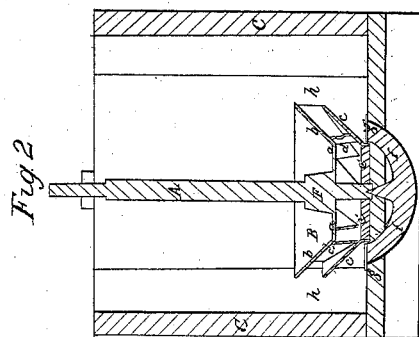
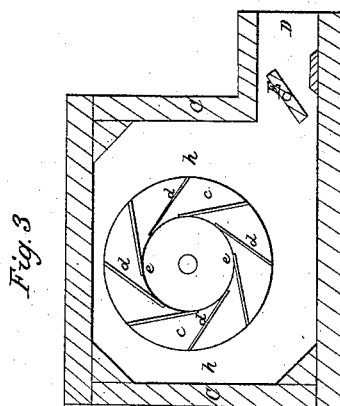
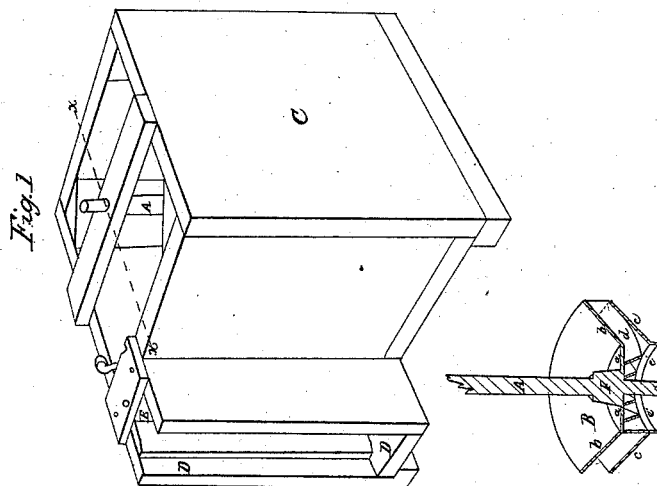


L. W. & G. W. Blake,
Water Wheel.

N^o 2,577.

Patented Apr. 21, 1842.



UNITED STATES PATENT OFFICE.

LEMUEL W. BLAKE AND GEORGE W. BLAKE, OF PEPPERELL, MASSACHUSETTS.

IMPROVEMENT IN WATER-WHEELS.

Specification forming part of Letters Patent No. 2,577, dated April 21, 1842.

To all whom it may concern:

Be it known that we, LEMUEL W. BLAKE and GEORGE W. BLAKE, of Pepperell, in the county of Middlesex and State of Massachusetts, have made certain Improvements in the Manner of Constructing the Reaction Water-Wheel with a Central Discharge; and we do hereby declare that the following is a full and exact description thereof.

That kind of reaction water-wheel which is contained in a flume or penstock and which receives the water at its periphery and discharges at its center has been known for a number of years, and the theory of its action was made the subject of investigation by M. Poncelet in Paris in the year 1826. In the year 1831 a patent was obtained by Joel Eastman for a water-wheel of this kind, and in the year 1839 another patent was obtained by Eliza Martineau for improvements thereon, which wheels, however, differed materially from that which we have constructed and are about to describe.

In the accompanying drawings, Figure 1 represents a square penstock in which our wheel may be contained; but the form of this part of the apparatus is not a point of any importance. Fig. 2 is a vertical section through the penstock in the line X X of Fig. 1—that is to say, through the axis A of the water-wheel and through the wheel B, which is represented as placed at the lower end of said axis. Fig. 3 is a horizontal section through the penstock near its lower end and exhibiting the direction of the buckets, the top plate of the wheel being removed for that purpose.

C C is the penstock, into which water may be admitted through an opening D, furnished with a gate or valve at E, which, as represented in the drawings, is made to extend from the bottom to the top of the penstock; but the water may flow in at the upper end of it or through a trunk at its lower portion or elsewhere, the arrangement of this part being dependent upon the choice of the builder, our improvement consisting in the particular manner in which we construct our water-wheel, which we will now describe.

The wheel B has an upper and a lower plate standing at a suitable distance from each other with buckets extending from one of them to the other. The upper plate consists at its middle portion of a flat disk *a a*, which

should be equal to about the semi-diameter of the wheel. From this middle part its outer portion *b b* rises at an angle, say, from thirty to forty-five degrees, more or less, so as to constitute the frustum of an inverted cone. The lower plate *c c* is in the same form with the portion *b b* of the upper plate, but it has no part corresponding to the flat disk *a a*, being left open within the conical rim for the discharge of the water. The buckets *d d* are contained between these plates, and are arranged as shown in Fig. 3, so that their planes shall stand in the line of a tangent to the circle of the central opening through which the water is to escape. The shaft A is made fast to the upper part or plate of the wheel B by means of a hub or flange F, and it has its lower bearing or step on a bridge *f f* crossing the central opening. From the lower plate *c c* of the wheel descends a neck or collar *e' e'*, which is turned true and fits into an opening in a plate of metal *g g*, fastened onto the bottom of the penstock, these parts being nearly in contact with each other, so as to admit of but little loss of water.

In Fig. 4 we have shown a section of the wheel in perspective to illustrate more clearly the principal parts shown in Fig. 2.

The buckets *d d* may be somewhat curved, if preferred, but we are not aware that this is a point of any importance. As the water is to enter the wheel at its periphery and to be discharged at its center, there must be a free space around it within the penstock, as at *h h*, thus admitting a ready supply to the buckets. As our principal dependence for the action of our wheel is upon the standing of the buckets in the direction of a tangent, or nearly so, to the circle of the opening of the lower plate thereof, and not upon its impulse on their outer edges, the water may, as above described, be introduced at the upper end of the penstock; and we intend sometimes to inclose the upper end securely, giving to it no greater height than is necessary for the action of the wheel, the shaft of which is in that case to pass through a stuffing-box in the center of the cover. The water may then be introduced through a trunk passing through an opening in said cover or in any other convenient way.

The size and depth of our wheel must of course be determined by the quantity of

water supplied by the stream and by the height of the head. No rule can be given, therefore, on the subject, nor will any competent millwright be at a loss in approximating very closely to the best proportion. In our first experiments with a wheel in which the buckets were placed tangentially to the circle of the discharge-opening the plates which inclosed said buckets were not made conical, and although the operation was generally satisfactory we were of the opinion that there was a loss of power from the water which was discharged on one side of the escape-opening striking against the internal part of the wheel and meeting and obstructing the water discharged from the opposite buckets; and this suggested the idea of making the rims conical, so as to direct the water downward directly toward the central escape, and on essaying this plan we found an advantage therefrom actually amounting to nearly or quite twenty per cent. Besides this essential advantage from the conical form given to the rims of our wheel, there is another incidental thereto—namely, there is no danger of the wheel being obstructed and raised from its seat by the entrance of blocks of wood or of other substances between the lower plate and the bottom of the penstock.

We will again refer to some of those water-wheels with a central discharge which have been heretofore constructed, and this we do for the purpose of more distinctly pointing out a substantial difference between them and our wheel. In that patented by Joel Eastman on the 28th of September, 1831, and in that patented for improvements thereon by Eliza Martineau on the 18th of April, 1839, the action is dependent almost exclusively on the percussion of the water against the outer ends of the buckets, to attain which it was made so to enter the penstock as at once to acquire a spiral whirling motion. The buckets extended in these wheels entirely across the discharge-opening, and the angle which they form with the circle of said opening is the very reverse in its direction to that formed by our buckets. The buckets also revolve

within a drum, not having an upper and lower plate attached to them, and the wheel is from this cause, as well as from others, subjected to great loss from leakage. Other central discharge-wheels—such, for example, as those which have been denominated “turbines”—act mainly upon the principle of percussion and differ materially in other respects from our wheel.

In the foregoing description of our improved wheel we have supposed its shaft to be placed vertically and the discharge to take place through the bottom of the flume or penstock, and one wheel only to be used. The shaft, however, may be placed horizontally and may carry two wheels having their discharge-openings through the sides of the penstock. In this case we do not allow the neck or collar *e' e'* to pass through openings in a metallic plate like that marked *g g* in the drawings, but make it to fit against the sides of such plate, as a little settling in the wheels would otherwise cause them to come into contact with each other and produce much friction.

Having thus fully described the nature and operation of our improved water-wheel, what we claim therein as new, and desire to secure by Letters Patent, is—

The placing of the buckets between two plates so formed that the parts in which they are contained shall constitute the frustums of cones, the lower or outer plate or plates being left open for a central discharge between the buckets, said buckets also being so arranged as that their planes shall form a tangent, or nearly so, with the circle of said opening, such wheel or wheels being likewise furnished with a neck or collar running truly within or against a metallic plate, and the respective parts of said wheel and its appendages being combined together and arranged substantially as above set forth.

LEMUEL W. BLAKE.

GEORGE W. BLAKE.

Witnesses:

NATHANIEL P. SONTELL,
JAMES BLAKE.