(No Model.) 3 Sheets—Sheet 1.

W. H. RIDGWAY.

JET OR IMPACT WATER WHEEL.

No. 453,449. Patented June 2, 1891.

FIG. 3.

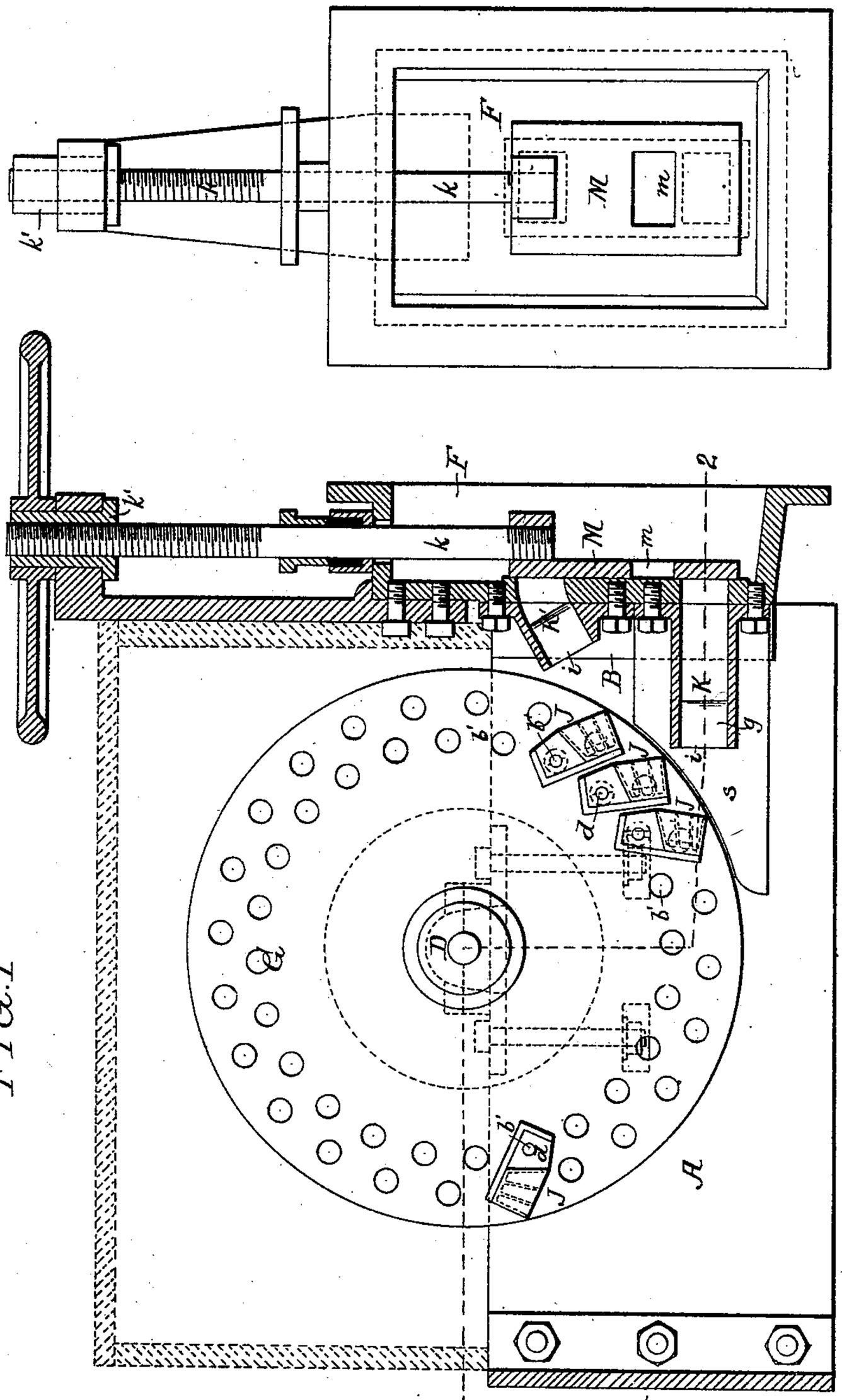

FIG. 1

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Inventor:
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FIG. 2

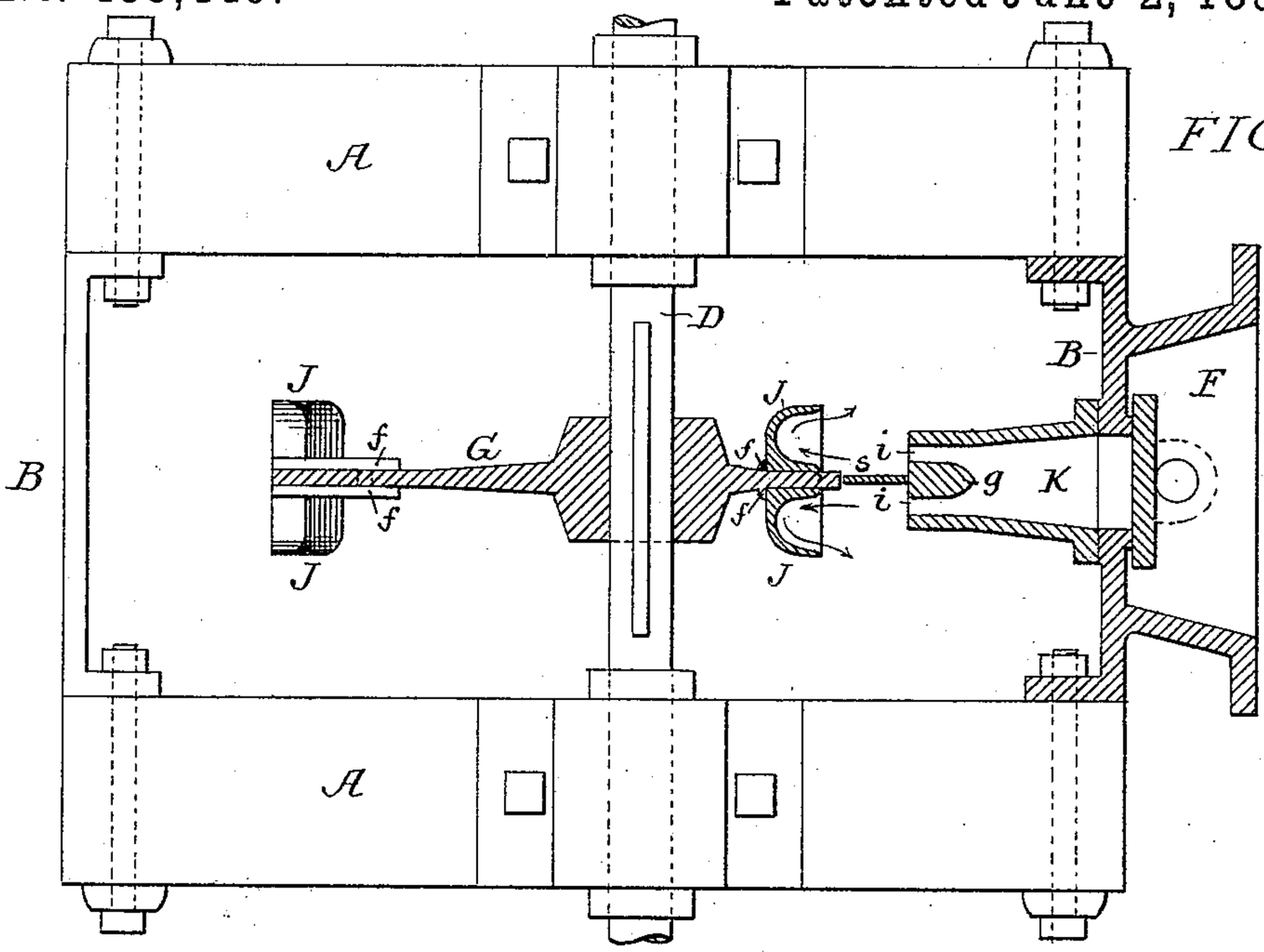


FIG. 9.

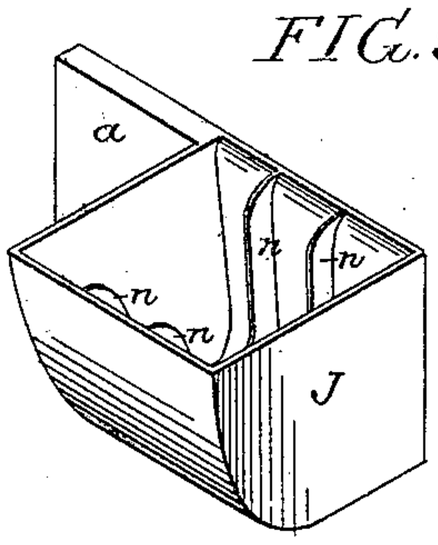


FIG. 10.

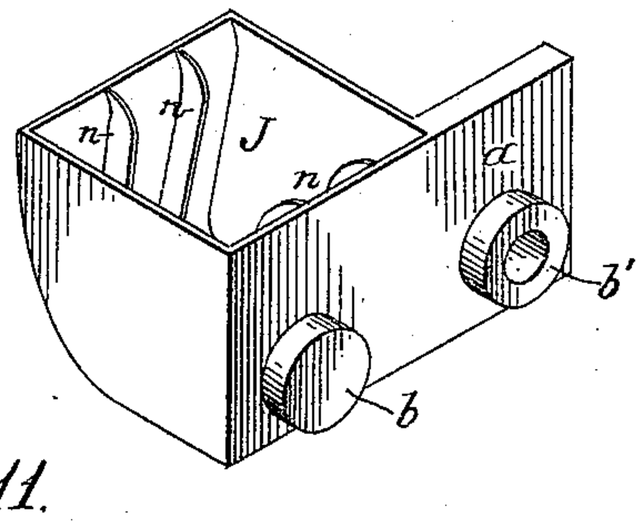
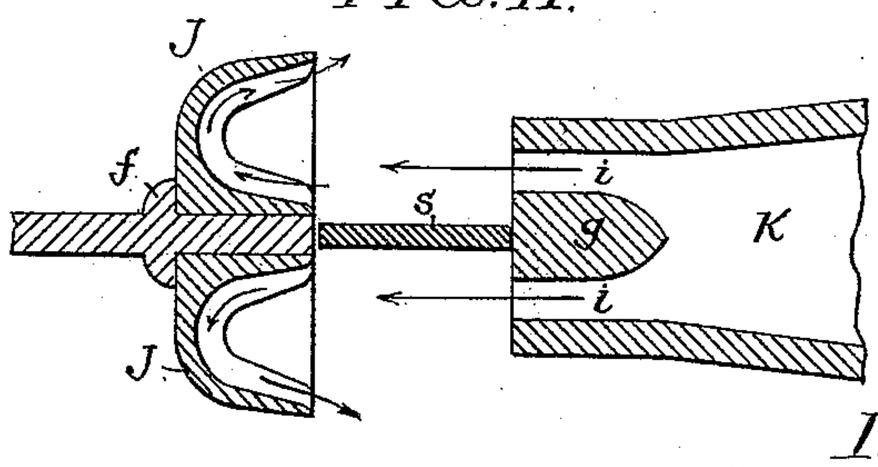


FIG. 11.



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(No Model.) 3 Sheets—Sheet 3.

W. H. RIDGWAY.

JET OR IMPACT WATER WHEEL.

No. 453,449. Patented June 2, 1891.

FIG. 4.

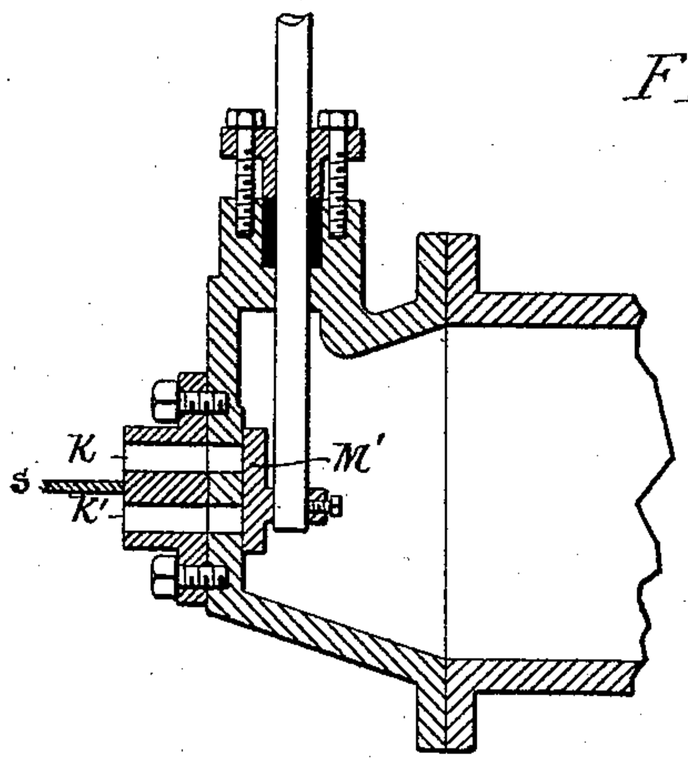


FIG. 5

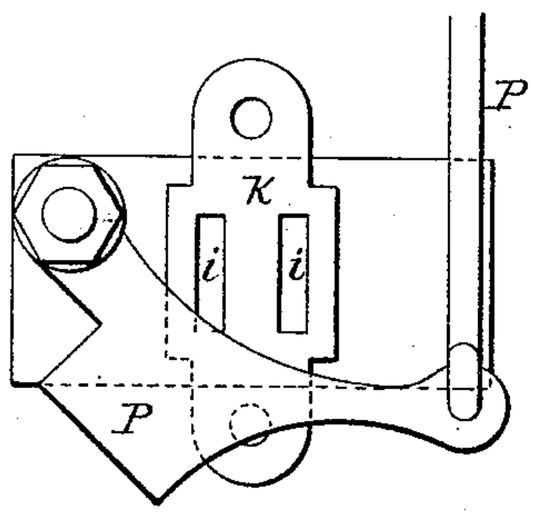


FIG. 7.

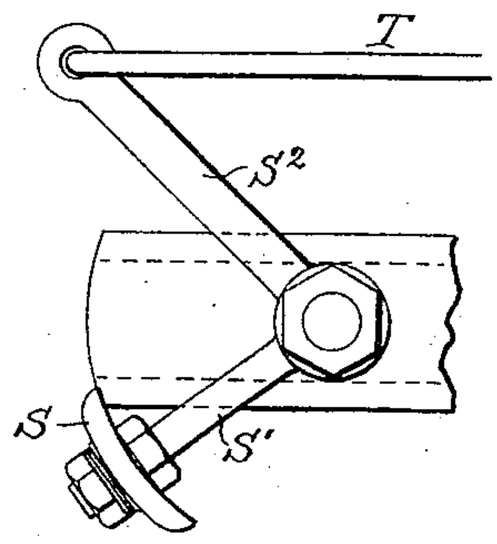


FIG. 6.

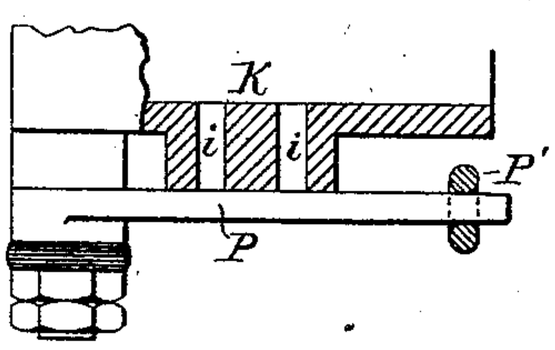
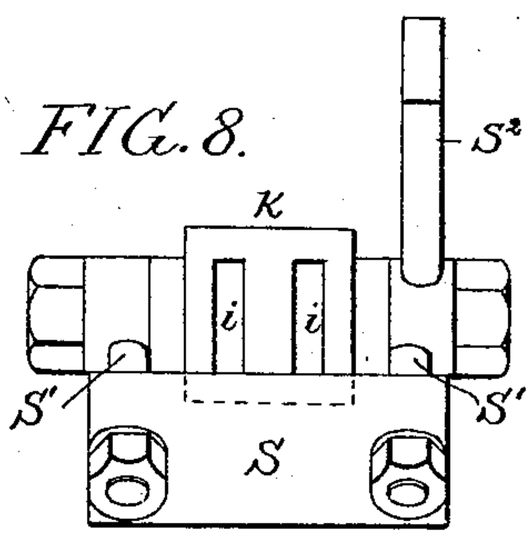


FIG. 8.



Witnesses:
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Inventor:
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by his Attorneys
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UNITED STATES PATENT OFFICE.

WILLIAM H. RIDGWAY, OF COATESVILLE, PENNSYLVANIA.

JET OR IMPACT WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 453,449, dated June 2, 1891.

Application filed July 10, 1890. Serial No. 358,260. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. RIDGWAY, a citizen of the United States, and a resident of Coatesville, Chester county, Pennsylvania, have invented certain Improvements in Jet or Impact Water-Wheels, of which the following is a specification.

One of the objects of my invention is to so construct a jet or impact water-wheel as to secure the desirable qualities of strength and compactness, a further object being to so construct the device that a high percentage of the full theoretical power of the water may be utilized and the power of the wheel readily graduated to accord with varying requirements. These objects I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal section, partly in elevation, of a jet or impact water-wheel constructed in accordance with my invention. Fig. 2 is a sectional plan view of the same, on the line 1 2, Fig. 1. Fig. 3 is a front view of the valve-box. Fig. 4 is a sectional plan view of another form of valve-box and valve constructed in accordance with my invention. Figs. 5 and 6 are respectively a front view and a plan view, partly in section, illustrating a cut-off valve for the jet-nozzle. Figs. 7 and 8 are respectively a side view and a front view of a different form of cut-off valve. Figs. 9 and 10 are respectively front and rear perspective views of one of the buckets of my improved impact water-wheel, and Fig. 11 is an enlarged diagram illustrating the action of the jets on the buckets of the wheel.

The frame-work upon which the wheel is mounted consists of opposite side bars A A and end plates B B, the side bars carrying the bearings for the wheel-shaft D and one of the end plates carrying the valve-box F, which is in communication with a supply of water under pressure.

The wheel consists of a disk G, having a hub keyed upon or otherwise rigidly secured to the shaft D, each side of this disk having around its periphery a series of buckets J. The ends of each bucket are straight and parallel with each other; but the opposite sides of each bucket are inclined or flared from the rounded bottom of the bucket to the outer edges, so that a jet of water directed against the inner flaring side of the bucket will follow the rounded bottom of the same and the outer flaring side, as shown in Fig. 11, and will exert a propulsive force upon the bucket until it leaves the same. Each bucket has a web or plate *a*, and on the inner side of each bucket are lugs *b* adapted to openings *b'*, formed in the disk G, the lugs formed on the plates *a* of the buckets being perforated for the reception of transverse securing-bolts *d*, each bolt passing through the disk and through the plates *a* of buckets on the opposite sides of the same, so that each bolt serves to secure two buckets in place on the disk.

The lugs *b*, seated in the openings in the disk G, serve to relieve the securing-bolts *d* from strain, and in order to still further relieve these bolts, the disk G has formed upon it a series of angular ribs *f*, against which each bucket is seated when secured in position upon the disk.

The valve-box F (shown in Figs. 1, 2, and 3) is provided with two projecting nozzles K K', located one above the other, so as to discharge successively into the buckets as the disk G is rotated, and each of these nozzles has at the delivery end a central partition *g*, in line with the disk G, so that each nozzle is divided at the delivery end into two jet-openings *i*, one discharging into the buckets on one side of the disk and the other into the buckets on the opposite side of the same.

A single valve M controls the flow of water into both nozzles, the valve being operated by a rod *k*, threaded for the action of an operating-nut *k'*, and said valve M has a port *m*, which serves to open the upper nozzle K' as the movement of the valve is continued after opening the lower nozzle K. By this means one or both nozzles may be used, depending upon the desired power to be developed by the wheel.

Another plan of duplex-nozzle arrangement in which one nozzle can be used independently of the other is that shown in Fig. 4. In this case there are two nozzles K K', side by side, one discharging into the buckets on one side of the disk, and the other into the buckets on the other side of the same, the flow of water into these nozzles being controlled by a laterally-moving valve M', so that one nozzle

may be in action while the other is out of action, water being consequently delivered either to the buckets on one side of the disk only or to buckets on both sides of the disk.

It is advisable in a jet or impact water-wheel having buckets such as described to employ a thin jet of water, so that it will strike upon the inner side of the bucket only. Hence in order to provide for such a thin jet and yet insure a jet of considerable volume I make each of the jet-openings *i* oblong in shape, the longitudinal line of the opening being in a plane parallel with the plane of the disk. This form of jet, moreover, provides for the convenient reduction of the area of the jet when it is desired to reduce the consumption of water and the power developed by the wheel, more or less of the jet-opening being in such case cut off in the direction of the length of the opening, so that the full width of the jet is maintained in order to insure the most effective action of the water striking the bucket. This reduction in the area of the jet-opening may be effected by simply inserting a plug which partly fills the opening, but the preferable plan is to provide a cut-off plate for the delivery end of the jet-opening, so that by the adjustment of this plate more or less of the opening in the direction of the length of the same may be covered. One form of such cut-off is shown in Figs. 5 and 6, the cut-off plate P in this case being hung at one side of the jet-nozzle and connected at the opposite side of the same to a suitable operating-rod P′, so that it may be swung across the jet-openings to cover or expose the same, as desired.

Another form of cut-off plate is that illustrated in Figs. 7 and 8, the cut-off plate S in this case traveling across the segmental end of the nozzle and being hung to arms S′, having hubs turning upon studs projecting laterally from the nozzle, one of said hubs having another arm S^2, to which is connected a suitable operating-rod T.

It will be observed that as the disk G rotates and carries its buckets past the nozzles the jet first enters the forward end of the bucket, the latter being carried farther and farther into the jet as the disk rotates.

When only a part of the full jet is acting, a certain percentage of its force is lost if it is allowed to spread into the advancing portion of the bucket. Hence I prefer to divide each bucket into a series of chambers by means of ribs or flanges *n* projecting into the bucket from the bottom and sides of the same and following the contour of the bucket, as shown more clearly in Fig. 9, for by this means the spread of the partial jet into an empty bucket when the water first enters the same is effectually prevented, and said partial jet is so confined as to exert its maximum propulsive effect upon the bucket.

In order that the jets of water issuing from the tangential nozzles may not strike the forward ends of the buckets as the latter are carried into the jets, said buckets are arranged upon the disk G at such an angle that their forward ends, when they enter the jets, are in a plane parallel with the planes of the jets or the front edge of the bucket is slightly in advance of that plane, as shown in Fig. 1.

In the construction shown in Figs. 1, 2, 4, and 11 the nozzle-plate has a thin projecting web *s*, the outer edge of which is on a curve of slightly greater radius than the periphery of the disk G, so that if the said web is set so as to be central in respect to the disk, and so as to just clear the same, the proper relation of the nozzles to the buckets will be insured. In case it is desired to use a cut-off-valve P or S this web is, of course, dispensed with.

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

1. The combination of the disk and the buckets on opposite sides of the same with a bolt passing through the disk and through opposite buckets and serving to secure said buckets to the disk, substantially as specified.

2. The combination of the disk having openings therein with buckets having projections adapted to said openings, and bolts for securing said buckets to the disk, substantially as specified.

3. The combination, in a jet or impact water-wheel, of the tangential nozzle and a disk having buckets with transverse partition-plates, whereby each bucket is divided into a series of chambers which are brought in succession into the path of the jet as the disk rotates, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM H. RIDGWAY.

Witnesses:

F. L. CAMPBELL,

H. E. WILLIAMS, Jr.