

No. 619,148.

Patented Feb. 7, 1899.

W. A. DOBLE.
WATER WHEEL.

(Application filed Dec. 29, 1897.)

(Model.)

2 Sheets—Sheet 1.

Fig. I.

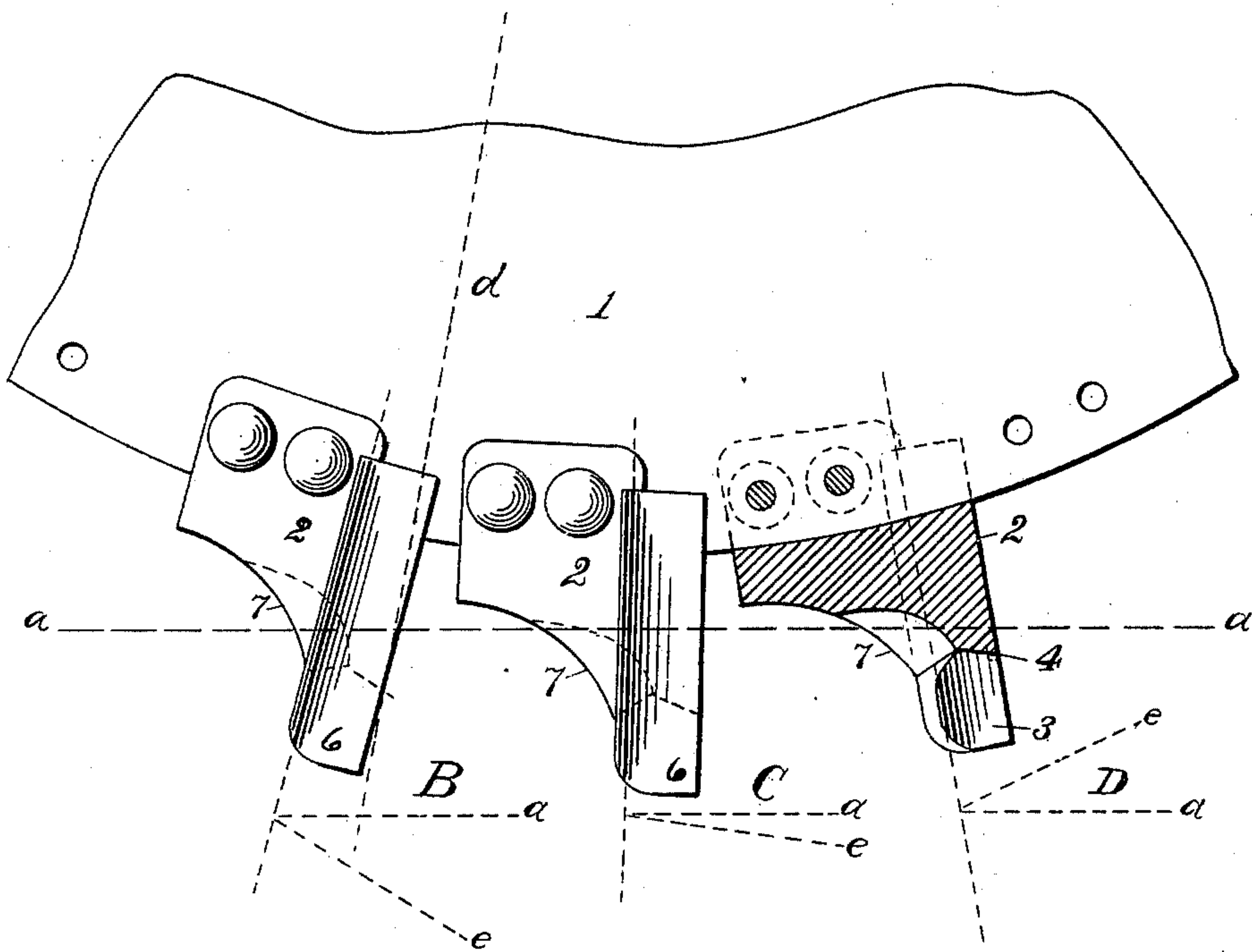


Fig. II.

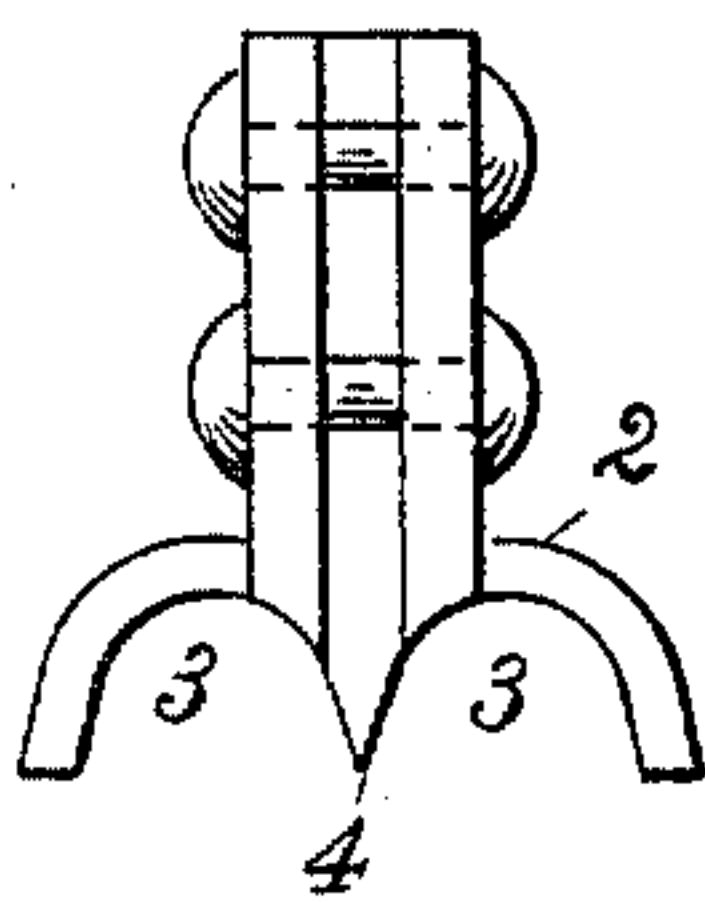


Fig. III.

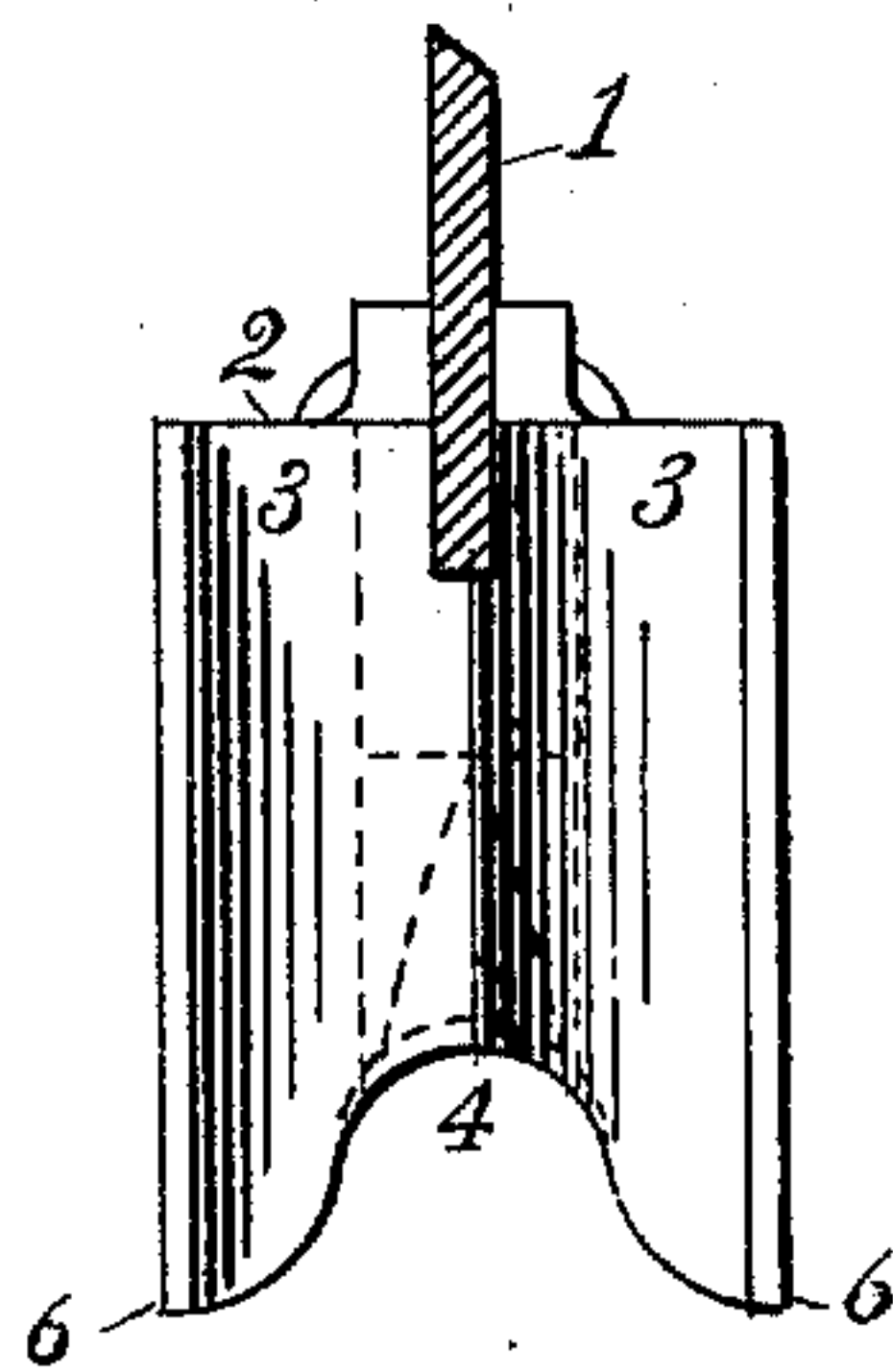
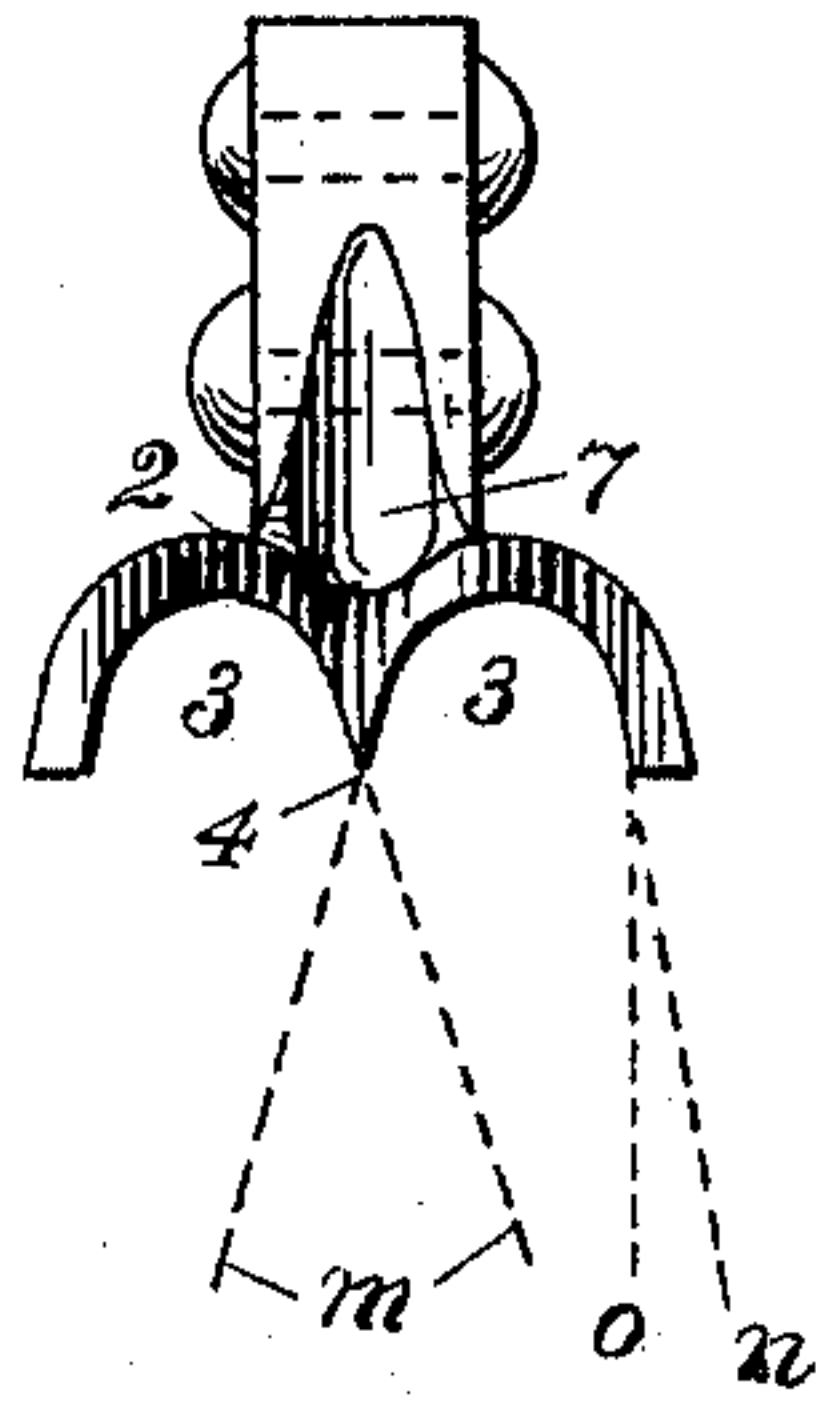


Fig. IV.



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Fig.V.

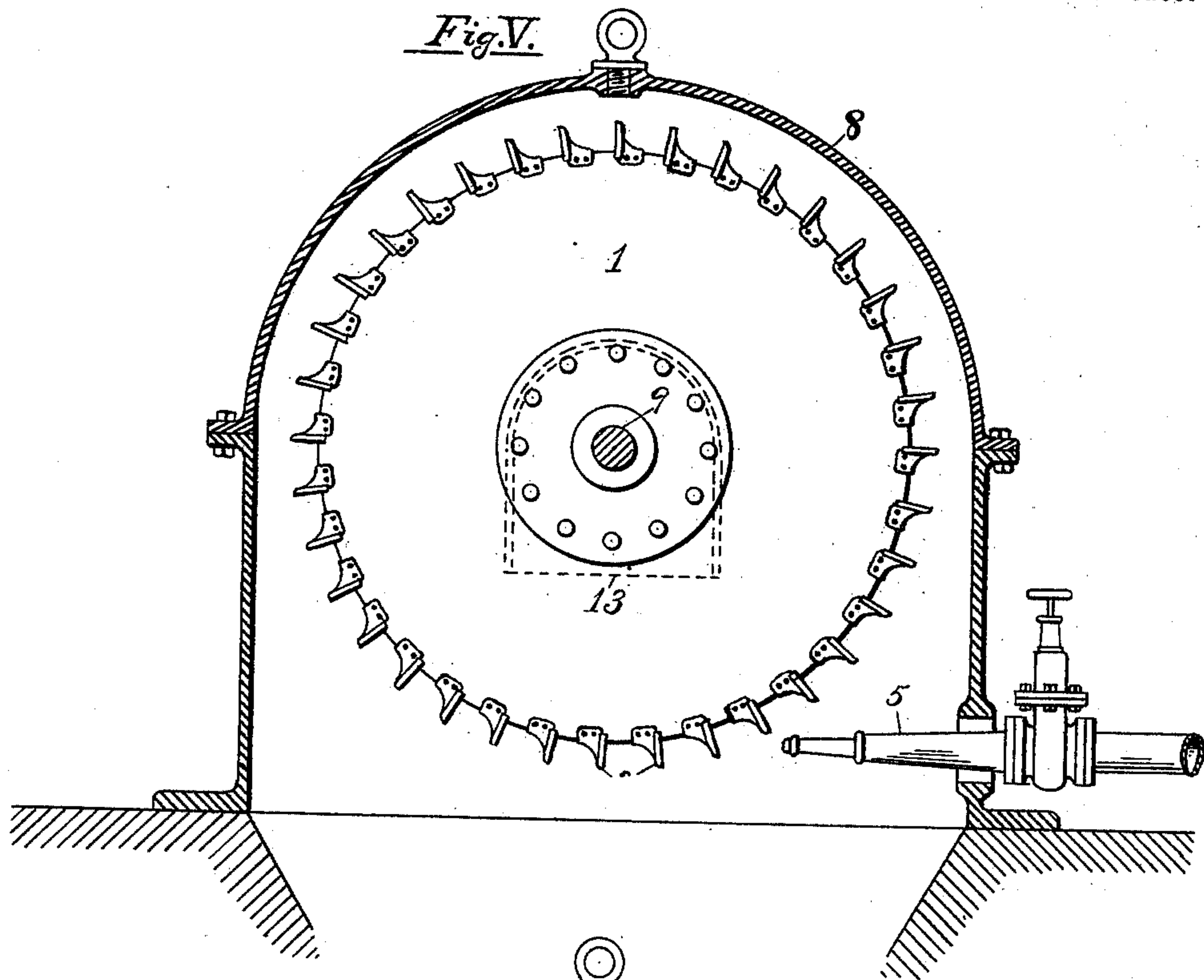
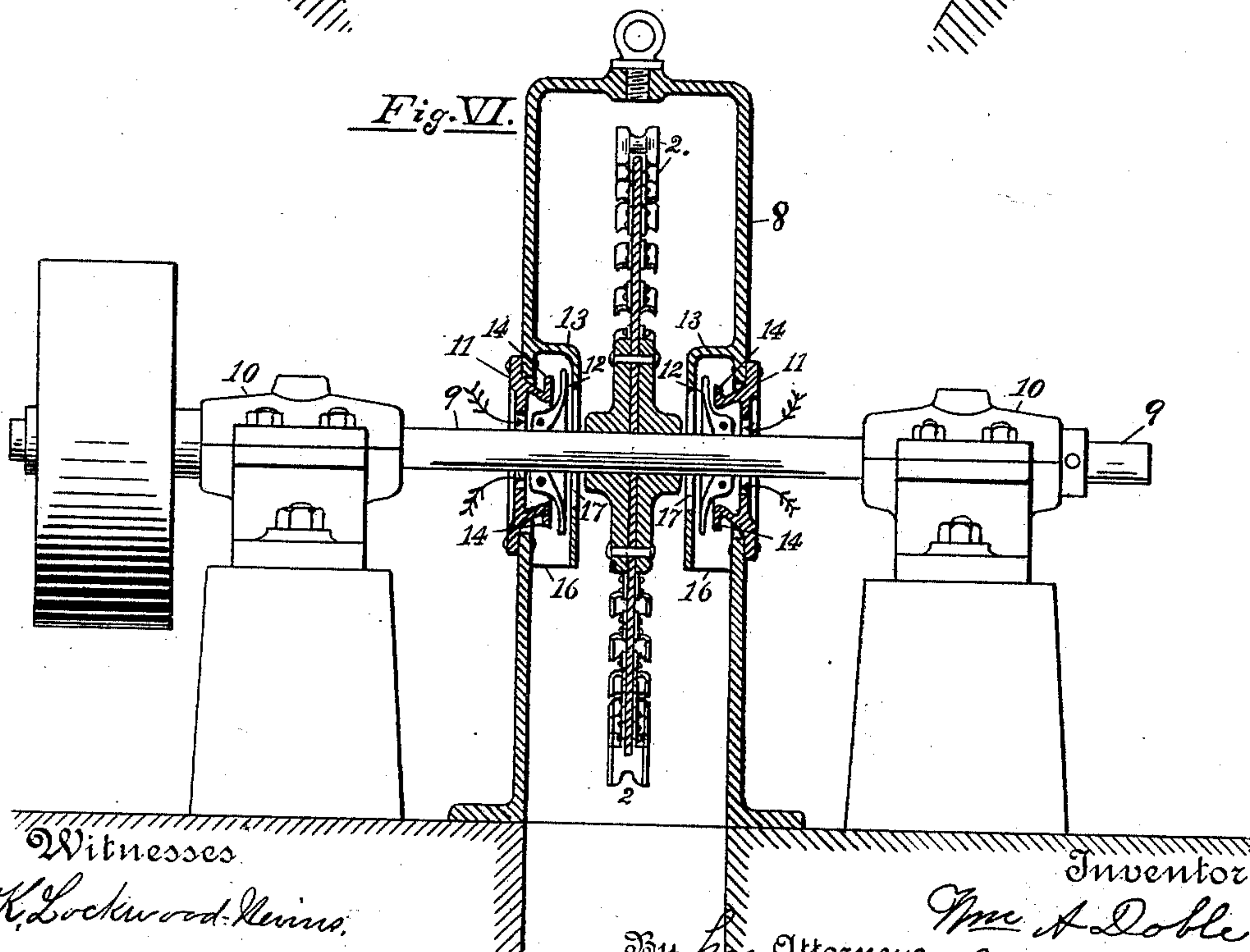


Fig.VI.



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UNITED STATES PATENT OFFICE.

WILLIAM A. DOBLE, OF SAN FRANCISCO, CALIFORNIA.

WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 619,148, dated February 7, 1899.

Application filed December 29, 1897. Serial No. 664,343. (Model.)

To all whom it may concern:

Be it known that I, WILLIAM A. DOBLE, a citizen of the United States, residing at San Francisco, county of San Francisco, and State of California, have invented certain new and useful Improvements in Water-Wheels; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to tangential water-wheels of the impulsive or impact type, especially for high heads or pressures—for example, from five hundred to two thousand feet—wherein the water is projected upon the wheel in one or more small jets or streams, and relates especially to a form of the vanes or buckets for such wheels whereby the water is more effectually applied and to other constructive features hereinafter explained.

My invention consists in forming the buckets or vanes of such wheels of symmetrical shape, with two curves, laterally, straight on their faces, without double curves, and producing in all positions by reaction an efficient angle of discharge; also, in forming the buckets without a bottom or outer end that divides and disturbs the stream horizontally as well as vertically or in two directions.

The objects of my invention are to secure entrance without disturbance and a free discharge of the water in a course as nearly as possible reverse to the line of its impingement on the buckets and to construct the latter so that they may readily be finished on their working faces by ordinary milling, planing, or other tools, and thus present a smooth and true surface to the water and avoid frictional resistances; also, in reducing so far as possible the area of contact between the water and the faces against which it acts; also, to prevent the escape of water from the wheel-housing without employing packing-boxes therefor. To these ends I construct the buckets as shown in the accompanying drawings, in which—

Figure I is a side view, partially in section, of a portion of a water-wheel constructed according to my invention. Fig. II is a top view of one of the buckets removed from the water-wheel. Fig. III is a front view of one of the same. Fig. IV is a view on the bottom

of Figs. II and III. Fig. V is a side elevation of a water-wheel provided with my improved buckets, the side of the inclosing case being removed. Fig. VI is a transverse section through the center of Fig. V in the opposite plane.

Similar references apply to corresponding parts throughout the views.

In the construction and operation of tangential water-wheels in which the active or effective surfaces are of small area and the pressure intense there is required a careful regard to entrance of the water without disturbing the stream or streams, the configuration and smoothness of the buckets, and to the lines of reaction after impingement of the water, also to the friction of the acting surfaces, which if extended seriously impairs the efficiency of such wheels.

The drawings in the present case represent to a true scale parts of a water-wheel constructed for and operating under a head of one thousand and forty feet, or a pressure of four hundred and fifty pounds per inch of area, to develop about twenty-five-horse power for each nozzle of one-fourth of an inch in diameter.

The disk 1, of which d is a radial line, is preferably a solid plate of steel or iron; but in the case of very large wheels the rim may be cruciform or other section, solid or built up of wrought or cast iron, a projecting flange or flanges being provided to which the buckets 2 are attached by bolts or rivets, as shown.

The buckets 2 are of such shape and contour as to be finished on their operating-faces by planing and milling in straight lines with ordinary implements and are in the case of a plate-wheel slotted on the top, as seen in Fig. II, so as to fit closely over the edge or periphery 1, and thus retain true alinement in the plane of rotation and coincident with the line $a a$ of the jets or stream of water.

The faces of the buckets 2 present, transversely, two curves 3, terminating in the center in an acute wedge 4, having faces as shown by the lines m in Fig. IV, the tangent n being divergent about ten degrees from the line of the jet or the plane of rotation indicated by o . At the outer end of the buckets 2 they are cut away in curved form at the bottom, as seen in Fig. III, so that while the

wedge 4 is in the jet or stream the downward-diverted water is reversed by the extensions 6 that have passed below or beyond the stream. This construction omits the bottom commonly found in such buckets, which cannot enter and pass through the jet or stream without diverting it to various angles and is an impediment to efficient action.

A lip or edge of any form or at any angle entering the stream transversely to the plane of rotation splits or divides the water, causing a distortion of its course and directs it in such way that the reactive effect is lost or is useless. I therefore avoid all diversion of the stream except to split or divide it in the plane of the wheel's rotation.

The natural angle of reaction or reversal of the water is indicated by the dotted lines *e* in Fig. I, *a* being the line of the jet or of impingement, coinciding at one point with the line *e* and changing from above to below the line *a*, as seen at B, C, and D in Fig. I; but in practice this line of reaction is not natural or theoretical, as is set forth more fully in a separate application for Letters Patent on water-wheels for lower heads and pressures filed by me at the same time herewith.

To cause free entrance of the wedge 4 that divides the stream, I form a curved recess 7 in the bottom of the buckets 2, as seen in Figs. I and IV, and otherwise provide so far as possible to maintain the solidity of the stream until its course is diverted by the curves 3.

Water is applied by a nozzle 5, usually a single one in the case of high heads and pressures; but when required two or more nozzles can be employed, placed at different points around the wheel, so the action of one will not interfere with another.

Referring now to Figs. V and VI, the wheels are by preference inclosed by a casing 8, which can be of any suitable form. This casing arrests spray from the water-wheel and guards against danger when the wheels are in exposed places and driven at high velocity. The shaft 9 is supported in the bearings 10 and where it passes through the sides of the casing 8 is provided with water-guards consisting of the plates 11, bolted to the sides of the casing 8, the flanges 12, attached to the shaft 9, and a housing or chamber 13, formed on the inside of the casing 8, as shown in Fig. VI and indicated by dotted lines in Fig. V. On the inside of the plates 11 are flanged rims 14, that extend within the housing 13 and catch any water that drips down on the inside of the casing 8. The disks 12 are preferably made in two parts, so as to be inserted from the bottom 16 of the housing 13, which is open, as seen in the drawings. Water passing out through the apertures 17 is taken up by the flanges 12, discharged in the housing 13, and falls out at the bottom 16, as before described.

In this manner air is freely admitted through the water-guard, entering as indicated by the arrows, supplying what is driven out by entrainment in the discharge-water. This guard device answers the use of packing-glands and avoids their care and wear. Drip from the chamber 13 that misses the flange 14 falls on the central disk 12 and is thrown out again.

Having thus described the nature and objects of my invention, I claim as new and desire to secure by Letters Patent—

1. A bucket for a tangential water-wheel, formed on approximately radial lines longitudinally, and formed transversely on two curves that meet in a central acute wedge 4, said bucket having no closure at the outer extremity and said central wedge terminating within the extremities of the sides of the bucket, substantially as specified.

2. A bucket for a tangential water-wheel, formed on approximately radial lines longitudinally, and formed transversely on two curves that meet in a central acute wedge 4, said wedge being relatively shorter than the curved sides, whereby it does not enter the stream until the curved sides embrace the same on each side, substantially as specified.

3. In a tangential water-wheel in combination with a supporting-disk a series of buckets each formed on approximately radial lines longitudinally, and formed transversely on two curves that meet in a central acute wedge, and the sides of which extend beyond the point of the said central wedge forming deflecting skirts or extensions 6 with curved extremities, substantially as specified.

4. In a tangential water-wheel, in combination with a supporting-disk, a series of buckets each formed on approximately radial lines longitudinally, and formed transversely on two curves that meet in a central acute wedge, the sides of said buckets extending beyond the point of said central wedge to form deflecting-skirts, said buckets being attached to said supporting-disk by a rearward extension and support embracing said disk on each side and secured thereto by bolts, substantially as specified.

5. In a tangential water-wheel, an inclosing case or housing 8, provided with an opening for the shaft 9, and an inner housing 13 on each side, having a downwardly-projecting flange, in combination with water-guard plates 11, having outturned flanged rims 14, and flanges 12 borne on the shaft, extending between the flange of the housing 13 and the flange 14 of the water-guard plate 11, substantially as specified.

In testimony whereof I have hereunto affixed my signature in the presence of two witnesses.

WILLIAM A. DOBLE.

Witnesses:

K. LOCKWOOD-NEVINS,
H. SANDERSON.