given diameter as compared with former constructions and whereby a relatively greater power is obtained at part gates than at full gates.

The novelty of my invention consists in materially enlarging the diameter of the wheel below the bottom plate of the chutes and surrounding the same with a band integral with the wheel, the upper edge of which band lies directly under the bottom plate of the wheel-case with its inner diameter flush with the inner diameter of said bottom plate, in carrying up the edges of the buckets above the bottom plate in vertical lines, in extending in the division-walls of the chute until their inner edges are in close proximity to the vertical edges of the buckets, and in providing an opening or clearance between the bottom plate of the case, which is beveled or rounded on its inner edge, and the vertical edges of the buckets, all as will be hereinafter set forth, and specifically pointed out in the claim.

In the accompanying drawings, Figure 1, Sheet 1, is a sectional elevation of a turbine water-wheel embodying my invention, taken on the dotted line *xx* of Fig. 2. Fig. 2, Sheet 2, is a sectional plan view taken on the dotted line *yy* of Fig. 1.

The same letters of reference are used to indicate identical parts in both figures.

Except in the particulars to be hereinafter pointed out the wheel and its case, chutes, gates, and gate-operating mechanism may be that of my prior patent before referred to or may be of any other suitable construction,

and in generally describing the same it is only necessary to say that A is the top plate; B, the dome; C, the bottom plate, and D the flume-cylinder, these parts constituting the case and being united in the usual or any suitable manner.

E is the bridge tree or spider, upon which is stepped the shaft F, upon which is secured the wheel G.

H are the vertical division-walls for the chutes confined between the plates A C, and I are the gates, pivoted, as at *a*, Fig. 2, in offsets of the walls H and operated simultaneously for open or closed positions by the rods *j*, Fig. 1, pivoted, as at *b*, thereto, and at their inner ends, as at *c*, to the ring K, journaled on the dome and carrying a segment-rack L, engaged by a pinion M on the gate-operating shaft N.

In my prior patent before referred to the inner diameter of the bottom plate C was less than that of the top plate A; but in the present wheel the inner diameter of the bottom plate C is greater than that of the top plate, as seen in Fig. 1, thus leaving a clearance or downward opening into the wheel in each of the chutes, as indicated at *d* in both figures. The inner ends of the division-walls H, which are substantially tangential to the wheel, project over this opening or clearance and extend in close proximity to the vertical edges *e* of the buckets, and their lower ends are cut off on an ogee curve, as seen at *b*, Fig. 1. The lower part of the wheel, as seen in Fig. 1, is enlarged in diameter, and O is the band surrounding the same and running close under the bottom plate C with its inner diameter flush with the inner diameter of said plate, whose edge is beveled or rounded, as shown in Fig. 1.

The purpose of the above construction is to produce a wheel that will develop as much power as possible for a given diameter, particularly at part gates. Manufacturers sometimes construct their wheels so that they will not discharge any more water with their gates entirely open than they will when partly open, and they claim the merit for their wheels of giving a greater percentage of power at half or part gate openings than a wheel properly constructed, as the present one, in which the



wheels discharge all the water at their full-gate openings and a less amount of water at part-gate openings.

By enlarging the diameter of the wheel below the bottom plate, extending the chute-walls inward in close proximity to the vertical edges of the buckets, and in providing the downward clearance or openings *d* at the bottom inner ends of the chutes I provide a construction in which the entire working surfaces of the buckets are constantly provided with water, acting both centripetally and downwardly, with all friction reduced to a minimum, whereby the power and efficiency of the wheel are largely increased and its velocity greatly accelerated.

The only novelty in the construction of the wheel itself consists in curving the buckets in horizontal section with their convex faces opposed to the inflow of the water, as clearly shown in Fig. 2, and at that point of the wheel where it joins the band in recurving the edges of the buckets, so that they are substantially radial to the axis of the wheel.

I have found from actual experience with wheels having their buckets thus formed that a greater percentage of power is obtainable for any given diameter.

Having thus fully described my invention, I claim—

In a turbine water-wheel, the combination with the case having an upper chute-plate and a lower chute-plate of greater internal diameter than the former plate, of the wheel revoluble therein and having its lower part extended in diameter and surrounded by a band lying under the inner beveled edge of the bottom plate, and the division-walls of the chutes extended in close proximity to the edges of the buckets and having their lower inner corners cut away, substantially as described.

In witness whereof I have hereunto set my hand this 3d day of February, A. D. 1896.

WILLIAM M. MILLS.

Witnesses:

J. THOMSON CROSS,  
WILLIAM J. PECK.