2 Sheets--Sheet 1.

N. F. BURNHAM.

No. 128,947.

Water Wheel.

Patented July 16, 1872.

Fig. 1.

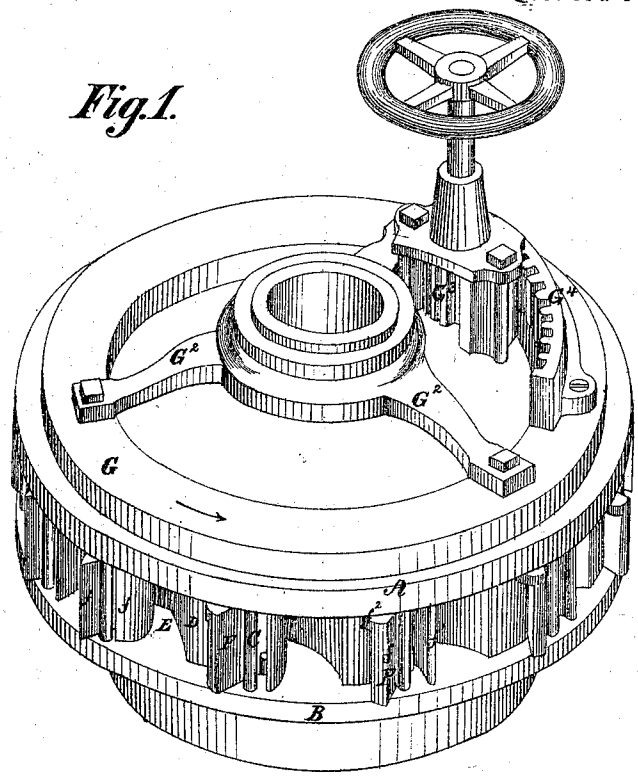
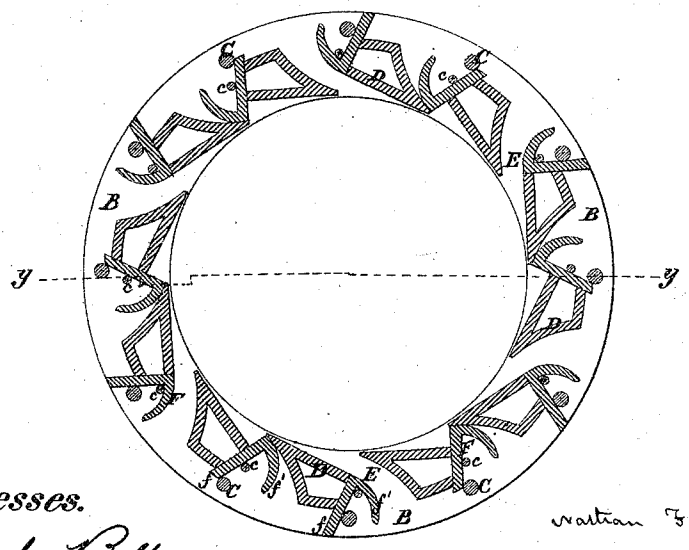


Fig. 2.



Witnesses.

J. Snowden Bell.

Joe. Keyton.

William F. Burnham

by his Atty

Wm D. Baldwin

N. F. BURNHAM.
No. 128,947.

2 Sheets--Sheet 2.
Water Wheel.
Patented July 16, 1872.

Fig. 3.

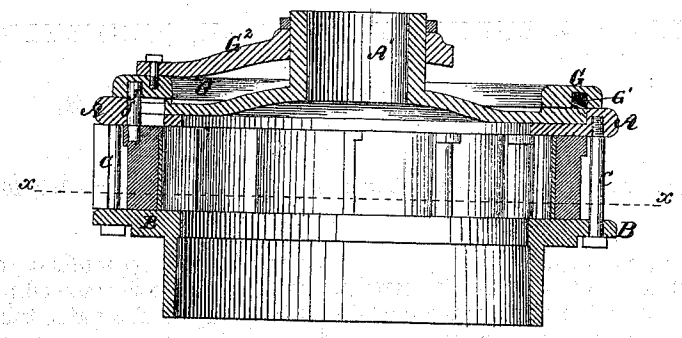


Fig. 5.

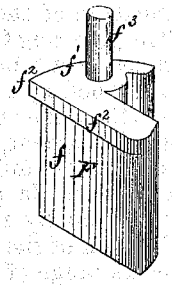


Fig. 6.

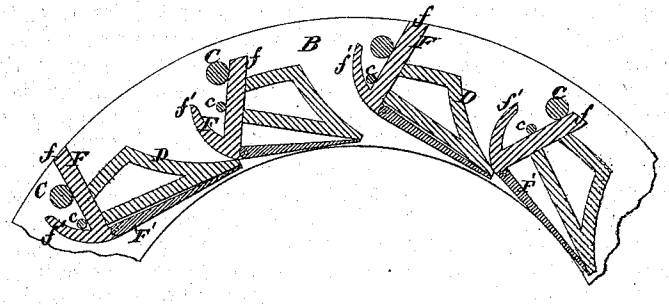


Fig. 4.

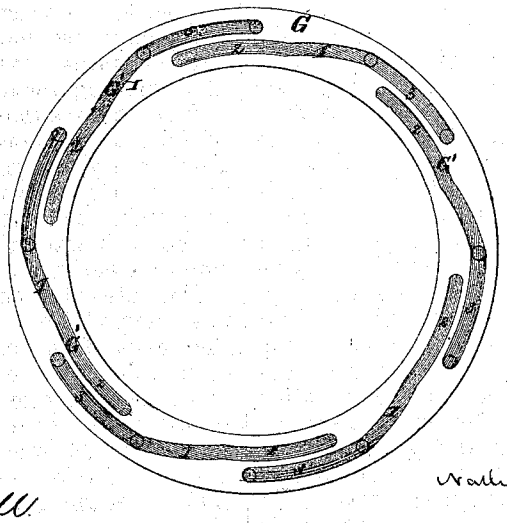
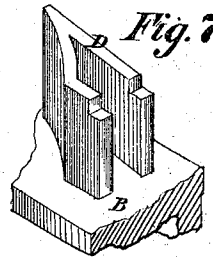


Fig. 7.



Witnesses.
J. Snowden Bell
Joe. Peyton

Inventor
William F. Burnham
by his Atty
Wm D. Blair

UNITED STATES PATENT OFFICE.

NATHAN F. BURNHAM, OF YORK, PENNSYLVANIA.

IMPROVEMENT IN WATER-WHEELS.

Specification forming part of Letters Patent No. 128,947, dated July 16, 1872.

To all whom it may concern:

Be it known that I, NATHAN F. BURNHAM, of York, Pennsylvania, have invented certain new and useful Improvements in Water-Wheels, of which the following is a specification:

The objects of my invention are to provide improved gates for admitting and regulating or arresting the supply of water to a turbine-wheel, and to provide such means for operating the gates as to admit of opening or closing any required number of them independently of the remainder. The improvements claimed are hereinafter set forth.

In the accompanying drawing, Figure 1 is a view, in perspective, of a wheel-case embodying my improvements; Fig. 2, a horizontal section of the same at the line *x x* of Fig. 3, half the gates being shown as open and half as closed; Fig. 3, a vertical section of the same at the line *y y* of Fig. 3; Fig. 4, a bottom plan of the gate-ring detached; Fig. 5, a view, in perspective, of one of the gates detached; Fig. 6, a horizontal section, showing a modification of the gates; and Fig. 7, a view, in perspective, of one of the guides.

The wheel-case is, in this instance, composed of an upper plate, A, and lower plate, B, united by bolts, C. A series of guides, D, upon the lower plate B is so arranged as to form spaces E between them, which serve as the chutes or inlets through which the water passes on its way to the wheel. Gates F slide transversely in the chutes D, so as to wholly or partially intercept the passage of water through them, and are operated by a gate-ring, G, in a manner presently to be described. Each gate is formed of a straight plate, *f*, and curved plate, f^1, and is provided at its top with a flange, f^2, resting in a recess in the adjacent guide upon which the gate bears when being opened or closed. The curvature of the plate f^1 is such that when the gate is fully or partially opened the plate f^1, in conjunction with the inner face of the adjacent guide upon which it bears, serves to form one of the walls of the chute, and assists in directing the water to the wheel in a direction substantially tangential thereto. The gates are guided in their movement by the bolts C, which unite the upper and lower plates of the case, upon which bolts friction-rollers may be fitted, if desired, and, by studs *c*, secured to the plate B, adjacent to the curved plates f^1 of the gates. Pins f^3 upon the gates take into cam-grooves G^1, formed in the lower surface of the gate-ring G. The central portion 1 of each cam-groove is eccentric to the case, and the end portions 2 3 are concentric therewith; the radial distance between the center lines of the portions 2 3 being the measure of the amount of travel of the gate. The gate-ring G is secured to a spider, G^2, journaled on a tube, A^1, on the upper plate A, and is turned by a pinion, G^3, having its bearings on the upper plate A and meshing into a toothed-segment, G^4, on the gate-ring. When the gates are full open their pins rest in the outer concentric portions 3 3 of the cam-grooves G^1, and by rotating the gate-ring G in the direction of the arrow, Fig. 1, through one-half of its range of movement, one-half of the series of gates will be closed, the rest remaining open. The further movement of the gate-ring through the remainder of its range of motion will close the other half of the series of gates. Conversely, by reverse movements of the gate-ring, the gates can be opened half the series at a time.

My improved method of opening and closing the gates obviously may be applied to those moving vertically as well as laterally.

It is obvious that by increasing the length of the eccentric portions of the cam-grooves a number of gates greater than half the series will be operated, while the rest remain stationary; and if the grooves were made eccentric above each gate, the gates will be operated simultaneously.

The gates shut off the water directly at the inner line of the chute, close to the buckets, the curve of the plates f^1 causing the same outline of chute to be preserved, no matter how much the gate may be opened or closed. In order to prevent the formation of eddies or currents in the inflowing water, and to maintain an unbroken outline for the wall of the chute when the gates are partially open, I provide tongues or flaps F^1, Fig. 6, hinged to the gates at their inner faces, their free ends being caused to rest against the ends of the adjacent guides by the pressure of the water. The tongues thus fill up the angular spaces which would otherwise be left vacant at the intersection of the inner faces of the guides with

the gates, and present an unbroken outline of chute, preventing the breaking of the inflowing water.

I claim as my invention—

1. The combination, with a water-wheel case, of gates F, sliding transversely to the inlet-chutes, substantially as set forth.

2. The combination, with a transversely-sliding gate, F, of a curved plate, f^1, to form a portion of the wall of the chute, substantially as set forth.

3. The combination, in a water-wheel case, of a guide, D, recessed at its top, and a transversely-sliding gate, F, having a supporting-flange bearing on the guide, substantially as set forth.

4. The combination of a transversely-sliding gate, F, and a hinged tongue, F^1, substantially as set forth.

5. The combination, with a water-wheel case, of gates F, operated in series, each independent of the other, substantially as set forth.

6. The combination of a water-wheel case, a series of gates F, and a gate-ring, G, provided with the cam-grooves alternately concentric and eccentric, substantially as set forth.

7. The improvement in the art of operating water-wheel gates, hereinbefore set forth, by means of a turning-ring, G, having slots in which pins on the gate traverse, or vice versa.

In testimony whereof I have hereunto subscribed my name.

N. F. BURNHAM.

Witnesses:

AUGUSTUS SONNEMAN,

N. GOODMAN.