C. & C. O. KROGH.

TURBINE WATER-WHEELS.

No. 194,445. Patented Aug. 21, 1877.

Fig. 1.

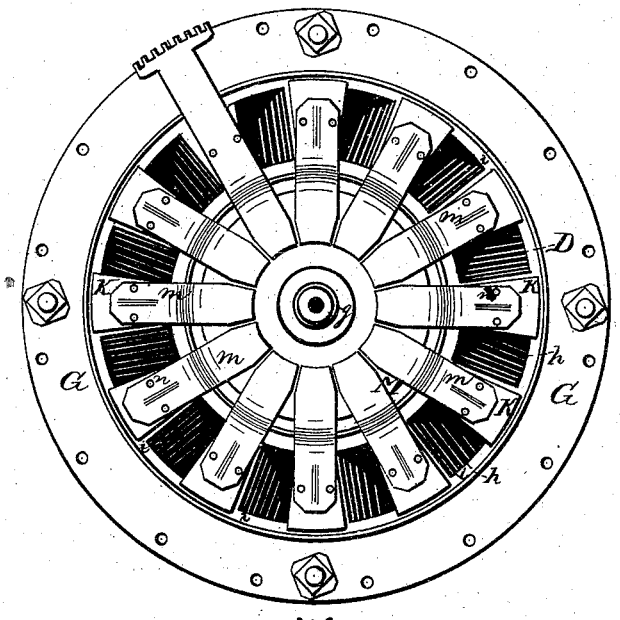


Fig. 2.

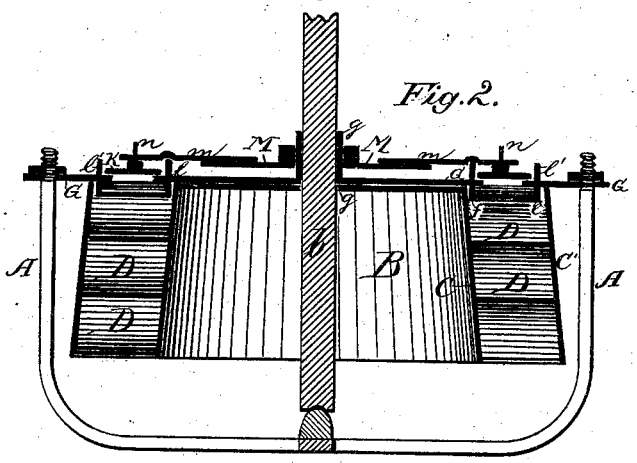
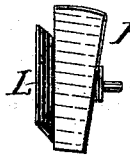


Fig. 3.



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UNITED STATES PATENT OFFICE.

CASPER KROGH AND CARL O. KROGH, OF KROGHVILLE, WISCONSIN.

IMPROVEMENT IN TURBINE WATER-WHEELS.

Specification forming part of Letters Patent No. **194,445**, dated August 21, 1877; application filed April 21, 1877.

To all whom it may concern:

Be it known that we, CASPER KROGH and CARL O. KROGH, of Kroghville, in the county of Jefferson and State of Wisconsin, have invented certain new and useful Improvements in Turbine Water-Wheels; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a top plan. Fig. 2 is a vertical section, and Fig. 3 is a perspective view, of the gate detached.

Similar letters of reference indicate corresponding parts in all the figures.

This invention relates to that class of turbine water-wheels which revolve without an outer casing or box; and it consists in the construction and arrangement of parts hereinafter more fully shown and described.

In the drawing, A is the frame. To the center of this is pivoted a shaft, *b*, carrying the turbine B. This consists of two tubes or bands, C C′, slightly conical in shape, being wider at the bottom than at the top. One of these bands, C, is of a less diameter than the other, C′, within which it is placed. D D are the buckets. These consist of blades of metal or other suitable material, placed spirally between the bands C C′, which are in this manner secured together. The spiral of each bucket should extend around at least one-fourth of the circumference of the bands C C′, in order to obtain the highest possible percentage of power.

G is the gate-cover. This is provided with a center hub, *g*, for the axle or shaft *b*; and it consists of a circular plate, completely covering the turbine, beyond which it projects, so as to be firmly attached to frame A. The cover G has two downward-projecting rims, *e f*, one of which, *e*, fits inside band C′, and the other, *f*, outside band C. Between these rims are the gate-openings *h h*, from which inclines *i i* lead down to the buckets, in order to cause the water to strike these with the greatest possible force. The number of gate-openings should exceed the number of buckets, in order that the water passing through more than one gate-opening may constantly act on each bucket, this having been found in practice to be most desirable.

The gates K are of the construction clearly shown in Fig. 3 of the drawings. They consist of flat pieces of metal, large enough to fully cover the openings *h*. They slide between upward-projecting rims *l l′* upon cover G, and are operated simultaneously by radial arms *m* of a disk, M, which rotates around the center hub *g* of cover G. The connection between the gates K and arms *m* may be formed by upward-projecting pins *n* upon the gates, working in corresponding perforations in arms *m*, or in any other suitable manner.

Each of the gates K has an inclined plate, L, projecting downwardly through the openings *h*, parallel to the inclines *i*, thus forming channels of equal width throughout, through which the water is conducted to the buckets in steady and unbroken streams, the result of which is that the power derived from this source is much greater than in turbines where the streams of water passing through the gates are shattered by the vacuums existing under the solid parts of the gate-cover.

The operation and advantages of our improved turbine water-wheel will be readily understood from the foregoing description.

When the gates are opened the water from the flume passes through the channels between inclines *i* and L, strikes the buckets D, and passes out, forcing the wheel around. A certain quantity of water is always carried around with the wheel, which, by the centrifugal motion of this, is forced against its outer walls, thus creating considerable friction. This is compensated for by the conical shape of the turbine, the power of which is in this way increased considerably. Owing to the rims *e f* of cover G, no drop of water is allowed to escape without first doing service in the wheel; and, finally, the box or casing usually employed with wheels of this nature is entirely dispensed with, thus doing away with the friction caused by the sheet of water invariably found between the revolving wheel and such casing.

Having thus described our invention, we claim and desire to secure by Letters Patent of the United States—

1. The turbine B, in combination with the gate-cover G, having openings *h* and inclines *i*, disk M, having radial arms *m*, and gates K, having inclines L, substantially as and for the purpose herein shown and specified.

2. The combination of the turbine B, constructed as described, with the gate-cover G, having downward-projecting rims *e f*, substantially as and for the purpose set forth.

3. In a turbine water-wheel constructed substantially as herein described, the gates K, having inclines L, substantially as and for the purpose hereinbefore set forth.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in presence of two witnesses.

CASPER KROGH.
CARL O. KROGH.

Witnesses:
AUGUST CREBELL,
JAMES M. KISTRODE.