(No Model.)

E. P. JONES.

WATER WHEEL BUCKET.

No. 599,845. Patented Mar. 1, 1898.

Fig. 1.

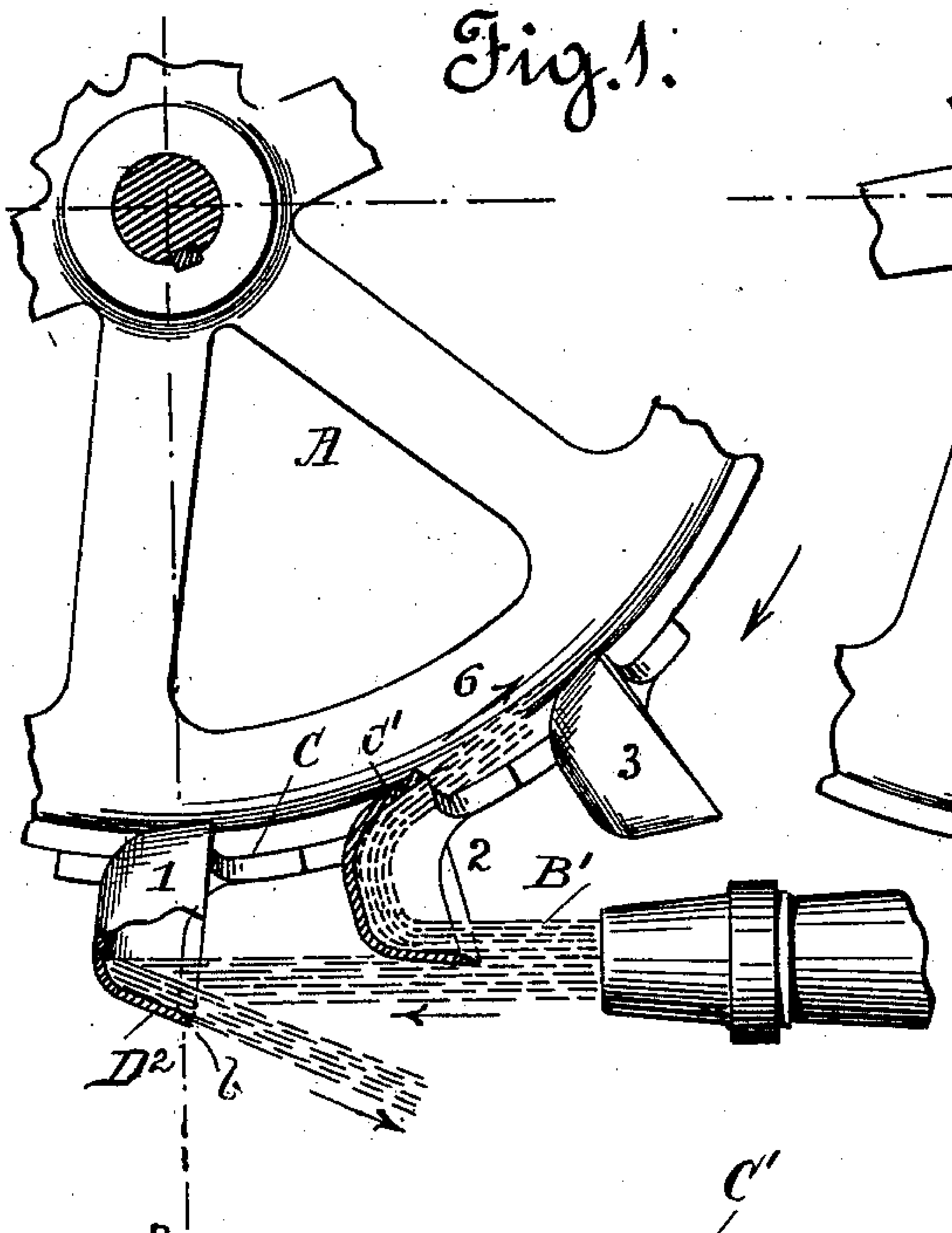


Fig. 2.

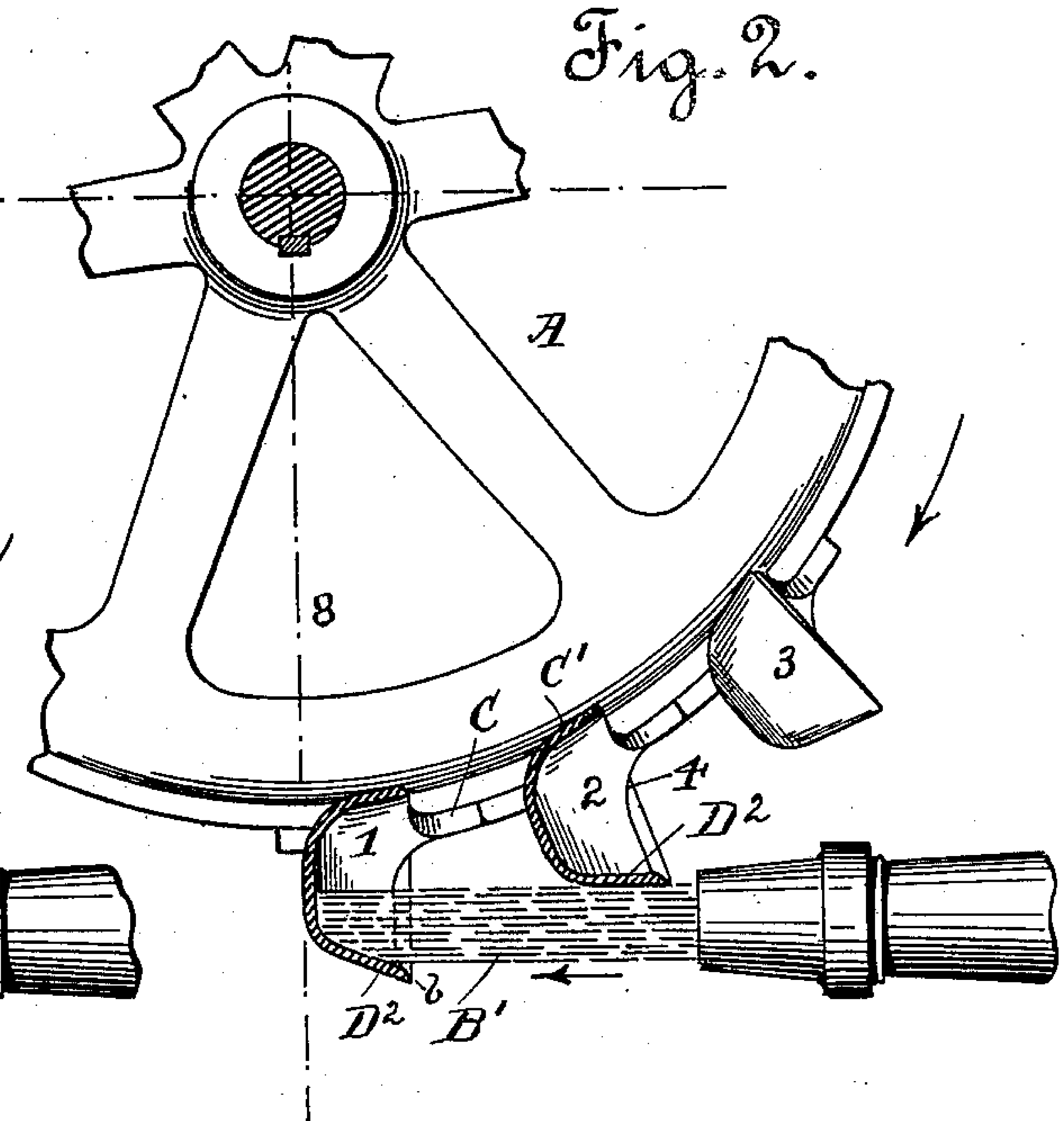


Fig. 3.

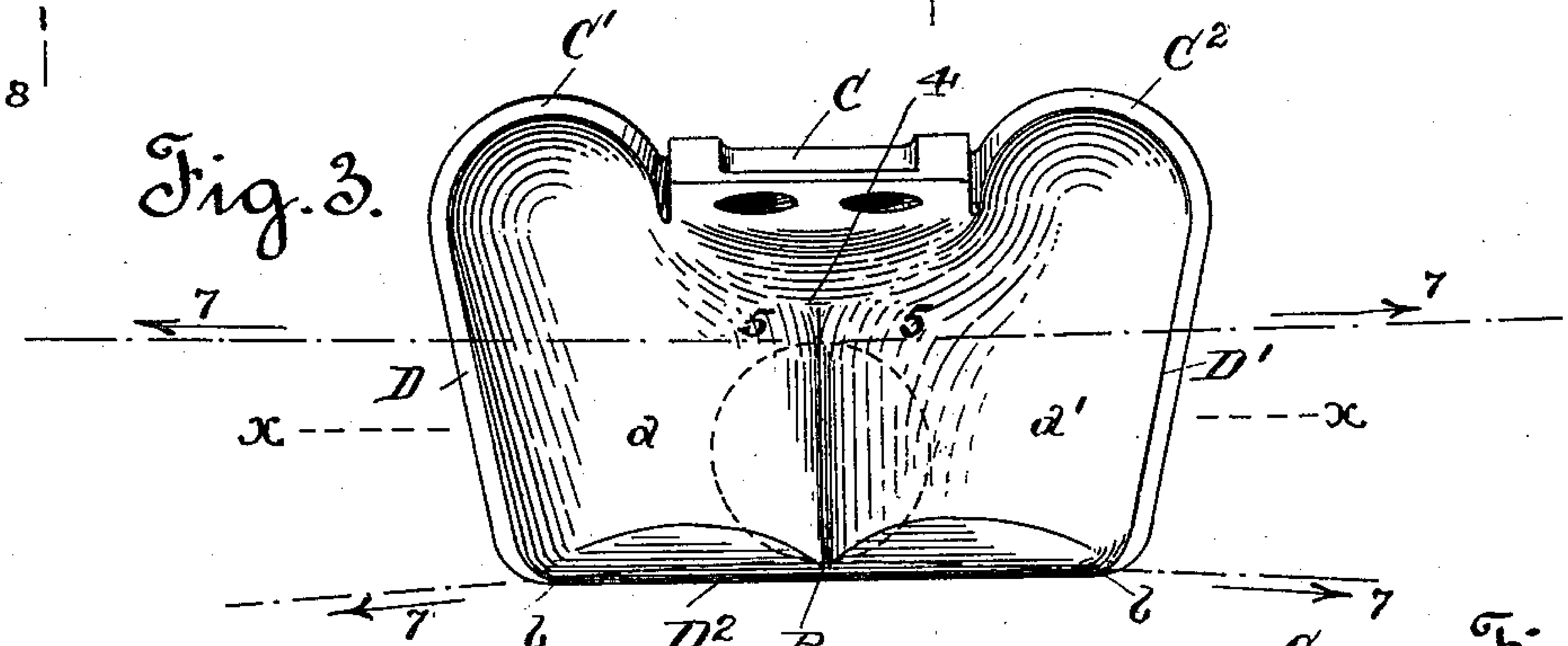


Fig. 4.

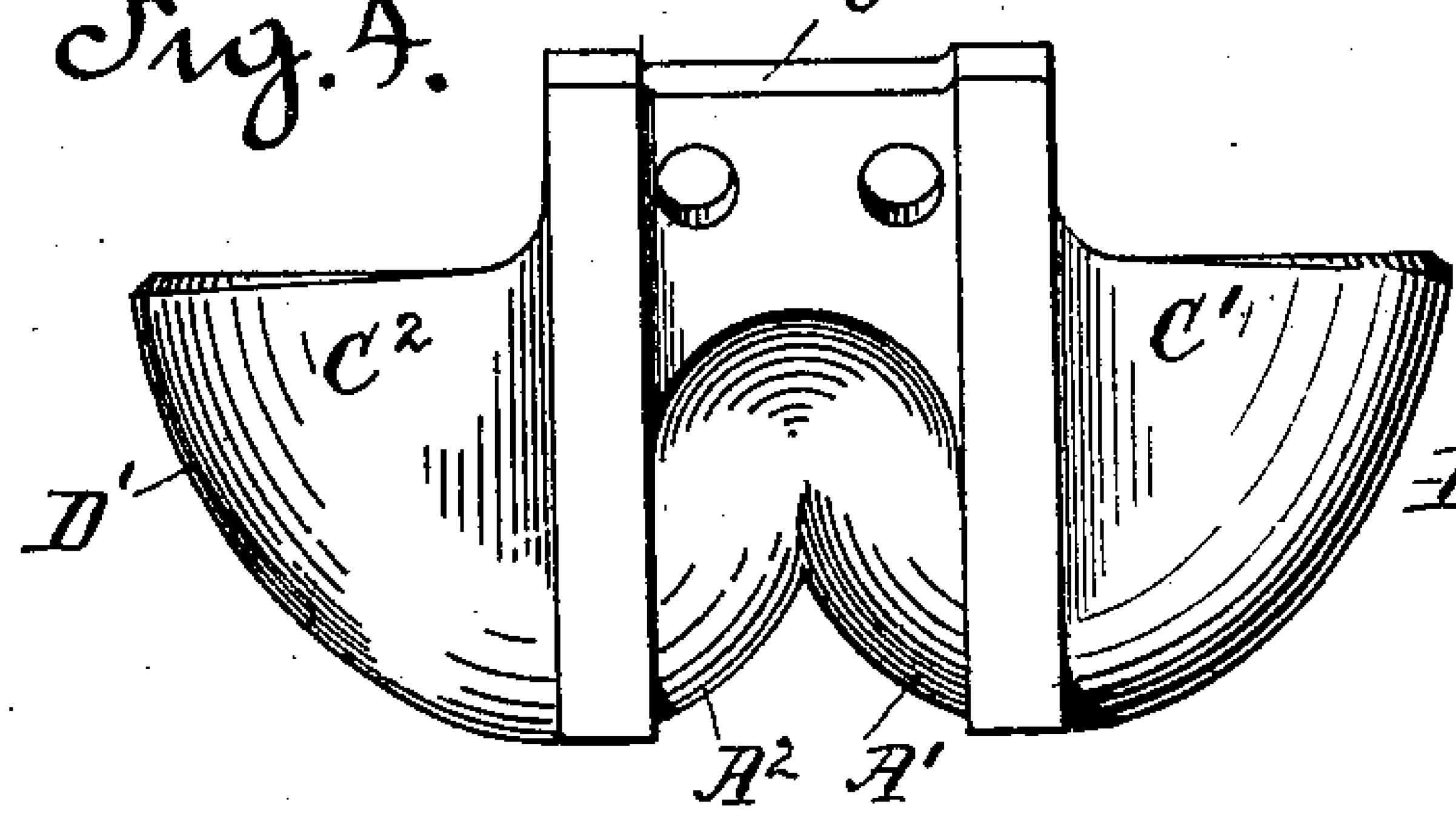
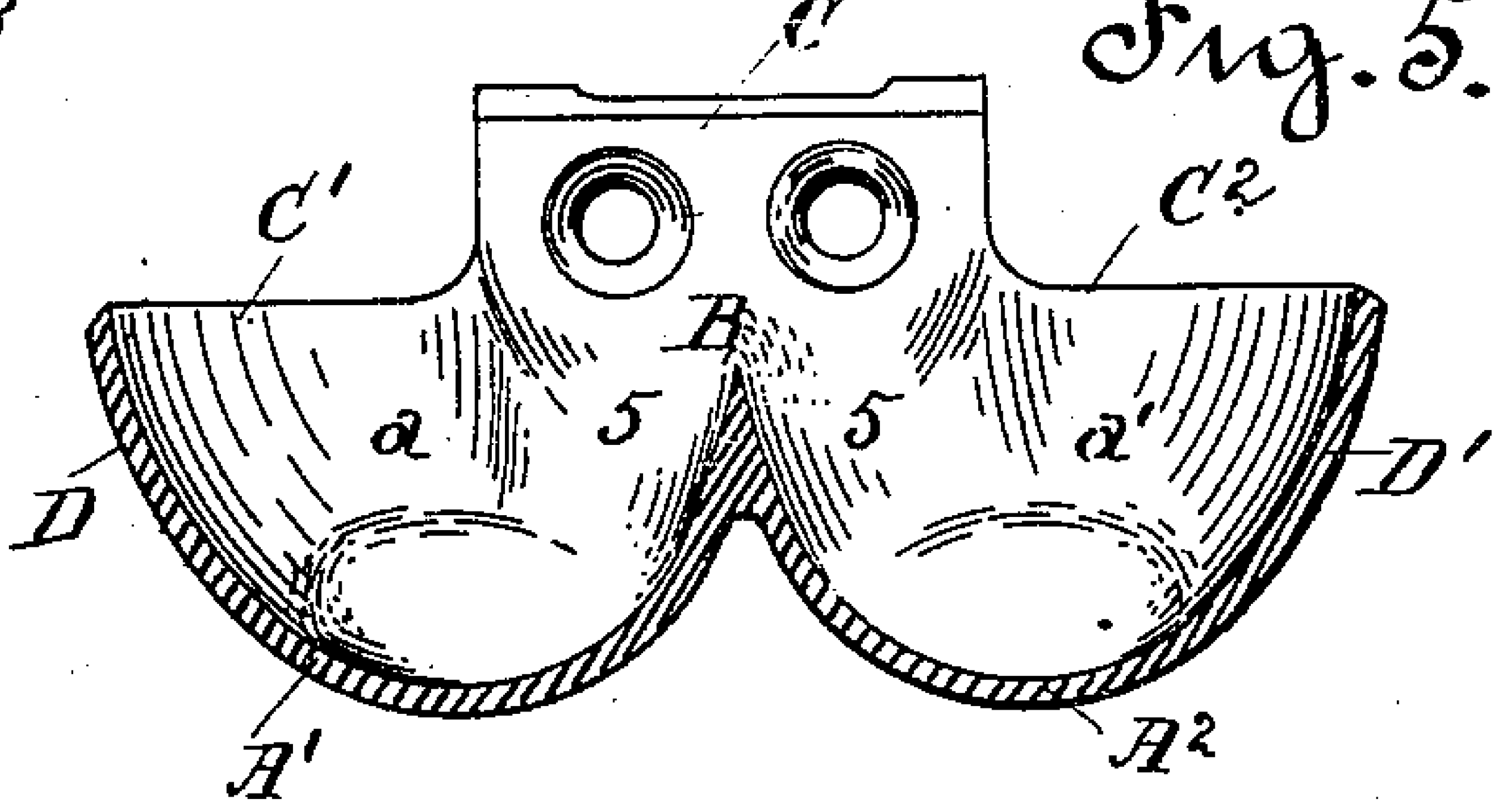


Fig. 5.



Witnesses.

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UNITED STATES PATENT OFFICE.

EDWARDS P. JONES, OF ALAMEDA, CALIFORNIA, ASSIGNOR TO THE RISDON IRON AND LOCOMOTIVE WORKS, OF SAN FRANCISCO, CALIFORNIA.

WATER-WHEEL BUCKET.

SPECIFICATION forming part of Letters Patent No. 599,845, dated March 1, 1898.

Application filed November 16, 1896. Serial No. 612,306. (No model.)

To all whom it may concern:

Be it known that I, EDWARDS P. JONES, a citizen of the United States, residing at Alameda, in the county of Alameda and State of California, have invented certain new and useful Improvements in Water-Wheel Buckets; and I do hereby declare that the following is a full, clear, and exact description thereof.

This invention relates to a certain new and useful bucket for use in connection with water-wheels, and more particularly in connection with that class of water-wheels known as "tangential" water-wheels, wherein power is derived from an impact stream or column of water directed against buckets secured to and projecting from the periphery or rim of the wheel.

The invention consists in the arrangement of parts and details of construction, as will be hereinafter fully shown in the drawings, and described and pointed out in the specification.

The various types of water-wheel buckets now in use are so constructed that the discharged or utilized water of the impact-stream flows therefrom at some one point, either from the back or from the side or from the front wall of the bucket; but, inasmuch as the relative position which the bucket assumes with reference to the impact-stream is constantly and continually changing or varying as the bucket is carried into and away from the impact-stream by the rotation or movement of the wheel itself, it is obvious that unless a portion of the power or force of the impact-stream be employed in order to impel the utilized or dead water from within the bucket the utilized water cannot and will not at all times flow from the bucket at any given or designated point, as from the back or from the side or from the front walls, upon natural lines or curves. If we suppose the bucket to be constructed upon such lines as will cause the utilized water to flow therefrom at either its back, its sides, or its front walls when receiving the full impact blow or force of the propelling jet or stream—that is, when the bucket stands at a right angle to the said stream—it is obvious that the waste water will not and cannot be discharged at such point where the bucket enters or cuts into or leaves the impact-stream unless a portion of the force or power of the impact-stream be converted to impel the utilized water from within the bucket; and the converse of this is true, for if the bucket is constructed so as to discharge from its back or from its sides or from its front walls as it enters or dips into the stream it will not discharge at such point when the bucket stands at a right angle to the stream, so as to receive the full impact blow or force, unless a portion of the power of the impact-stream is utilized to impel the waste water from within the bucket at such point. It will thus be seen that in order to discharge the waste or utilized water from within the bucket as now constructed, at a given point, under all conditions which the bucket during its rotary movement to the impact-stream may assume it is requisite that a portion or percentage of the available energy of the stream be converted to force the waste or dead water from within the bucket. In other words, the said waste water will not flow therefrom on natural lines except under certain conditions—to wit, when the bucket stands at that position in which it is designed to discharge upon natural lines. Realizing this defect in the water-wheel buckets of the present time—a defect which those skilled in this particular art appreciate—and being desirous to avoid this unnecessary partial appropriation of the power of the impact stream or jet to force the waste or utilized water from within the buckets, I construct the water-buckets upon such lines as will cause the waste or dead water to flow of its own accord from within the bucket at various points, in accordance with the position it assumes in relation to the impact-stream. In other words, the object of the invention is to construct the bucket so that the point of discharge of the waste water will vary as the position of the bucket in relation to the line of the impact stream or jet changes, in order that the waste or utilized water will flow from the bucket in lines or in curves corresponding to the natural flow of the water without converting a portion of the force of the impact-stream to impel the waste water from within the bucket. By thus

constructing the bucket a perfect, free, and unobstructed flow or discharge of the waste water from within the bucket is secured, thereby obviating the liability of the rotation of the water-wheel being retarded by a portion of the force of the impact-stream being diverted for other purposes than that of impelling the water-wheel.

In order fully to comprehend my invention, reference must be had to the accompanying sheet of drawings, wherein—

Figure 1 is a view in elevation showing a section of a water-wheel with a series of my buckets secured to the periphery thereof, the position of the buckets being illustrated as dipping into and leaving the impact-stream. Fig. 2 is a similar view showing one of the buckets in position just prior to its dipping into the stream and showing the position of the lower bucket when receiving the full force of the impact-stream. Fig. 3 is an enlarged detail top plan view of one of the buckets. Fig. 4 is a rear view in elevation of one of the buckets; and Fig. 5 is a cross-sectional view in elevation taken on line *x x*, Fig. 3.

The letter A is used in the drawings to indicate the water-wheel proper. To the periphery of this wheel I secure, by means of lugs, bolts, or otherwise, the water-wheel buckets represented in Figs. 1 and 2 of the drawings by reference-numerals 1, 2, and 3. Each bucket has its bottom formed into two curves $A' A^2$, which meet in the central apex B. This central apex serves as a ridge against which the impact-stream B′ strikes and is split or divided, so as to throw one-half of the impact-stream into each of the pockets *a a′*, formed by the curved bottoms and the central apex B. The curved bottoms are joined to or formed integral with the rear wall of the bucket, the central portion C, or that portion of the said wall impinging against the periphery of the wheel A, being flattened and gradually inclined outwardly from the lower end toward the top in order that the bucket will assume its proper position when secured to the periphery of the wheel. That portion of the back or rear wall extending beyond the sides of the water-wheel rim is curved backward, so as to project inwardly beyond the face of the wheel-rim. This curved portion I designate as the rear curved walls $C' C^2$ of the curved bottoms $A' A^2$. These rear curved walls are gradually inclined upwardly and outwardly from their lower end or bottom to their top, so as to form gradual rearwardly-extending walls. The curved rear walls are cast integral with the side walls D D′ of the bucket, and they may be said to constitute prolongations or continuations of said walls. These side walls are inclined from their top to their bottom and they converge from the curved rear walls of the curved bottoms toward the front wall D^2. The front wall D^2, while being straight, is gradually inclined rearwardly. By converging the side walls from the rear to the front the width of the bucket is gradually decreased toward the front. The thickness of the central apex B gradually decreases from its bottom upward, so as to give a gradual curve to the inner faces of the curved bottom, and the rear or what I term the "butt" portion 4 of the central apex is made slightly convex or with the swell 5 on each face. The purpose of this is to change the discharge or flow of the waste or utilized water as the position of the bucket with reference to the impact-stream varies during the rotation of the wheel.

During the rotation of the water-wheel the discharge of the waste or utilized water of the impact-stream is at all times upon natural lines or curves. As the bucket enters or dips into the impact-stream (this position being indicated by the bucket 2 in Fig. 1) the waste water, following the curved bottoms, discharges from the rear curved walls $C' C^2$ to one side of and above the impact-stream, as indicated by the arrow 6, Fig. 1. During the downward movement of the bucket the waste water, owing to the water flowing against the convex or swelled portion of the central apex, is gradually turned to the sides of the bucket, so that by the time the bucket stands at a right angle to the stream, in which position the bucket receives the full impact blow of the stream, the waste water will flow from the pockets at the sides of the bucket in a direction reverse to but nearly parallel with the impact-stream or at an angle of nearly one hundred and seventy degrees (170°) to the stream, as indicated by the arrow 7, Fig. 3. This discharge is due to the fact that the waste water when the bucket stands at a right angle to the impact-stream must, in order to escape from the rear curved walls, flow upward or over the convex or swelled portion 5 of each pocket. It will not do this unless a portion of the power of the impact-stream be appropriated for the purpose of forcing the water over this obstacle. In order to do this, the waste water must react upon itself, which it will not do if a free uninterrupted escape is provided. This it finds by flowing over the side walls, the force of the water, after being divided by the central apex, being sufficient to carry it over the side walls. The position of the bucket while receiving the full impact blow of the stream is illustrated by the bucket 1, Fig. 2 of the drawings. As the bucket is carried past the axial line 8 of the wheel, or as it moves out of or away from the impact-stream, the position illustrated by the bucket 1, Fig. 1, the waste or utilized water will flow from the pockets *a a′* at the points *b* at the side walls near the front wall D^2, so that in such position the waste or utilized water will discharge from the buckets or pockets at the sides thereof, but below the impact-stream.

It will thus be observed that by the foregoing-described bucket the waste or utilized water is discharged at the rear curved walls at the side of and above the impact-stream

at the side walls on a plane with and at an angle of nearly one hundred and seventy degrees (170°) to the impact-stream and laterally to but below the impact-stream, the point of discharge depending upon the position of the bucket with reference to the impact-stream.

By so constructing the bucket that the point of discharge varies with the changed position of the bucket with reference to the stream the waste water is permitted to flow freely from the bucket without necessitating the appropriation of a portion of the available energy of the impact-stream in order to expel the utilized water from within the bucket, which is due to the fact that at no time does the waste water during the travel of the bucket react upon itself.

It will also be observed by reference to Fig. 2 of the drawings that my bucket is secured to the rim of the wheel, so as to stand at a perfect right angle to the impact-stream when receiving the full force of the stream.

Inasmuch as the rear and side walls of each bucket are inwardly inclined from top to bottom, the top portion of the bucket will be wider than the bottom portion. The waste water discharging upwardly from the rear curved walls above the impact-stream will consequently clear the bottom of the bucket arranged upon the periphery of the wheel above the bucket from which the water is being discharged. The rear discharge from one bucket is thus prevented from striking against or interfering with the succeeding bucket.

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

1. In a water-wheel bucket, the combination with the curved bottoms meeting at a central apex or sharp ridge, of the curved rear walls continuous with the curved bottoms, the curved rear walls being separated by a central portion beyond which the said curved walls inwardly extend, the front wall and of the converging side walls uniting the rear curved walls to the front wall of the bucket.

2. In a water-wheel bucket, the combination with the curved bottoms meeting at a central apex or sharp ridge so as to form two distinct pockets, the central apex or ridge being formed convex on each face at or near its butt-end, the curved rear walls forming a continuation of the curved bottoms, the rear curved walls being separated by a central portion beyond which the said curved walls inwardly extend, the front wall, and the converging side walls which unite the front wall to the rear curved walls.

In testimony whereof I affix my signature, in presence of two witnesses, this 31st day of October, 1896.

EDWARDS P. JONES.

Witnesses:
N. A. ACKER,
LEE D. CRAIG.