Sheet 1-2 Sheets.

I. G. Hall.

Water Wheel.

No. 90,167. Patented May 18, 1869.

Fig: 5.

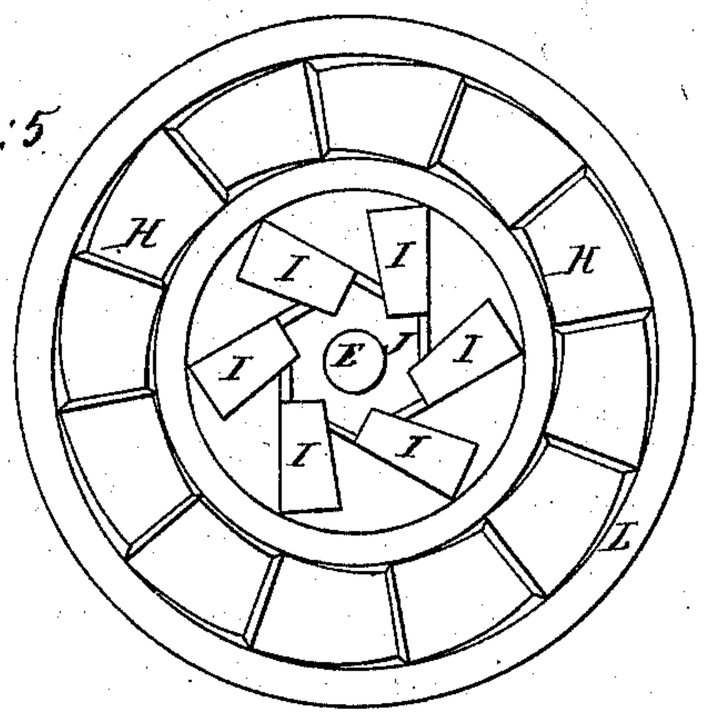


Fig: 6.

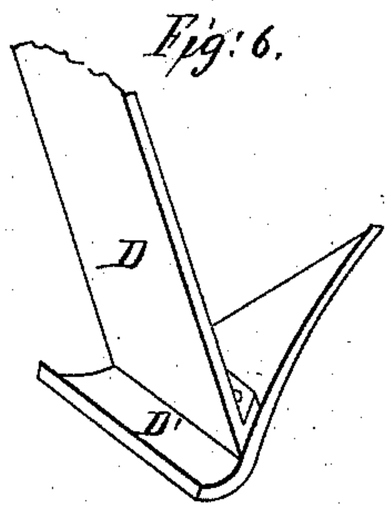


Fig: 7.

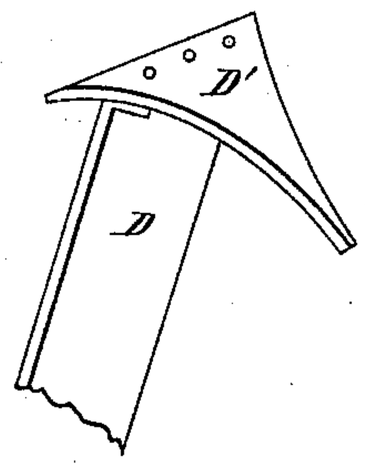
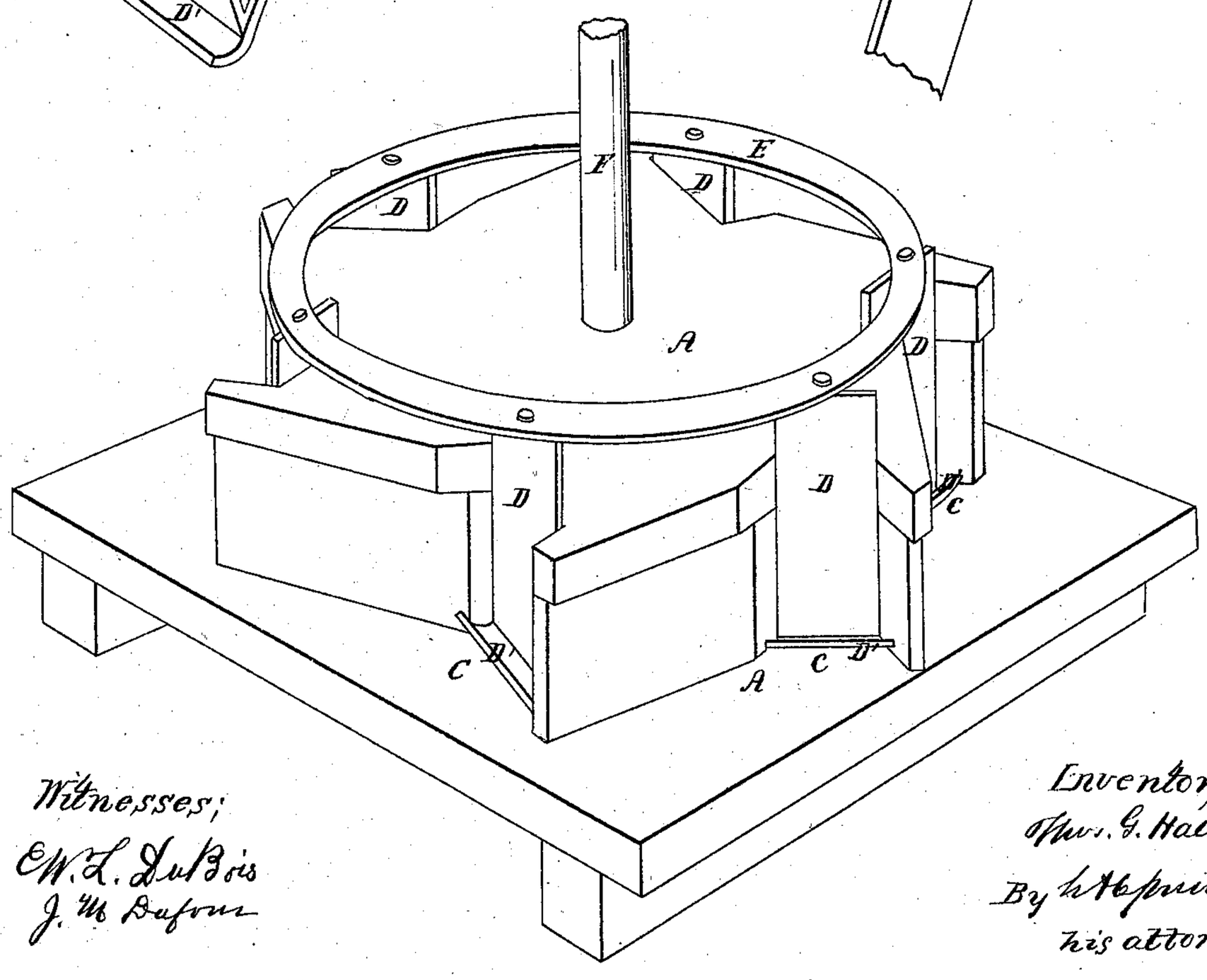


Fig: 1.



Witnesses;
E. W. L. DuBois
J. M. Dufour

Inventor;
Thos. G. Hall.
By his attorney
H. Hopkins

Sheet 2-2, Sheets.

T. G. Hall.

Water Wheel.

No. 90,167. Patented May 18, 1869.

Fig: 8.

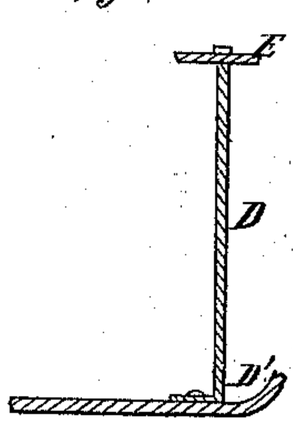


Fig: 10.

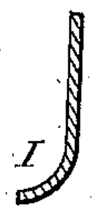
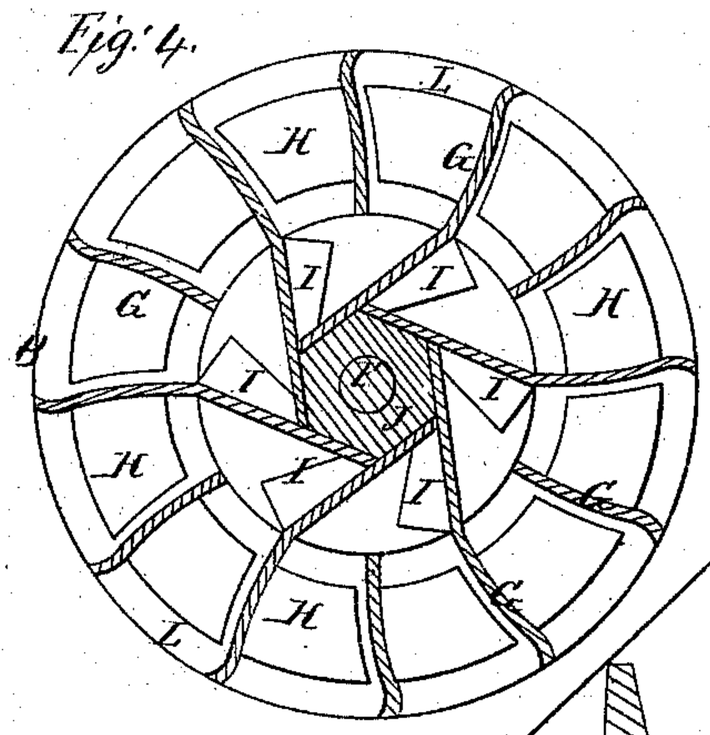


Fig: 4.



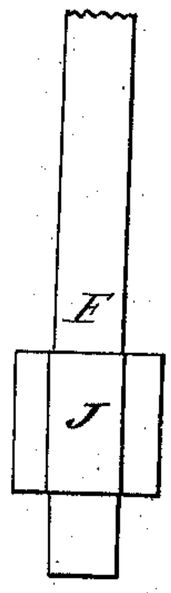
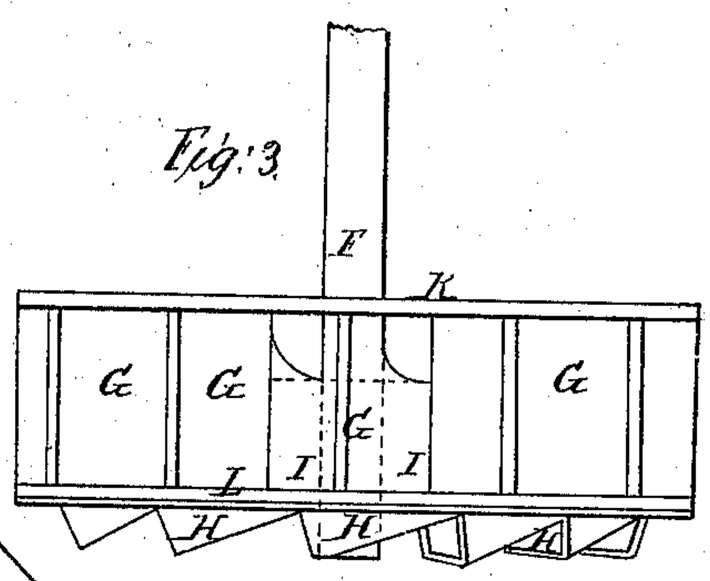


Fig: 2.

Fig: 3.



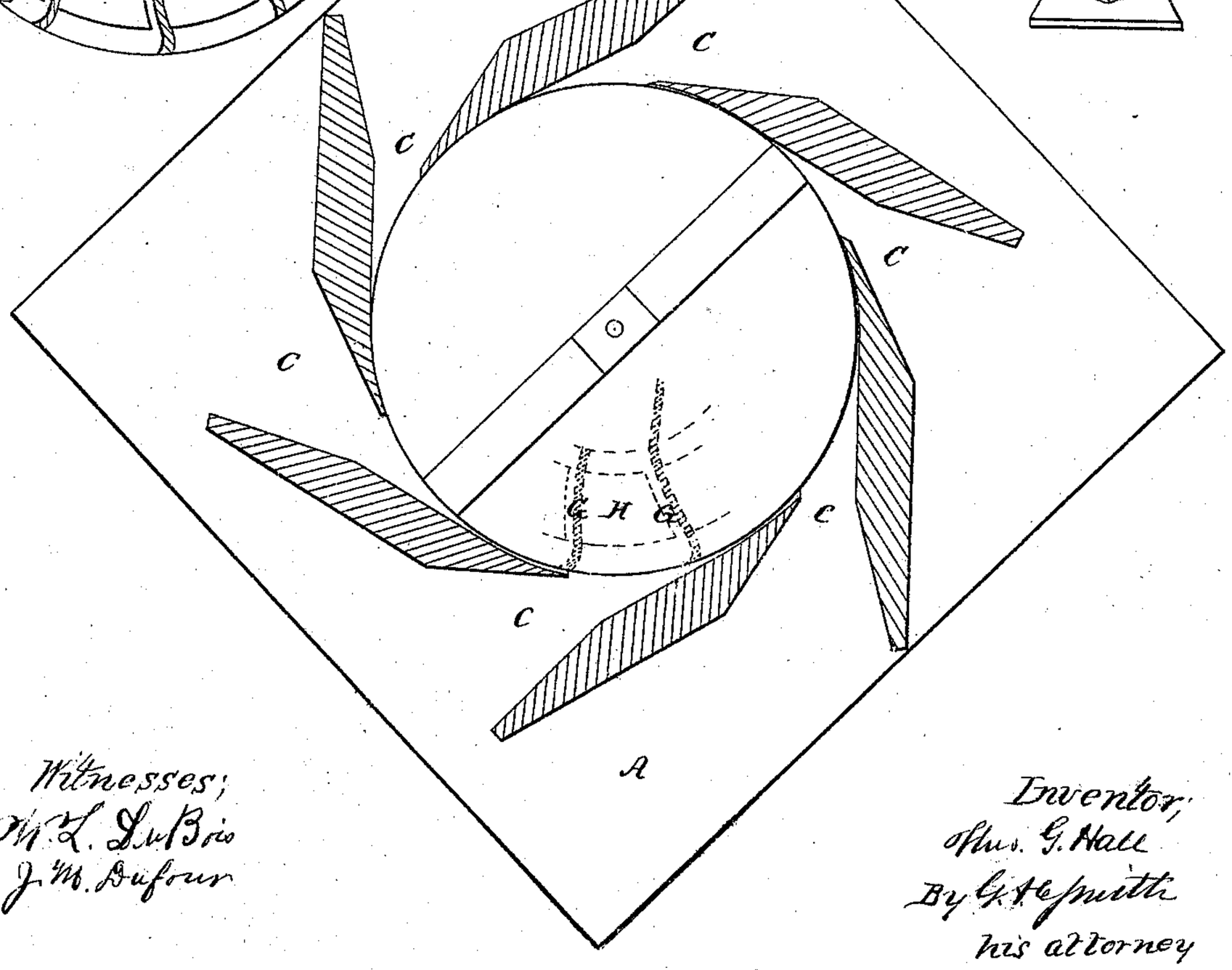
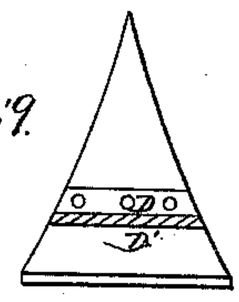


Fig: 9.



Witnesses;
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By G. H. Gephart
his attorney

United States Patent Office.

THOMAS G. HALL, OF BEACH HAVEN, ASSIGNOR TO HIMSELF AND DANIEL F. SEYBERT, OF SALEM, PENNSYLVANIA.

Letters Patent No. 90,167, *dated May* 18, 1869.

IMPROVEMENT IN WATER-WHEELS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, THOMAS G. HALL, of Beach Haven, in the county of Luzerne, and State of Pennsylvania, have invented a new and useful Improvement in Water-Wheels; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view;

Figure 2, a horizontal section of the case which surrounds the wheel;

Figure 3, a side elevation;

Figure 4, a horizontal section; and

Figure 5, a bottom view of the wheel.

Figures 6 and 7 are perspective views of one of the gates.

Figure 8, a vertical section, and

Figure 9 a horizontal section of the same; and

Figure 10, a vertical section of one of the central buckets.

Like letters designate like parts in all the figures.

The nature of my invention consists in the peculiar form and arrangement of the buckets of the wheel, form of the inlets to the wheel, for the passage of the water, and the form of the gates.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation

In the drawings—

A represents the case, inside which the wheel, B, is placed.

C, the inlets, around the sides of the case A, for the passage of water to the wheel.

D D′, the gates.

E, the ring, or collar, to which the gates are attached.

F, the shaft, to which the wheel is secured.

G, the main arms, or vertical buckets.

H, the bottom-discharge buckets, and

I, the central-discharge back-water buckets.

J, the piece on the shaft E to which the arms, or buckets G are secured.

K and L are circular plates, between which are the buckets G, and between each of these buckets, in the lower plate, L, is an opening through which part of the water escapes into the bottom-discharge buckets, H.

The inlets C are constructed in such a manner that the water that passes through them strikes the vertical buckets of the wheel at about right angles, as seen in fig. 2.

They are also so constructed that they are shaped like a letter **V** with its point cut off, the narrow part being next to the wheel, by which means the force of the water against the buckets is increased.

The form of the buckets G is such that the portion where the water first strikes is concave, and it then curves in the opposite direction, which allows part of the water to pass to the central buckets I, without being obstructed in its course.

A portion of the water escapes through the buckets H.

The central buckets I are inside of the inner circumference of the vertical buckets G, and are formed of an extension of each alternate bucket.

The buckets I extend down below the buckets G, and curve backward, that is, in an opposite direction to that of the revolution of the wheel, and are long enough to discharge the water back of the centre, thus preventing back-water from remaining in the wheel.

To the lower ends of the gates D are secured horizontal **V**-shaped pieces, D′, the outer ends of which are turned upward, as shown in the drawings. The object of these pieces is to cause the water to flow with greater evenness to the wheel when the gates are partially closed.

Having thus fully described my invention,

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

1. A series of perpendicular gates, connected to a ring at the top, by the elevation of which ring they may be simultaneously raised, said gates having a transverse double flange at the bottom, the outward part of which flares, or curves upward, and the inner part conducts the flow in a direct line to the wheel, all substantially as and for the purpose described.

2. A turbine-wheel, having the two concentric sets of buckets, I and G, all substantially as described.

THOMAS G. HALL.

Witnesses:

D. F. SEYBERT,

S. FRANK SCHWARTZ.