

(No Model.)

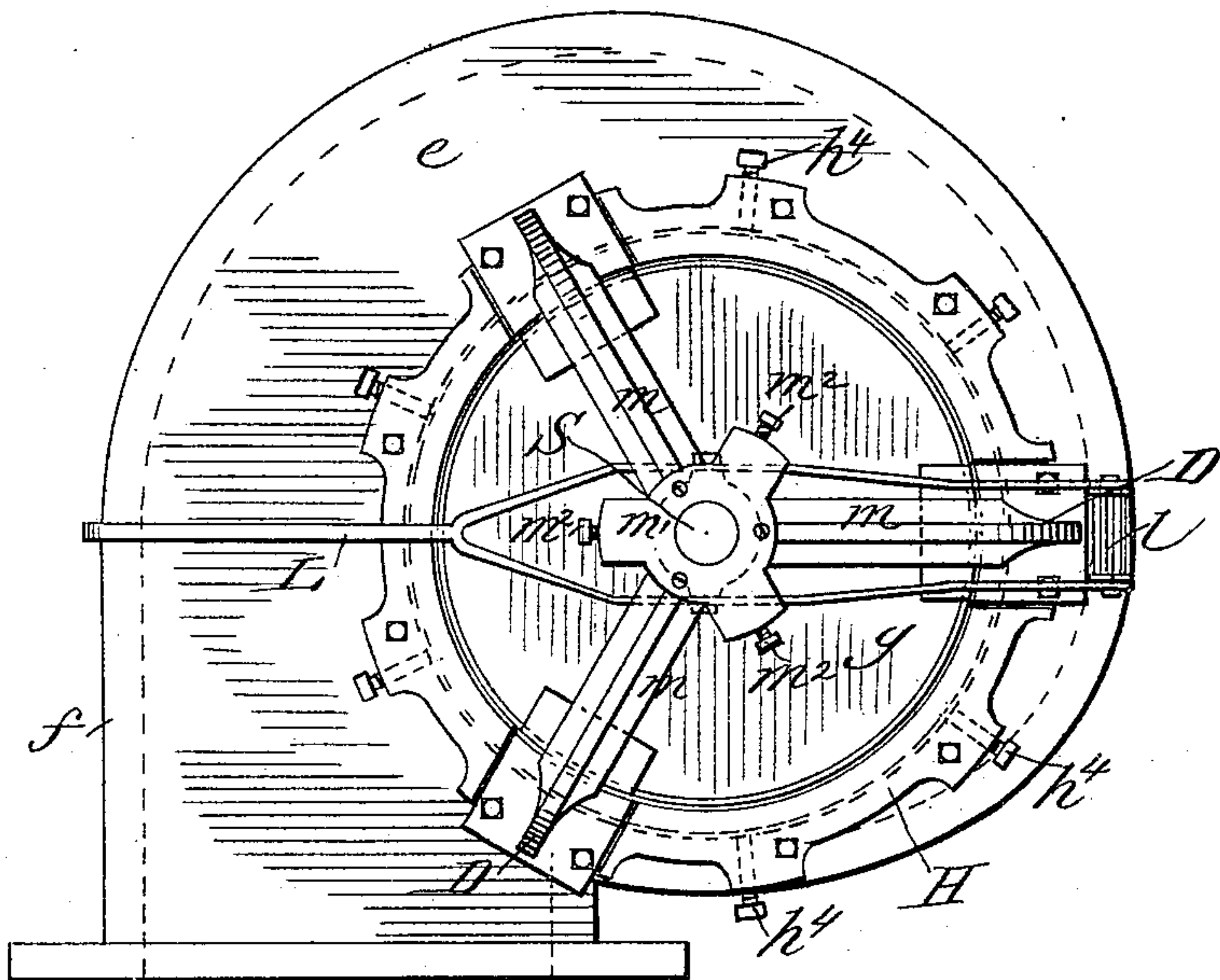
2 Sheets—Sheet 1.

W. G. SPENCER.  
WATER WHEEL.

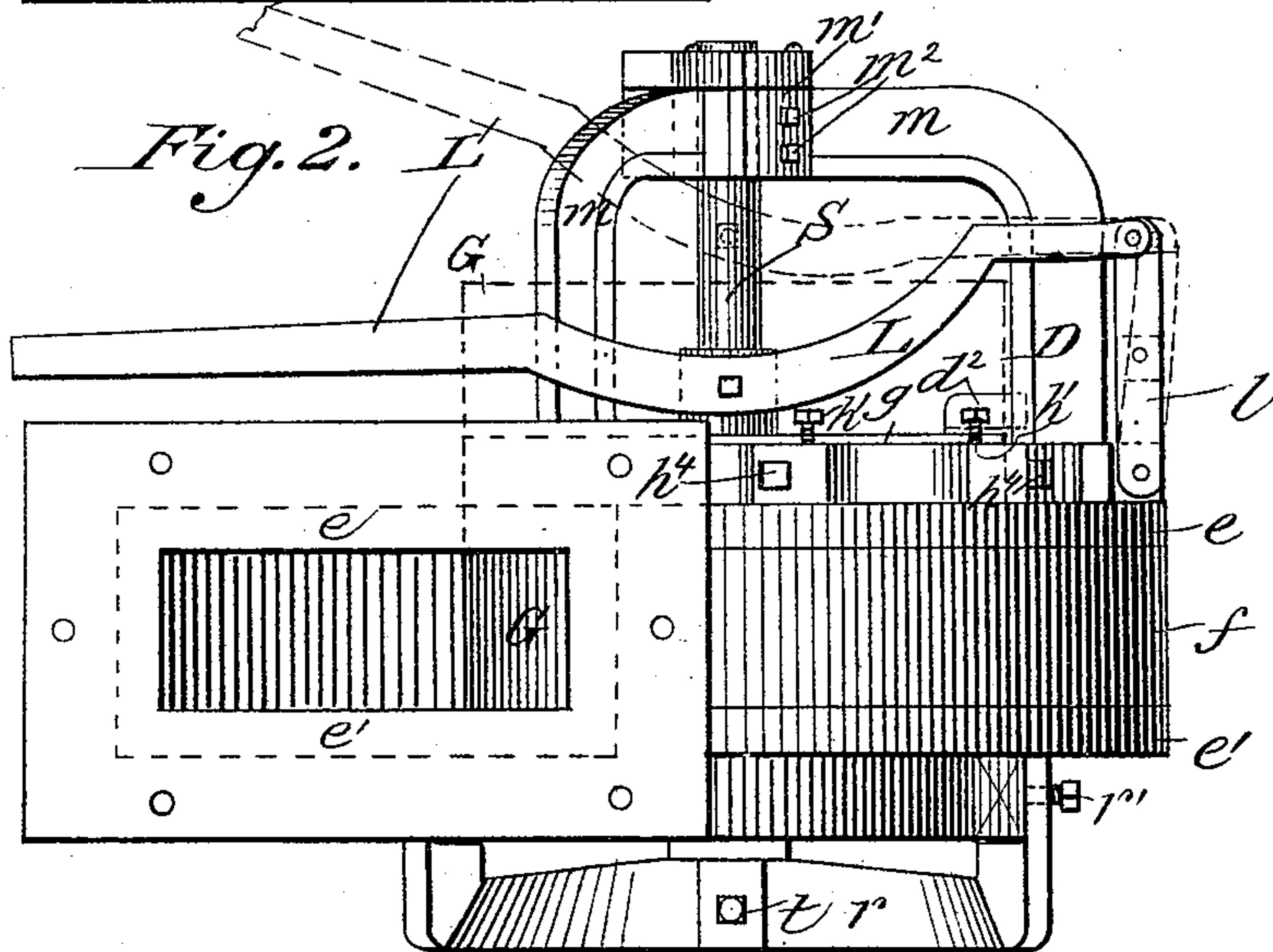
No. 481,074.

Patented Aug. 16, 1892.

*Fig. 1.*



*Fig. 2.*



*Attest:*

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*R*

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*William G. Spencer.*

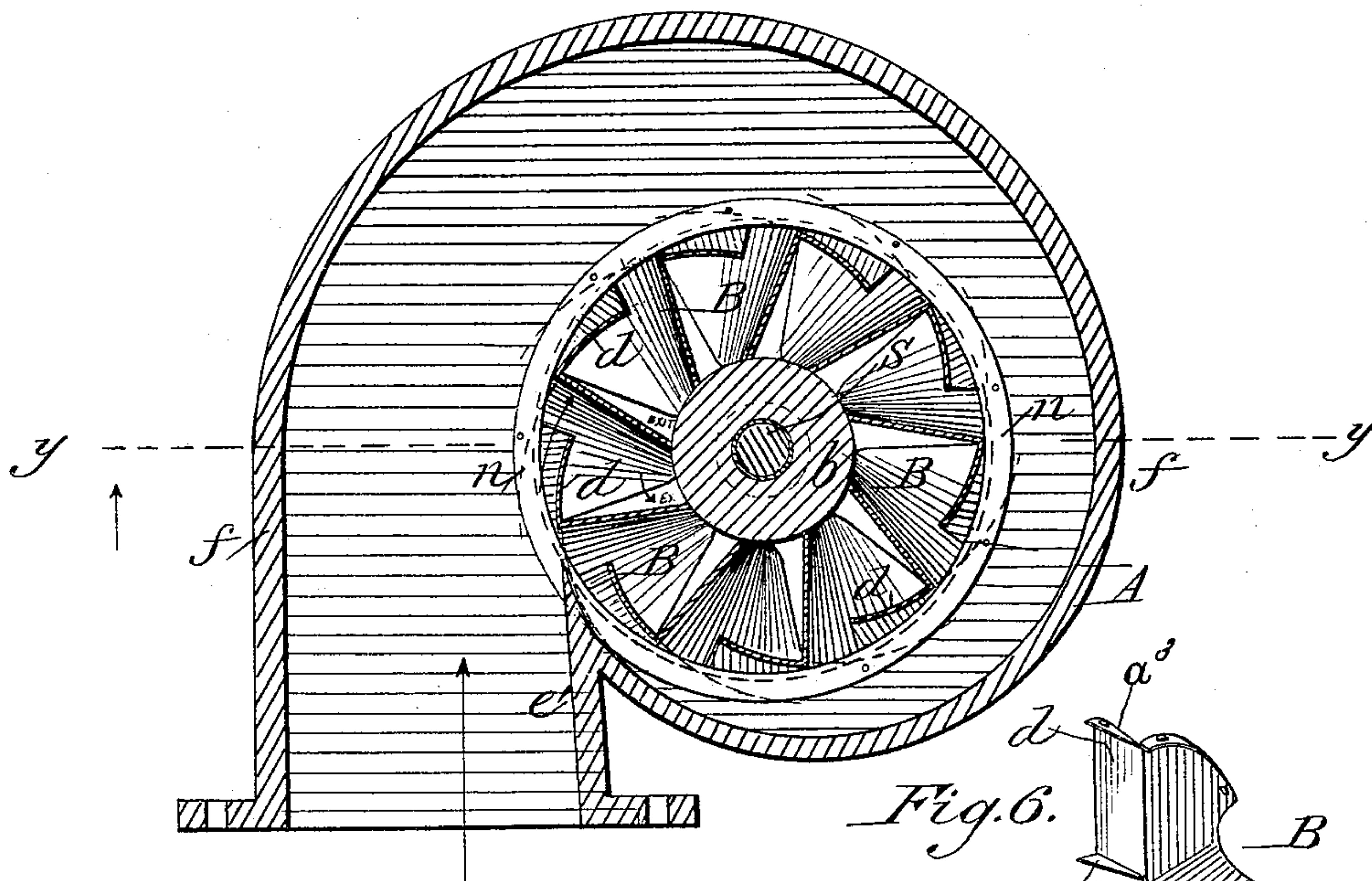
*by M. T. E. Chandler & Co.*  
*attys*

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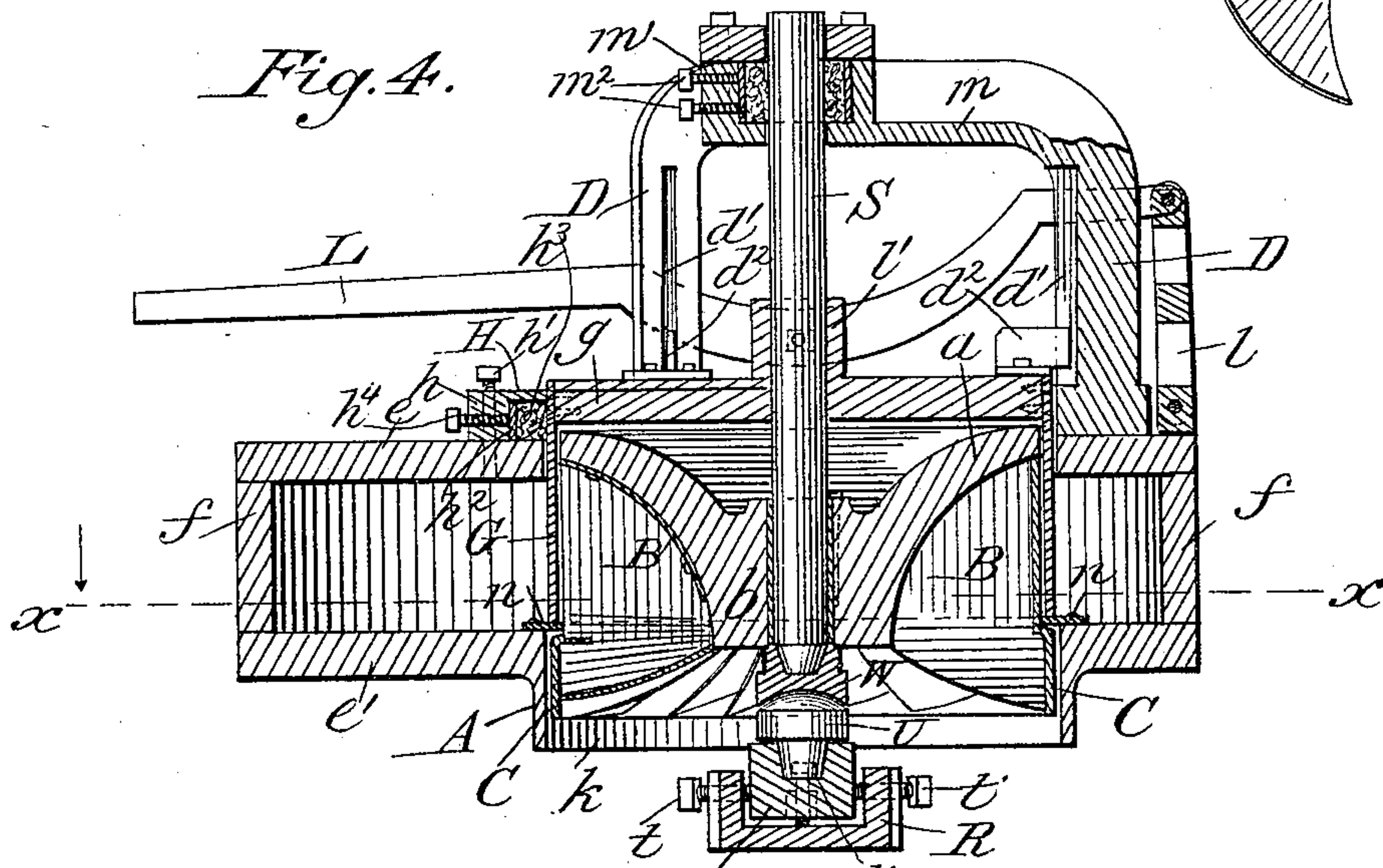
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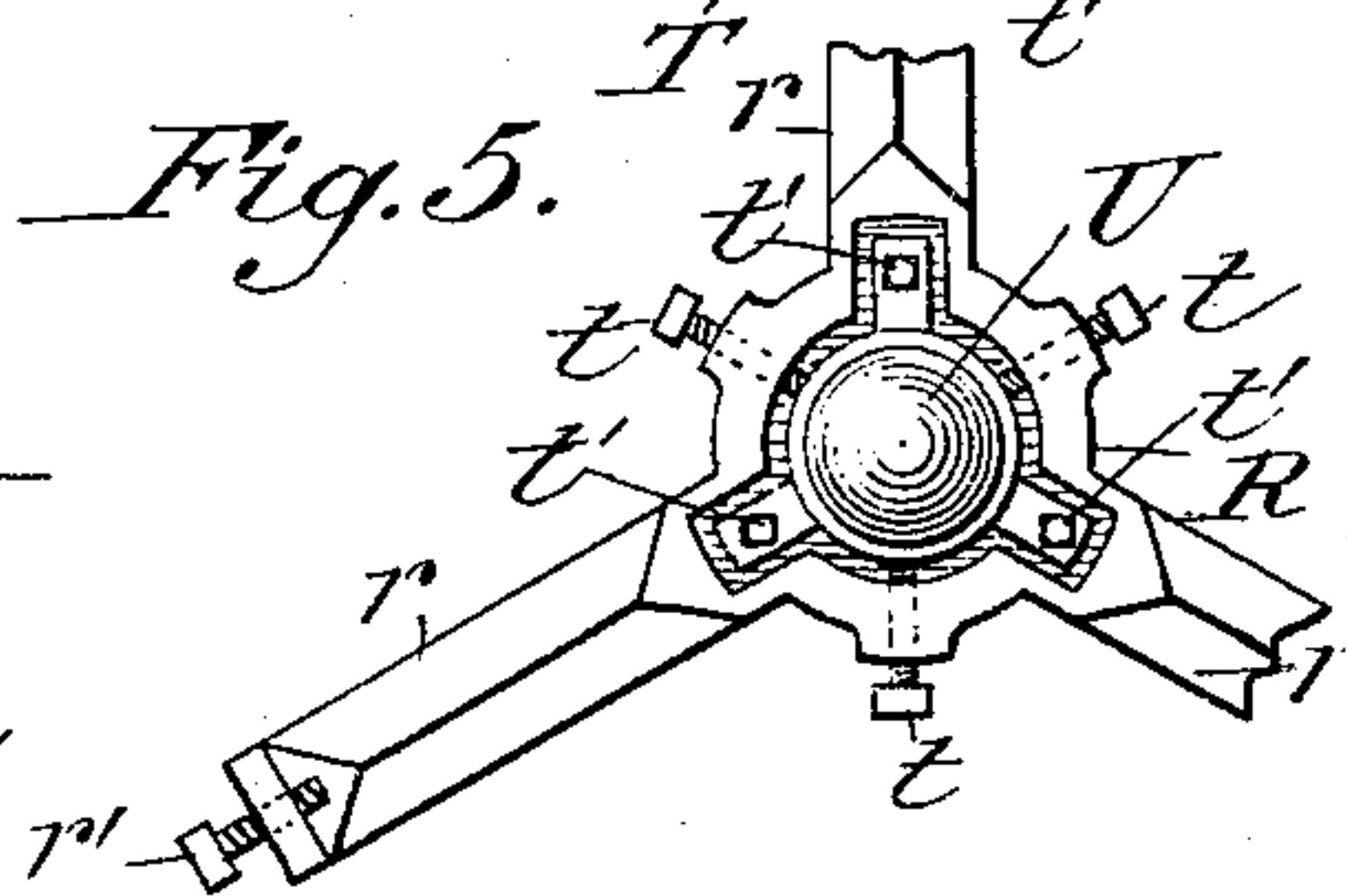
*Fig. 3.*



*Fig. 4.*



*Fig. 5.*



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# UNITED STATES PATENT OFFICE.

WILLIAM GLENN SPENCER, OF DAHLONEGA, GEORGIA.

## WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 481,074, dated August 16, 1892.

Application filed October 27, 1891. Serial No. 410,006. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM GLENN SPENCER, a citizen of the United States, residing at Dahlonega, in the county of Lumpkin and State of Georgia, have invented certain new and useful Improvements in Water-Wheels, of which the following is a full, clear, and exact description, such as will enable those 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.

This invention relates to improvements in turbine water-wheels of that class ordinarily termed the "Burchard," in which water is introduced into the side of the wheel and flows inwardly and downwardly through the same.

It has for its object the construction of guides whereby the water is directed tangentially upon the buckets, such as will be simple, efficient, and easily applied. The guides ordinarily used are of complicated construction, placed within the scroll separate from the wheel. In the present instance the guides are placed upon the wheel itself, thereby relieving the scroll of all obstructions to the flow of the water, as would be occasioned by the guides ordinarily used. It has, further, for its object a construction such as will utilize the force exerted by the impact of the water to its greatest extent. In most all wheels of this class as they have been previously constructed a large portion of the water after it passes into a bucket, instead of striking against the face of the bucket, forms an eddy back of the succeeding bucket, thereby losing to some extent its force. In the present instance it is proposed to avoid this loss by introducing the water directly upon the face of the bucket at its outer end and by allowing only so much to enter as it can freely empty itself of.

The invention has also for its object the construction of an adjustable packing to surround the gate to prevent any leakage of water between it and the inner edge of the scroll.

The invention consists in attaching to the outer edge of each bucket between the crown-plate of the wheel and the band surrounding the lower ends of the buckets a supplementary side which extends from the back of the bucket to which it is attached toward the face

of the preceding bucket and which has its lower edge flared or turned outwardly to the said band to form a guide and covers substantially one-half of the intermediate space, the supplementary sides being inclined inwardly to a slight degree substantially parallel with the curve of the outer wall of the scroll.

It also consists in attaching to the top of the scroll a casing to surround the gate and in seating within the same a packing backed by an adjustable metallic band.

The invention further consists in the novel construction, combination, and arrangement of parts, such as will be hereinafter more fully described, pointed out in the appended claims, and illustrated in the accompanying drawings.

In the accompanying drawings, in which similar letters of reference designate corresponding parts, Figure 1 is a plan view of a device embodying the invention. Fig. 2 is a side elevation of the same, the gate being shown in dotted lines in an elevated position. Fig. 3 is a horizontal section on the line  $x x$  of Fig. 4. Fig. 4 is a vertical section on the line  $y y$  of Fig. 3. Fig. 5 is a detail view showing a plan of the bridgetree, the adjustable holder, and the step for the shaft. Fig. 6 is a detail view showing one of the buckets removed from the wheel.

Referring to the drawings by letter, A designates the wheel, which consists of the crown-plate  $a$ , integrally with which is formed a conical-shaped hub  $b$ . To the crown-plate and hub are secured the buckets B, the outer lower edges of which are inclosed by the band C, which extends upward about a third of the height of the buckets. A portion  $a^2$  of one of the ends of the supplementary side of the bucket is turned outwardly, forming, together with the outwardly-turned portion  $a^3$  of the other end of the side, means whereby the side can be secured in place by being attached at one end to the band C and at the other end to the hub  $b$ . The outwardly-turned portion  $a^2$  also forms a guide to keep the water upon the face of the main guide or supplementary side, so that none will escape beneath the band C. The main face of each of the buckets is warped in the manner common to this class of wheels. To the outer edges of the



buckets, between the band C and the crown-plate, the supplementary sides or guides  $d$  are secured. These sides may be made separate from the main portion of the buckets and secured to them in any suitable manner, or they may be formed integral with them. In the present instance they are shown as being formed of continuations of the main plate of the bucket. The supplementary sides project from the outer edges on the main plates of the buckets backward from the same toward the faces of the preceding buckets. They are slightly inclined inwardly, so that they are substantially parallel to the curve of the outer wall of the scroll and so that the periphery of their inner edges has a diameter somewhat shorter than that of the periphery of the outer edges of the buckets. The width of each of the supplementary sides is such as to make the size of the entering opening of the bucket equal to the discharge-opening.

In buckets constructed in the ordinary manner—that is, in those in which the water is supplied by a scroll, as in the present case, and which are not provided with special guides—some of the water after passing the edge of a succeeding bucket instead of impinging directly upon the face of the preceding bucket curves around the edge of the first bucket and forms an eddy or vortex back of the same, thereby causing the loss of considerable force. In the present instance this loss is prevented by the guides, as all the water entering the bucket is directed against its face.

The scroll consists of the crown and bottom plates  $e$  and  $e'$ , connected at their outer edges by the side  $f$ . The inner side is provided with a gate for closing the same. This gate consists of a cylindrical vessel G, open at its bottom and closed at its top by the crown  $g$ . The dimensions of the cylinder are such as will allow it to fit closely in the interior opening of the scroll and when in position completely close the same. To the top of the scroll the vertical standards D are secured. In their faces grooves  $d'$  are formed, in which the guides  $d^2$ , secured to the crown of the cylinder, move, thereby securing a steady and even register of the gate. To prevent any leakage between the inner edge of the crown-plate of the scroll and the gate, a packing-box H is secured to the crown-plate around its inner edge surrounding the gate. The packing-box consists of the casing  $h$ , made in sections secured between the bottoms of the standards D by the set-screws  $h'$ . In the inner faces of the sections and the lower ends of the standards an annular groove is formed, within which the band  $h^2$  is first seated, and the remaining space is filled with a suitable packing  $h^3$ , which firmly presses against the gate. The band  $h^2$  forms a backing for the packing, so that when the latter has become worn it can be moved forward by the set-screws  $h^4$ .

In order to move the gate, a lever L is provided. It is fulcrumed on a swinging arm  $l$ , pivoted at its lower end to the scroll. From the top plate of the gate around the shaft S an annular projection  $l'$  extends, to which the lever L is pivoted. The lever is of such length as to allow the gate to be easily raised, the swinging arm  $l$  allowing its connecting-point with the annular projection to move in a vertical line.

The band around the lower ends of the buckets is of considerable thickness and to some extent forms a journal working in a bearing formed by the annular flange  $k$ , projecting downward from the edge of the opening in the bottom plate of the scroll. It is not intended that the band should move in contact with the flange, but only serves to steady the movement of the wheel. To prevent any debris from falling between the band and the flange, a flat annular band  $n$  is secured to the inner edge of the opening in the lower plate and projects over the band C.

The vertical standards D are connected at their tops by the cross-pieces  $m$ , at the intersection of which a journal-bearing is formed, consisting of the packing-box  $m'$ , provided with a suitable packing, and the set-screws  $m^2$  to allow the necessary horizontal adjustment.

To the under side of the lower plate of the scroll the bridge R is secured. Its radiating arms  $r$  have angle projections at their outer ends, through which set-screws  $r'$  pass, so that the bridge may be removably secured in place. The central part of the bridge in its upper side is recessed annularly and radially. In this recess the holder T is secured. It is adjusted horizontally by means of the set-screws  $t$  and vertically by the set-screws  $t'$ . In the holder is seated the step U, of lignum-vitæ, having a convex bearing formed upon its upper end.

S is a vertical shaft provided with a concave bearing W on its lower end, which is seated on the step U. The upper end of the shaft is journaled in the bearing formed in the intersection of the cross-pieces  $m$ . On the lower end of the shaft the wheel is keyed. When the wooden step has become worn and the wheel commences to settle, the holder T, carrying the step, can be raised by means of the set-screws  $t$  and  $t'$ , thereby raising the wheel to its normal position. By means of the adjustable packing-box  $m'$  and the adjustable step U the shaft can be adjusted to its proper alignment.

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

1. In a turbine water-wheel, the combination of the scroll, the wheel proper consisting of the crown-plate having an inwardly-projecting hub, the buckets secured thereto, the band surrounding the lower outer edges of the buckets, and the supplementary sides secured to the outer edges of the buckets between the



crown-plate and the said band, the lower end of each side being turned to form a guide, substantially as described.

5 2. In a turbine water-wheel, the combination of the scroll, the wheel, the gate, the casing secured to the top of the scroll and surrounding the gate, the band and packing carried within the said casing, and the adjusting-screws passing through the casing and

impinging upon the said band, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM GLENN SPENCER.

Witnesses:

J. B. DUCKETT,

R. P. McDONALD.