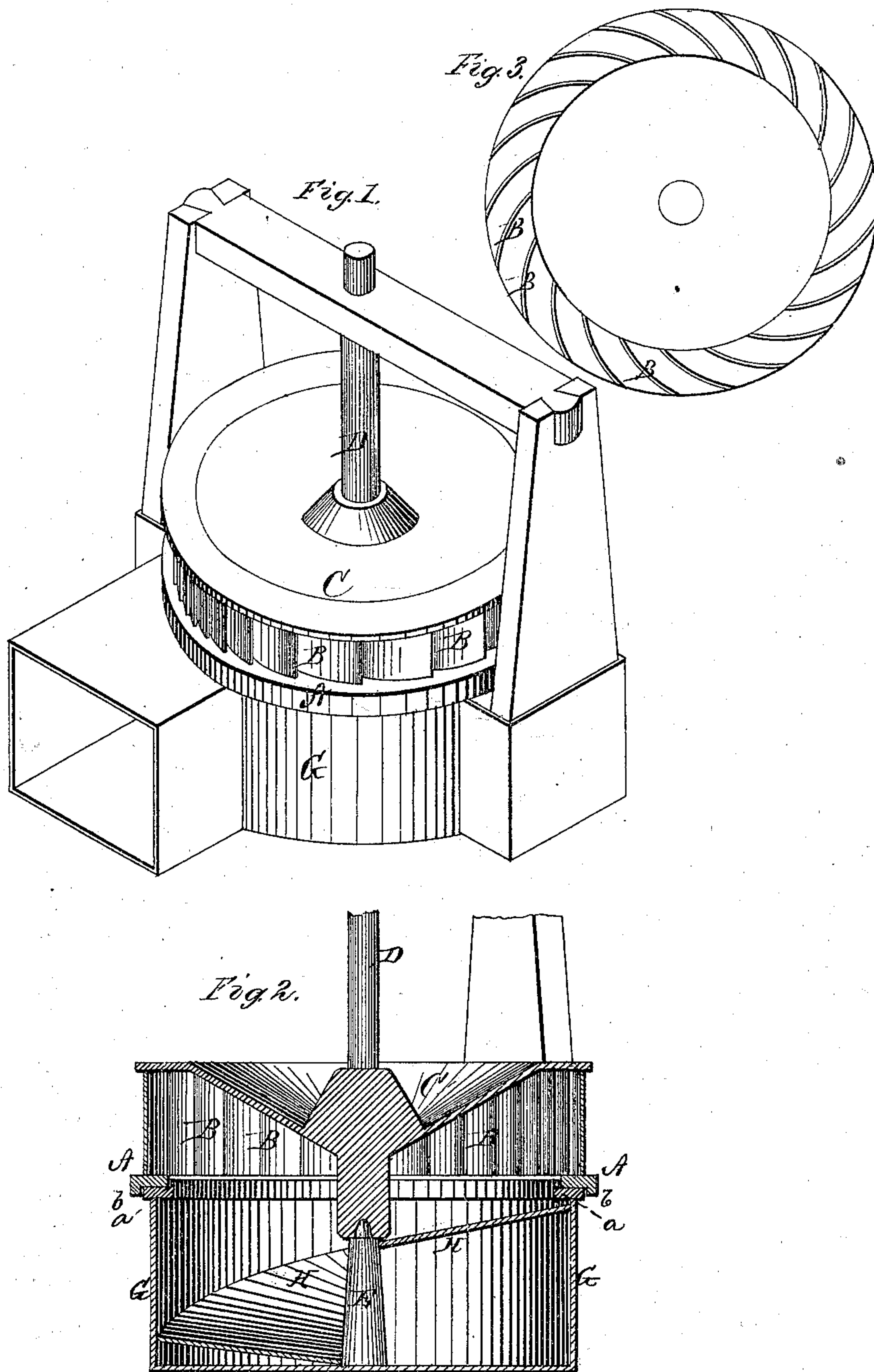


W. P. HALE.  
Turbine Water-Wheels.

No. 135,707.

Patented Feb. 11, 1873.



Witnesses  
John A. Ellis.  
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# UNITED STATES PATENT OFFICE.

WILLIAM P. HALE, OF LOCKHAVEN, PENNSYLVANIA.

## IMPROVEMENT IN TURBINE WATER-WHEELS.

Specification forming part of Letters Patent No. 135,707, dated February 11, 1873.

*To all whom it may concern:*

Be it known that I, WILLIAM P. HALE, of Lockhaven, in the county of Clinton and State of Pennsylvania, have invented certain new and useful Improvements 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 drawing and to the letters of reference marked thereon which form a part of this specification.

The nature of my invention consists in the construction and arrangement of a water-wheel, as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawing, in which—

Figure 1 is a perspective view, and Fig. 2 is a vertical section, of the entire wheel. Fig. 3 is a plan view of the wheel proper with the top plate removed.

A represents the bottom rim of the wheel, made in the shape of an annular ring, upon which stand the buckets B B, and upon said buckets rests the top plate C. The buckets B B are made on a true circle of one-half the diameter of the wheel, and stand perpendicularly up and down, discharging the water on the outside of the wheel. The outer edge of the top plate C, where it rests on the buckets B B, is made perfectly flat or horizontal, while inward from the same it is inclined downward, forming an inverted cone, and in the center thereof is secured the shaft D, which rests on the step E. G represents the curb underneath the wheel. The water comes in on one side of the curb G under the wheel, and rises up on an inclined scroll, H, within the same; and the under side of the wheel being on an angle, as described, the water is forced outward to the buckets. The scroll H runs in the opposite di-

rection to that of the buckets, which causes a direct action and a reaction at the same time; and the water entering on the inside of the wheel under full pressure, and discharging on the outside of the wheel without any back pressure, gives a greater amount of power than it would otherwise have. In order to increase the size of the delivery of the buckets, the top plate C inclines downward toward the center, thus allowing the buckets to be placed in a perpendicular position, and thus delivering the water at the side of the wheel. The curb G projects upward on the inside of the wheel the thickness of the lower rim A, as shown at *a a*, and this lower rim of the wheel projects down over the rim of the curb, as shown at *b b*, thereby causing two right angles in the only joint there is for any water to escape. The pressure of the water on the under side of the wheel relieves the pressure and friction on the step.

I am aware that perpendicular buckets, combined with a bottom rim and a conical top plate, have been before used. I do not, therefore, broadly claim such device; but

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

The water-wheel provided with the rim A and buckets B B, formed on a circle of one-half the diameter of the wheel, and the conical top plate C, and used in combination with the interior inclined scroll H, all constructed and arranged as and for the purpose herein set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

WILLIAM P. HALE.

Witnesses:

I. M. DEVLING,  
HUGH DEVLING.