

C. F. H. Huff,

Water Wheel.

No. 113,888.

Patented Apr. 18. 1871.

Fig. 1.

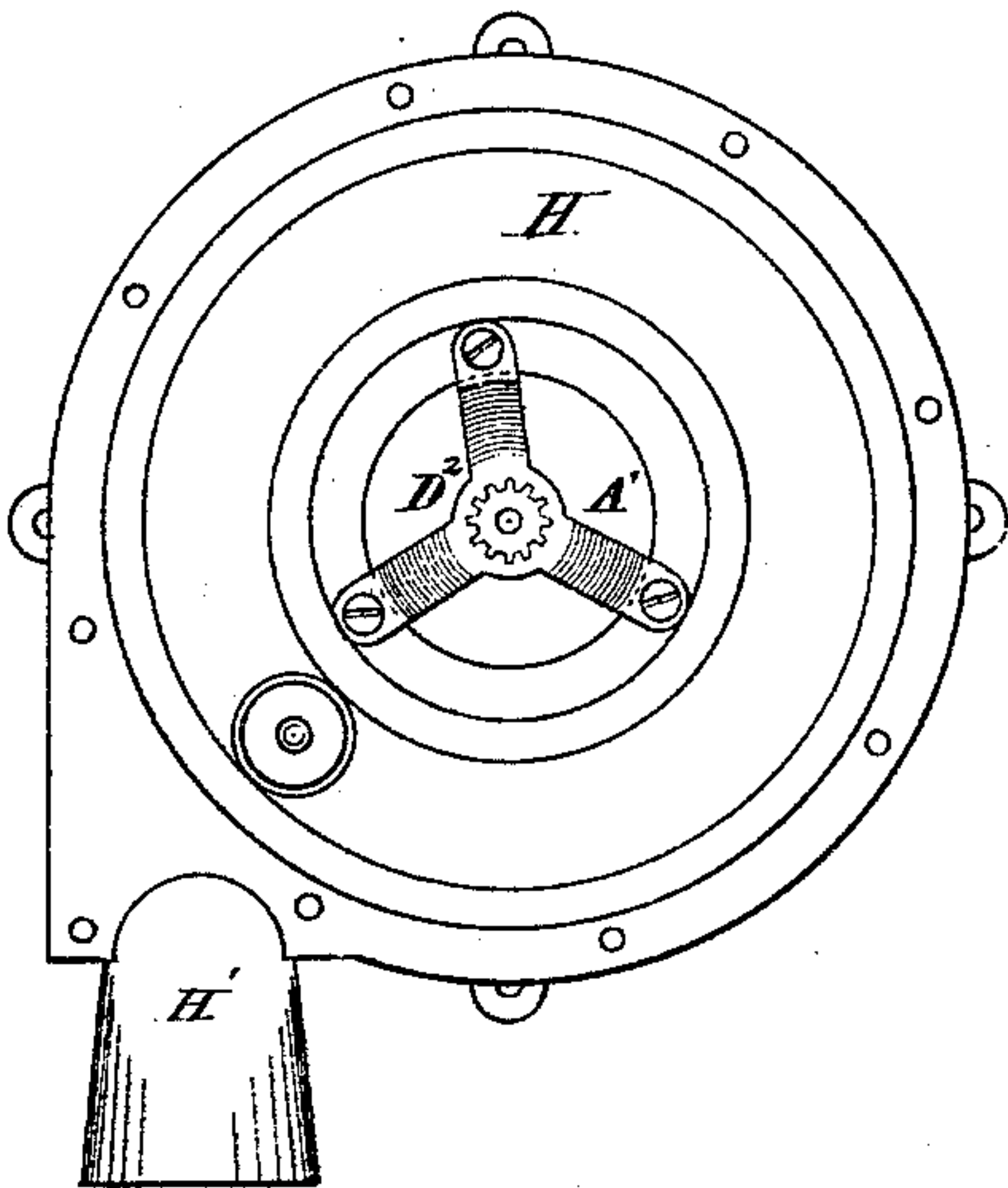


Fig. 2.

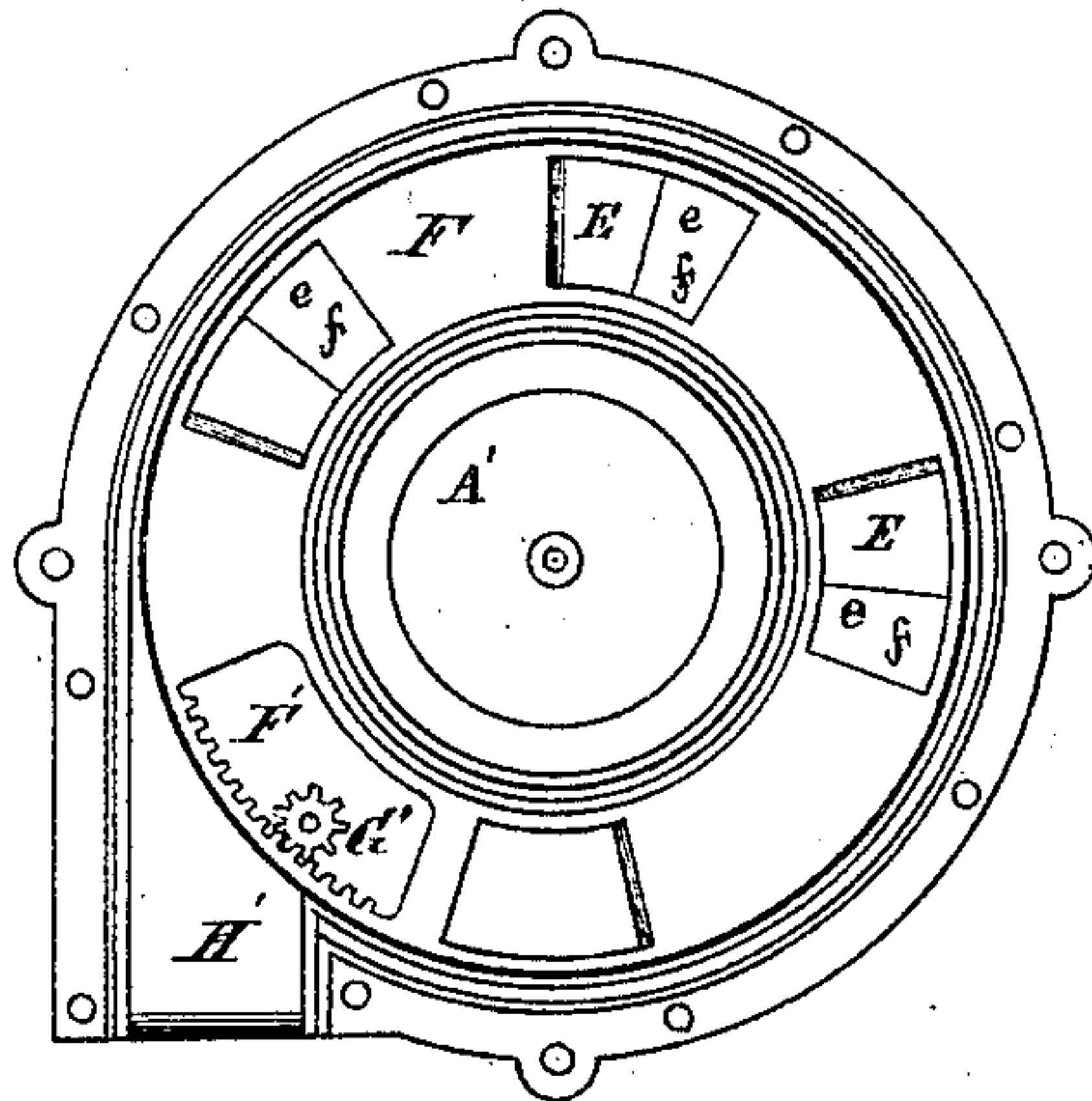


Fig. 3.

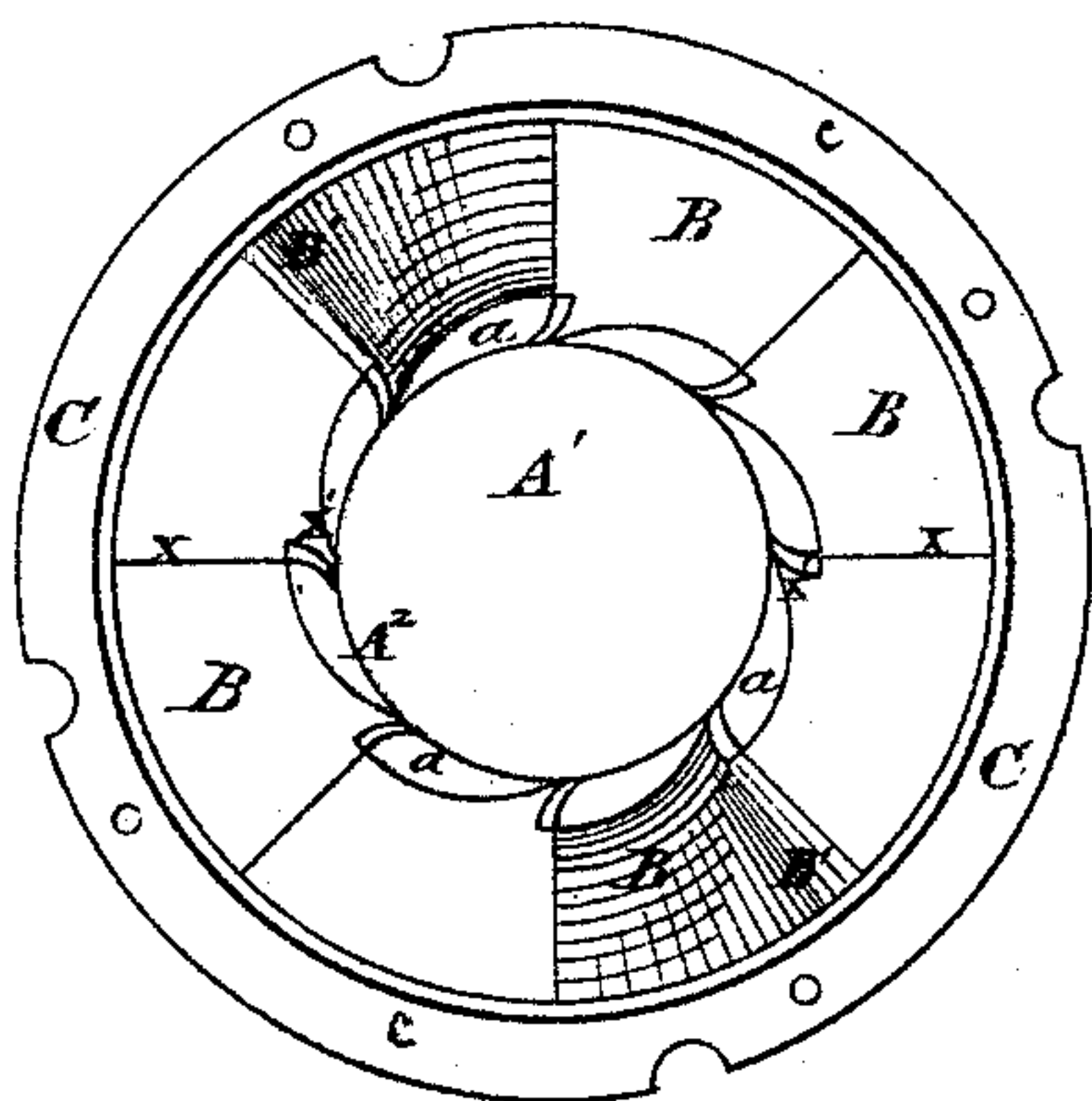


Fig. 4.

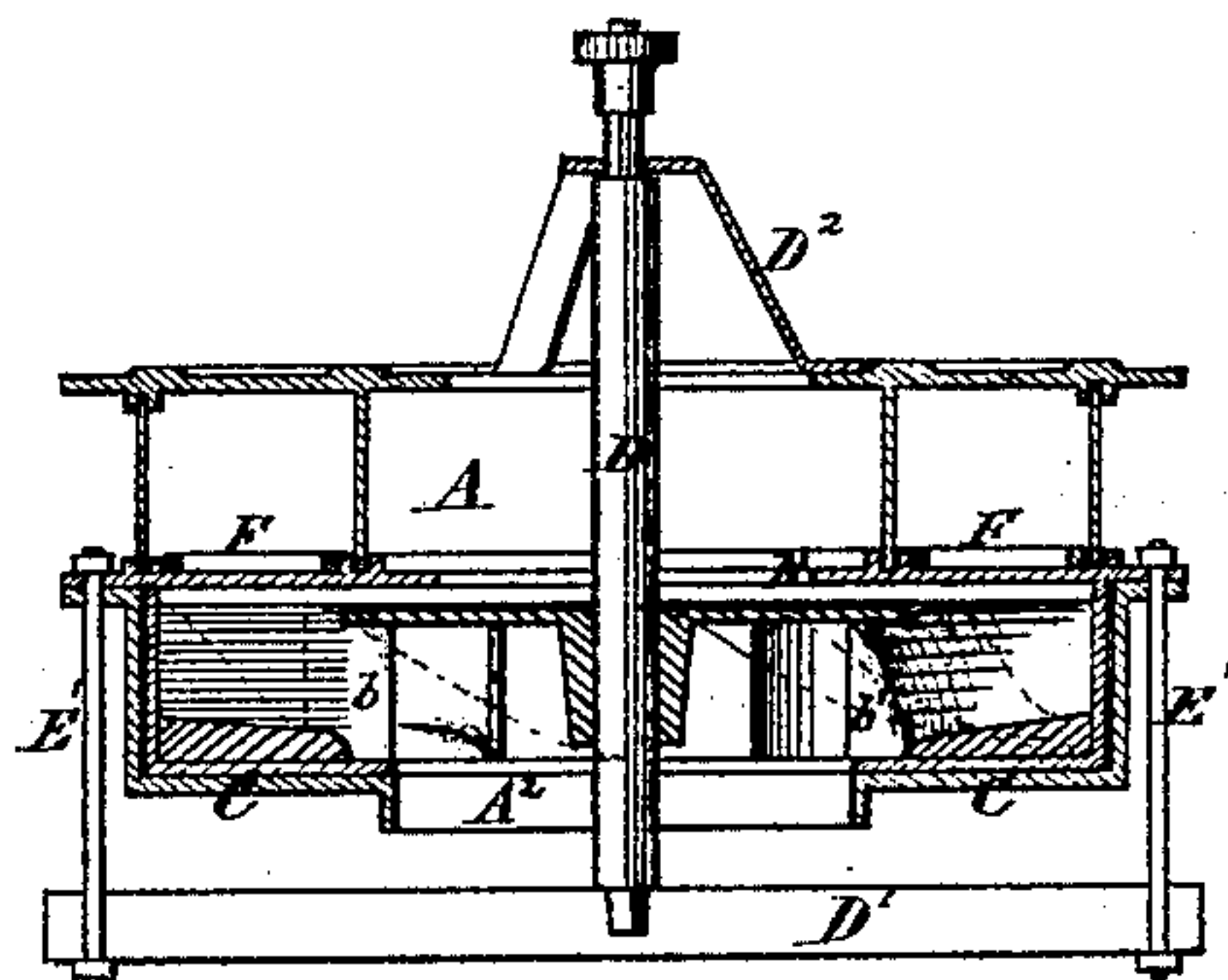


Fig. 5.



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN WATER-WHEELS.

Specification forming part of Letters Patent No. 113,888, dated April 18, 1871.

*To all whom it may concern:*

Be it known that I, CHANCY F. H. HUFF, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Water-Wheels; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, and to the letters of reference marked thereon, making a part of this specification, in which—

Figure 1 is a top-plan view of the wheel. Fig. 2 is a top-plan view with the crown-plate and chute removed. Fig. 3 is a top-plan view of the bucket and its tub detached. Fig. 4 is a vertical sectional view. Fig. 5 is a cross-section, showing the form of buckets.

My invention has for its object to furnish an improved turbine water-wheel which shall be simple in its construction, and durable and accurate in use, the same being so formed and arranged as to economize the water.

The nature of my invention consists, first, in the peculiar form of the buckets and their arrangement, whereby the entire force of the downward current is utilized, and then discharged from the wheel at its center without in the slightest degree impeding its progress. The buckets consist of a compound curve of the following general outline: A radial inclined curve, terminating in a spiral twist, which affords, as it were, a tapering overflow for the water. The head of each bucket is a straight plate, slightly curved at its inner portion, which, after the water has acted by impact against the horizontal face of the wheel, and whereby its full force is directly exerted, conducts it to its center discharge. These buckets may be formed in one piece with the rim and base of the wheel, or independently, and attached thereto by any convenient means.

My invention also consists in securing the wheel in an independent tub, which is, instead of the wheel, to be secured and seated in the flume or fore-bay. This adds much to the smooth running of the wheel, as the water that will necessarily be cast or spilled over the inner band, descending between the inner and outer one, will act as a lubricator.

My invention also consists in securing on the upper plate of the wheel, or the plate in which are the water-ways, and through which

the water is fed to the buckets, an independent movable ring plate or gate. This plate is slotted or provided with a series of openings, which are the same in number and dimensions as those of the stationary plate on which it works. Thus it will be seen that the size of the water-ways depends entirely on the relative position of these plates, which can be regulated at pleasure by a pinion-shaft and ratchet-rack, the latter being cut in the face of the independent wheel.

To enable others skilled in the art to make and use my invention, I will now proceed to describe its construction and operation.

A is a turbine or horizontal wheel, which is provided with the usual annular rim and base-plate. This wheel has a discharge-opening,  $A^1$ , at its center.

B B represent a series of buckets or floats, and is either formed with or secured to the annular rim and base of the wheel by suitable bolts or other convenient means. These buckets are so arranged that the foot of each one shall be in direct contact with the head of the adjoining one.

The surfaces of the buckets are of a warped or compound curve, or a radial incline curve,  $x$ , which terminates in, as it were, a spiral twist,  $x'$ , formation of surface, which, in connection with the contour of the head of the adjacent bucket, which is a straight vertical plate,  $B'$ , with a curved lip,  $b'$ , and in conjunction with which each acts, as the water which passes over the surface of one acts by impact against the head of the next or forward bucket, secures to the wheel such a direct and effective impinging of the current as will insure that its full power shall be instantaneously exercised.

Owing to their peculiar formation, when the buckets are arranged on the base, as shown in Fig. 3, the base  $A^2$  extends out to the edge of the curved lips  $b' b'$ , so as to leave a space,  $a$ , in front of each bucket after the full force of the current by impact against the head of the bucket has been exerted. The water then, reacting, passes over the spiral twist  $x'$  to the space  $a$ , from which it escapes by the center opening,  $A^1$ , in such manner as not in the slightest degree to impede the progress of the wheel.

The wheel A thus constructed rests in a cir-



cular tub, C. This tub C is of such dimensions as to fit over the wheel like a jacket, the upper face of their rims being on a line flush with each other. This tub is provided with a flange, *c*, by means of which it can be secured in any suitable flooring or support, and has a center opening corresponding exactly with the opening *A*<sup>1</sup> of the wheel.

A vertical shaft or spindle, D, is the axle of the wheel, and is permanently secured to the buckets of the same by means of a hub-plate, D<sup>1</sup>, which is a circular plate or disk resting on and attached to the upper face of the curved lips *b' b'* of the buckets, as clearly shown in Fig. 4. This shaft D rests and is secured in a suitable step, D<sup>1</sup>, and which furnishes its lower bearing and entire support.

The upper bearing of the shaft D is in a triangular arch, D<sup>2</sup>, or equivalent device, secured on the crown-plate of the chute or scroll H.

E is the top or cap plate of the wheel, and is secured to the step D<sup>1</sup> of the spindle, and which is formed of cross-bars or bars running at right angles to each other by supporting columns or bolts E' E'. This plate or cap E is provided with a series of openings, *e e*, and which constitute the water-ways through which the water, received through the mouth or throat H' of the chute or scroll H, passes or is fed to the wheel.

F is a regulating ring or gate, and consists of a thin plate that fits in a circular recess formed on the upper face of the plate E, and, like the plate E, the gate F is provided with a series of openings, *f f*, which correspond in number and size with the openings *e e* of the plate E. In addition to these openings *f f*, the gate is slotted at F', and provided with a ratchet-rack, as clearly shown in Fig. 2. In this ratchet-rack gears or meshes a small pinion-wheel, G', attached to a short vertical shaft, G, which passes up through a suitable opening in the crown-plate of the scroll or chute H, as clearly shown in Fig. 1.

H is the scroll or chute, and is constructed in any suitable manner, it simply being such as is ordinarily used with this class of wheels. H' is the mouth or throat of the chute, and through which the water is received that drives the wheel.

The operation is as follows: The water en-

ters the chute, and is discharged directly on the plate E and gate F; from which, through the openings *e f*, which constitute the water-ways, it is fed to the buckets B, acting by impact against the heads of the same, and by its reaction being discharged at the center opening, A<sup>1</sup>, as described. By this arrangement it will be seen that the full force of an unbroken downward current is secured.

The head of water that is to be fed to the wheel is regulated and controlled entirely by the relative positions of the openings *e f* of the plate E and gate F. When these openings coincide the water-ways are entirely unobstructed, and the full current is fed. Should this be found to be unnecessarily great, or from any reason should it be found either necessary or desirable to economize in the use of the water, this can readily be done simply by turning the shaft, which, through the pinion G' acting on the ratchet-rack, will turn or revolve the gate so as to cause the solid portions of its face to partially close the water-ways, as shown in Fig. 2.

Thus it will be observed that the amount of water fed to the wheel can, with the utmost facility, be regulated and controlled at pleasure, and always fed, no matter how small the current may be, in an unbroken compact volume.

Having thus fully described my invention, what I claim therein as new, and desire to secure by Letters Patent of the United States, is—

1. The buckets or floats B B, when the same consist of a warped surface, *x x'*, and a vertical head, B', terminating in a curved flange-lip, *b'*, and are so arranged in relation to the rim and base-plate of the wheel A as to receive and discharge the water, substantially as described.

2. The wheel A, when the same is constructed as stated, and is secured in an independent tub, C, substantially as described.

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

CHANCY F. H. HUFF.

Witnesses:

OSCAR FRISBIE,  
JOHN L. SLINGERLAND.