

I. SHERCK.
TURBINE WATER-WHEEL.

No. 178,969.

Patented June 20, 1876.

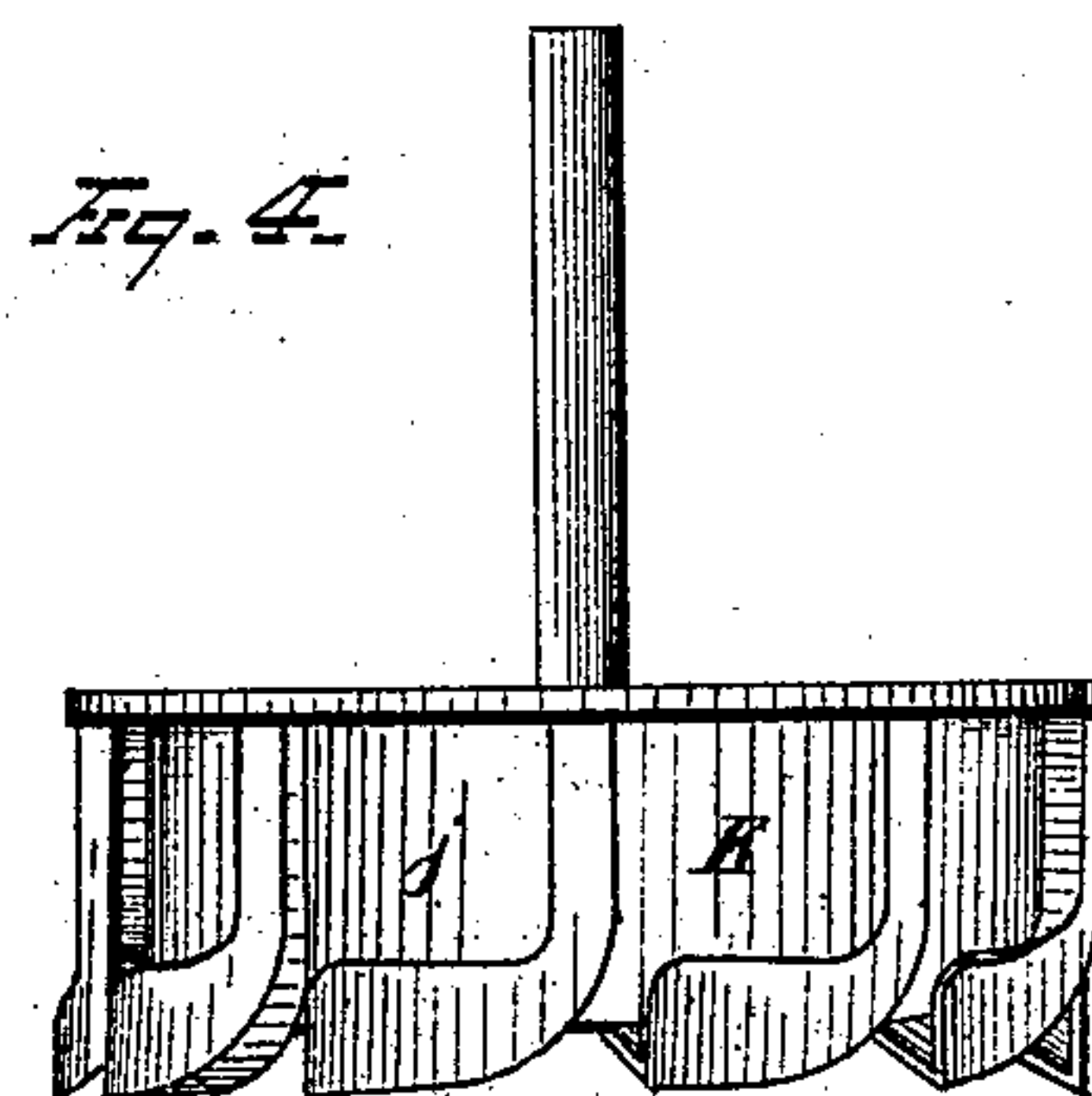
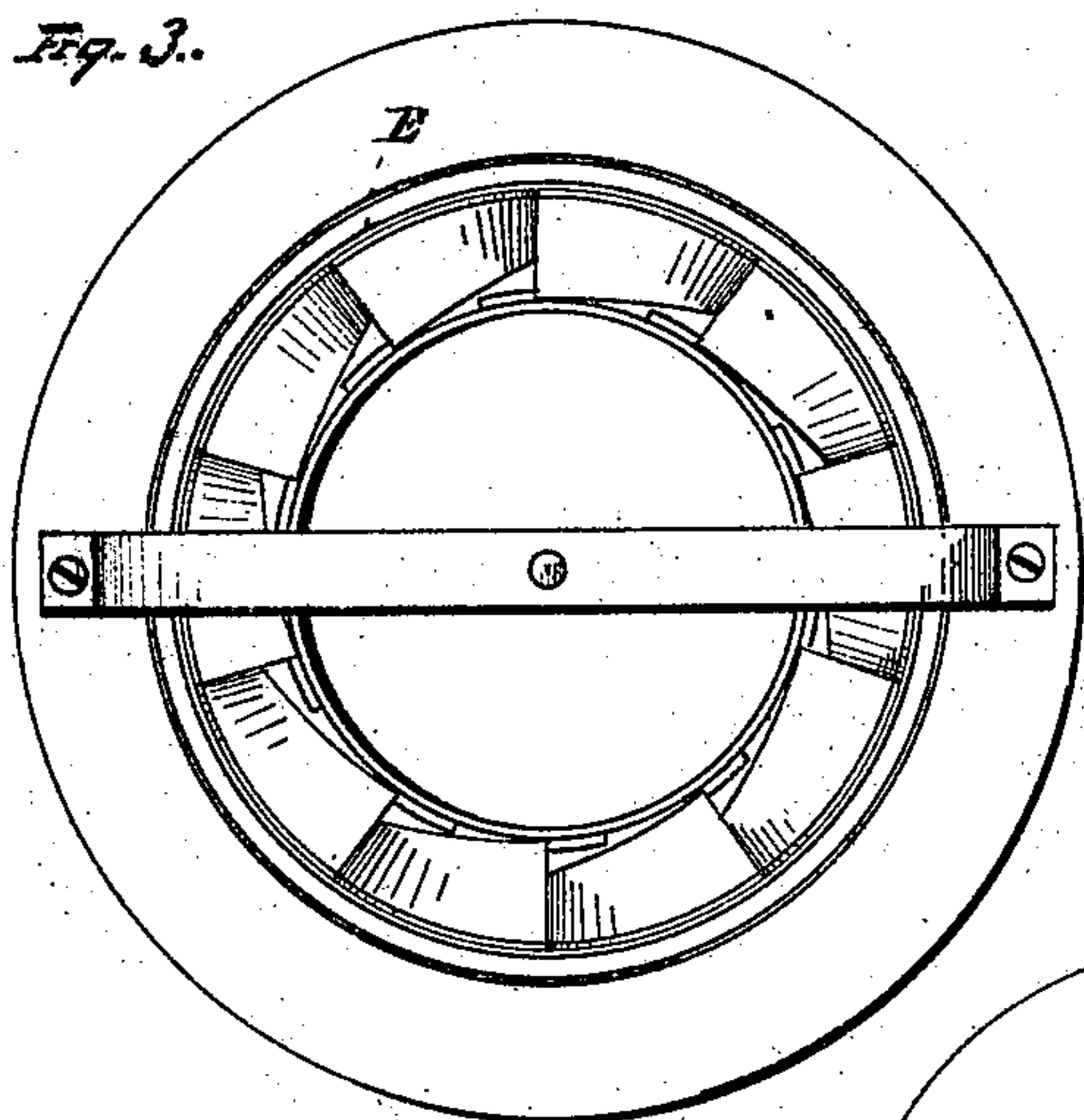
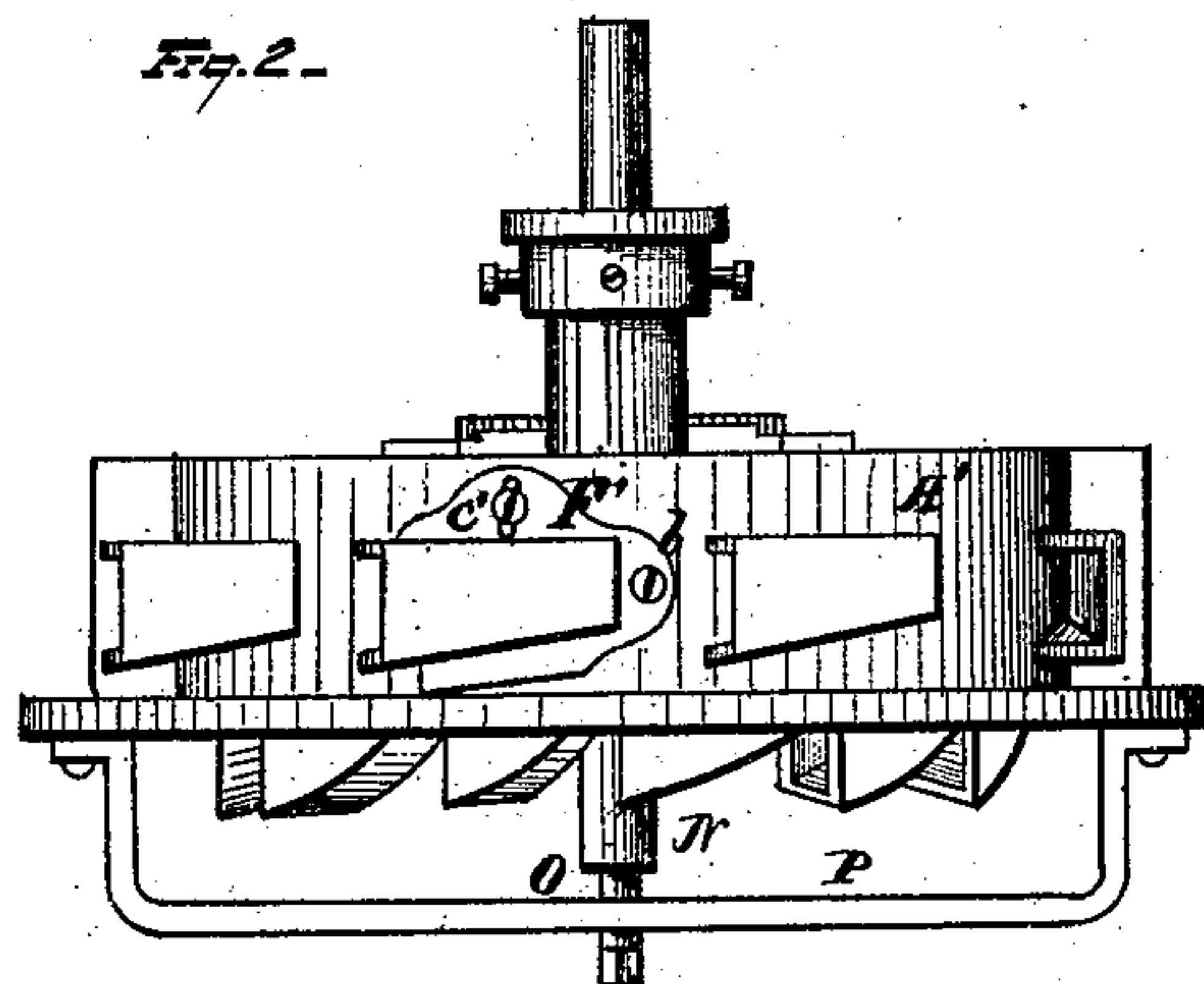
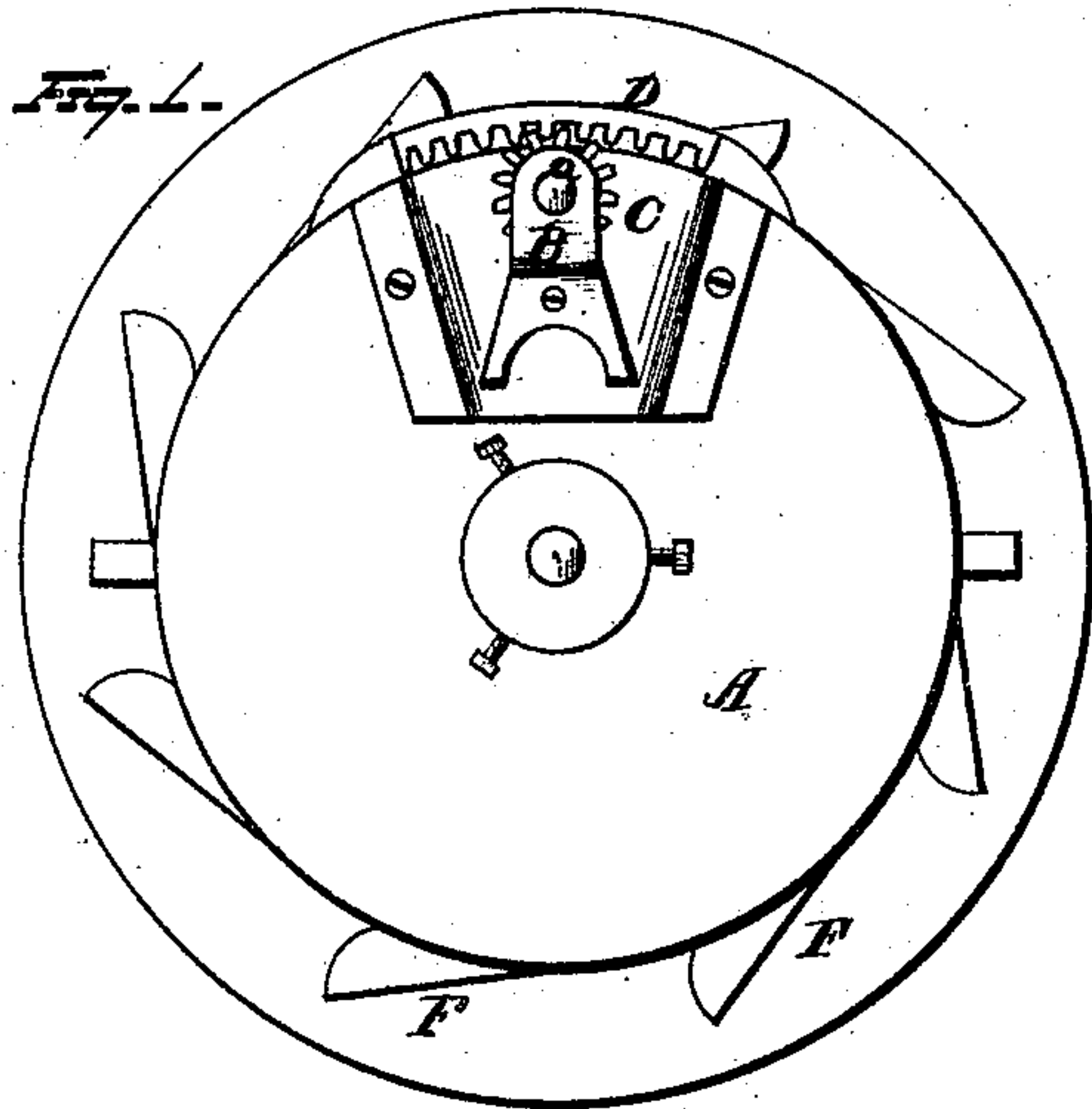
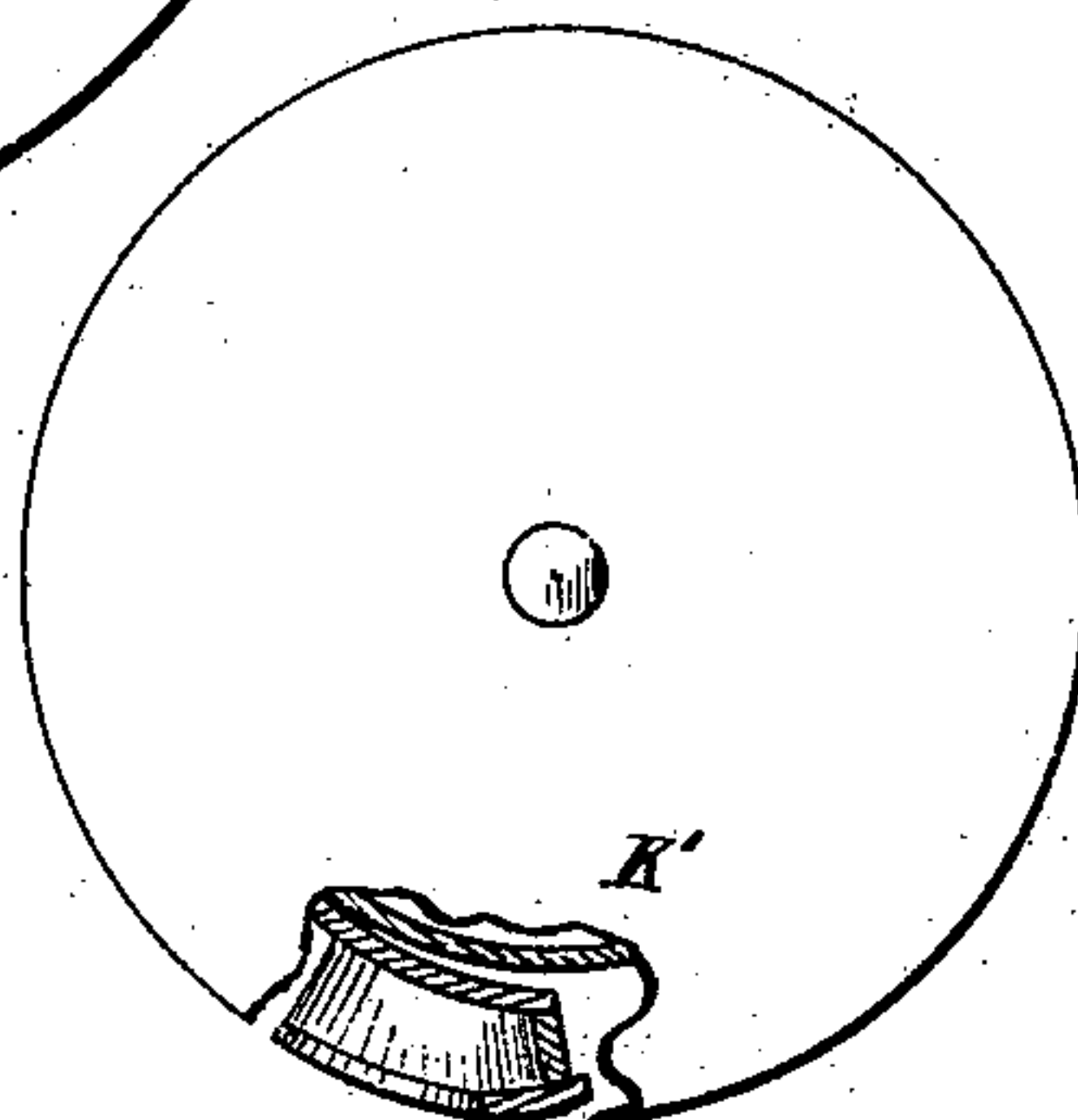


Fig. 5.



WITNESSES.

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Fig. 6-

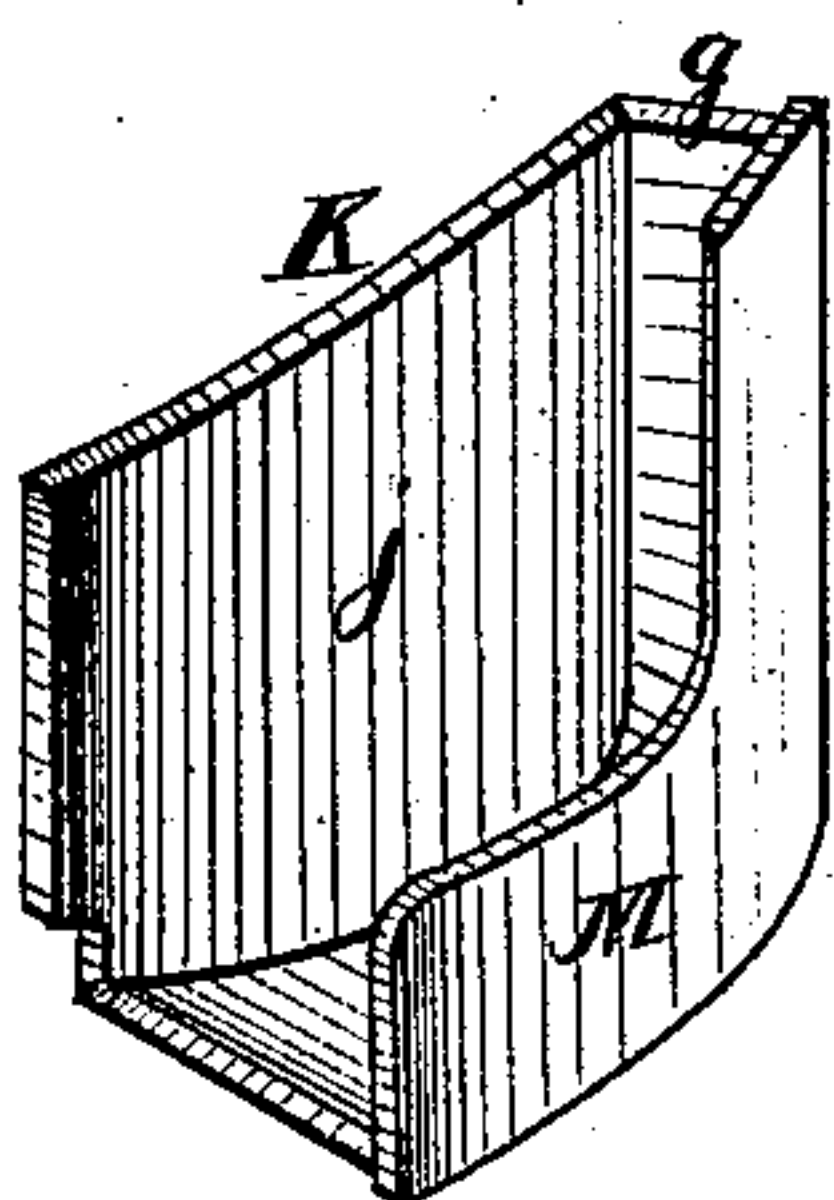


Fig. 7-

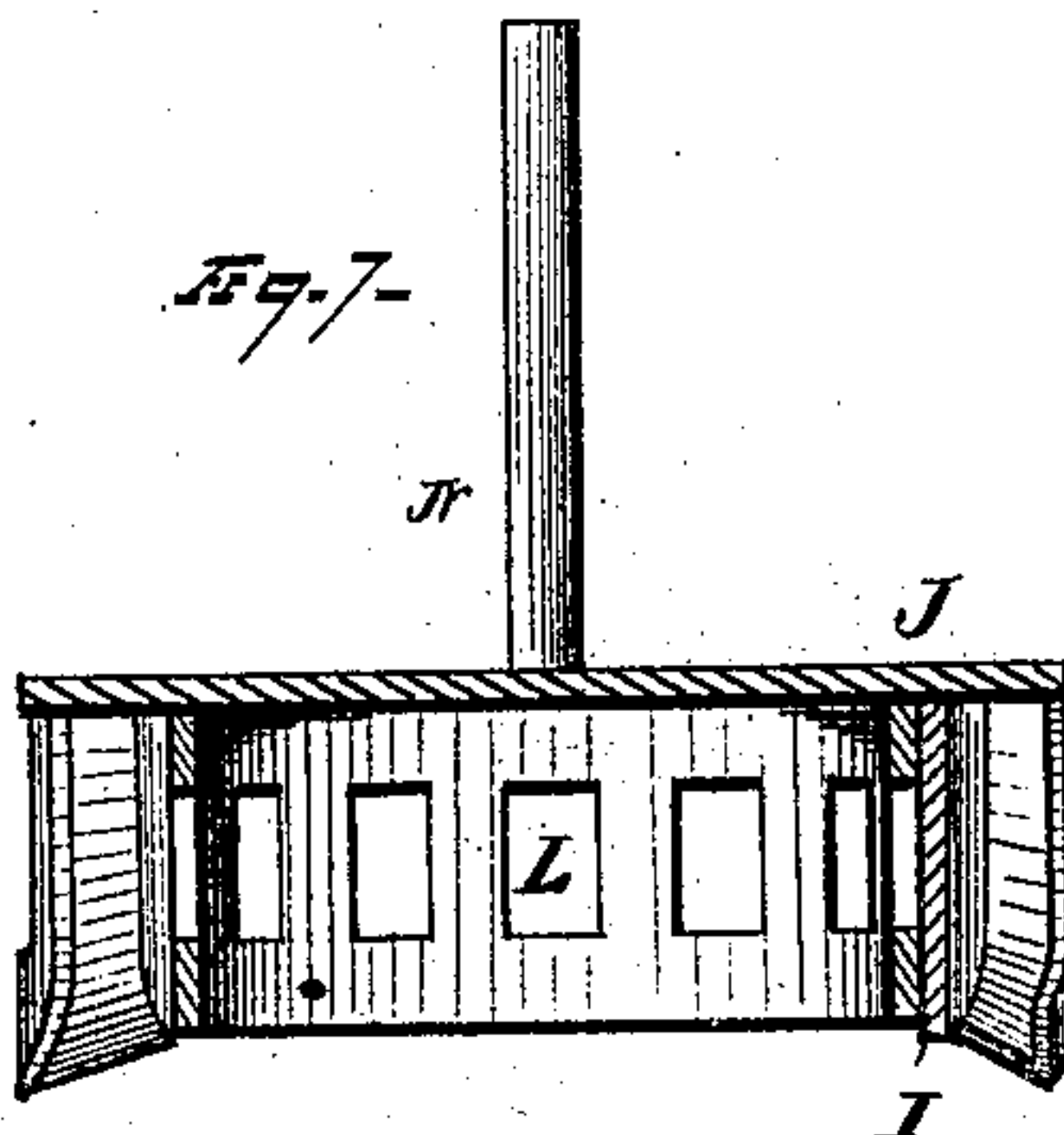


Fig. 8-

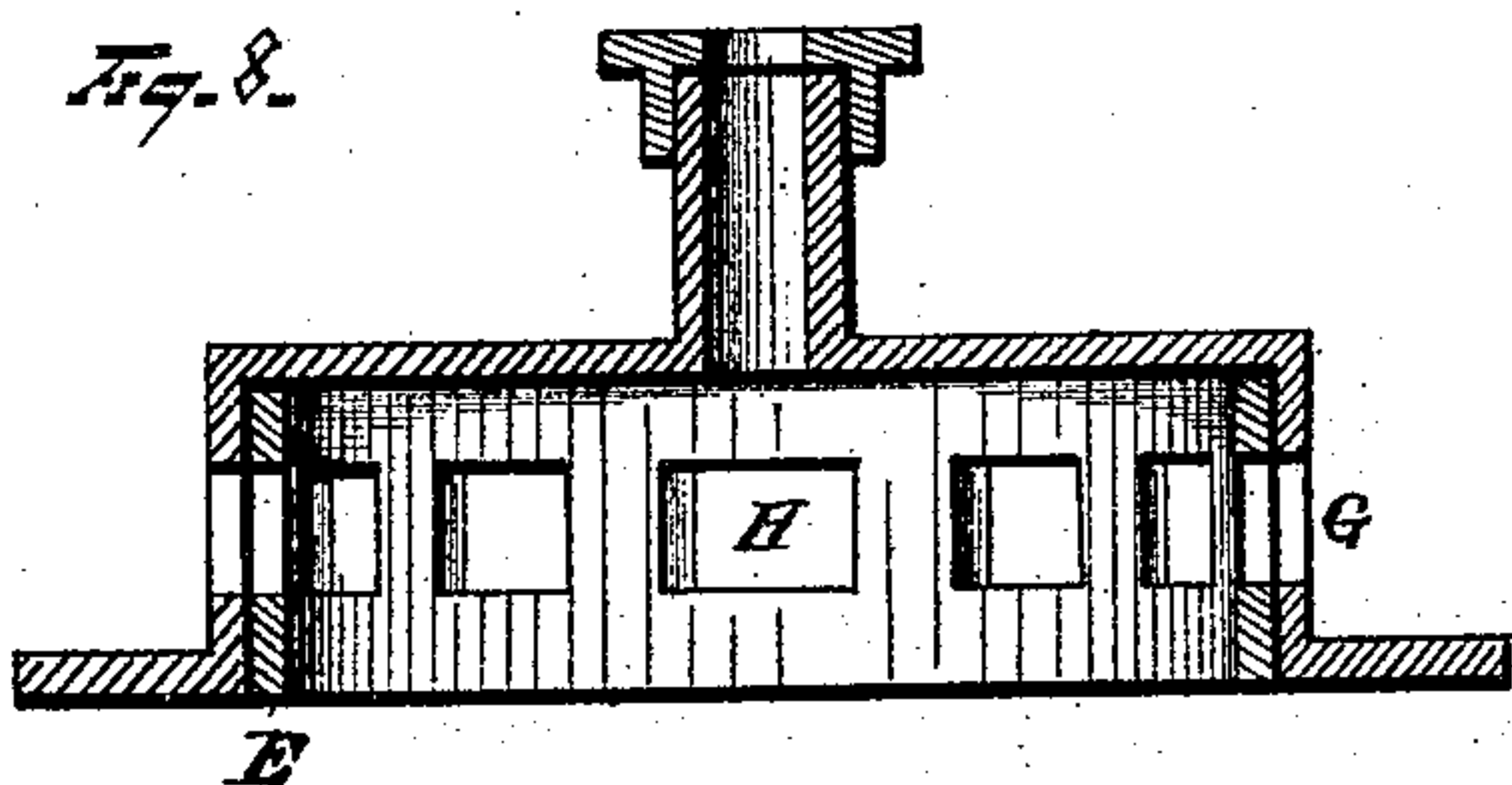
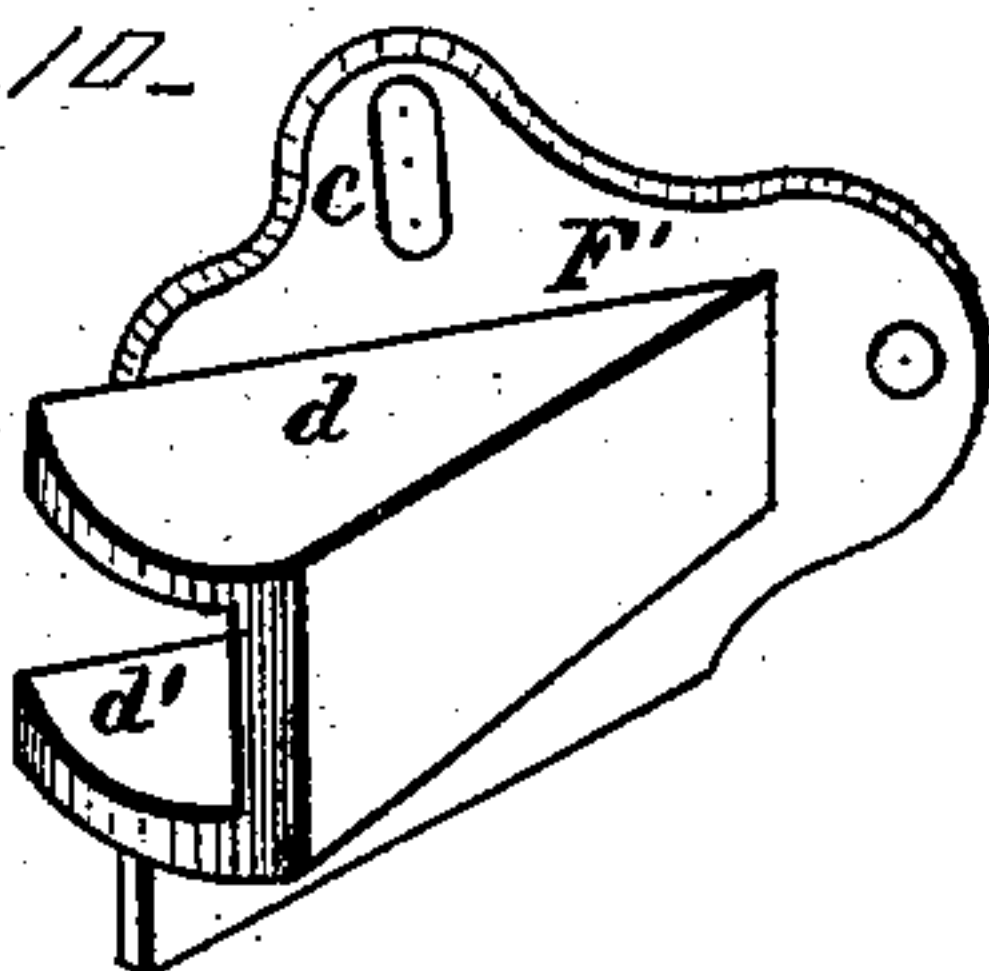


Fig. 9-



Fig. 10-



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UNITED STATES PATENT OFFICE.

ISAAC SHERCK, OF BELLEVUE, OHIO, ASSIGNOR TO HIMSELF, ISAAC KERN, EDWARD KERN, AND WILLIAM H. KERN, OF SAME PLACE.

IMPROVEMENT IN TURBINE WATER-WHEELS.

Specification forming part of Letters Patent No. **178,969**, dated June 20, 1876; application filed April 29, 1876.

To all whom it may concern:

Be it known that I, ISAAC SHERCK, of Bellevue, in the county of Huron and State of Ohio, have invented certain new and useful Improvements in Turbine Water-Wheels; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improved turbine water-wheel.

Figure 1 is a plan view of my invention. Fig. 2 is a side view of the same. Fig. 3 represents a bottom view of the wheel, gate, and casing. Fig. 4 shows a side view of the wheel detached from the casing. Fig. 5 is a top view of the wheel with a portion of the crown cut away to show the form of the buckets. Fig. 6 is an enlarged view of one of the buckets. Fig. 7 is a vertical section of the wheel. Fig. 8 is a vertical section of the gate and casing. Fig. 9 is an enlarged view of the openings in the casing and gate. Fig. 10 represents the chute, made adjustable to direct the flow of the water against the buckets of the wheel.

My invention consists, first, in the combination with the buckets of a turbine water-wheel, of chutes closed at top and bottom, and extending in rear of the ports or passage-ways through the casing, whereby a current tangential to the periphery of the wheel is formed without the casing of the wheel; second, in the chutes, closed at top and bottom, and the bottom of said chute formed at an angle to the wheel, whereby the current of water strikes the wheel at a sufficient upward inclination to compensate for the weight of the wheel, and thereby prevent undue friction on the spindle step or bearing; third, in a chute closed at top and bottom, and secured to a plate, the latter being adjustably secured to the periphery of the wheel-casing, whereby the direction of the current may be adjusted, as desired; fourth, in certain details of construction of bucket and gate, as hereinafter specified and claimed.

A represents the top of the casing, having

a bridge, B, secured thereto, between which and the casing the pinion C is rigidly secured to an upright post, *a*. The pinion C meshes with a segmental rack, D, the lower flange of which has full bearing on the periphery A' of the casing, said segmental rack being secured to a cylindrical gate, E, interposed between the wheel and casing. As the pinion C is turned, a corresponding movement is imparted to the gate E, and the same may be adjusted in any degree thereby. The gate being completely protected by and inclosed within the casing, all wear arising from the lodgment of sand between the gate and casing, as in ordinary wheels, is effectually obviated.

To the periphery of the casing any desired number of chutes, F, are attached, preferably in an adjustable manner, as shown in Fig. 10, wherein the chute is secured to a plate, F', which in turn is attached to the casing by a screw or bolt, *b*, the bolt serving as a pivotal bearing for the plate F'.

The upper portion of plate F' is provided with an arc-shaped slot, *c*, through which passes a set-screw, *c'*. The plate may be raised or lowered, as desired, in order to direct the flow of water against any particular portion of the bucket, and may be retained in place by turning the set-screw against the same. The chutes F are formed with closed top and bottom *d d'*, and of sufficient length to extend well over and in rear of the openings or ports G in the casing. The lower portion *d'* of the chute is made to incline slightly toward the crown of the wheel.

The particular form and construction of the chute, as above set forth, effects two marked results in the operation of the wheel: first, it establishes a current of water in a line with the extreme outer surfaces of the buckets, whereby the greatest leverage of the wheel is obtained for utilizing the motive power employed; and, secondly, the upward inclination of the chute directs a sufficient portion of the current toward the crown of the wheel, to counteract the weight of the wheel on the step or bearing, and serves to practically balance the wheel within its casing.

The ports or passages H in the gate E have channels *f* formed in the outer surface of the gate, of about the same inclination as the chute, and also like channels *f'* are formed on the inner surface of the gate on opposite sides of the ports or passages H. The inclination of these channels in the gate is such that they will not obstruct or deflect the current of water as it enters through and issues from the chutes, but will allow the water to flow in line with the chute, and strike the extreme reacting surface of the buckets of the wheel, thereby preserving and carrying into effect the main object of the invention, which is to utilize, as nearly as practicable, the full force of the water on the periphery of the wheel.

The band I is attached to the crown J of the water-wheel, and to said band the inner sides *j* of the buckets K are secured by bolts, or in any manner found most expedient in practice. The outer ends of the sides *j* are raised slightly from the surface of the band I, thereby forming a space, K', in the rear of each bucket, and the said spaces K' communicate with openings L in the band I. This construction will prevent the back action of water against the rear surfaces of the buckets, as it will flow through the openings K and L in the center of the wheel, and from thence have free exit.

The blades *g* of the buckets are fastened to the crown of the wheel, and on a line tangential to the periphery of the band I. The blade *g* is secured to the band I in a vertical position for about one-third the depth of the band, where it is curved inwardly, and extends slightly below the lower edge of the band, to form a central and downward discharge from the buckets. The blades *g* are of about the same width throughout their vertical portion, but they gradually increase in width from the point of curvature to the lower end of the bucket. Cutters or sides M are secured to the outer edge of the blades *g*, and flare outwardly from the crown to the curvature of the bucket, from whence they extend to the lower end of the bucket in a line parallel with band I.

It will be observed that the current of water, as it flows through the several chutes arranged tangential to the periphery of the wheel, strikes the buckets with full force, and at about right angles to the face of the bucket. As the bucket recedes from the port or passage, a portion of the current strikes the inner surface of the outwardly-flaring cutter or side M, and the remaining portion is received by the blade *g*, while both currents converge toward the intersection of the blade *g* and cutter M, thereby forming a central resisting medium, which has the effect of preventing the "slip" of water on the buckets, which usually obtains where curved buckets are employed. As the currents unite in their descent they mingle and flow through the enlarged portion of the buckets, producing a downward and an effective discharge.

The spindle N of the wheel has its bearing in a step, O, secured to a spider or cross-bar, P, and, if desired, said step may be adjustably secured to the spider to admit of the vertical adjustment of the wheel within the casing.

An important feature in the operation of a turbine-wheel, constructed with a cylindrical gate interposed between the casing and wheel, is, if any matter of sufficient size to obstruct the rotation of the wheel passes through the gate, the buckets and gate will act to automatically shut the gate, as the latter closes in the direction of the revolution of the wheel. The cutters M project rearward from the edges of the blades *g*, so that they constitute cutting-edges to divide the current of water as the buckets are passing the openings or ports in the gate. This construction obviates any "dash" formed by the ordinary buckets, and renders the movement of the wheel uniform and with comparatively little friction from its contact with the body of water passing into the buckets.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The chutes of a turbine water-wheel, constructed with close top and bottom, and extended in rear of the ports or passage-ways through the wheel-casing, substantially as and for the purpose described.

2. The chutes of a turbine water-wheel, constructed with close top and bottom, and the bottom formed on an angle toward the crown of the wheel, substantially as and for the purpose specified.

3. The chutes of a turbine water-wheel, constructed with close top and bottom, and attached to the casing in a vertically-adjustable manner, substantially as and for the purpose set forth.

4. The combination, with the wheel and the casing, of an interposed cylindrical gate, having channels formed in its inner and outer surfaces adjacent to the ports or passage-ways, whereby the current may flow in line with the periphery of the wheel, substantially as and for the purpose specified.

5. The combination, with the cylindrical gate, of a segmental rack having its bearing on the periphery of the casing, and a pinion secured to a shaft located on top of the wheel-casing, substantially as and for the purpose specified.

6. The combination, with the crown and band of the wheel, of buckets formed with a blade arranged tangential to the periphery of the wheel, and the cutter or side of the bucket flaring outwardly from said blade, substantially as and for the purpose set forth.

7. The buckets constructed of a vertical portion extending about one-third the depth of the band, and then curved inwardly to the lower edge of the band, the curved portion gradually increasing in width from the throat

of the bucket to its discharge-opening, substantially as and for the purpose set forth.

8. The combination, with the band provided with openings, of the buckets attached to the band, substantially as described, whereby a passage-way is formed in rear of the buckets through the band to the center of the wheel, substantially as and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 25th day of April, 1876.

ISAAC SHERCK.

Witnesses:

H. A. SEYMOUR,
THOS. B. HALL.