

(No Model.)

F. M. BOOKWALTER.
WATER WHEEL.

No. 445,845.

Patented Feb. 3, 1891.

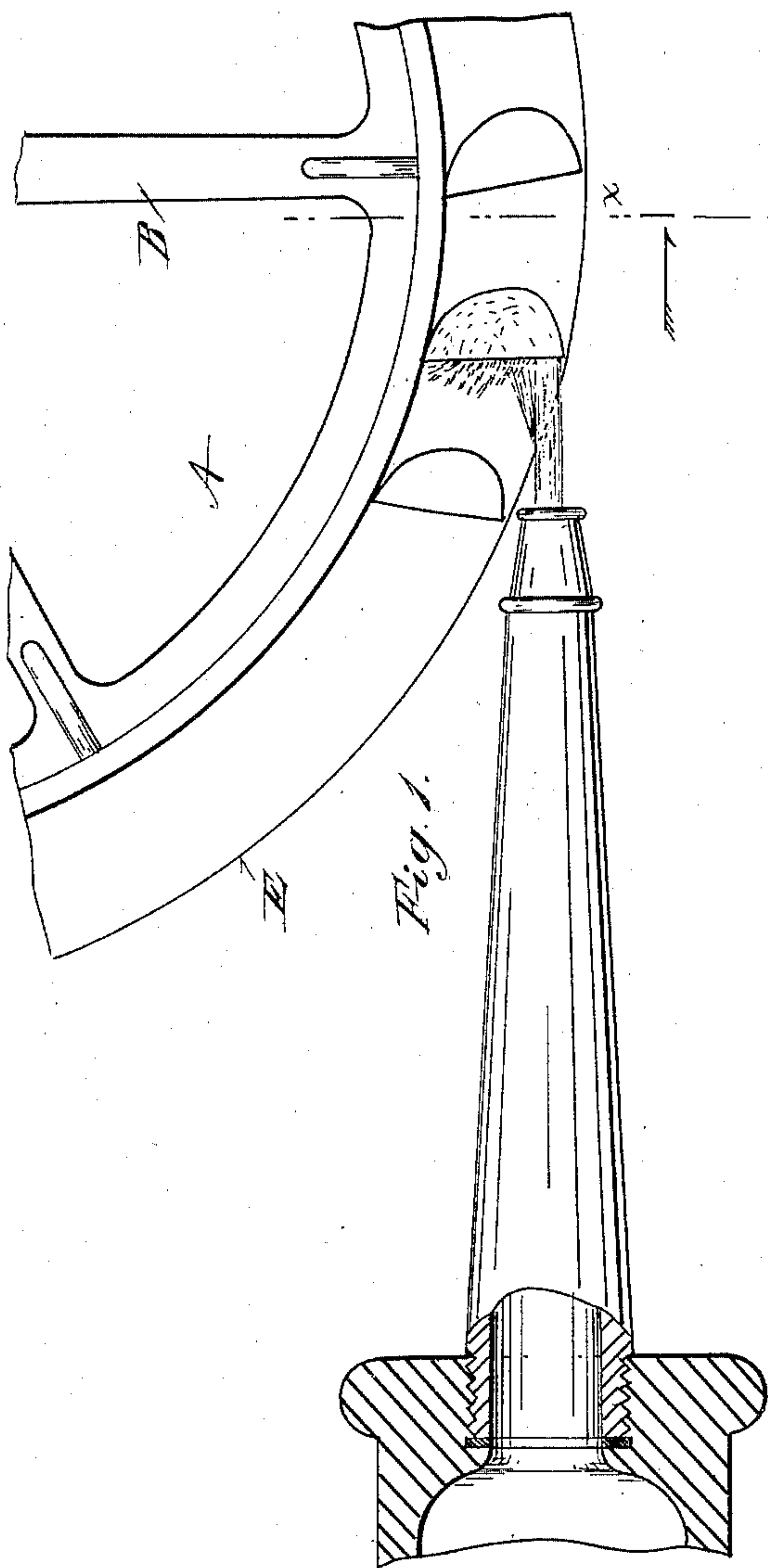


Fig. 1.

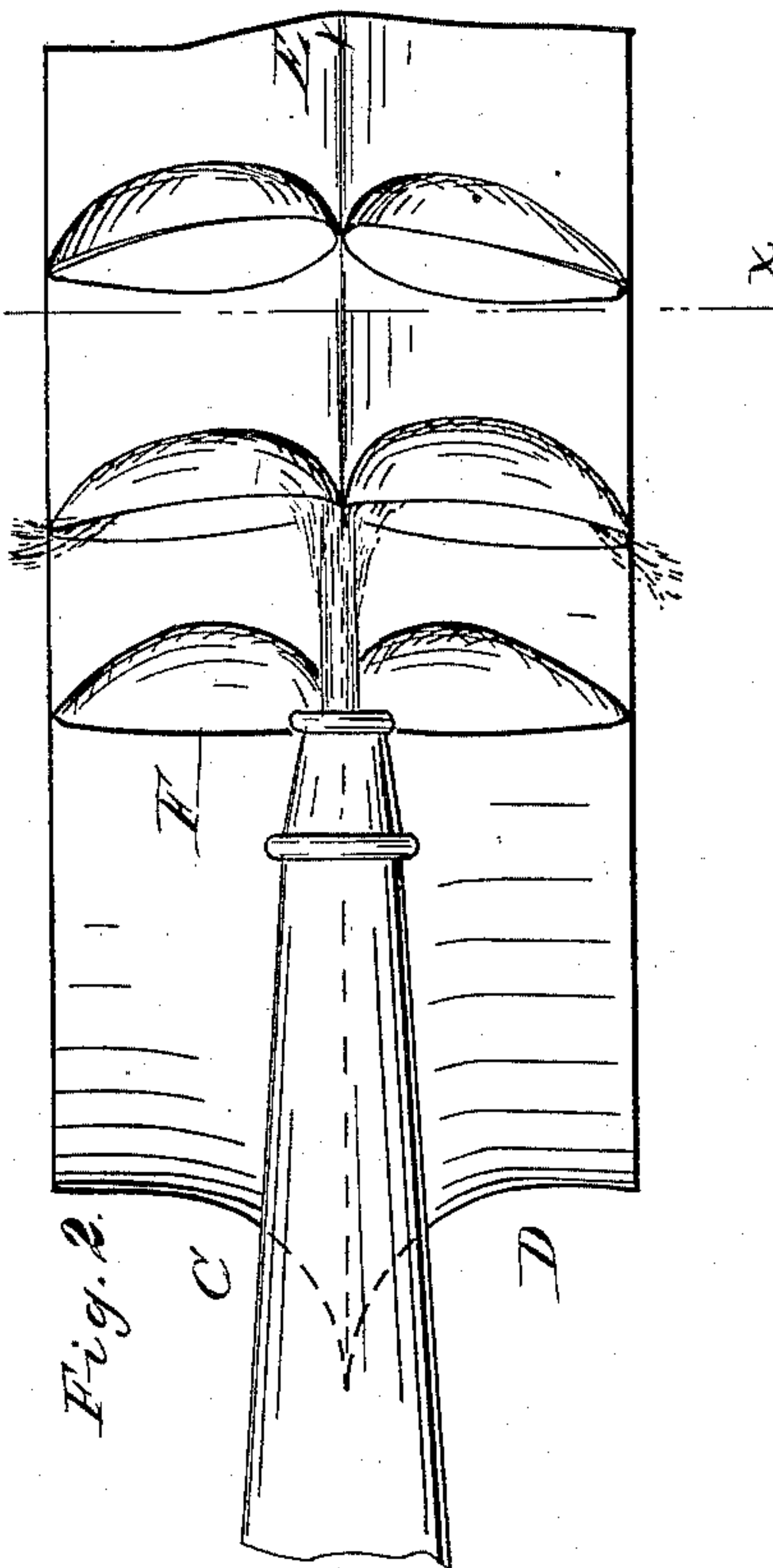


Fig. 2.

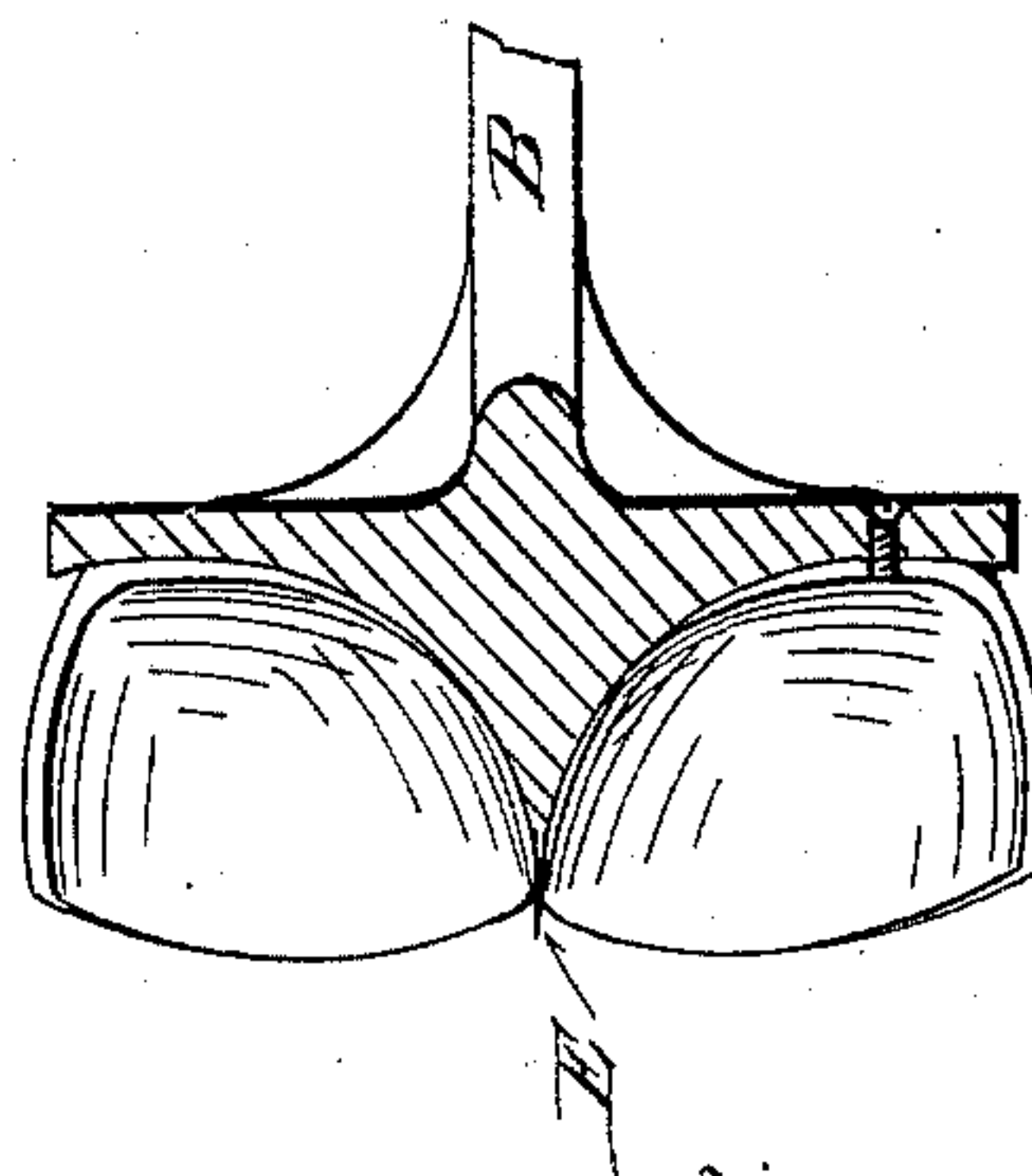
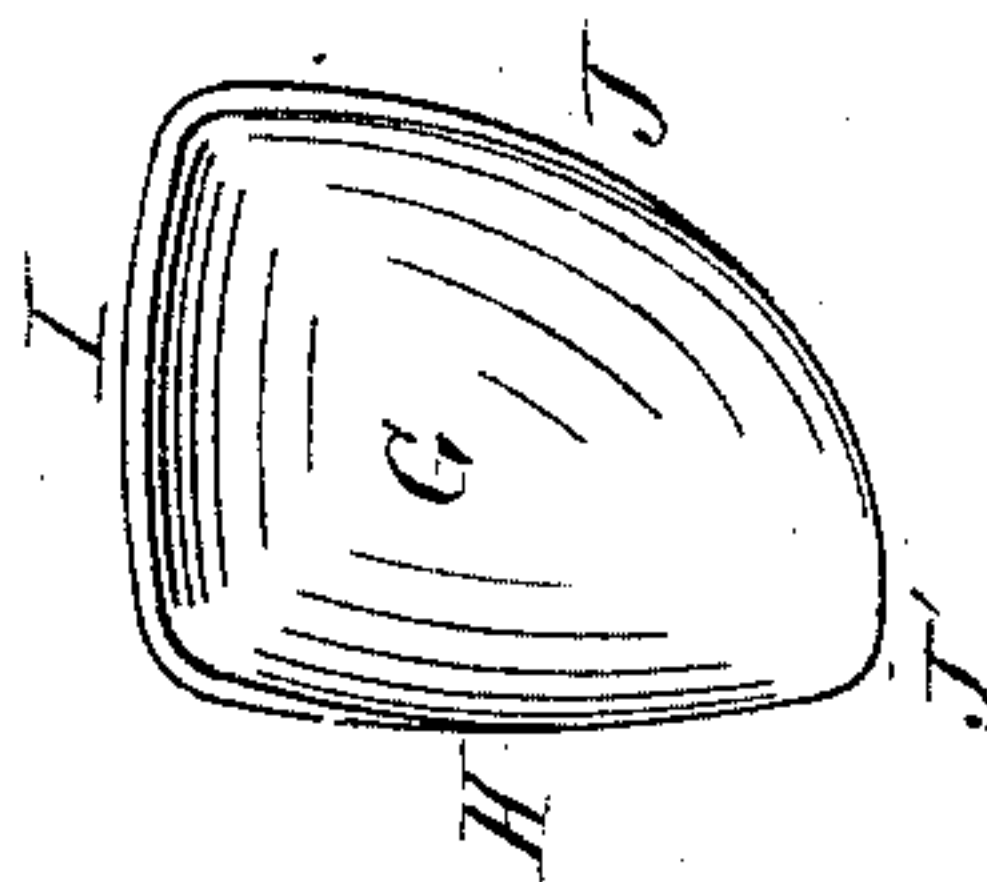


Fig. 3.

WITNESSES:

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Fig. 4.



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FRANK M. BOOKWALTER, OF SPRINGFIELD, OHIO.

WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 445,845, dated February 3, 1891.

Application filed October 2, 1890. Serial No. 366,812. (No model.)

To all whom it may concern:

Be it known that I, FRANK M. BOOKWALTER, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Water-Wheels, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to certain new and useful improvements in water-wheels, and is of the type known as the "hurdy-gurdy" wheel, in which a stream of water is projected into buckets to impart rotary motion to the
15 wheel.

The essential object of my invention is to provide a wheel having a periphery adapted to divide a stream of water into two parts or portions and to equip to such a wheel or
20 combine therewith water-receiving buckets having a contour adapted to direct the water laterally and discharge the same therefrom at the outer sides thereof, the contour being such that the momentum and the reactionary
25 force of the water both act to propel the wheel.

In the accompanying drawings, forming a part of this specification, and on which like reference-letters indicate corresponding parts, Figure 1 represents a side elevation of a portion of a wheel and several buckets embodying my invention and a partial side and sectional view of a nozzle projecting a stream of water; Fig. 2 an inverted plan view of the instrumentalities shown in Fig. 1; Fig. 3, a sectional view of the wheel-rim on the line $x x$ of Fig. 2 and an inside view of two buckets; and Fig. 4 a detail view of one of the buckets detached, looking down into it.

The letter A designates a segment of a wheel, preferably though not necessarily divided in the inner portion into spokes B. The periphery of this wheel presents two concaved surfaces C and D, meeting about the middle of the width of the rim in a somewhat sharpened apex E. This apex preferably extends in a radial direction beyond the adjacent edges of the buckets, though this is not indispensable. The function of this projecting edge is to divide the stream into parts, so that one stream
45 will be converted into two and each portion assigned to a bucket. The object in concav-

ing the periphery is to accommodate the buckets and more accurately conform to the desired contour of that part of the buckets which is fitted against the periphery. It will
55 be understood, however, that if the dividing-edge of the wheel is preserved it is not indispensable to also preserve the concave face.

The buckets are indicated at F, and inasmuch as they are all alike a description of
60 one will suffice. It consists of a vessel of metal, preferably brazed, screwed, or otherwise secured to the wheel-rim to one side of the dividing-edge. The bucket has a bottom G and three sides H, I, and J. The side J is
65 fitted to the concave of the wheel, the portion J' terminating near the dividing-edge E, as seen in Fig. 3. It is preferred to reduce the thickness of the side J from its union with the side I toward and to the part J' to practically
70 a knife-edge, so as not to obstruct the water as it passes along the side of the dividing edge or ridge, as seen in Fig. 1, whence it enters the bucket. The water enters the bucket in the corner adjacent to the dividing-edge,
75 and as the entering place includes a part of the side H it too is reduced in thickness from its union with the side I to the part J', as is best seen in Fig. 4. The sides of the bucket all curve, and the bottom also curves, so that
80 each blends into the other. The water entering as aforesaid acts by the force of its momentum against the interior of the bucket, except when it reaches that portion essentially
85 comprehended by the side I, when its reactionary force is exerted against the bucket. As each successive set of buckets passes opposite the stream it is acted upon in this manner and the wheel given a uniform momentum and strong rotary movement. Referring
90 to Fig. 1, it will be observed that the face or that part of the bucket comprehended by the edges of the sides inclines back from a radial line commencing at the side I and proceeding toward the periphery of the dividing-
95 edge. It will also be observed from this figure that the edge H is lower than any other part of the bucket. The object of these features is to insure the delivery of the water into the buckets without its coming into contact with the lower outer part of the side H,
100 the edge being the lowest. It is preferred

that the edge II shall be on a curve, as best seen in Figs. 3 and 4. It is also preferred that that part of the bucket where the water discharges, and which is comprehended by the side I and is near the side of the rim as viewed in Fig. 2, shall be farther forward as viewed from the nozzle than that part of the bucket where the water enters and lying near to the outer portion of the cutting-edge. By this arrangement the free reactionary effect of the water is obtained.

The operation of my improved wheel will be understood by the foregoing in connection with the accompanying drawings.

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

1. In a water-wheel of the character described, the combination, with a wheel proper having a water-dividing edge on its periphery and water-receiving buckets secured to the periphery, of a nozzle adapted to project a stream of water against the dividing-edge.

2. In a water-wheel of the character described, the wheel proper having a dividing-edge on its periphery and water-receiving buckets secured to the periphery, with re-

duced edges adjacent to said dividing-edge, and a nozzle adapted to project a stream of water against said edge, as set forth.

3. In a water-wheel of the character described, the combination, with a wheel proper having a dividing-edge on its periphery and water-receiving buckets secured to said periphery with their outer edge, radially measured, lowest and their edge where the water discharges set farther forward than the water-entering part, of a nozzle adapted to project a stream of water against the dividing-edge and into the said bucket.

4. In a water-wheel of the character described, the combination, with a wheel proper having two concaved surfaces on its periphery and a dividing-edge formed by the apex of said concaves, of buckets fitted into the said concaves and secured and having curved sides and a curved bottom and reduced edges.

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

FRANK M. BOOKWALTER.

Witnesses:

OLIVER H. MILLER,
WARREN HULL.