(No Model.)

N. F. BURNHAM.

TURBINE WATER WHEEL.

No. 382,026. Patented May 1, 1888.

Fig. 1.

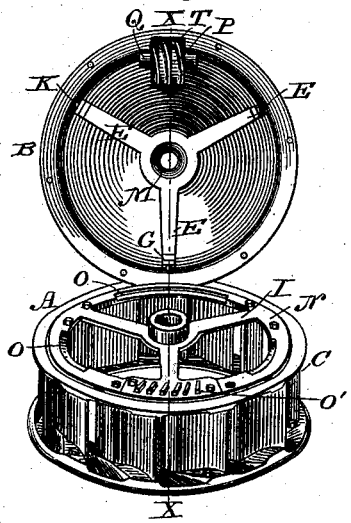


Fig. 3.

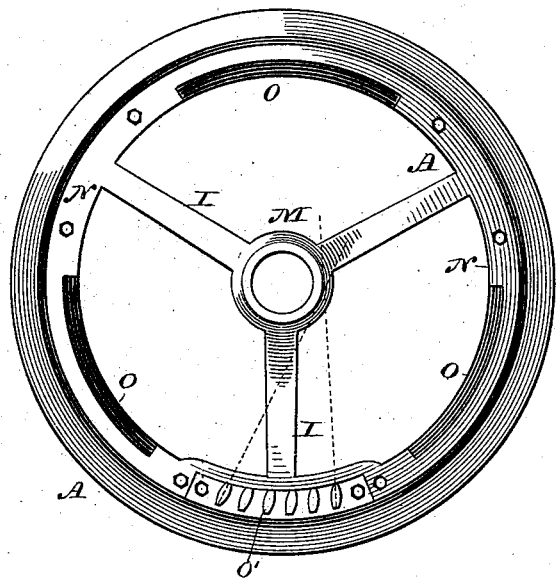
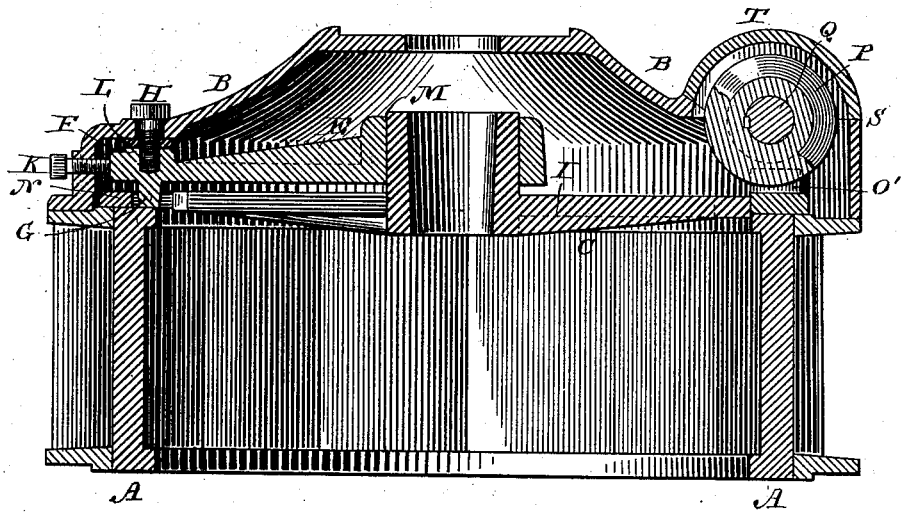


Fig. 2.



WITNESSES

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TURBINE WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 382,026, dated May 1, 1888.

Application filed December 17, 1887. Serial No. 258,177. (No model.)

To all whom it may concern:

Be it known that I, NATHAN F. BURNHAM, a citizen of the United States, and a resident of the city and county of York, and State of Pennsylvania, have invented certain new and useful Improvements in Turbine Water-Wheel Cases, of which the following is a specification.

My invention more especially relates to that class of turbines manufactured by me for many years, and secured to me by several United States Letters Patent. This class of turbines comprises, among other things, a case, a gate inclosed therein, and a cover resting on the case. The spindle of the water-wheel itself, as well as the gate, has center bearings in the case and cover. The pressure of the water sometimes tends to cause the cover to spring unequally, and thus produce friction and consequent wear of the gate and case.

It is the object of one part of my invention to obviate this objection, while securing other advantages, which ends I attain by interposing arms between the cover and gate, as hereinafter set forth.

The subject-matter claimed is hereinafter specifically designated in the claims.

The accompanying drawings illustrate so much of a water-wheel case embodying my improvements as is necessary to illustrate the invention herein claimed in my preferred form of embodiment; but formal modification may be made therein without departing from the spirit of my invention.

Figure 1 is a perspective view with the cover turned up, more clearly to show the organization of the mechanism. Fig. 2 represents a vertical section on the line *x x* of Fig. 1, with the cover shut down; and Fig. 3, a plan view of the case, the gate, and the gear thereon.

Unless otherwise indicated, the parts are of well-known construction, the case A, cover B, and gate C, for instance, being substantially similar to corresponding parts shown in my former patents above referred to. A ring, N, bolted to the top of the gate overlaps and rests on the upper part of the case. This ring is provided with recesses *n* on its inner side, for a purpose hereinafter described. A rack, O, is secured on the upper side of the gate-ring, to the curve of which it corresponds. The teeth of this rack are beveled or rounded at the ends, as shown in Fig. 3, with their longitudinal axes radiating from a point slightly eccentric to the bearing on which the ring turns. These gears mesh with a worm-gear, P, secured on a shaft, Q, turning in bearings on the case and inclosed by a shield, S, and cap T. The cogs being arranged with their axes substantially coincident with the worm-thread, a smooth contact is secured, as well as great durability and resistance to strains. The gate arms N are secured at their outer ends to the gate ring, their inner ends being connected with a central boss or journal, M. The cover-arms E are preferably connected with the cover adjustably and near their outer ends by means of set-screws H, passing through elongated slots in the cover into lugs F on the cover-arms. Similar screws, K, passing horizontally through the cover, abut against the ends of the arms, thus affording means for horizontal adjustment.

The cover-arms unite in the center to form a ring or bearing, in which the journal of the gate-arms has its bearing. The screws K, above mentioned, insure accurate centering, to which the screws H accommodate themselves by moving laterally in their slots in the cover. Lugs G on the lower outer ends of the cover-arms bear on the gate, and thus prevent its rising or tilting and keep it down to its work accurately. As these lugs bear on the gate in the recesses *n* of the gate-ring, they furthermore act as stops to limit the range of movement of the gate and its ring. Wear of the gate may be compensated by inserting collars L between the lugs F and the cover. The cover-arms, being interposed between the cover and gate and connected with the former near its outer edge, are not affected by its uneven springing, and at the same time prevent the throwing of the center bearing of the gate out of place and the consequent rubbing by the gate of the vertical part of the case, as sometimes happens under the old system.

The horizontal adjustment of the cover-arms, as before remarked, insures the accurate centering of the gate in its bearings, and the collars interposed between the cover and its arms compensate wear simply and effectually.

I am aware that gate-arms have heretofore

been provided with fixed center bearings inside the cover and with adjustable outside center bearings, and do not therefore broadly claim adjustable center bearings.

I am also aware that the movement of a gate has been limited by rods passing through slots in a central ring, and that worm-gear has been used to move a gate, and do not therefore claim either of these features, broadly.

What I claim herein as of my invention is—

1. The combination, substantially as hereinbefore set forth, of the turbine water-wheel case, the gate inclosed therein, the gate-arms, their central spindle or journal, the cover over the case, and the arms secured to the cover near its outer margin, interposed between the cover and gate, and provided with a central ring to form a bearing for the gate arms, for the purposes specified.

2. The combination, substantially as hereinbefore set forth, of a turbine water-wheel case, the gate inclosed therein, the gate ring, the recesses on its inner margin, the gate-arms, their central journal, the cover over the case, the cover-arms interposed between the cover and gate, and the lugs on the cover-arms bearing on the gate in the recesses of the gate-ring to limit both its vertical and lateral movement.

3. The combination, substantially as hereinbefore set forth, of the turbine water-wheel case, the gate inclosed therein, the gate-ring, the gate arms, their central journal, the cover over the case, the arms secured to the cover near its outer margin and interposed between the cover and gate, the rack on the top of the gate-ring, and the worm on the case meshing therewith.

4. The combination, substantially as hereinbefore set forth, of the turbine water-wheel case, the gate inclosed therein, the gate-arms, their central journal, the cover over the case, the arms interposed between the cover and case, the central ring on the cover-arms forming the bearing for the gate arms' journal, the set-screws passing horizontally through the cover and abutting against the ends of the cover-arms, and the vertical set-screws passing through slots in the cover into lugs on the cover-arms to insure accurate centering and adjustment of the gate-ring.

5. The combination, substantially as hereinbefore set forth, of the cover, the cover-arms, the adjusting-screws passing horizontally through the cover and abutting against the ends of the cover-arms, slots in the cover near its outer edge, lugs on the cover-arms, and set-screws passing through said slots to connect the cover and its arms and to permit of their relative adjustment.

In testimony whereof I have hereunto subscribed my name.

NATHAN F. BURNHAM.

Witnesses:

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