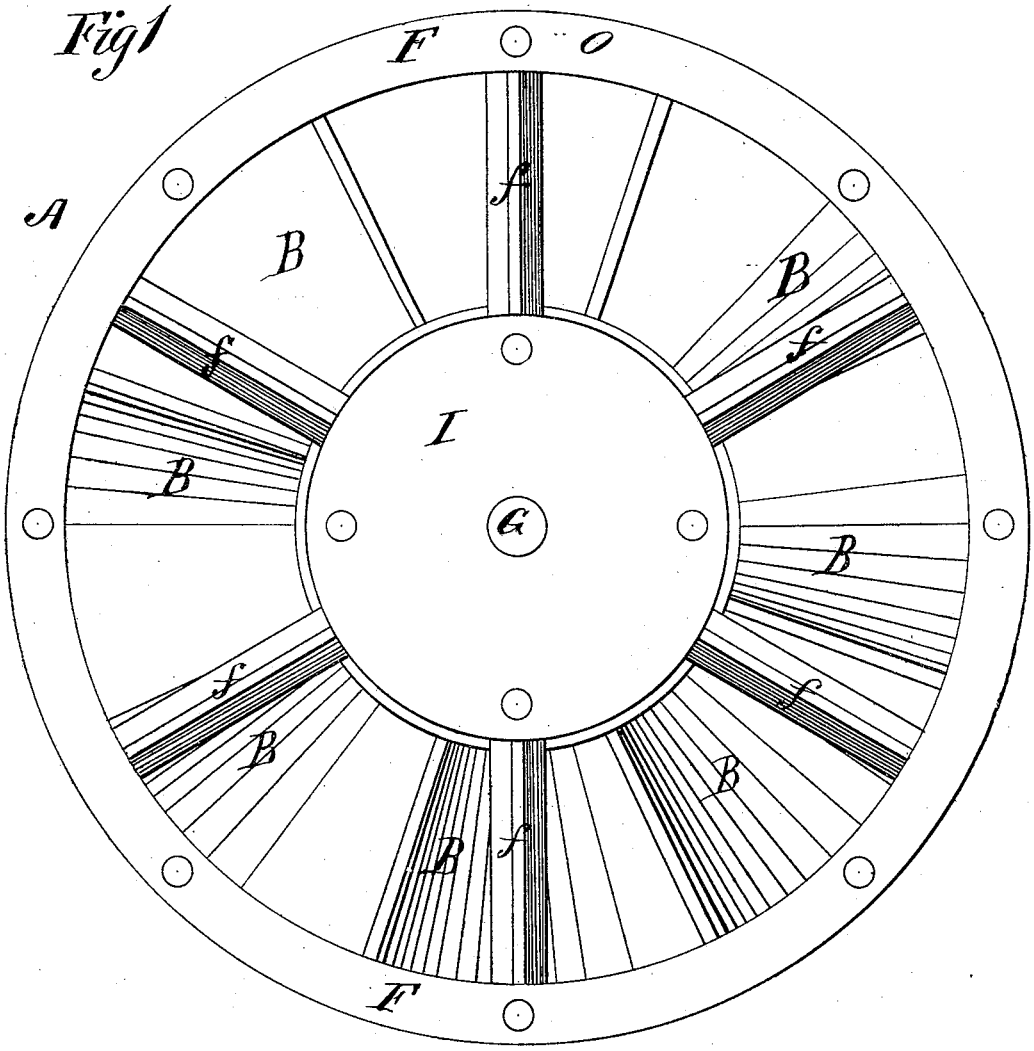
3 Sheets--Sheet 1.

M. E. WASHBURN.

Turbine Water-Wheel.

No. 167,143. Patented Aug. 24, 1875.

Fig 1



WITNESSES

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Fig 2

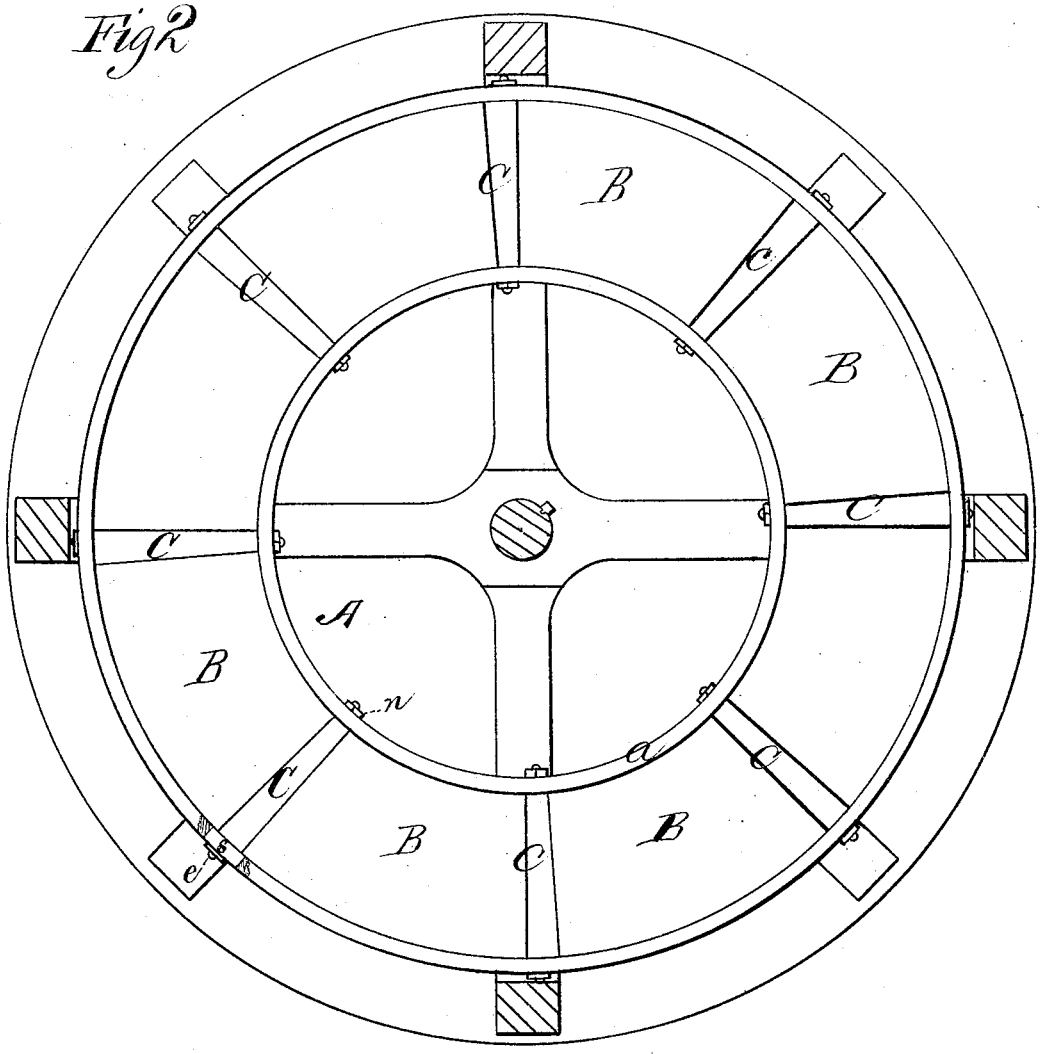
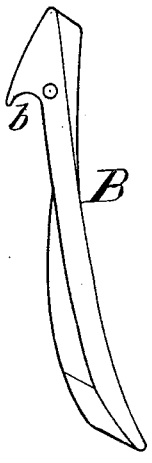


Fig 3



WITNESSES

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3 Sheets--Sheet 3.

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Turbine Water-Wheel.

No. 167,143. Patented Aug. 24, 1875.

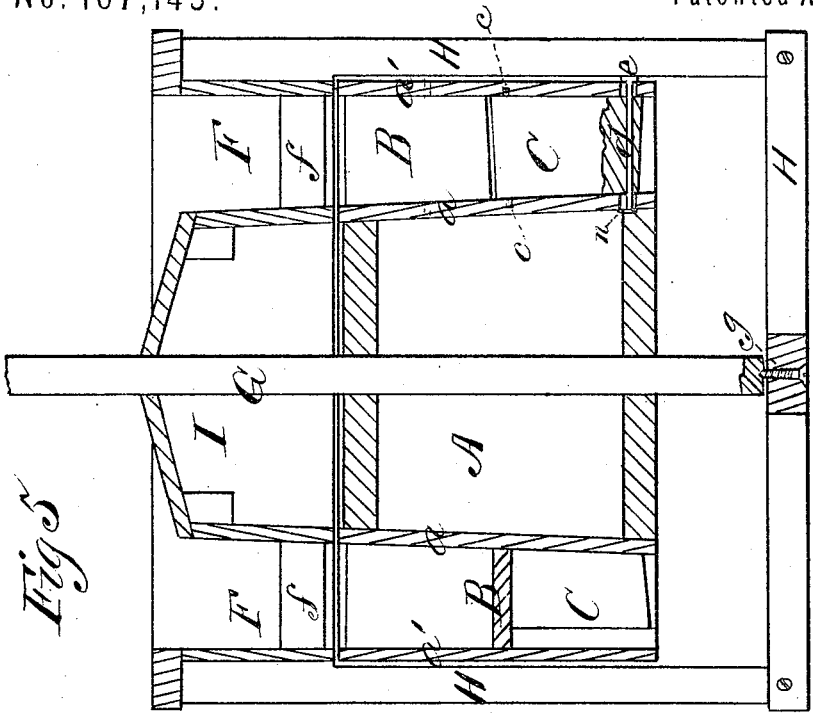

Fig 3.

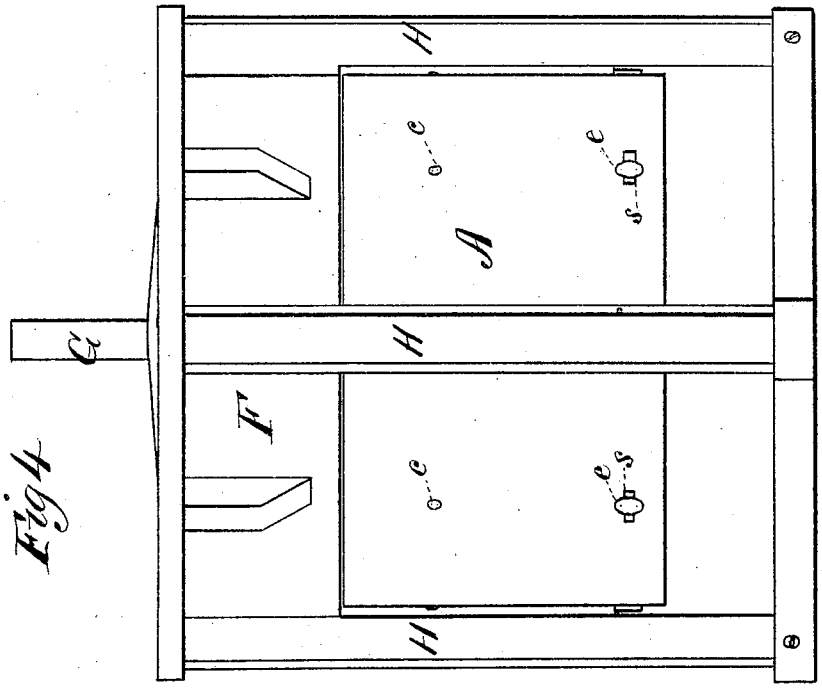

Fig 4.

WITNESSES

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UNITED STATES PATENT OFFICE.

MILO E. WASHBURN, OF INDIAN LAKE, NEW YORK.

IMPROVEMENT IN TURBINE WATER-WHEELS.

Specification forming part of Letters Patent No. **167,143**, dated August 24, 1875; application filed June 26, 1875.

To all whom it may concern:

Be it known that I, MILO E. WASHBURN, of Indian Lake, in the county of Hamilton and State of New York, have invented a new and valuable Improvement in Turbine Water-Wheels; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a front or face view of my water-wheel; and Fig. 2 is a horizontal sectional view of the same. Fig. 3 is a detail view; and Fig. 4 a plan view. Fig. 5 is a vertical sectional view.

This invention has relation to improvements in turbine water-wheels, which are caused to rotate by the weight of a superincumbent column of water.

The object of the invention is to devise a simple and effective means whereby the exit of the water from the wheel may be hastened or retarded in accordance with the head of water.

To this end the nature of the invention consists in combining, with the buckets of a turbine water-wheel, pivoted gates, which are adjustable to or from the lower edge of the side buckets, whereby the discharge of water from the wheel may be regulated in accordance with the head of water obtainable at various seasons, as will be hereinafter more fully explained and claimed.

In the annexed drawings, A designates a turbine water-wheel consisting of two concentric annuli, *a a'*, of suitable dimensions, to which are rigidly or detachably secured a number of buckets, B. These buckets are of the form known as warped surfaces; and they are adapted to fit snugly to the peripheries of annuli *a a'*, between which they are arranged, at a suitable distance apart, in an inclined position, and with their concave surfaces upward. These buckets are each provided, as to their upper rear edges, with a concaved shoulder, *b*, which is adapted to receive the upper convex edge of a gate, C, which extends from the upper edge of one bucket to the lower edge of the next, being in a vertical position, or nearly so, in relation to their retaining-rings. These gates are provided with journals *c* near their upper edges, by means of which they are attached to annuli *a a'*, so as to have a degree of vertical vibration. They are also provided, each, with a regulating, or rather an adjusting, bolt, *d*, near their lower edges, by means of which the gates are maintained to a required position. These bolts pass entirely through the said gates, and their projecting ends work in horizontal slots *s* cut in the said rings, as shown in Fig. 2. They are also provided with enlarged heads *e* on one end, and are clamped to hold the said gates in a required position by means of nuts *n* applied upon their inner projecting screw-threaded ends.

Gates C being pivoted or hinged to rings *a a'* they may be caused to vibrate to or from the buckets, for the purpose of enlarging or narrowing the exit-port at the lower end of the buckets in proportion to the head of water obtainable. Where the head is very great the exit-port may be increased in size, and the water allowed to escape rapidly; but when, as in dry weather, there is no great head attainable, the ports will be lessened in size, and the rapidity of the escape of the water proportionately lessened. By this means the full effect of the water will be obtained. By confining it in the buckets as long as may be necessary to produce its most effective use by the means above described the full working power of the wheel will be obtained from a small head of water as well as from a large one.

Wheel A is provided with a shaft, G, stepped at *g* in a suitable frame, H H, which latter sustains the chute-ring F, as shown in figure. This ring is of the same diameter as the outer annulus of the said wheels, and it may be of any height which I may elect. It is also provided with a central hub, I, which is, at its lower edge, of the same diameter as the inner ring of the wheel, but tapers gradually upward, and which is connected with the chute-ring by means of radial arms *f*. By this means as the water is discharged from the flume into the chute-ring it is made to swirl rapidly, and

it is crowded, as it were, into and against the buckets of the wheel, thus acting with great force upon them, and causing the wheel to rotate with great speed and power, which will be greater or less in proportion as the exit-ports are narrowed or enlarged, there being a given head of water.

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

1. The combination of the vibrating and adjustable gates C with a water-wheel having inclined buckets B, and rings *a a'*, substantially as specified.

2. The clamping-bolts *d*, in combination with the rings *a a'*, buckets B, and vibrating gates C, substantially as specified.

3. The buckets B, having shoulder *b*, and being a warped and concaved surface, in combination with the rings *a a'* and vibrating gate C, substantially as specified.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

MILO E. WASHBURN.

Witnesses,
CARLOS D. GILSON,
HENRY G. PAGE.