G. A. HARBAUGH.
Turbine Water-Wheel.

No. 201,007. Patented March 5, 1878.

Fig. 1.

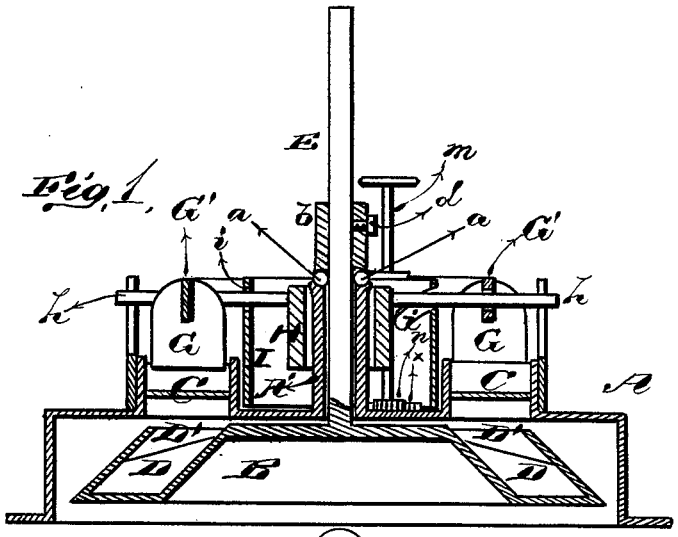



Fig. 2.

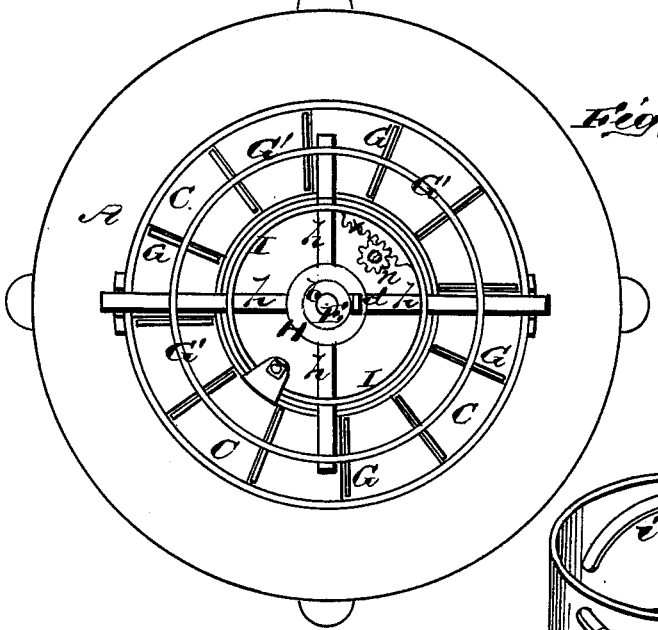



Fig. 4.

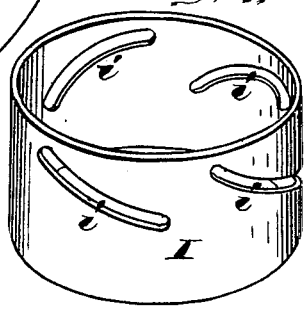
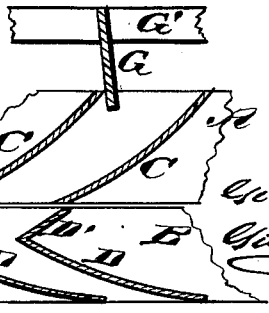



Fig. 3.

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# UNITED STATES PATENT OFFICE.

GEORGE A. HARBAUGH, OF BELLEFONTE, PENNSYLVANIA.

## IMPROVEMENT IN TURBINE WATER-WHEELS.

Specification forming part of Letters Patent No. **201,007**, dated March 5, 1878; application filed August 18, 1877.

*To all whom it may concern:*

Be it known that I, GEORGE A. HARBAUGH, of Bellefonte, in the county of Centre and State of Pennsylvania, have invented a new and valuable Improvement in 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 vertical sectional view of my water-wheel. Fig. 2 is a plan view. Fig. 3 is a sectional detail, and Fig. 4 is a perspective detail, thereof.

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

The annexed drawings, to which reference is made, fully illustrate my invention.

A represents the casing, and B the wheel. Within the casing A are guides C C, set in an inclined position, as shown, to conduct the water to the buckets D D upon the wheel B. These buckets are set inclined in the opposite direction nearly at right angles; and each bucket has, at its upper end, a wing or flange or extension, D′, running in the same direction as the guides C, and forming, as it were, a continuation thereof, and each complete bucket is in the shape of an arrow.

By this construction of the bucket, all the recoil force of the water is confined and retained within the wheel itself.

In the flat radial bucket a portion of the recoil force of the water urged against it is forced against the case-guide, and consequently lost, while in my wheel it is forced against the upper extension of the bucket, and thus confined and retained in the wheel.

The wheel B is attached to the spindle E, which passes upward through the hub A′ of the casing A. The upper end of the hub, around the spindle, is made concave to receive a series of balls, *a a*, and upon the spindle is secured a collar, *b*, by means of a set-screw, *d*. This collar *b* rests upon the balls *a*, so that the wheel is entirely suspended, and turns upon these friction-balls, whereby I dispense with the usual step-spider, thimble, step, and everything else below the wheel, and by this means the wheel is also placed within convenient reach to take up any downward wear.

G G are a series of sluice-gates, all attached to one ring, G′, which is connected by four radial arms, *h h*, with a collar, H, placed around the hub A′. These arms pass through spiral slots *i i* in a ring, I, which is provided with a rack at *x*, and operated by a pinion, *n*, on a vertical shaft, *m*.

All the sluice-gates are operated by one movement, and they are located at the head of the guides C in a slightly-inclined position. By the use of these gates I avoid the wide blank spaces between the openings for the water through the case, the guides being only thick enough to give direction to the water through the case.

By the ring I the gates are lifted and closed, the slots *i* in said ring acting on the principle of a screw, being powerful in its action, and holds the gate at any desired position.

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

1. In a turbine water-wheel, the inclined bucket D, provided at its upper end with a triangular extension, D′, inclined in a direction opposite to the inclination of the bucket, substantially as described, and for the purpose set forth.

2. The hub A′, made concave at its upper end, in combination with the collar *b*, made concave at its lower end, balls *a a*, and spindle E of the water-wheel B, substantially as described, and for the purpose set forth.

3. The casing A, provided with the guides C, in combination with the sluice-gates G, all attached to the adjustable ring G′, and buckets D, provided with the triangular extensions D′, substantially as described, and for the purpose set forth.

4. The combination of the gates G, ring G′, with arms *h*, and the ring I, with spiral slots *i*, for the purposes herein set forth.

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

GEORGE A. HARBAUGH.

Witnesses:

H. G. STITZER,

WM. NEWCOMER.