R. SIEGMUND.

WATER WHEEL BUCKET.

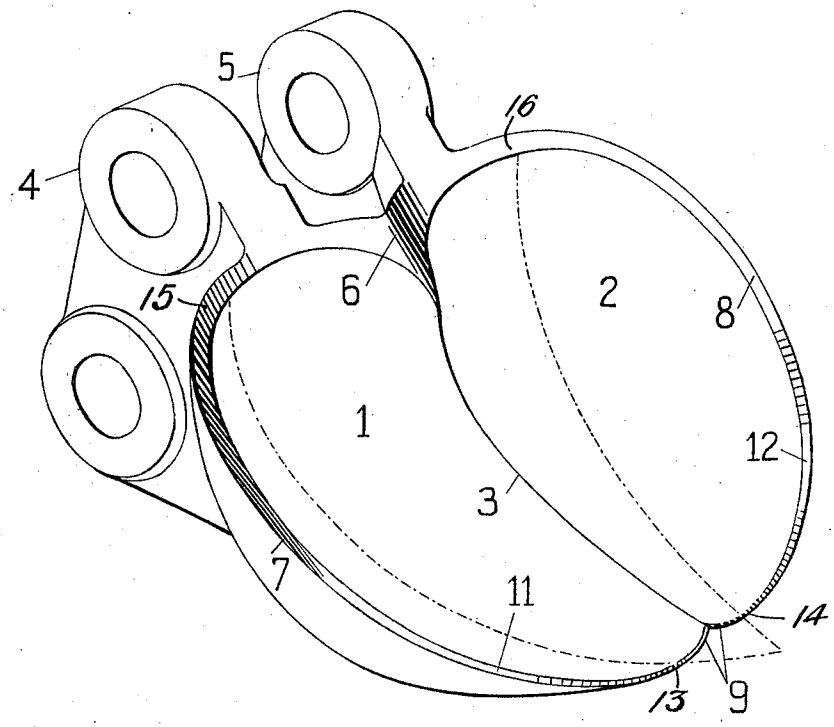
APPLICATION FILED APR. 19, 1906.

1,037,065.

Patented Aug. 27, 1912.

2 SHEETS—SHEET 1.

Fig. 1.



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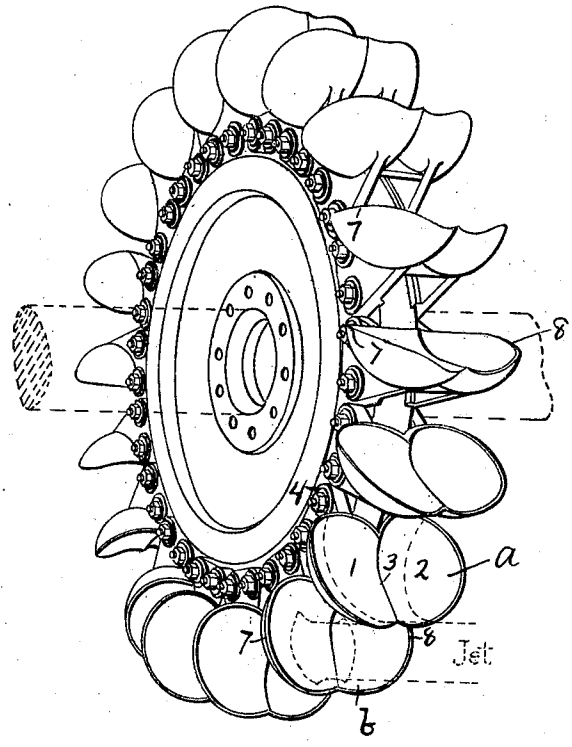
2 SHEETS—SHEET 2.

Fig. II.



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RUDOLPH SIEGMUND, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO ALLIS-CHALMERS COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF NEW JERSEY.

WATER-WHEEL BUCKET.

1,037,065. Specification of Letters Patent. **Patented Aug. 27, 1912.**

Application filed April 19, 1906. Serial No. 312,531.

To all whom it may concern:

Be it known that I, RUDOLPH SIEGMUND, a subject of the Emperor of Austria-Hungary, but having declared my intention to become a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Water-Wheel Buckets, of which the following is a specification.

This invention relates to certain new and useful improvements in tangential jet water wheels which are rotated by power derived from the jets or streams of water impinging upon or within a series of buckets secured to the rim of the wheel.

The object of the invention is to so shape the bucket as to abstract the maximum power from the jet as it impinges against the buckets of the wheel. The shape of the bucket also permits of the use of a jet of water which is projected with great force in a plane at right angles to the axis of the wheel and in a line tangent to the circle of buckets. As the wheel revolves, each bucket in turn dips into the jet and receives the full force or impulse of the stream of water.

Figure 1 is a perspective of a water wheel bucket embodying this invention. Fig. 2 is a perspective of a water wheel with buckets attached thereto.

The bucket consists of two intersecting ovoid shaped pockets 1, 2, having their widest part toward the rear and diverging rearwardly. Their line of intersection is depressed below the rim of the two pockets and forms a dividing edge 3 for the stream of water. The dividing edge 3 extends reentrantly into the bucket, being curved at a portion of its length. The mid portion of the dividing edge 3 projects less distance above the bottoms of the pockets 1, 2, of the bucket than immediately adjacent portions of the edge, see Fig. 1.

The bucket is attached to the wheel by means of lugs 4, 5, projecting from the rear of the bucket and bolts clamping the lugs to the wheel. The deepest portion in each of the two pockets 1, 2, is represented in the drawing by a dotted line. These two lines are shown as converging toward the front of the bucket, and their divergence toward the rear of the bucket and away from the sides of the wheel is gradually increasing. That is, the divergence of the lines of deepest portions of the pockets at the rear of the bucket is greater than the divergence of the lines of deepest portions of the pockets at the front of the bucket. This formation of bucket causes the water to be gradually turned aside so as to be discharged from the rear of the bucket on either side of the wheel so as not to be thrown against the outside of the succeeding bucket and thus cause retardation of the wheel.

At the rear end of the dividing edge 3, the bucket rim forms a projection 6 on the rim of the bucket. The side edges 7, 8, of the pockets 1, 2, are also projected out from the plane of the low points 13, 14, 15, 16 of the rim of the bucket. The same is true, but to a less degree, of the front portion 9 of the rim of the bucket directly at its intersection with the front end of the dividing edge 3; but this front portion is not projected out from the plane of the low points 13, 14, 15, 16, to as great an extent as the rear projection 6 of the rim. Moreover, portions of the rim of the bucket adjacent the front portions or low portions 13, 14, of the bucket slope gradually away from the radial plane of the wheel passing through the low points 13, 14, and the forward portions 11, 12, of the side edges of the pockets 1, 2, are projected a maximum distance out from the plane of the low points 13, 14, 15, 16 of the edge of the bucket or as measured circumferentially. This maximum projection of the forward portions 11, 12, insures maximum abstraction of energy from the jet as the bucket is about to leave the arc of action of the jet. The latest discharge of water from the bucket will be at the forward portions 11, 12, and these being projected to a maximum will insure the continuation of the force of reaction of the water upon the bucket to a maximum.

It should be noted that the bucket constructed as described is narrow in front and that the front portion of the rim of the bucket is slightly reëntrant viewed in a direction of the entering jet to cause the two points 13, 14, of the edge to enter the jet before the dividing edge 3 comes under its action. This front portion of the rim of

the bucket is made sharp for the purpose of properly cutting into the jet. This causes the stream to commence its division on the front portion of the bucket rim and later continue the division by the dividing edge 3. It is not necessary therefore to extensively cut away the front edge of the bucket so as to form a notch to pass the jet in the entering buckets and thus lose the effect of such cut-away portion. Fewer buckets are therefore necessary for a wheel and greater efficiency insured.

The shape of the bucket above described is adopted in order that the full effect of the jet may be utilized for turning the wheel. The underlying principle of these buckets is that they receive a jet of water directed against them, and by turning the jet from its original direction, the energy of motion of the jet is converted into motion of the bucket and wheel, the water, as the result of this conversion of energy, losing its velocity and dropping dead from the bucket under the influence of gravity. Three stages of action must be recognized in the operation of a bucket. First, the action of the bucket when entering the jet. Second, the action of the jet within the bucket. And third, the action of the bucket in leaving the jet.

By referring to Figs. 1 and 2 of the drawings it will be seen that the action of this bucket in entering the jet may be compared to that of a shovel dipped into the jet at a very slight inclination with respect to the axis of the jet.

By referring to Fig. 1 of the drawings and the bucket marked *a* on Fig. 2, it will be noticed that at the rim each of the pockets 1 and 2 of the bucket is extended beyond the dividing edge 3 formed at the junction of the two pockets as viewed in the direction of the entering jet and using the term "beyond" in the sense of direction away from the bucket, and this construction permits these extended parts of the pockets to be tangent to the entering jet while the dividing edge 3 does not at that time touch the entering jet. By "entering jet" is meant the jet as referred to the bucket about to enter the jet. By the term "in the direction of the entering jet" is meant the direction in which the view is to be taken or considered and the view so considered will be that of parts as projected on a plane at right angles to the jet and at a time when a bucket is about to enter the jet. When the bucket is entering the jet, these extended portions of the bucket enter the jet first and the water is directed through the pockets in the general directions indicated by the dotted lines on the drawings. This construction permits a bucket to enter the jet without disturbing the jet except to direct it into new paths of movement, and, by the peculiar construction of bucket shown, the jet is divided into two portions because of the two separate paths provided for it by the bucket before the water has touched the dividing edge 3 at all.

In order to utilize the full effect of the jet without loss of energy due to disturbing the water in bringing it to rest, this bucket is shaped to utilize both the impact and the reaction of the jet. When the bucket first enters the jet, the reaction of the jet is fully utilized. As the bucket dips deeper into the jet, and when it comes into the position of the bucket marked *b* on Fig. 2, and is receiving the full impact of the jet by directly opposing the jet, the greatest impulse effect is experienced by the bucket, and to provide for the easy and unobstructed escape of the water from the bucket when in this position, while at the same time realizing the complete reactive effect, the sides of the bucket in line with the jet, as at 7 and 8, are extended somewhat in order to lengthen the path of the water within the bucket. When the bucket is leaving the jet, the length of the bucket allows the full effect of the jet to be utilized.

It will be seen by referring to the drawings that this bucket by dividing the jet before the jet is impacting against the bucket, except at its sharp front end, causes the bucket to cut into and through the jet without causing commotion and disturbance of the jet, as is common with other types of buckets.

It is claimed and desired to secure by Letters Patent:

1. A water wheel bucket having two ovoid pockets separated by a dividing edge, the front portions of the bucket being extended beyond the front end of said dividing edge, as viewed in the direction of the entering jet, whereby the pockets enter the jet before the dividing edge receives the impact of the jet.

2. A water wheel bucket having two ovoid pockets separated by a dividing edge, the front portions of the bucket being extended beyond the front end of said dividing edge, as viewed in the direction of the entering jet, and the sides of the bucket being extended out from the plane of the low points of the bucket rim or measured circumferentially.

3. A water wheel bucket having two ovoid pockets separated by a dividing edge, the front portions of the bucket being extended beyond the front end of said dividing edge, as viewed in the direction of the entering jet and said dividing edge extending reëntrantly into said bucket.

4. A water wheel bucket having shallow ovoid pockets separated by a continuously reëntrant dividing edge, the front portions of the bucket being extended beyond the

front end of said dividing edge as viewed in the direction of the entering jet.

5. A water wheel bucket having two shallow ovoid pockets separated by a dividing edge, the front portions of the bucket being extended beyond the front end of said dividing edge as viewed in the direction of the entering jet, whereby the pockets enter the jet before the dividing edge receives the impact of the jet.

6. A water wheel bucket having two shallow ovoid pockets separated by a dividing edge, the front portions of the bucket being extended beyond the front end of said dividing edge as viewed in the direction of the entering jet, and said dividing edge extending reëntrantly into said bucket.

7. A water wheel bucket having a pair of ovoid pockets separated by a dividing edge, the mid portion of said edge projecting to less distance from the bottom of said ovoid pockets than immediately adjacent portions of said edge, and the front portion of said edge projecting from said pockets to a greater extent than front portions of the rim of said bucket as measured in a circumferential direction.

8. A water wheel bucket having ovoid pockets separated by a dividing edge, the front portions of the bucket being extended beyond the front end of said dividing edge as viewed in the direction of the entering jet, and portions of the rim of said bucket immediately adjacent said projecting front portions sloping gradually away from the low points of said front portions of said bucket.

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

RUDOLPH SIEGMUND.

Witnesses:
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H. C. Case.