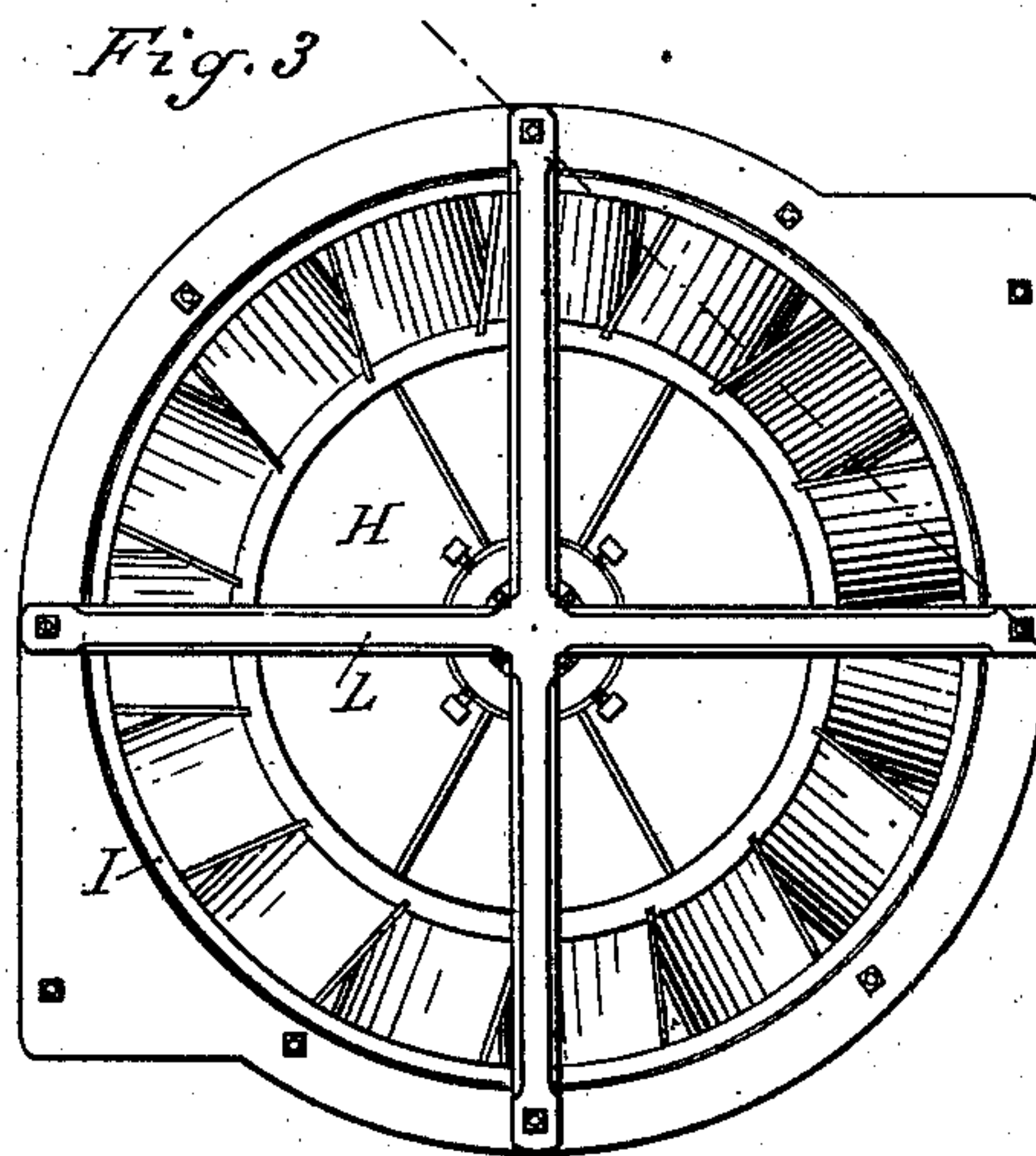
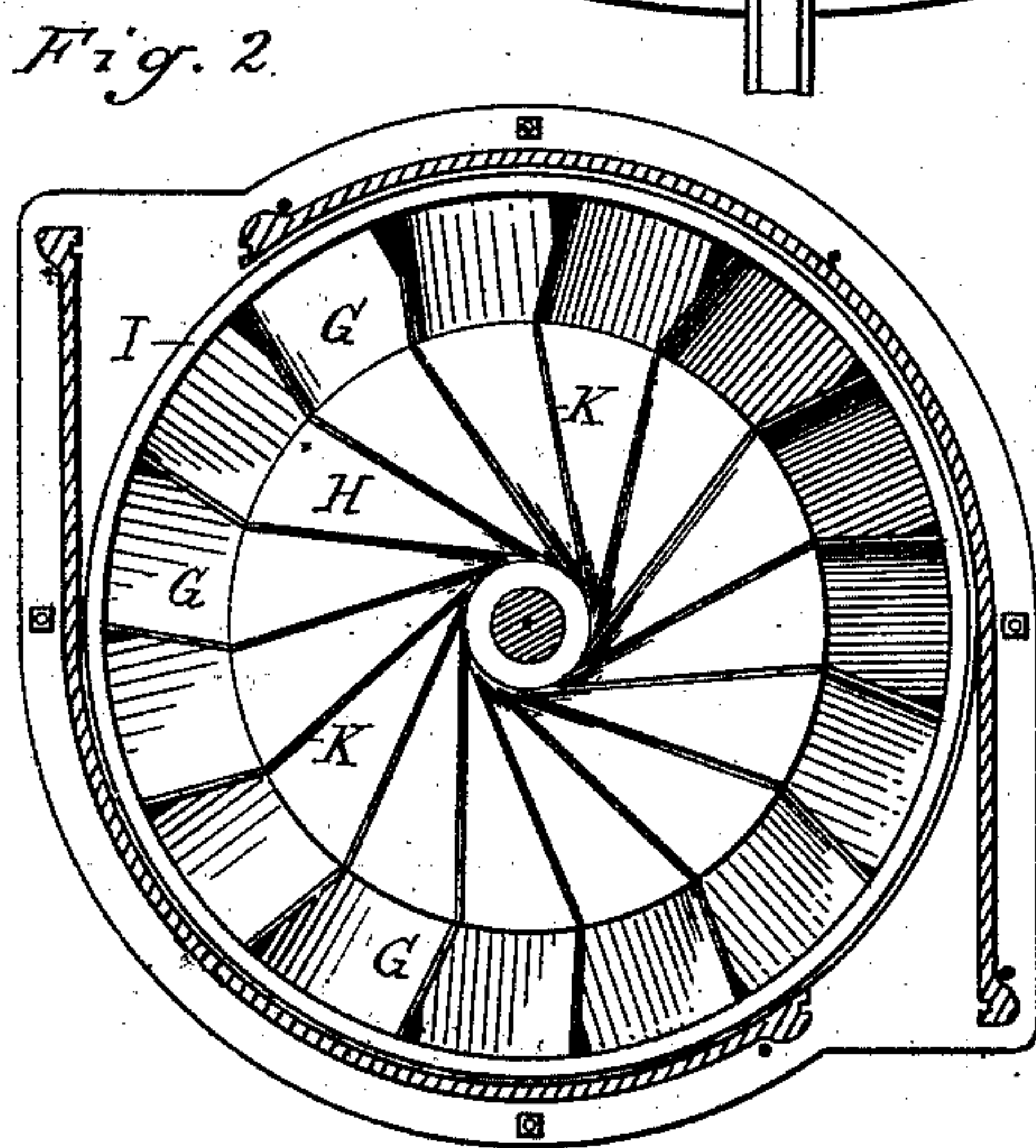
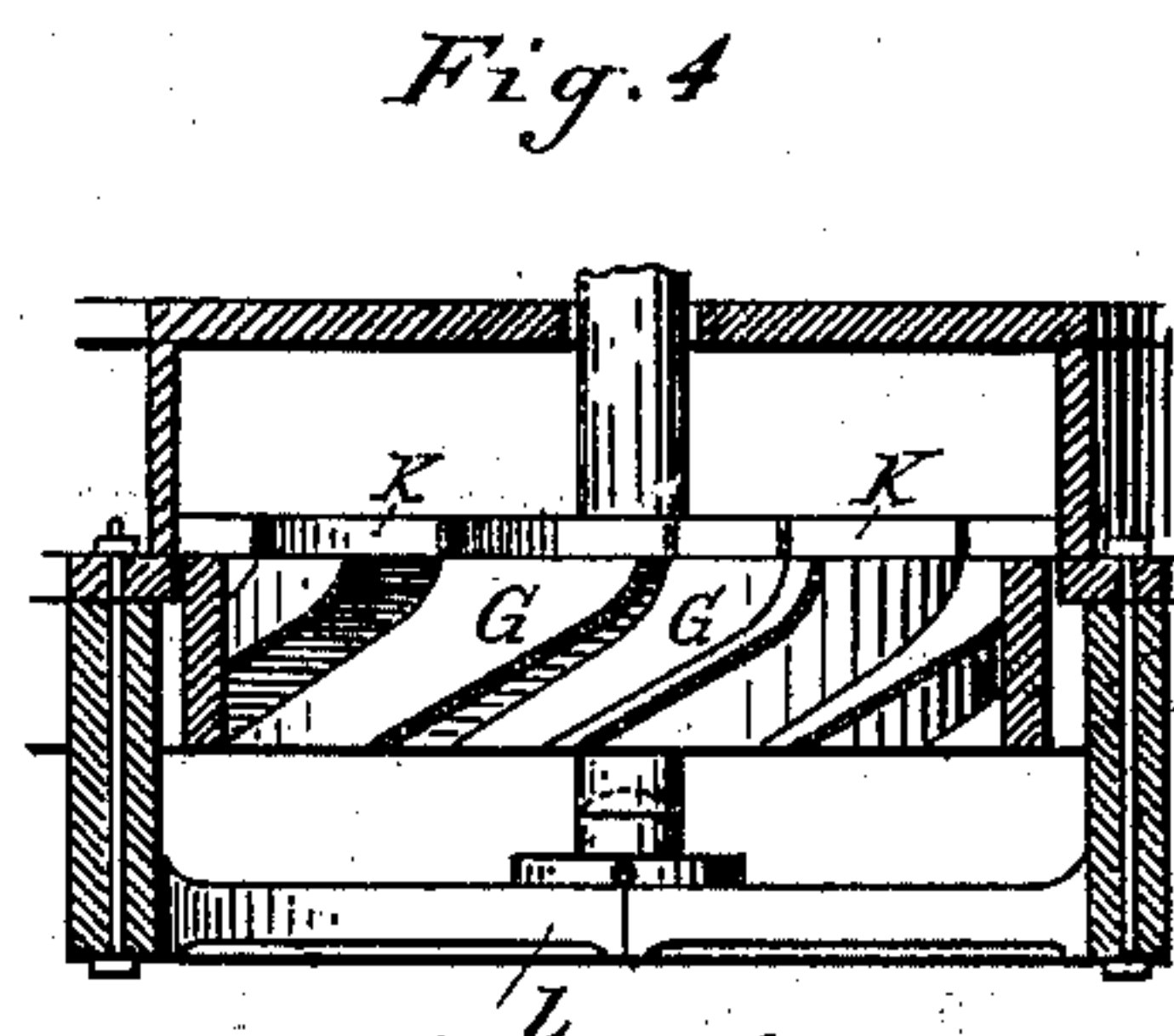
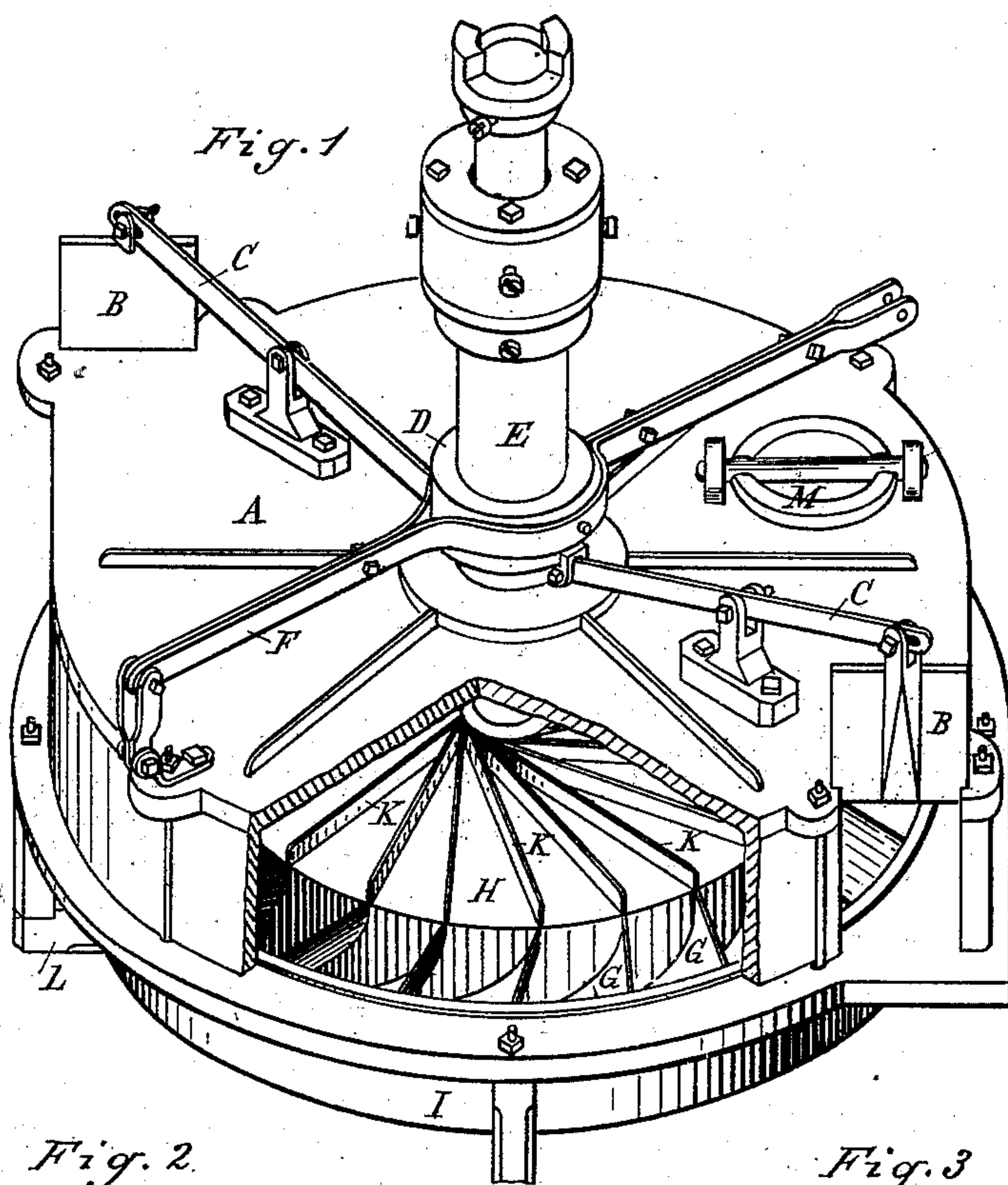


F. M. KENT.  
Turbine Water-Wheel.

No. 216,860.

Patented June 24, 1879.



Attest:  
A. Barthel  
H. Stanley

Inventor:  
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By Atty  
J. C. Sprague



# UNITED STATES PATENT OFFICE.

FRANCIS M. KENT, OF GRAND LEDGE, MICHIGAN.

## IMPROVEMENT IN TURBINE WATER-WHEELS.

Specification forming part of Letters Patent No. **216,860**, dated June 24, 1879; application filed January 30, 1879.

*To all whom it may concern:*

Be it known that I, FRANCIS M. KENT, of Grand Ledge, in the county of Eaton and State of Michigan, have invented an Improvement in Turbine Water-Wheels, of which the following is a specification.

The nature of my invention relates to certain new and useful improvements in the construction of that class of water-wheels known as "turbines;" and the invention consists in the details of construction and various combinations of such details, by means of which the wheel in operation is equally balanced, and all water applied thereto is brought to bear upon the outer portions of the wheel, farthest from the axis, and drives such wheel without reaction, or but very slight reaction, as more fully hereinafter described.

In the drawings, Figure 1 is a perspective, showing the gates open. Fig. 2 is a plan view with the upper part of the case removed. Fig. 3 is a plan view of the bottom. Fig. 4 is a vertical central longitudinal section through one of the buckets.

In the accompanying drawings, which form a part of this specification, A represents the case, provided at opposite points with two openings, which are controlled by the gates B, each of which is secured to levers C, the inner ends of which are pivoted to the yoke D, which straddles the spindle E, and to which the lever F, fulcrumed at one side of the case, is attached, so that the operation of said lever simultaneously actuates both gates.

G are the buckets, arranged at regular intervals around the outer edge of the central wheel, H, and a band, I, upon the outer edges of these buckets holds them firmly in place. These buckets are made in the form shown in cross-section, and preferably made with their upper ends nearly in the true form of a segment of a circle, terminating in about a thirty-degree incline. This bucket is constructed substantially in this form so that the force of the current entering the openings will impinge against the curved portion of the bucket and upon the concave face therein, and give the same a forward rotary motion. The water, after having exerted its force in this manner, passes on to the inclined portion of the bucket, and by the forward motion of said

bucket said inclined portion is withdrawn from under the water, thereby effecting a discharge of the water from the wheel with a very slight reaction.

To the hub or central portion of the wheel H, the upper plane of which is coincident with the upper edges of the buckets, there are secured a series of wings, K. The outer ends of these wings extend to the periphery of said hub or central wheel, and are eccentric to the axis of the wheel and to the buckets thereof, and are so arranged that water upon the face of the central portion of the wheel is, by the centrifugal motion, thrown off, and so much as is between each pair of wings is guided to its appropriate bucket, so that all the water entering at the openings in the case is compelled to act upon the buckets without waste.

As ordinarily constructed this surplus water passes out through a central discharge unutilized, or travels around the scroll or case with the buckets.

From the under side of the case there projects a spider, L, of the usual construction, for the purpose, in part, of providing a central step upon which the spindle of the wheel rotates.

By making two openings at points directly opposite each other to admit water into the case, it will be found that such water, being admitted in nearly uniform quantities at these separate points, produces a perfect balance of the wheel, while if admitted but at one point, as is common, the weight of the water and the force of the current overload the wheel upon one side, causing friction and wear, which it is my object to avoid.

A hand-hole provided with suitable cover, M, is arranged in the top of the case, for the purpose of giving access to the interior when necessary, thereby rendering it unnecessary, as is often done, to remove the entire wheel for the purpose of removing obstructions which may accidentally pass in with the water.

What I claim as my invention is—

1. The combination, with a turbine wheel and its case A, of the two gates B on opposite sides of the case, hung on levers C, which are fulcrumed to the top of the case, and are connected at their inner ends with the yoke D on the wheel-shaft, and the lever F, fulcrumed

on the case and operating the said yoke, constructed and arranged substantially as described and shown.

2. A turbine water-wheel wherein are combined the solid hub H, the curved and inclined buckets G on the periphery of the hub, and the eccentric wings K upon the solid hub, extending from the shaft to the buckets, substantially as described and shown.

3. A turbine wheel consisting of the case A,

provided with two water-openings directly opposite each other, gates B, arranged to operate simultaneously, spindle E, buckets G, hub H, wings K, and spider L, when the parts are constructed, arranged, and operating substantially as and for the purposes described.

FRANCIS M. KENT.

Witnesses:

H. S. SPRAGUE,

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