# H. Vandewater,

## Water Wheel,

No. 13,287. Patented July 17, 1855.

Fig: 1.

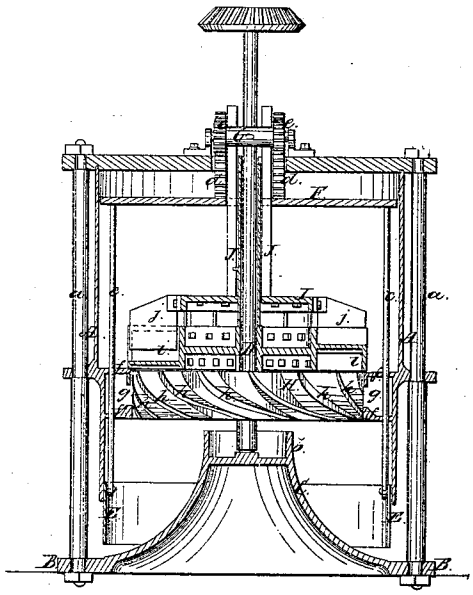


Fig: 2.

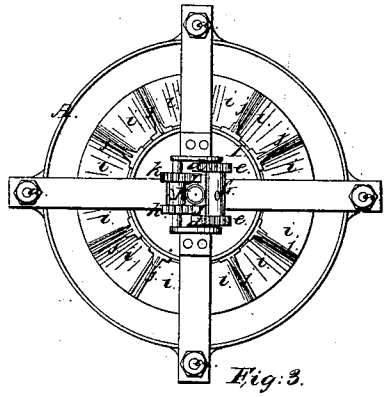


Fig: 3.

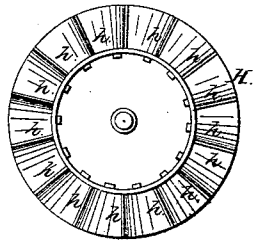
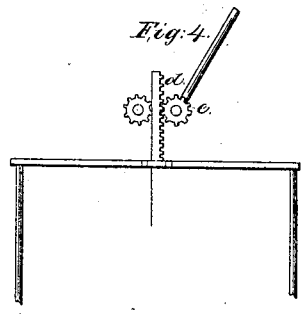


Fig: 4.



# UNITED STATES PATENT OFFICE.

HENRY VAN DE WATER, OF TROY, NEW YORK.

## TURBINE WATER-WHEEL.

Specification forming part of Letters Patent No. **13,287**, dated July 17, 1855.

*To all whom it may concern:*

Be it known that I, HENRY VAN DE WATER, of Troy, in the county of Albany and State of New York, have invented certain new and useful Improvements in Turbine Water-Wheels; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a vertical section of my improved wheel. Fig. 2 is a plan or top view of same. Fig. 3 is a top or plan view of the wheel detached from the case. Fig. 4 is a detached side view of the gearing by which the gates are operated.

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates to certain new and useful improvements in water-wheels termed "turbine-wheels," and it consists, first, in the employment of a concave guide or deflecting projection at the lower part of the casing underneath the wheel, in combination with a gate, which surrounds it to regulate the discharge of the water from the casing or wheel, as will be presently shown and described.

My invention consists, second, in the employment of a gate and a series of chutes or guides constructed and arranged, as will be hereinafter shown, by which the requisite quantity of water is admitted to the wheel, so as to act properly upon it.

My invention consists, third, in surrounding the wheel with a chamber or recess which is filled with water, and which, in connection with the peculiar form of the buckets, causes the water to act upward against the wheel and relieve the bearing or step of its weight.

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

A represents the casing of the wheel, which may be constructed of cast-iron. The casing is of cylindric form, and is secured in a vertical position by rods *a* to a flange B underneath the casing. The flange B is at the lower part of a guide or deflecting projector C, which is of concave conical form, as shown clearly in Fig. 1, and projects upward a suitable distance within the casing A. On the upper end of the projection C the wheel-shaft D is stepped, the step being surrounded by an upright ledge *b*. (See Fig. 1.)

Within the lower part of the casing A there is a rim or band E, which forms a gate at the lower end of the casing A. The gate works snugly within the casing, and has four vertical rods *c* attached to it at opposite points. The upper ends of the rods *c c* are connected to cross-bars F, to which two vertical racks *d d* are attached, in which pinions *e e* at the ends of a drum G gear.

Within the casing A, and directly above the projection C, the wheel H is placed. (See Fig. 1.) The wheel is fitted between lateral flanges *f f* on the inner side of the casing, said flanges forming a chamber or recess *g* around the wheel. The form of the buckets *h* is shown in Fig. 1. The top and bottom edges of the buckets are radial with the wheel, and the intermediate points are gradually curved, so as to leave the spaces between the upper edges of the buckets wider than the spaces between the lower ends.

Directly above the wheel H there is permanently attached a series of chutes or guides *i*, which are placed directly over the buckets *h* of the wheel. The chutes or guides *i* are curved or of spiral form corresponding to the buckets *h*, and at the mouth or orifice of each chute or guide there is a slide *j*, which is connected to a circular rim I, which encompasses the shaft D. The slides *j* form the gate above the wheel. To the upper surface of the rim I there are attached two vertical racks J J, in which two pinions *k k* at the ends of a drum K gear. (See Fig. 2.) By turning the drum K the slides *j* are raised or lowered, and by turning the drum G the gate E is raised or lowered.

The lower end of the casing A is placed in the "tail-water" below the wheel, and the water from the penstock or flume flows into the upper part of the casing A. The slides *j*, which form the upper gate being opened, the water fills the entire casing, and is directed properly or tangentially against the buckets *h* of the wheel in proper quantity by means of the chutes or guides *i* and slides *j*, and as the spaces between the lower edges of the buckets are narrower than the spaces between the upper edges the water impinges or presses upward to a certain extent against the under surfaces of the buckets, and the step of the shaft D is greatly relieved of the weight of the shaft and wheel. The surrounding water in the chamber or recess *g*

acts upon the wheel when at work. By regulating the gate E the suction upon the wheel or draft of the column that descends from the bottom of the wheel is partially suspended by the tendency of vacuum to the tail-race. It will be observed that when the gate E is raised or lowered there will be an equal space all around the guide or projection C, so that the draft will be equal at all points around the wheel. In the ordinary French turbine a valve similar to a throttle-valve is used, and this valve causes an unequal draft as one side is elevated and the other depressed, thereby causing an unequal fall at opposite sides of the wheel. The guide or deflecting projection C obviates this difficulty. The ledge *b* on the upper part of the guide or projection C will retain water to keep the lower end of the shaft D perfectly lubricated.

I am aware that the French turbine (Jonval's) receives power from the water the same as mine—viz., first by gravity and then by suction. The first column operates by the same law as in ordinary wheels. The second part of the column—that is to say, from the bottom of the wheel to the lower part of the fall—would in ordinary wheels, which discharge in the open air, be of no additional effect to the wheel, as the water would leave this point without velocity and would only fall by its gravity. I do not claim, therefore, placing the wheel H within a cylindrical casing the lower end of which is immersed in the tail-water underneath the wheel, for that has been previously done; but

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

1. The employment of the guide or concave conical projection C at the lower part of the casing A, in combination with the cylindrical gate E, the above parts being constructed and arranged as shown, and for the purpose as set forth.

2. The chutes or guides *i*, placed above the wheel H, in combination with the slides *j*, which form a gate by which the water is admitted in proper quantity upon the wheel and tangentially thereto, as herein described.

3. Surrounding the wheel H with an annular chamber or recess *g*, in combination with the buckets *h* of the wheels H, when said buckets are formed as herein shown, viz., with smaller spaces between their lower ends than their upper ends, for the purpose of causing the water to act upward against the lower surfaces of the buckets and thereby relieve the step of the shaft D of the weight of the wheel and said shaft, as herein shown and described.

HENRY VAN DE WATER.

Witnesses:

JAS. GEO. MASON,

WM. TUSCH.