Y. W. LARMON.

Combined Water-Wheel Gate.

No. 168,507. Patented Oct. 5, 1875.

Fig. 1.

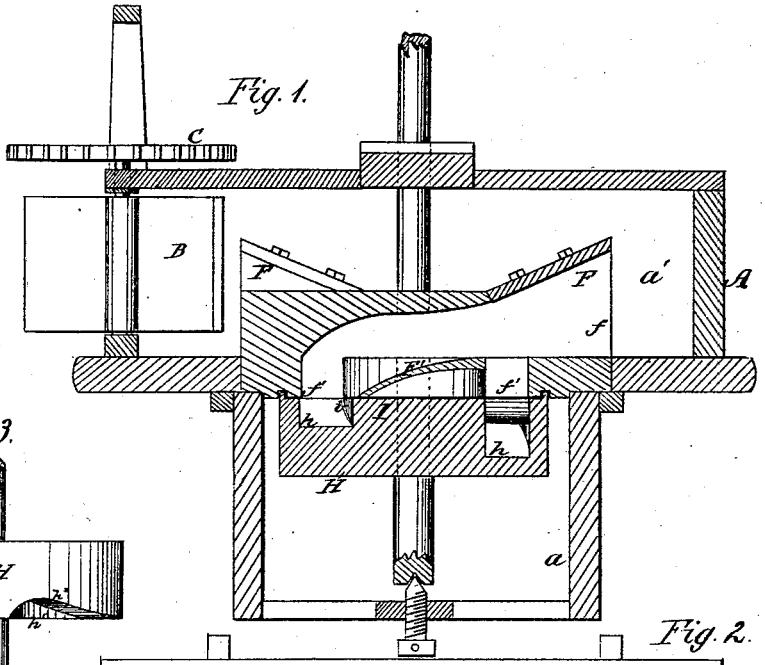


Fig. 3.

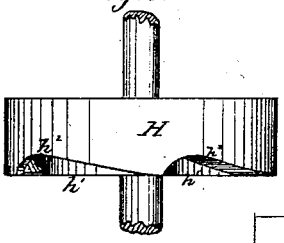


Fig. 2.

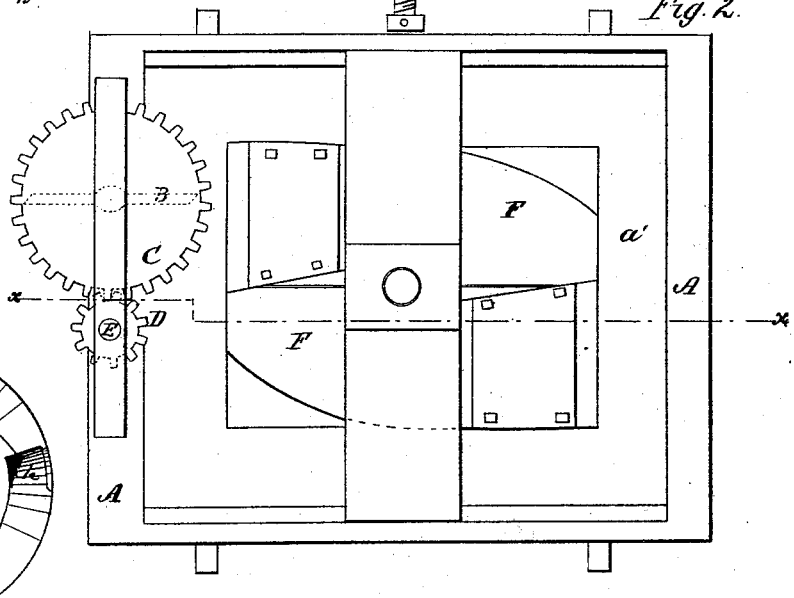
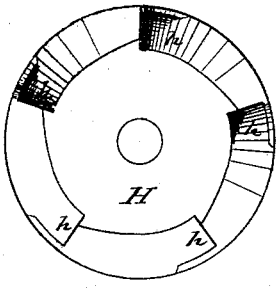


Fig. 4.



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UNITED STATES PATENT OFFICE.

YOUNG W. LARMON, OF RUSSELLVILLE, KENTUCKY, ASSIGNOR OF ONE-HALF HIS RIGHT TO JAMES H. BOWDEN, OF SAME PLACE.

IMPROVEMENT IN COMBINED WATER-WHEEL GATES.

Specification forming part of Letters Patent No. **168,507**, dated October 5, 1875; application filed July 13, 1875.

To all whom it may concern:

Be it known that I, YOUNG W. LARMON, of Russellville, in the county of Logan and State of Kentucky, have invented a new and Improved Combined Turbine Water Wheel and Gate; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming a part of this specification, in which—

Figure 1 is a vertical, and Fig. 2 a horizontal, section; Fig. 3, a side elevation; Fig. 4, a plan view of wheel.

The invention relates to the improvement of turbine water-wheels, so that they may run more easily when submerged by the backwater, under a less head of water, and so that the velocity of wheel and the power may be graduated conveniently to the work which is required.

The invention will first be described in connection with drawing, and then pointed out in the claims.

A represents a water-tight wheel-box, which has a discharge-tube, *a*, that passes down through the fore-bay to discharge the water that has been used, and a basin, *a'*, considerably larger than the wheel, and kept constantly more or less filled from the fore-bay, in whose water the said box is completely submerged when the water is sufficiently deep. B is a middle-pivoted gate or rocking valve, making a water-tight joint, and operated, preferably, by a spur-wheel, C, pinion D, and shaft E, provided with hand-wheel, a ratchet and detent-pawl being employed to hold it open at any preferred width.

By thus providing a submerged box with solid body of water immediately around the wheel, the stream that enters the chutes is undisturbed, enters in an unbroken volume, and does not foam or carry air within the wheel. The latter thus runs with great uniformity, and a sensible saving of power.

F F represent the chutes, which flare at the mouth *f*, and gradually lessen in cross-sectional area until the issue *f'* is reached. This allows for the natural and unavoidable waste of water, and makes certain a solid current to impinge upon the face of buckets. F' is an inner flange of chutes over the hub of wheel, to prevent the weight of water from being carried by the wheel before it acts as a motive power. H is the wheel, having curved buckets *h*, bottom issues h^1, and lateral issue h^2. The curved cutting away underneath the wheel and between the issues is a curve whose radius is equal to the diameter of the circle between the bucket-issues at the bottom of the wheel; and the object of this arrangement is to prevent friction in dragwater, and to prevent beading around the wheel, so as to allow the water, after having spent its force upon the wheel, to have a ready escape. The lateral escape is the more important, in consequence of the centrifugal tendency of the current on the inside of wheel, the same (and thus the leverage of the water) being increased by the bevels *i* on the wheel-hub I extending downwardly and outwardly toward the circumference.

This gate enables the miller to cut off, at pleasure, any part of the water-power in a moment, while keeping on the wheel a full and steady pressure. It enables him to cut down at pleasure the actual head of water, however great it may be, to any desired lower head, even to the point of cutting it all off. This gate, being placed at some distance from the wheel, removes the disturbance in the water as far as possible from the wheel, which receives it solid, while the construction is so simple that derangement and consequent loss of time need never occur. It is also cheaply manufactured, and does not involve the necessity of any great capital. The size of the gate depends on the size and number of the issues, and ought to give an area of inlet at least five times as large as the sum of all the issues.

The two chutes are placed inside the water-case—one with the mouth fronting the gate, the other with the mouth fronting the farther end of the case. They are both constructed alike. The top of the water-case is fastened down with screws, and may be removed, while man-holes are made on the top and at the forward part of the chutes, near the mouths. These holes are made by removable pieces fastened across the chutes. The slopes of

chutes pass into a circular form on the outside, but at the bottom are discontinued.

The water just past the point where the bottom of the chute is discontinued presses on the wheel and carries it around; but the chutes continue above the wheel. The chutes continue in this way about two-thirds the distance around the wheel. The chutes are, at the point where the water leaves them and goes on the wheel, larger than the wheel-buckets, that widen up and out both ways. The object in gradually decreasing the height of the upper part and inside of the chute is to keep solid pressure of water on the wheel, allowing for escape of water through the draft.

The chutes are so sized as to let pass four-thirds of the quantity of water which passes through the issues of the wheel. The advantage of this chute is that it feeds to the wheel all the water it can use, keeps the water solid or in a body, and delivers it to the wheel with its greatest propelling power, the excess of one-third or more in capacity of chutes over that of the issues obviating the difficulty from a circular chute.

The wheel is so constructed as to receive the benefit of the water-power to a superior degree, to hold the water only so long as it has power in it to communicate, and then to get rid of it. The buckets are put eighteen inches apart in wheels whose diameter is thirty-six feet, or more, between the outer edge of the wheel and a rim, the chutes set directly over these buckets, and the water runs down from the chutes into the buckets and escapes near the outer edge of the wheel. These buckets sit somewhat outward, so that the wheel-rim is thicker at top than at bottom, to let the water pass freely, and the edge of the rim at the bottom is cut away for the same purpose.

The buckets are ranged around so that the rim side of them is a circle; but the inner side is so cut that the segments between the buckets are not circular, half of the circle being cut away. This widens the bucket at the top, making it larger than the issue, which secures steadiness of pressure and a solid body of water; also shortens the line, and prevents friction. The cutting away half of the circle also prevents the bending of water along the edge. The buckets at the top are considerably curved, the curve gradually becoming less toward the bottom, terminating in nearly an inclined plane. The wheel will not be affected by backwater except so far as to diminish the head of water, although the wheel may be submerged to any depth. It will continue to exert the same power as long as the difference between the height of head and tail water is sufficient to run it.

In regard to the head of water required to run the wheel, it secures more power from a low head than any other wheel, and admits the running of mills with heads so low that no other wheel will furnish sufficient power.

By using two chutes instead of one, I render unnecessary the convolution or winding passage of the current of water, thus saving much friction and consequent velocity of the current. This feature is thought to utilize a considerable percentage of the water-power that has been hitherto lost. The merit of the two chutes does not consist in the number, but in the arrangement, whereby the point where the bottom of the chute is discontinued is just over the tail end of the other chute, and from this position the water as it passes out of the tail-chute presses up under the water coming in, and which, in its turn, presses down on the tail-water, thus keeping the water solid and free from air. As the two currents of water (coming in and going out) go in the same direction, there is no friction.

Having thus described my invention, what I claim as new is—

1. The combination, with a turbine water-wheel, of an air-tight case submerged in fore-bay, and provided with adjustable gate and chutes, arranged above the wheel, as and for the purpose described.

2. A turbine-wheel, provided with overlying chutes and curved continuous buckets, tending outwardly from top to bottom of wheel, as and for the purpose set forth.

3. The flange F′ on the inner bottom-edge chute, as and for the purpose specified.

4. The wheel-hub I, having bevels *i* extending outwardly toward the periphery of wheel, as and for the purpose described.

YOUNG W. LARMON.

Witnesses:

HUGH BARCLAY, Jr.,

J. CAP. MORTON.