

D. M. Cummings,

Water Wheel,

N^o 37,034,

Patented Dec. 2, 1862.

Fig. 1.

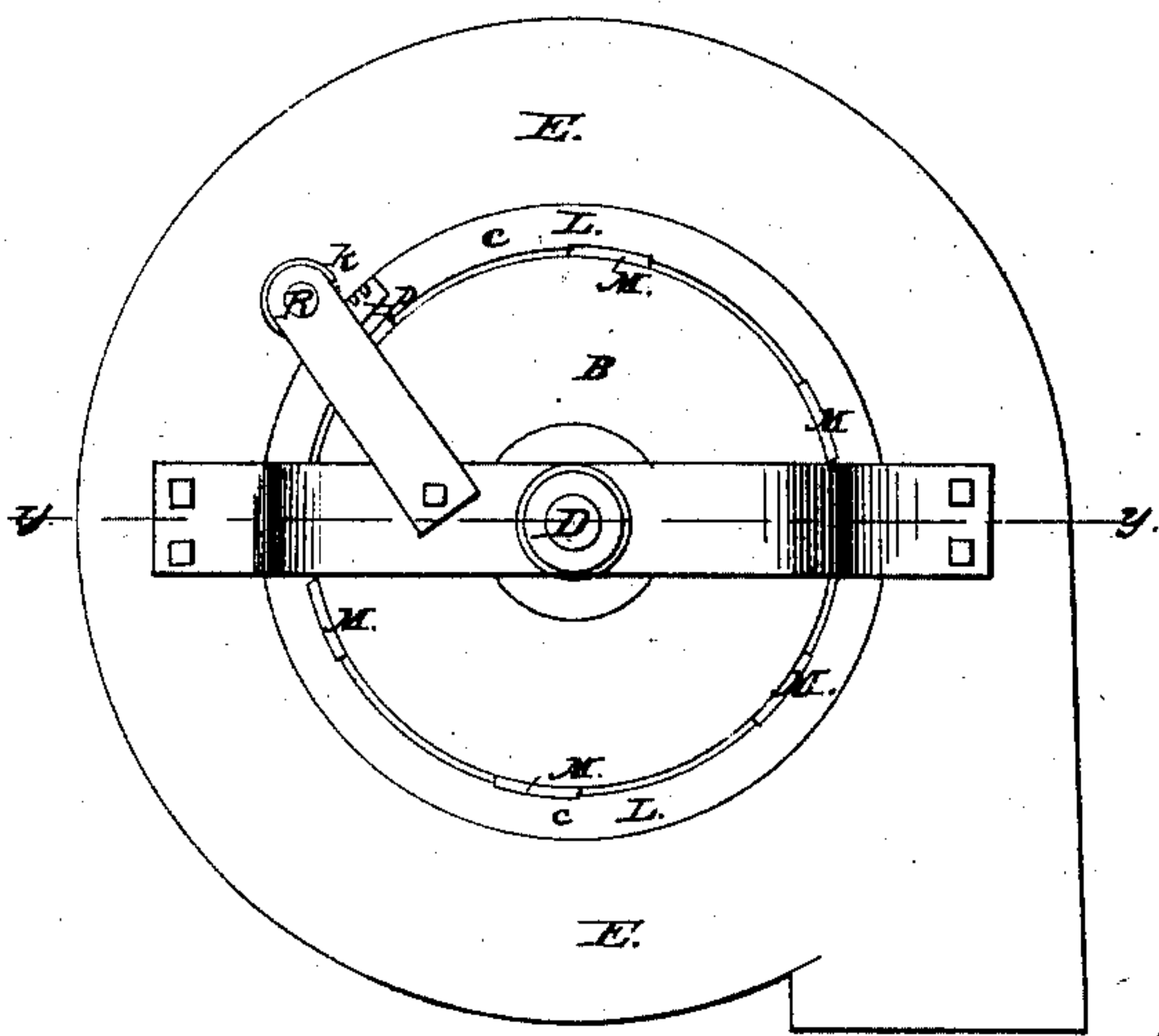


Fig. 2.

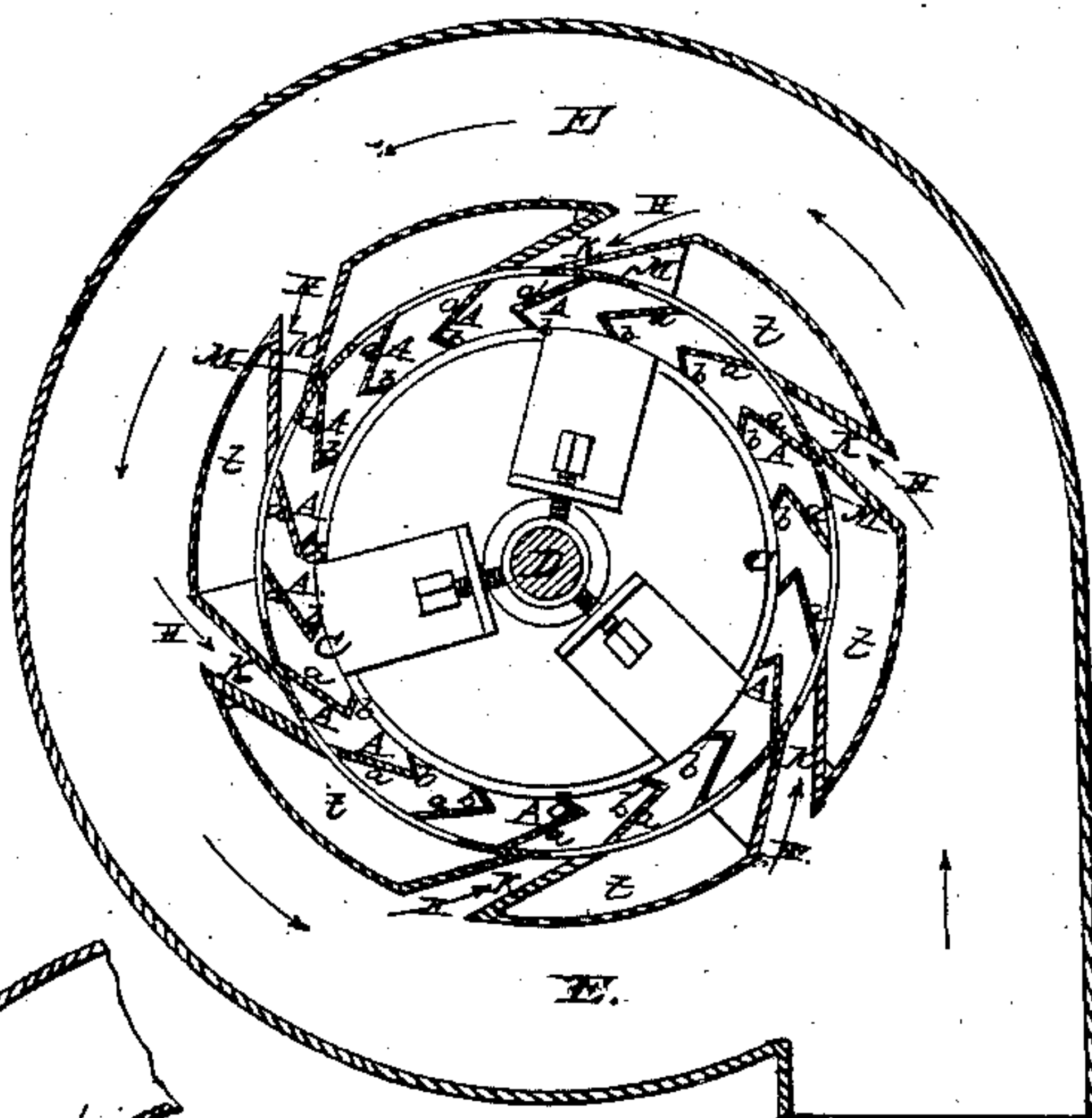


Fig. 3.

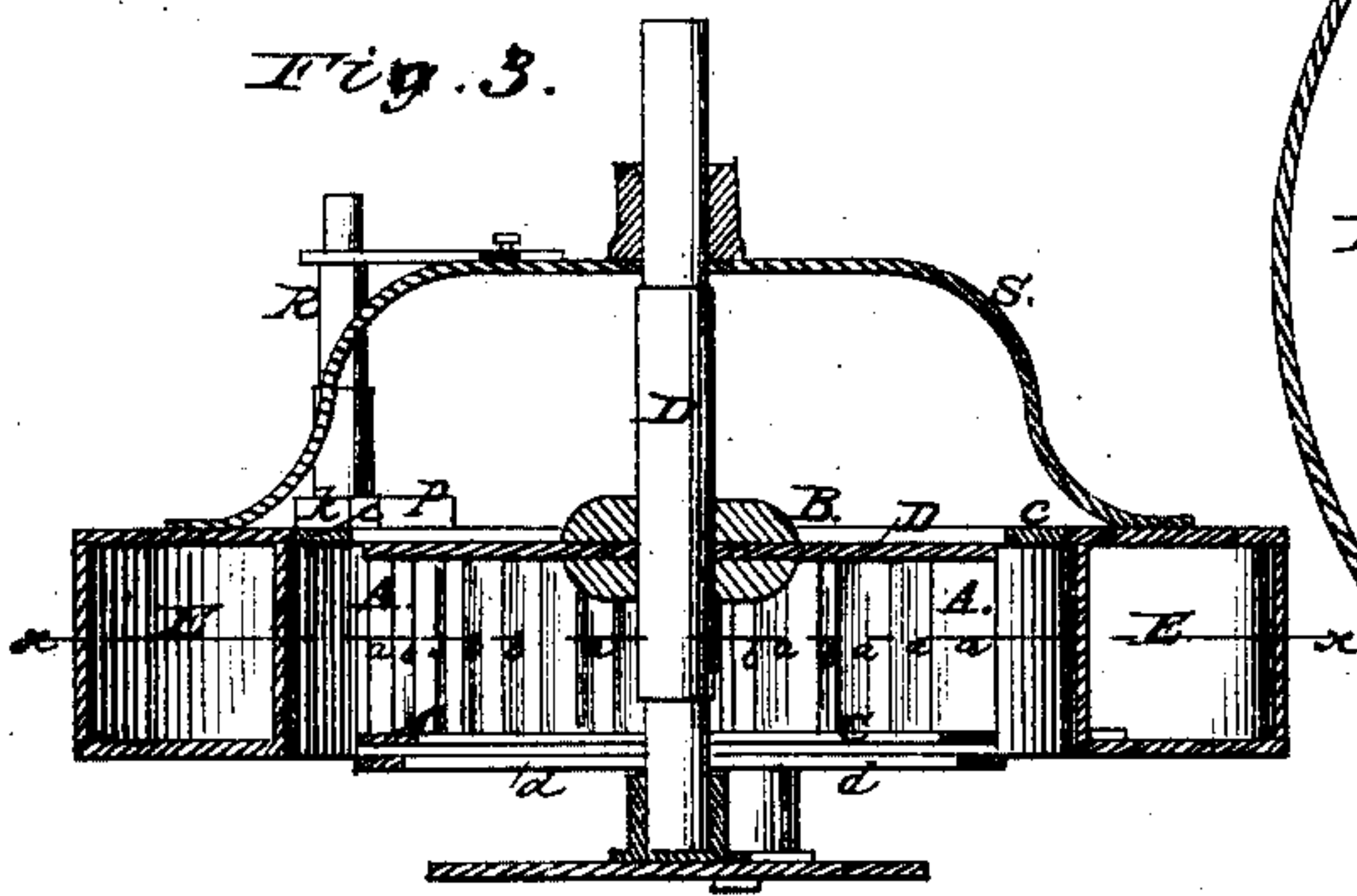


Fig. 4.

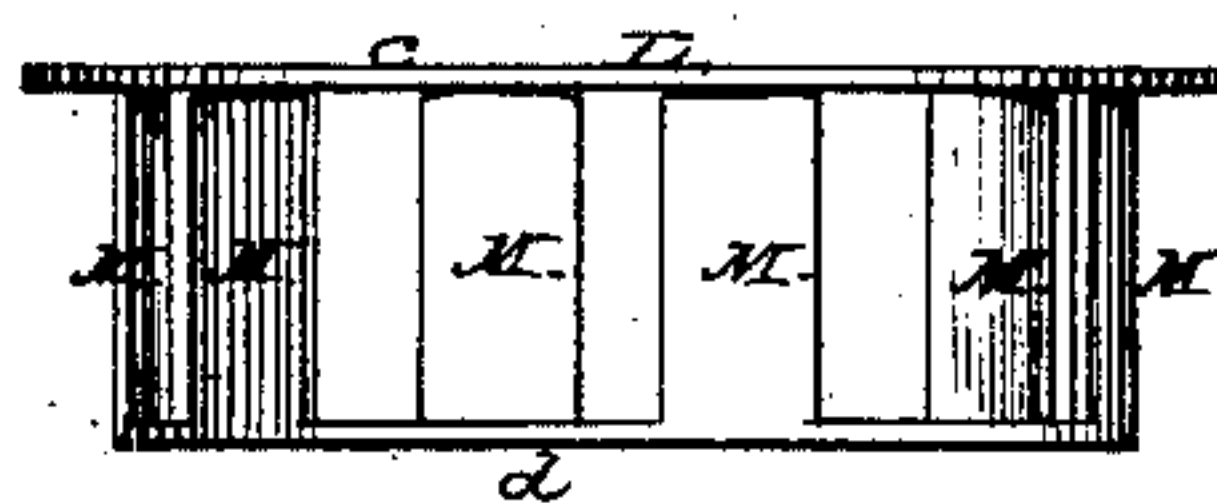
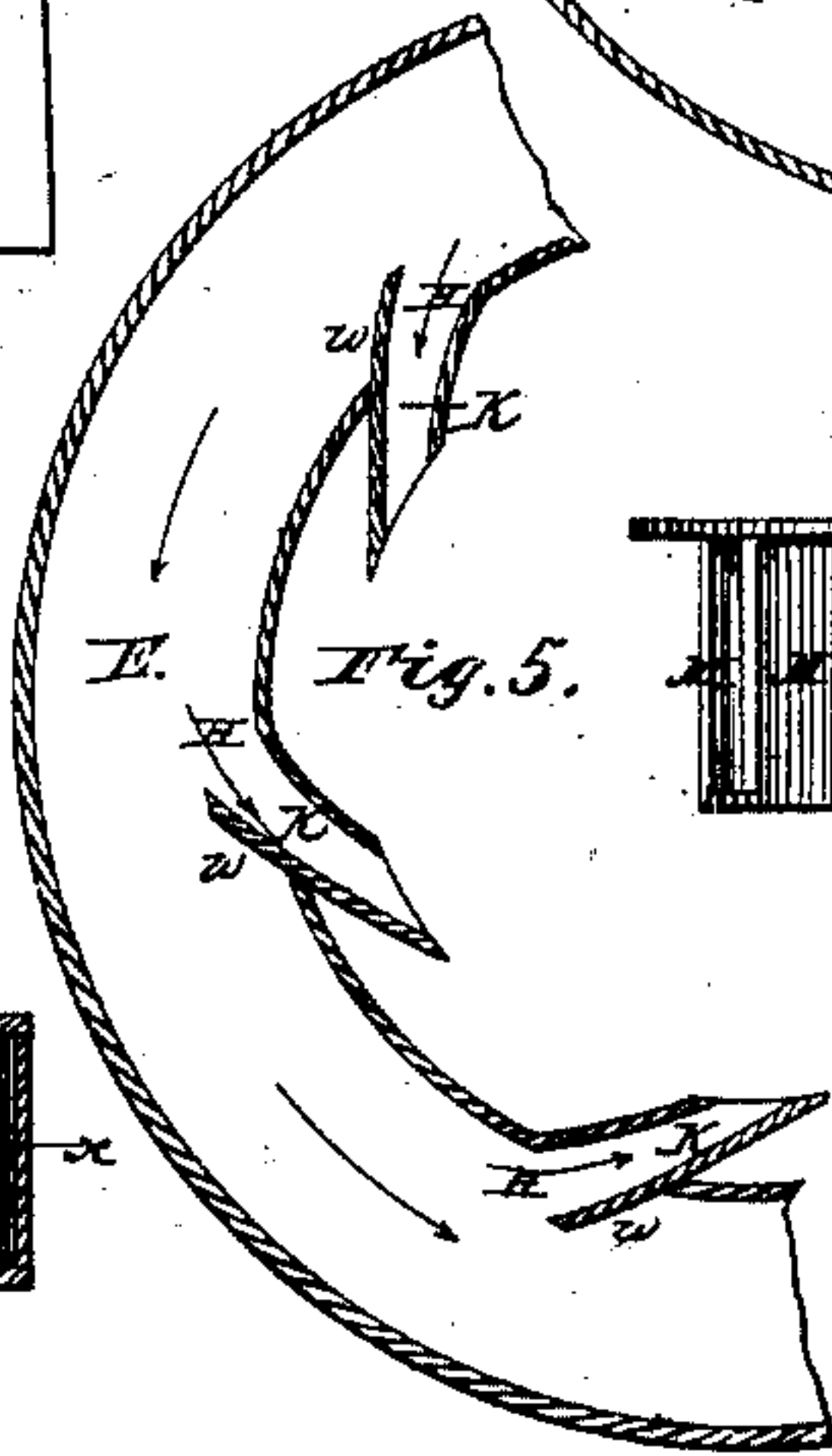


Fig. 5.



Witnesses:

J. H. P. [Signature]
Alfred B. Toole.

Inventor:

Daniel M. Cummings.
By his Attorney's
Robbins & Burr.

UNITED STATES PATENT OFFICE.

DANIEL M. CUMMINGS, OF ENFIELD, NEW HAMPSHIRE.

IMPROVEMENT IN WATER-WHEELS.

Specification forming part of Letters Patent No. 37,031, dated December 2, 1862.

To all whom it may concern:

Be it known that I, DANIEL M. CUMMINGS, of Enfield, in the county of Grafton and State of New Hampshire, have invented certain new and useful Improvements in Water-Wheels; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making a part of this specification.

Figure 1 is a top view of my improved water-wheel; Fig. 2, a transverse section of the same in the line *x x* of Fig. 3, and Fig. 3 a vertical section thereof in the line *y y* of Fig. 1. Figs. 4 and 5 are views of certain detached parts.

Similar letters indicate like parts in each of the drawings.

My improved water-wheel is formed of a series of V-shaped buckets, A A A, whose sides *a a* and *b b* embrace an arc of about sixty degrees. These angular buckets are secured either in an inclined or vertical position between the outer edge of an upper circular metallic plate, B, and a lower annular rim or plate, C. The circular plate B, which serves as the upper shroud of the water-wheel, is securely fastened to the central vertical shaft, D, Fig. 3. The lower annular plate, C, is of a width coincident with the lower edges of the buckets A A. The outer sides, *a a*, of these buckets are in proportion about two-thirds wider than their inner sides, *b b*, Fig. 2, and are so placed within the shrouds as to be tangential to the inner circumference of the annular rim C, the said circumference coinciding with an imaginary circle drawn about the center of the shaft D and touching the inner edge of the inner sides, *b b*, of said buckets, as is clearly represented in Fig. 2.

My improved wheel revolves upon its shaft D within a circular horizontal water box or casing, E E, Fig. 2, which is made perfectly close and tight, and fits accurately to the penstock from whence the water is supplied. Upon the upper surface of this inclosing water-box E is secured an overarching metallic bow, S, spanning centrally the inner open space, and which furnishes a suitable journal-box for the support of the wheel-shaft D, as represented in Fig. 3. The inner wall of the circular water box or casing E encompassing my improved wheel is in circumference about one-

fourth greater than that of the outer rim of the wheel, and is pierced at regular intervals with induction-openings H H H, Fig. 2, which are so arranged as to occupy opposite positions upon the inner circumference of the water-box. These openings are fitted with tight vertical chutes K K, tapering inwardly toward their outlets, and the outer sides of which are tangential to the inner rim of the wheel, as represented in Fig. 2. Between the chutes K K and the inclosed wheel is fitted an annular gate, L, formed of a series of curved vertical plates, M M M, secured to the inner edge of an upper horizontal annular rim or plate, *c*, and the outer edge of a lower parallel annular plate, *d*, as represented in Fig. 4. The upper annular plate, *c*, of this circular water-gate rests and turns freely upon the upper sides of the chutes K K K, whose ends are so beveled as to coincide closely and accurately with the faces of the vertical plates M M in the said water gate L. Upon the upper horizontal rim, *c*, of the water-gate is secured a toothed rack, P, Fig. 1, into which gears a toothed sector, *k*, fitted upon the vertical shaft R, Fig. 3, by means of which motion is communicated to the water-gate. The vertical plates M M are so arranged with the annular rims *c* and *d* with reference to the chutes K K that motion communicated to the gate from the shaft R will cause these plates M M to pass over the openings of the chutes K K in a direction coincident with that of the flow of the water, which will thus be controlled and regulated at pleasure. The arrangement of these plates may also, if necessary, be varied, so that any one or more of the chutes may be closed in advance of the remainder, and the consumption of water be thereby limited to its supply, while the full effect of any given stream shot upon the wheel is retained by the concentration of the full pressure of the column of water thereon.

When my improved wheel is put into operation, the connected gates M M are opened more or less by means of the shaft R. The water is thereby introduced upon the wheel at opposite points of its circumference with uniform pressure and velocity, whereby the wheel is kept evenly balanced, and lateral friction upon its bearings is entirely obviated. This arrangement permits also great economy

of water and a limitation of its expenditure to the minimum of power desired without waste. The outlets of the chutes K K are opened in a direction opposite to that of the flow of the water, and the remote sides of each, being tangential to the outer periphery of the wheel, guides the stream of water in a right line against the outer and longer sides, *a a*, of the buckets of my improved wheel. These sides *a a*, being tangential to an imaginary circle touching the inner edge of each bucket, deflect the water slightly and guide it directly against the inner acute angle of the buckets, where it strikes with certain force, exerting its full momentum directly upon the wheel. From the peculiar position and relation of the tangential sides *a a* of the buckets with the tangential sides of the chutes not only is the current of water deflected as required without impeding its velocity and direct percussive force, but additional momentum is also imparted to the wheel from the centrifugal force of the current, which is wholly exerted upon the longer sides *a a* of its buckets. This centrifugal tendency of the current, when diverted from its direct course, carries it upward against the upper sides and angles of the several buckets with sufficient force to relieve measurably the friction of the lower bearing of the wheel.

When the wheel is to be used under a constant heavy pressure of water the chutes K K may be constructed with inner curved lips, *w*, projecting from their tangential remote sides out into the water-box, as represented fully in Fig. 5. The curve of these projecting lips should form a tangent with the sides of the chutes to which they are attached, and at the same time be of such a radius that the chutes shall decrease in width with perfect uniformity from their mouths to their outlets. These projecting lips *w w* serve to secure to each jet the full impetus of the current as well as the simple pressure of the head of water in the box.

The series of inclosing arc-shaped open spaces *t t t*, Fig. 2, which are formed around the wheel between the several chutes K K and the water-way E, constitute an important feature in the arrangement of my improved water-wheel, for they serve as frictionless spaces, opposing the resistance of a water-cushion when the wheel is submerged for the water to

recoil against after having first acted percussively upon the series of buckets. Hence by means of this improved open casing, in combination with the arrangement securing a uniform pressure of the several streams of water upon opposite points of the periphery of the water-wheel, and which, acting with centrifugal force against the upper sides of the buckets, measurably support its weight, the friction of the wheel in its evolutions is almost entirely avoided and its power greatly increased. The arc-shaped encircling spaces *t t t* also allow the free and instant egress of the water the moment its propelling force is exhausted, (the resilience of the air or water occupying said spaces being that of inertia alone,) and my improved wheel is thereby always free from the injurious influences of dead-water.

In addition to the great inherent advantages of my acute-angled buckets in eliminating the full percussive power of water, their peculiar shape renders them far superior to other buckets now in use when the wheel is submerged, for the acute angle more readily overcomes the resistance of the back-water, and to that extent affords a decided and appreciable saving of power.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The long and short sided buckets A A A of my improved water-wheel, made substantially as herein described.

2. The use of a combined series of long and short sided acute-angled buckets, A A, when arranged within a water-way, E, which is furnished with a series of stationary tangential chutes, K K, and with a connected series of movable connecting gates, M M, substantially in the manner and for the purpose herein set forth.

3. The arc-shaped open spaces *t t t* which immediately surround my improved water-wheel, the said spaces being outwardly bounded by the tangential chutes K K and the inner side of the water-way E, substantially in the manner and for the purpose herein set forth.

The above specification of my improved water-wheel signed and witnessed this 15th day of September, A. D. 1862.

DANIEL M. CUMMINGS.

In presence of—

WYMAN PATTEE,
JAMES F. PATTEE.