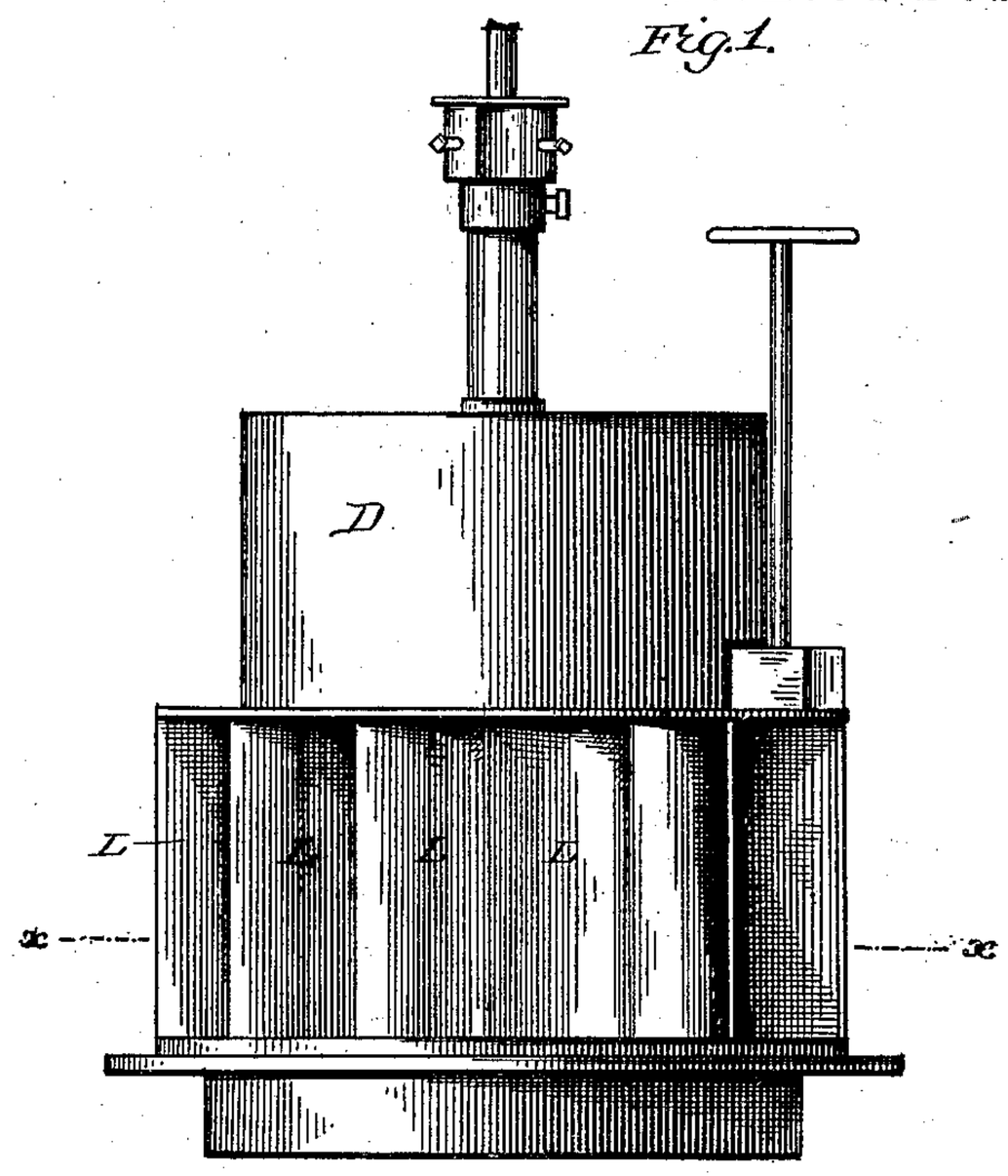
(No Model.) 2 Sheets—Sheet 1.

M. D. GROW.

TURBINE WATER WHEEL.

No. 272,428. Patented Feb. 20, 1883.

Fig. 1.



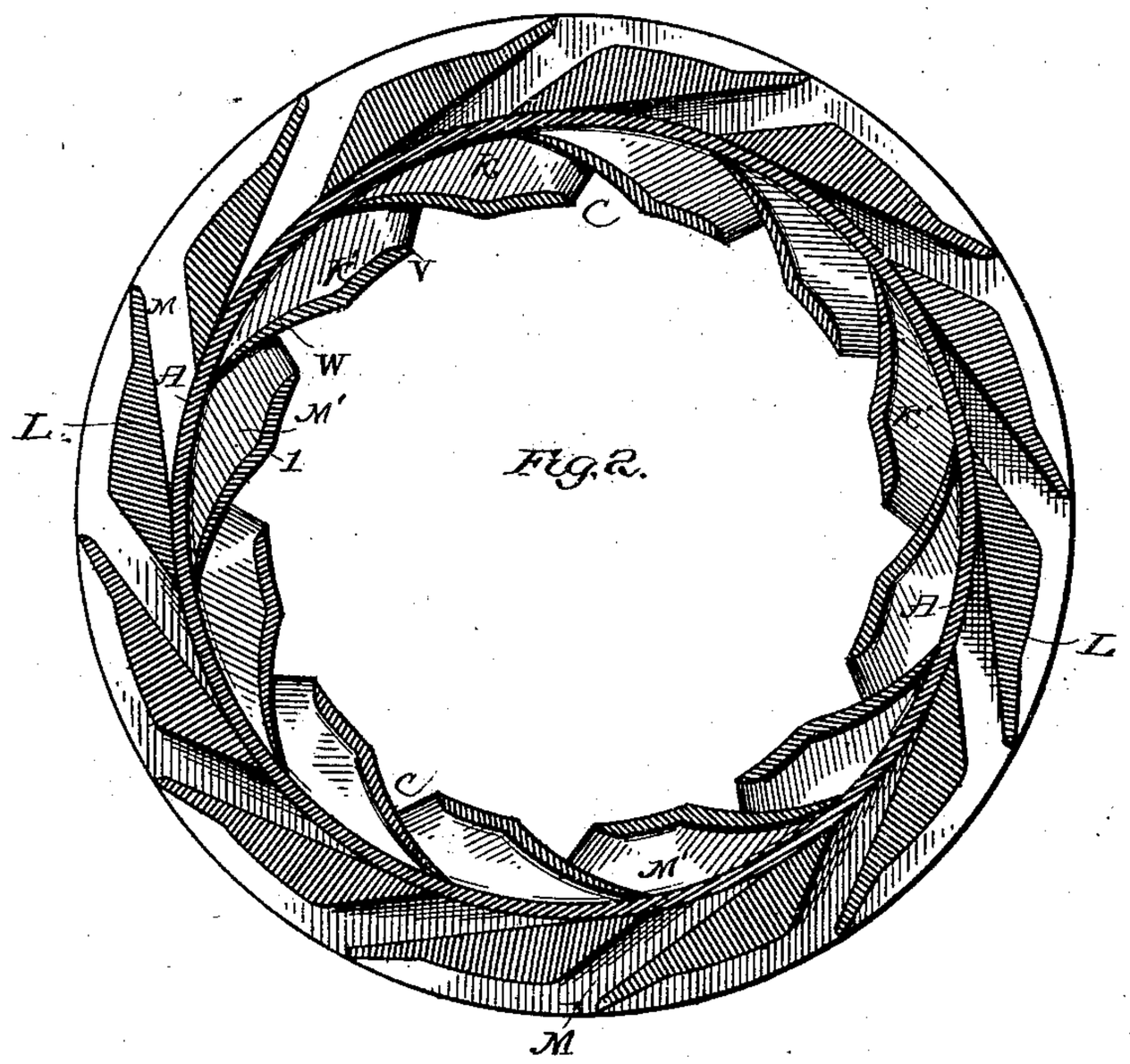


Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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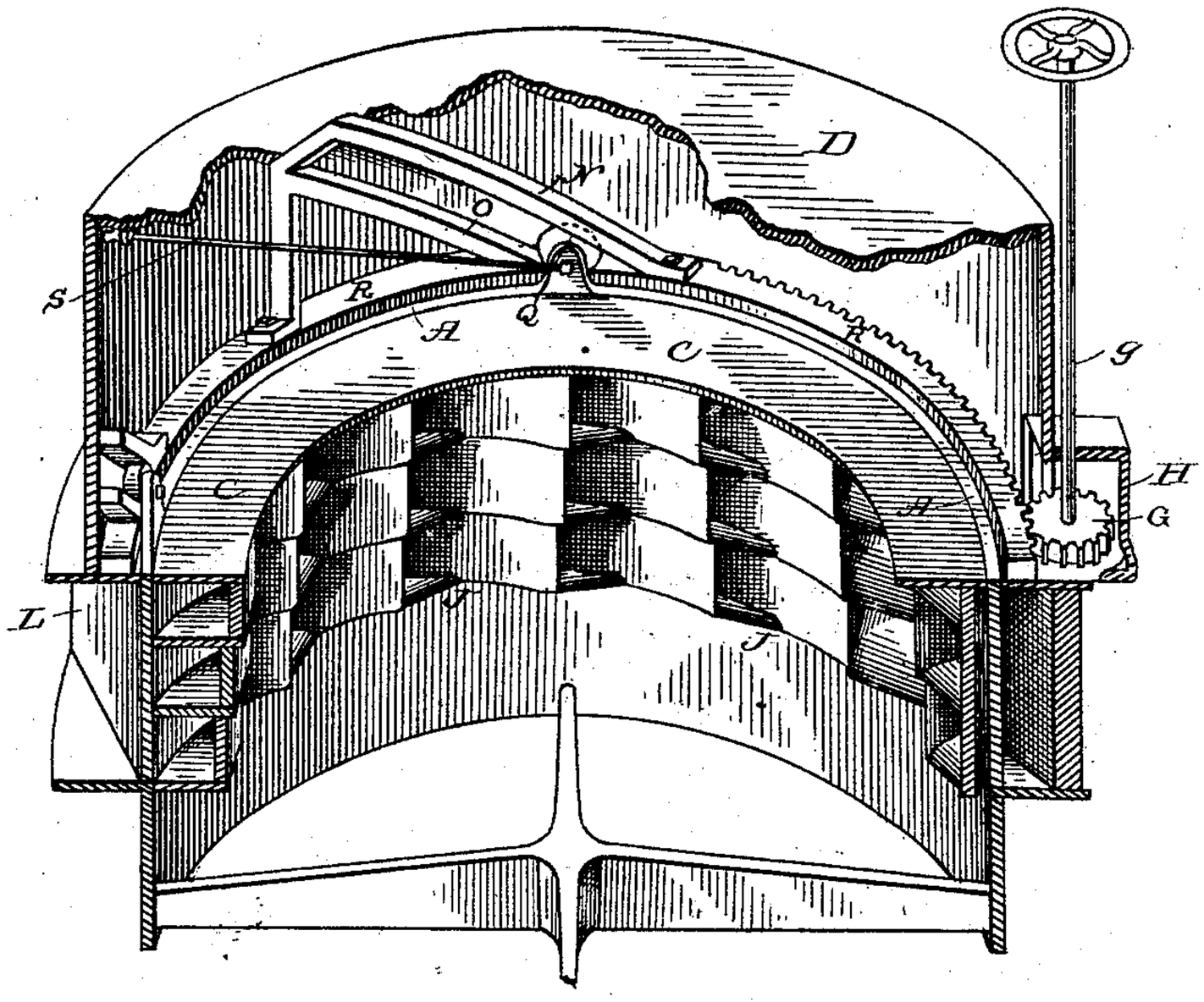
Fig. 3.



Attest:
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UNITED STATES PATENT OFFICE.

MARQUIS D. GROW, OF DUBUQUE, IOWA.

TURBINE WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 272,428, dated February 20, 1883.

Application filed June 26, 1882. (No model.)

To all whom it may concern:

Be it known that I, MARQUIS D. GROW, of Dubuque, in the State of Iowa, have invented a new and useful Improvement in Turbine Water-Wheels; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to turbine water-wheels of the class denominated "inward-flow turbines."

It consists, first, in a special form of grooves in the bucket; second, in a notched or indented form at the point of discharge of the bucket on the inner face of the wheel; third, the special form and construction of the wheel with two or more series or stories of buckets placed one above the other, each upper bucket overlapping the lower and extending farther inward; fourth, the construction of the cap covering the gate and leaving space for the raising of the gate; fifth, in the construction of inclines or ways upon a movable ring in connection with a wheel upon the two, whereby by the motion of the ring the gate is raised or lowered.

In the accompanying drawings, Figure 1 shows a side elevation of my improved turbine wheel. Fig. 2 is a horizontal section on line *x x* of Fig. 1. Fig. 3 is a vertical section, showing the interior of the wheel.

The parts not shown and not particularly described are of construction ordinary in this class of turbines.

In these drawings, L L represent the outer director-vanes, which receive the water and give it direction inwardly toward the buckets of the wheels. These vanes form substantially the outer inlet to the wheel C. The inner part of the bucket, or that part which is upon the wheel C, is shown at K. It will be understood that the director-vanes are fixed rigidly in the outer case, and are substantially of the form shown in Fig. 2.

The buckets K are designed to be in two or more stories. I have represented them in Fig. 3 as arranged in three stories, in which each succeeding story, beginning with the second, overlaps that next below it, so as to cause the water escaping therefrom to pass farther inward before falling, and thus overlap the water of the bucket next below.

The special form of the buckets is shown more plainly in Fig. 2. The inner face of it is formed with three curves, W K′ V. Of these curves the first, starting from the point of contact with the gate (marked A) and opposite the inner end of the director-vane L, curves inwardly to a point, 1, and from the point 1 it curves substantially on a circle concentric with the periphery of the wheel. The third curve, V, commences at *k′* and extends approximately at right angles to the wall of the first curve of the next bucket, which wall the end of this curve joins. At this last curve is the discharge or point of egress of the water, as hereinafter described. It will be understood that the first and second curves, heretofore described, are in the inner wall of the bucket. The peculiar shape of the outlet J is more clearly shown in Fig. 3. It has a slight downward curvature, as shown in the latter figure, in addition to the special curvatures previously described, and shown in Fig. 2, and the direction of approach of the last line or curve to the wall of the next bucket leaves a notch or indentation, as clearly shown in the figures. This gives a freer discharge from the bucket-space M′, and the form described is adapted better to utilize the momentum of the water.

The gate is shown at A in Figs. 2 and 3. It consists of an annular plate or ring inserted in the thin annular space between the director-vanes and the outer periphery of the wheel C. When it is shut down to the lower limit of its motion, it closes the buckets, shutting the bucket-space M′ from the space M between the director-vanes. It will be understood that this gate incloses all three of the stories of the buckets; or it may be raised to admit water to the lower or to the whole, according to the height to which it is elevated.

For the purpose of raising and lowering the gate, I have provided inclined ways N and O. Of these there may be three or more sets symmetrically arranged about the wall or case of the wheel, so as to give equal amount of elevation on all sides. These inclines are supported upon a ring, R, to which they are fixed, as shown in Fig. 3. The inner faces of the inclines are provided with flanges, between which runs a wheel, Q, pivoted upon an ear on the upper edge of the gate. The gate is

held from rotary movement by means of a rod, S, connecting the ear to the case. Movement is imparted to the ring R by means of a pinion, G, which works in a case, H, and meshes into teeth in the outer periphery of the ring. The pinion is provided with a shaft, *g*, and ordinary hand-wheel, by means of which it is rotated. When the ring is turned to the right, as shown in Fig. 3, the wheels Q bear upon the inclines O, thereby raising the gate, and when the ring is turned in the opposite direction the inclines N bear upon the wheels and force the gate down.

The upper part of the apparatus is covered by cap D, which incloses the inclines, and also gives space for the elevation of the gate A. It is bolted to and supported upon the upper ledge of the outer case, which contains the director-vanes. The shaft and its connection with the wheel are of ordinary construction.

Having thus described my invention, what I claim is—

1. In a turbine water-wheel, the buckets K, having the curves W K′ V, the latter at the discharge-opening, all substantially as described.

2. In a turbine wheel, the buckets K K, having the curves, as described, and arranged in the relation described to each other, provided with the discharge-opening at J, curved downward, as set forth.

3. In a turbine wheel, two or more stories of buckets arranged in succession, one above the other, each story projecting inwardly beyond the edge of that next below it, substantially as described.

4. In a turbine water-wheel, the gate A, provided with means for preventing it from rotating, and with a wheel, Q, in combination with inclines and a ring, R, and means for rotating the ring, substantially as described.

5. The combination of the wheel C, the gate A, the friction-wheel Q, the rod S, the inclines O and N, the toothed ring R, and the pinion G, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MARQUIS D. GROW.

Witnesses:

BEECHER CHATFIELD,

M. F. MICHELS.