

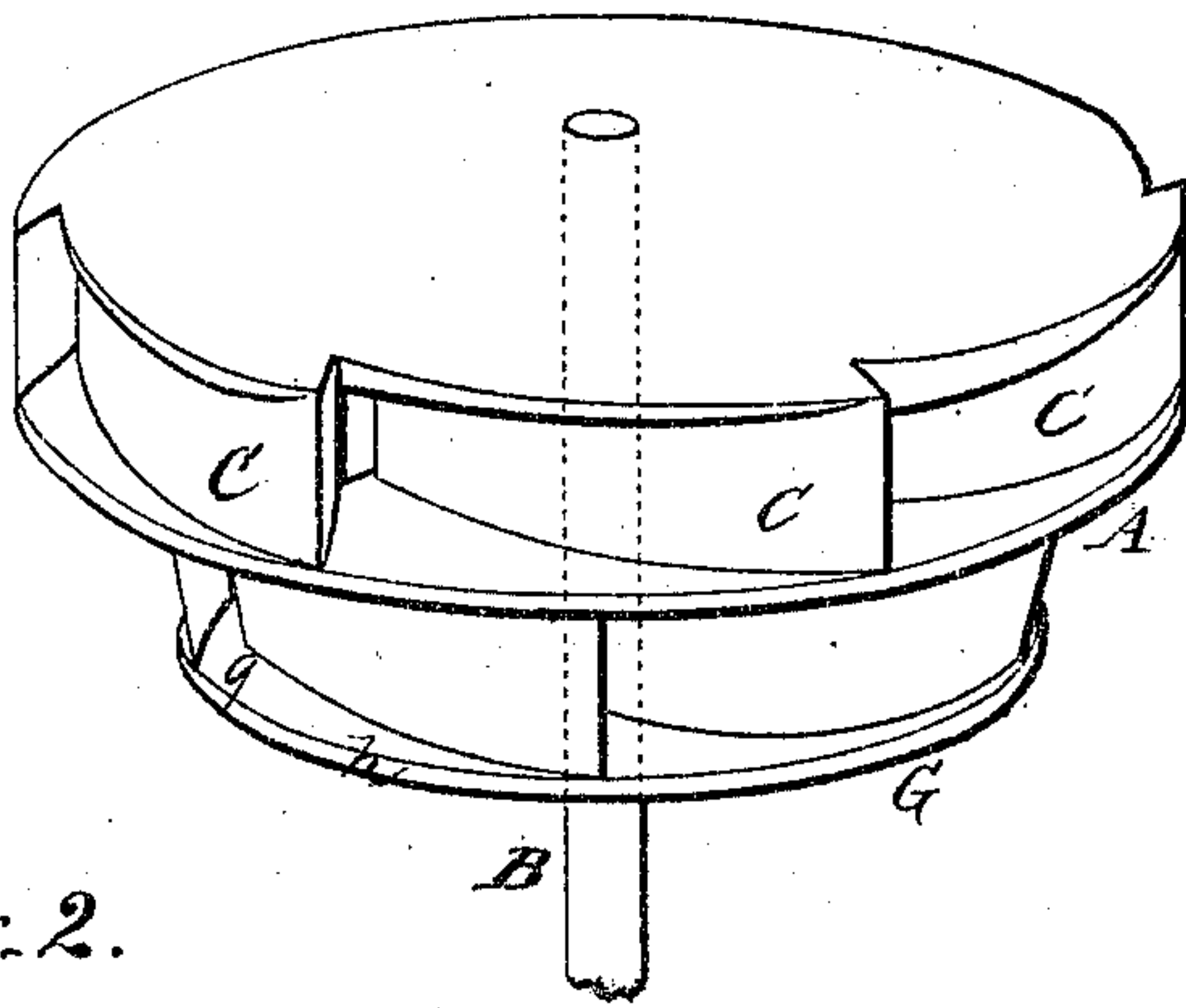
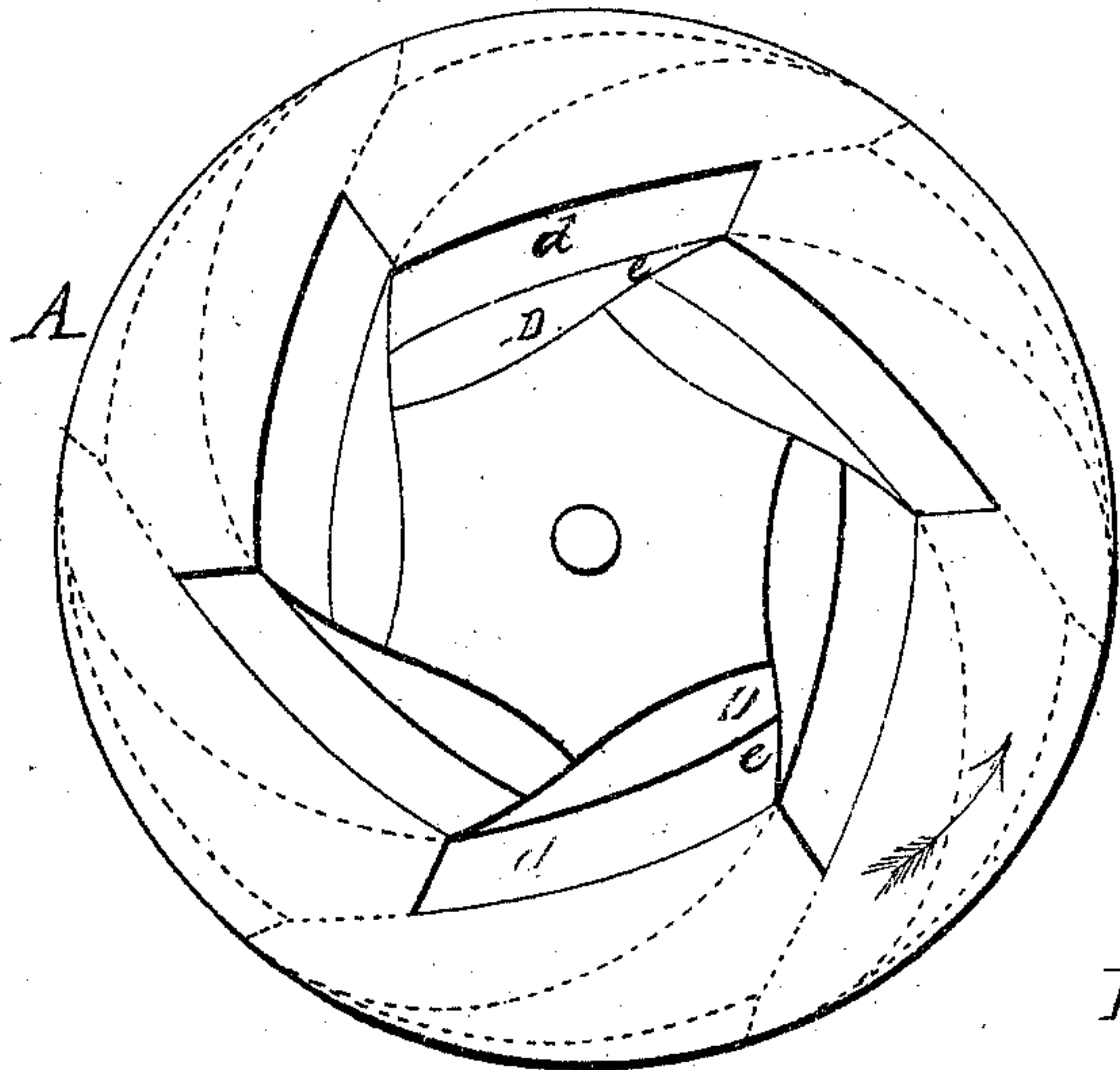
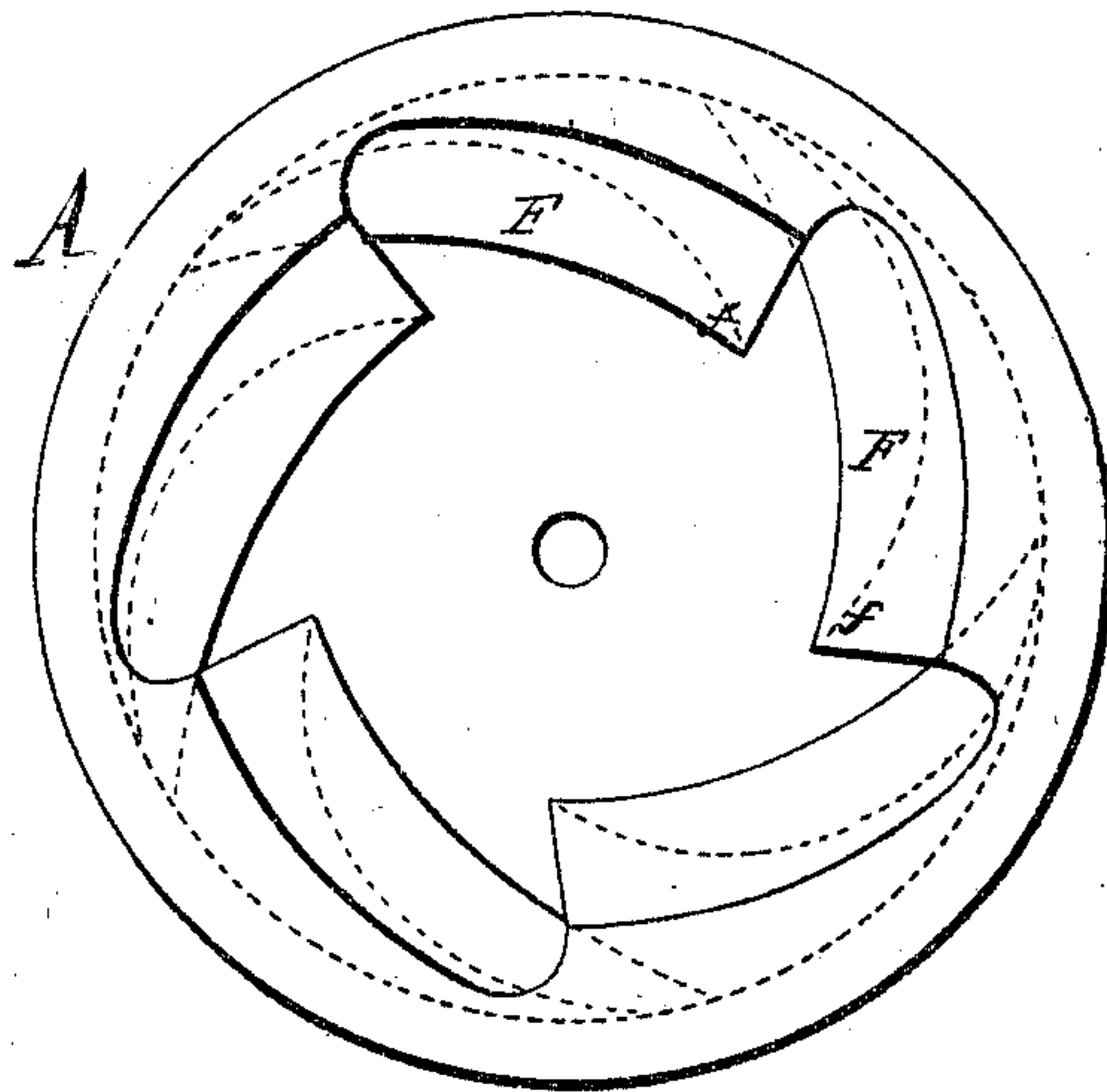
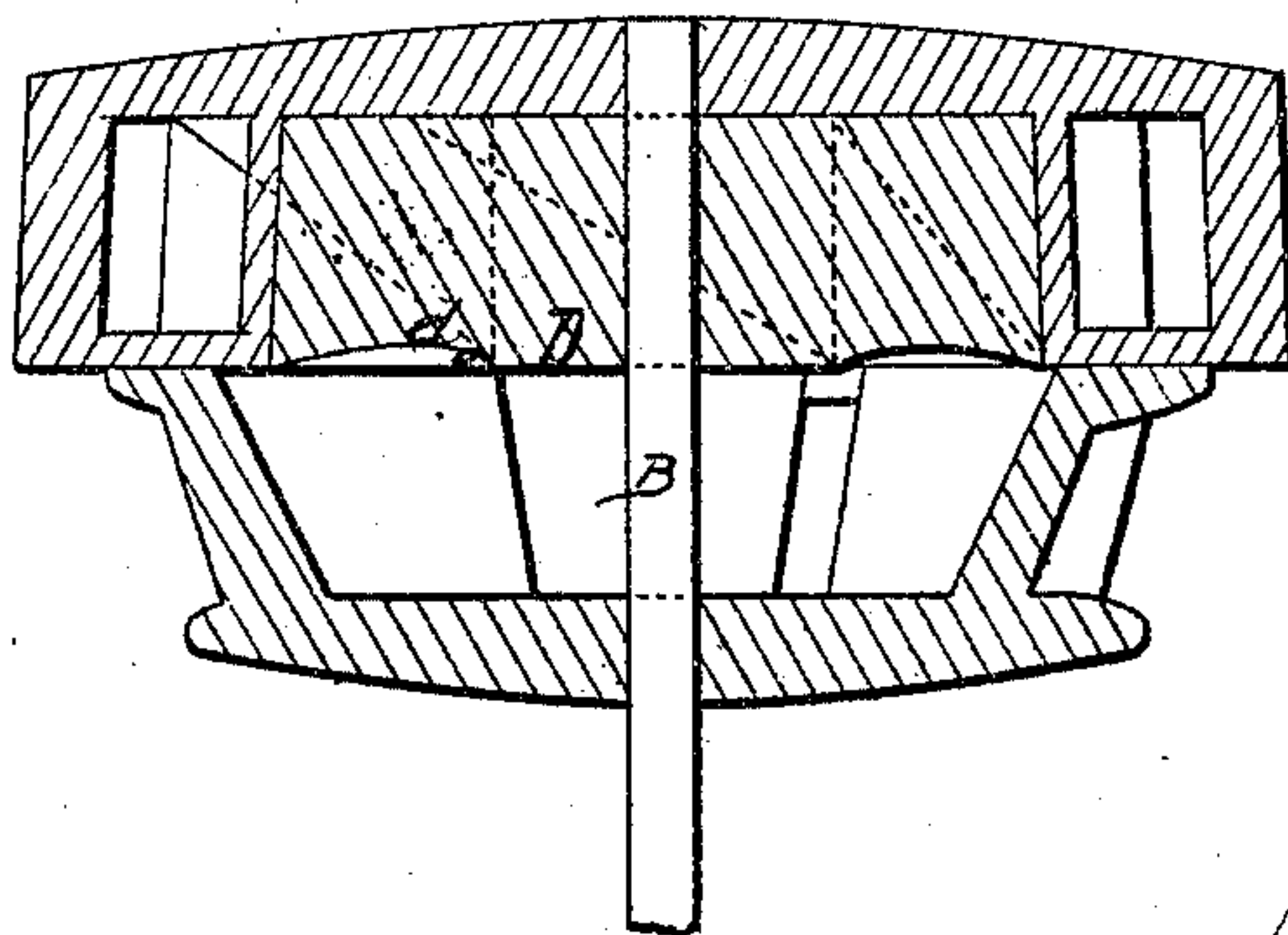
JOHN & B. MULLICA, Jr.

Water Wheels.

No. 122,732.

Fig. 1.

Patented Jan. 16, 1872.

*Fig. 2.**Fig. 3.**Fig. 4.*

Witnesses.

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Fig 5

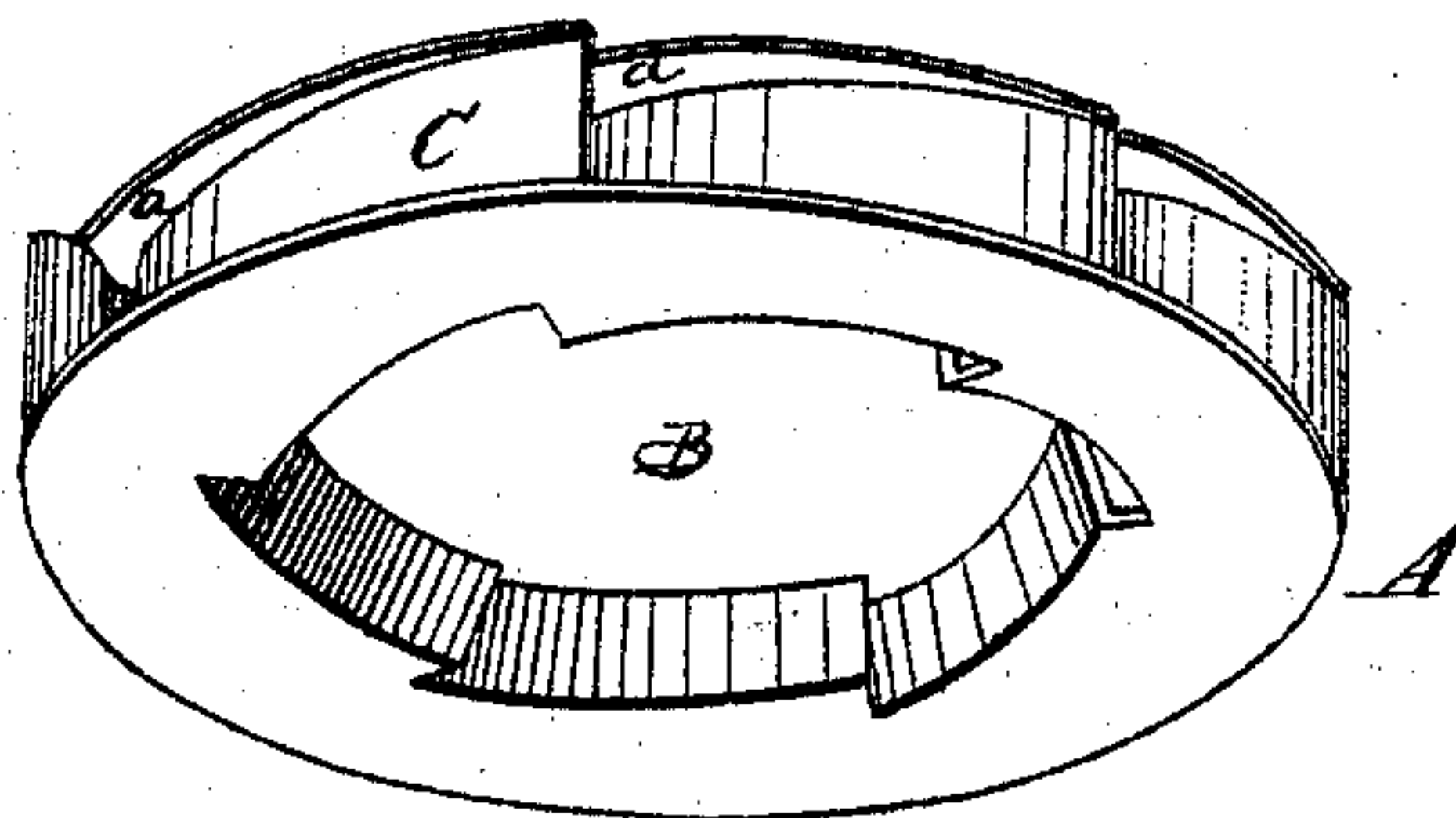
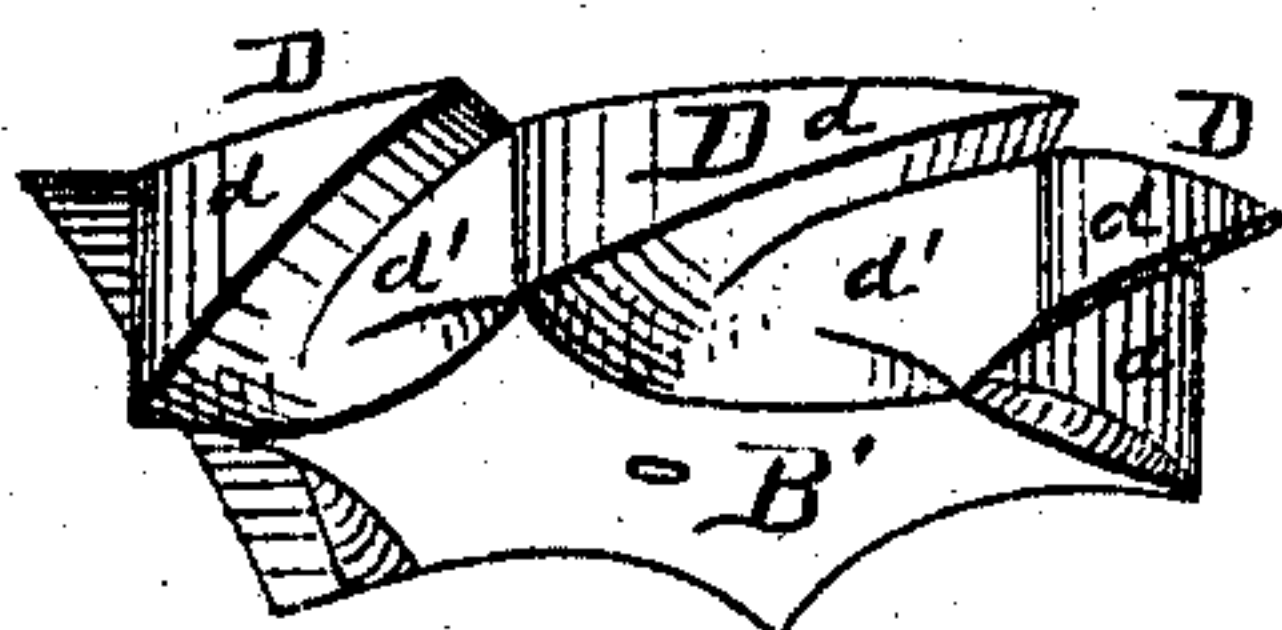
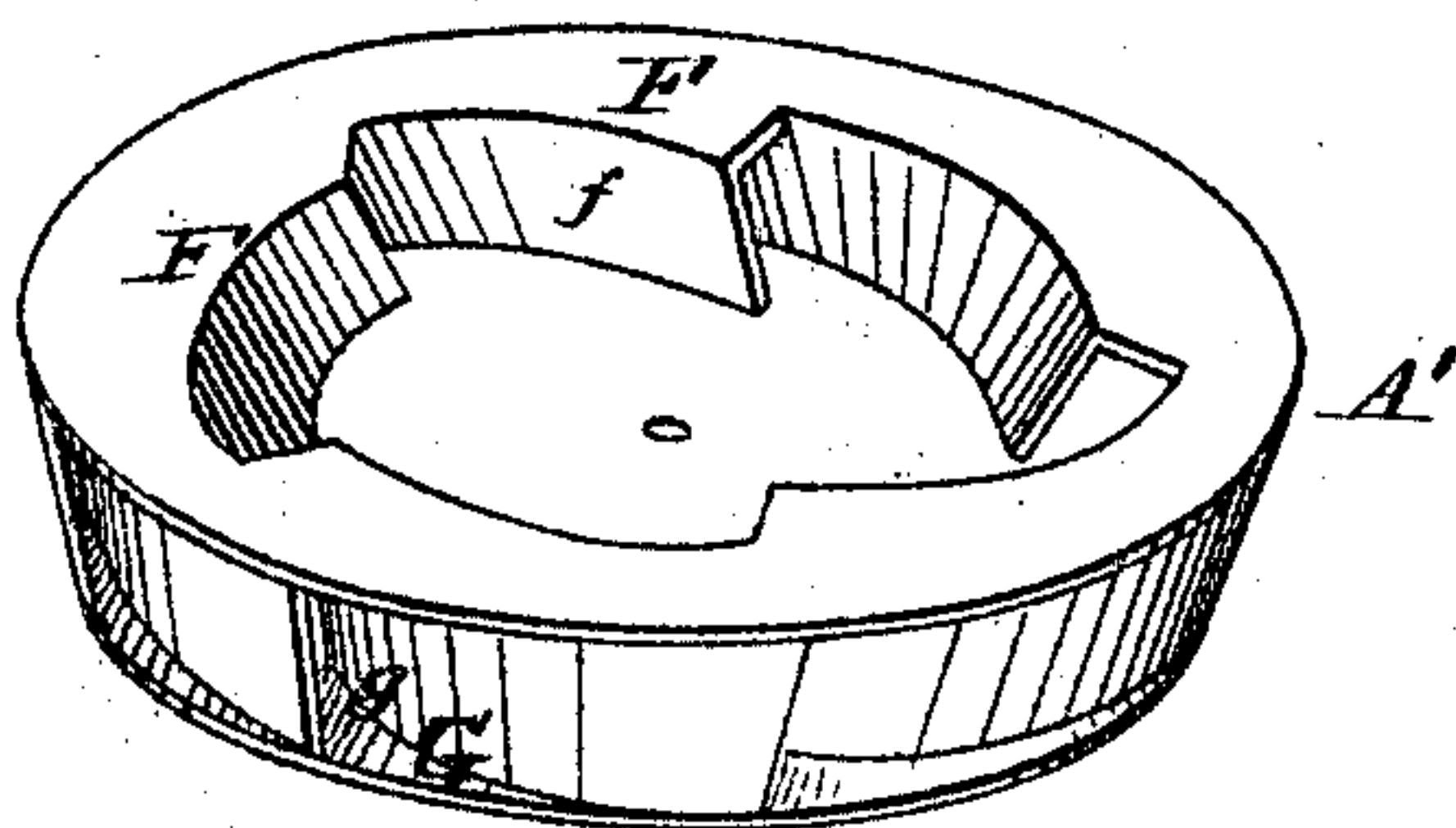


Fig. 6



Fig



Witnesses
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UNITED STATES PATENT OFFICE.

JOHN MULLICA AND BENJAMIN MULLICA, JR., OF WATERFORD WORKS,
NEW JERSEY, ASSIGNORS OF ONE-THIRD THEIR RIGHT TO ROBERT
A. HENNESSEY, OF SAME PLACE.

IMPROVEMENT IN WATER-WHEELS.

Specification forming part of Letters Patent No. 122,732, dated January 16, 1872.

To all whom it may concern:

Be it known that we, JOHN MULLICA and BENJAMIN MULLICA, JR., of Waterford Works, in the county of Camden and State of New Jersey, have invented a new and valuable Improvement in Turbine Water-Wheels; and we do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawing making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawing is a representation of our improved wheel inverted, in perspective. Fig. 2 is a top view of the lower half of our wheel. Fig. 3 is a bottom view of the upper half of our wheel. Fig. 4 is a central vertical section. Fig. 5 is a perspective view of upper section of our improved wheel. Fig. 6 is a perspective view of hub and internal buckets. Fig. 7 is a perspective view of lower section of wheel.

This invention has relation to turbine water-wheels; and it consists in the novel construction and arrangement of the buckets, which are disposed in three distinct sets or series, as hereinafter described.

The object of this invention is to utilize to as great an extent as possible, the force of the water, and to provide ample means of escape by the aid of which a complete discharge may be obtained at the verge of the wheel, without impeding its action or decreasing its power.

In the accompanying drawing illustrating this invention is shown a double turbine water-wheel, having the upper case A and the lower case A' each provided with a series of scroll buckets, marked respectively C F, and both secured to a vertical shaft, B. The buckets C commence at the periphery or verge of the case A, and thence curve inwardly in such directions that their sides, which correspond to the arcs of circles, if produced, would pass, or almost pass through the axial center of the wheel. The outer end of each bucket of the series C is beveled to a surface nearly radial to the center of the wheel, so as to receive the force of water more directly at or near the verge of the wheel where it will have the greatest effect. The roof *a*, between each pair of

buckets C, inclines downwardly toward the interior of the wheel, so as to direct the course of the water to a series of internal buckets, D. It is also formed with a slight bevel, facing the beveled ends of the buckets C, and designed for the purpose of throwing the water against said beveled ends, and also against the inner sides of the buckets. B' indicates the hub of the case A, located inside of the latter, and constructed with the series of buckets D, the vertical sides *d* of which coincide with the inner sides of the buckets C. The roofs of the buckets D incline downwardly from the upper part of the inner openings between the buckets C, and are in the nature of combinations of the roofs *a*, although more abrupt in their incline than the roofs A. The inner walls of the buckets D are marked *d'*, and are slightly screw-form or curled, as shown, so as to give the streams of water a whirl or "slush," as they pass to the lower buckets F, and thus increase their effectiveness. The water is thrown against these curled sides, from the inner sides of the buckets C, and after passing down, strikes the inner surfaces of the lower buckets F, which are inclined in such a manner as to receive the water directly from the buckets D. To receive the full force of the water deflected from the buckets D the roofs of these buckets should proceed nearly at right angles to the plane of the buckets F. The incline of the buckets F increases the effect of the water passing through the wheel, by reason of the nature of the action of the water applied as a motive power. Thus, considering water to combine two elements of force, one derived from its velocity, the other from its weight, the former element will gradually decrease in accordance with the manner in which the water is applied—as for instance, its meanderings through the various passages provided in a turbine water-wheel. Hence, in a wheel constructed as described, the velocity of the water lessens as the water proceeds from one to another series of buckets, and with the exception of the velocity caused by the weight of the water, is almost lost after passing the buckets D. Consequently if the buckets F were vertical the water would tend to fall as a dead weight on the floor of the case A', and

have no centrifugal force whatever. But the buckets being inclined, as shown, lie under or before the streams, and are thus necessarily affected by whatever force remains in the water. After the water has spent its power on the wheel it is discharged from the openings *g* at the verge of the lower case *A'*. In order that the discharge may be complete the floors of the discharge-passages, as well as the outer surfaces of the buckets *F* are inclined, as shown in the drawing at *G*, and have, therefore, a tendency to cast off the water and to prevent it remaining long enough to impede the action of the wheel.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In a turbine water-wheel, having an upper case, *A*, and a lower case, *A'*, we claim the inner series of buckets *D*, having vertical sides and inclined roofs, as described, in combination

with a series of surrounding scroll buckets, *C*, and a series of reaction buckets, *G*, arranged below them, substantially as described.

2. In a turbine water-wheel, having the upper case *A*, with scroll buckets *C*, and the lower case *A'*, with inclined scroll buckets *G*, we claim the series of buckets *D*, having inclined roofs, and constructed with a screw-shaped gain or depression, *d'*, to give the descending water a whirl, as and for the purpose specified.

In testimony that we claim the above we have hereunto subscribed our names in the presence of two witnesses.

JOHN MULLICA.

BENJAMIN MULLICA, JR.

Witnesses:

BARZILLAI W. BENNETT,
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(168)