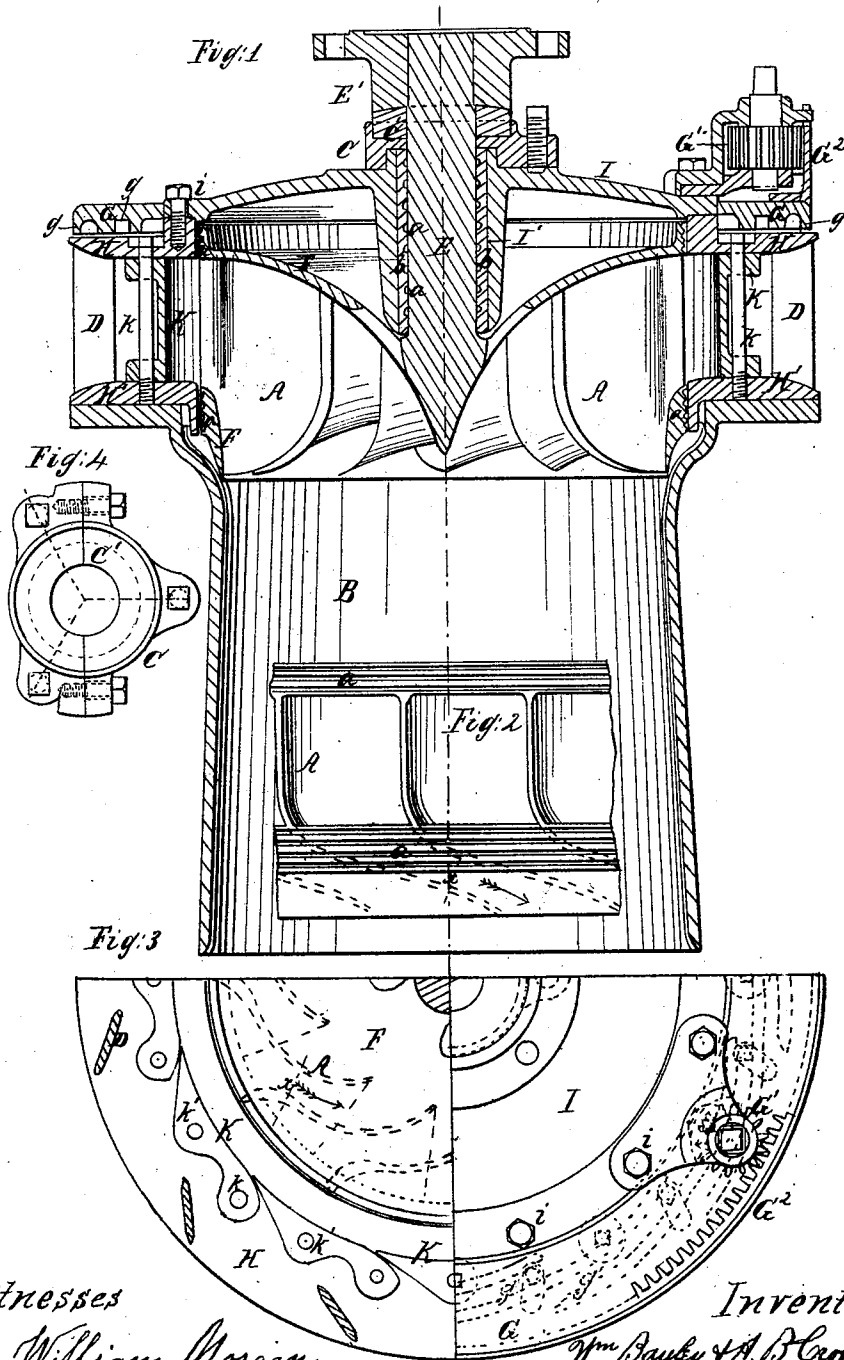


Bayley & Crowell.

Water Wheel.

N^o 101,084.

Patented Mar. 22, 1870.



Witnesses

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WILLIAM BAYLEY AND A. B. CROWELL, OF BALTIMORE, MARYLAND.

Letters Patent No. 101,084, dated March 22, 1870.

IMPROVEMENT IN TURBINE 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 we, WILLIAM BAYLEY and A. B. CROWELL, both of the city and county of Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Turbines, of which the following is a full, clear, and exact description.

The objects of our invention are:

First, to provide improved means for preventing the leakage or issue of water between the wheel and its case; and our improvement consists in forming grooves upon the wheel, shaft, and case, or any or all of them, at their meeting surfaces, into which the water enters and is obstructed or retarded in its flow, thereby obviating waste of water which would otherwise escape without acting upon the wheel, as hereinafter more fully set forth.

Second, to provide an improved means of operating the gates by which water is admitted to the wheel; and our improvement consists in a novel combination of a movable ring provided with straight or curved inclined grooves upon its lower surface, with a series of pivoted gates having pins which enter the grooves, and are operated thereby, so as to be opened and closed by suitable rotary motion being imparted to the ring, as hereinafter more fully set forth.

Third, to provide improved means for facilitating the discharge of the water from the wheel after having acted thereon, and thereby to reduce the amount of power which is required to impart the velocity to the issuing water; and our improvements consist in constructing the buckets of the wheel with diverging tail or discharging ends, as hereinafter more fully set forth.

In the accompanying drawings—

Figure 1 is a vertical central section of our improved turbine wheel and case;

Figure 2, a side view of a portion of the wheel detached;

Figure 3, a half-plan view, partly in elevation and partly in section, of the wheel and case; and

Figure 4, a plan view of the step detached.

A wheel, F, in the form of a conical or dished plate is cast in a piece with a shaft, E, and provided with a series of buckets, A, arranged around its periphery, and receiving water tangentially to the wheel.

The wheel F revolves within a casing composed of upper and lower rings H H', united by columns D, or by bolts if preferred, and an upper plate or cover I firmly secured by bolts *i* to the upper ring H.

A step, C, upon which the wheel and shaft bear by means of a collar-bearing, E', upon the upper end of the shaft, is secured upon the upper plate I of the wheel-case, and in this instance is shown as formed in two sections united by bolts, but a greater number of sections may be used if found desirable or more convenient.

The packing or bearing pieces C' upon which the bearing E' revolves, and which may be of wood, brass, or other suitable material, are placed within the step C, and usually correspond in number with the sections of which it is composed.

By this construction it will be seen that the step is readily accessible for lubrication and repair, and the bearing pieces can be conveniently removed and replaced when found necessary.

A guide, I', is cast upon or secured to the lower side of the cover I, in which is inserted a sleeve, *b*, of any suitable material, which surrounds the shaft closely and maintains it in vertical position.

The wheel is thus supported entirely above the case, and bridge-trees or lower supports, which are both expensive and inconvenient of access, are dispensed with, the bearing-surfaces, by our method of construction, being conveniently accessible, as before shown.

By casting the wheel and its shaft in one piece, which, on account of the short length of shaft required by the above arrangement of parts, is perfectly practicable, the expense of fitting is obviated, and the wheel can be made much lighter than it would be if it were made separate and secured to the shaft.

In order to prevent waste by leakage of water between the wheel and case, a series of grooves, *a*, is formed upon the periphery of the wheel A at its point of contact with the upper and lower rings H H', (within which it fits neatly, so as to revolve without friction,) and also upon the sleeve *b*. The water entering the grooves is obstructed or retarded and prevents leakage at these points, thereby correspondingly increasing the efficiency of the wheel.

Water is admitted to and excluded from the wheel by a series of gates, K, arranged around the wheel between the upper and lower rings H H' of the case, and movable upon pivots *k* secured thereto, by means of studs or pins *k'* upon their upper surfaces, about midway of their length, or near their free ends.

A movable ring, G, rests upon the upper ring H, and is rotated as required by means of a pinion, G', mounted in bearings upon the cover I, and gearing with a toothed segment, G², secured to the ring G.

A series of grooves, *g*, either straight or curved, and inclined at an angle to its radii, is formed upon the lower surface of the ring G.

The pins *k'* fit into the grooves *g*, and by the partial rotation of the ring by the pinion G' the gates K are opened and closed at pleasure by the pins *k'* being drawn toward or from the center of the wheel by the grooves, the pins working in slots formed in the upper ring H.

By the foregoing construction we provide a simple and economical method of operating the gates, dispensing with separate links or attachments for each

gate, and enabling the whole series to be simultaneously operated, without any tendency to breakage or derangement of its parts.

For the purpose of facilitating the discharge of the water from the wheel after having acted thereon, and thereby to reduce the percentage of the head required to produce the necessary velocity of the issuing water, we construct the buckets A of our wheel with tail ends longer than usual, and diverging from what we term the line of impingement, marked *x* in figs. 2 and 3, toward their tail or discharging ends, whereby the water issues from them with diminished resistance, and its useful effect is proportionally increased. In practice we make the diverging portion of the bucket equal to about four times its diameter, and experiment has shown that by this construction the wheel will discharge the same amount of water with one-half the loss of power of one constructed with buckets of uniform diameter toward their tail ends.

The draught-tube B through which the water escapes after having acted upon the wheel, is secured to the lower ring H' of the case. This tube we construct

in a similar manner, that is to say, having its lower or discharging end of increased diameter as compared with its upper end, and, as hereinbefore stated, the discharge of the water is correspondingly facilitated.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The combination of the movable ring G and its grooves *g*, with the pivoted gates K and their pins *k*, all these parts being constructed to operate substantially as set forth.

2. The combination with a turbine wheel of buckets constructed as set forth, with an area increasing from the impinging point *x* of the wheel to the point of discharge.

In testimony whereof we have hereunto subscribed our names.

WM. BAYLEY.
A. B. CROWELL.

Witnesses:

JACOB HARTZELL,
WM. H. REED.