(No Model.)

F. M. BOOKWALTER.

WATER WHEEL.

No. 469,959. Patented Mar. 1, 1892.

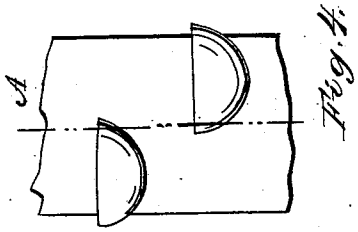

Fig. 4.

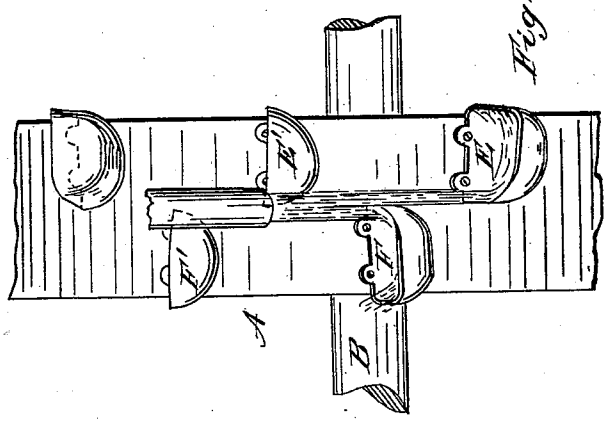

Fig. 2.

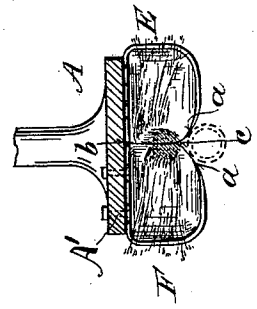

Fig. 3.

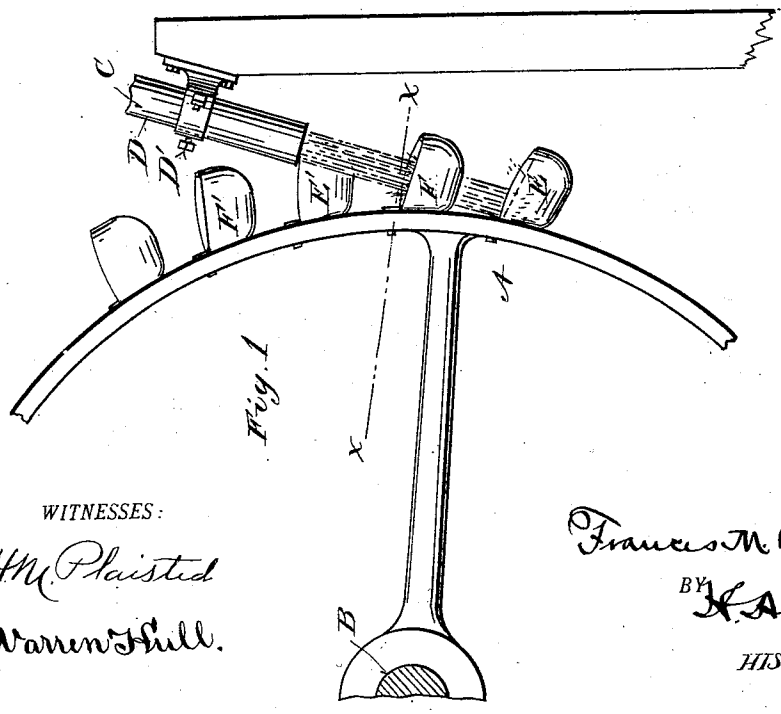

Fig. 1.

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FRANCIS M. BOOKWALTER, OF SPRINGFIELD, OHIO.

WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 469,959, dated March 1, 1892.

Application filed February 16, 1891. Serial No. 381,526. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS 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.

This invention relates to certain new and useful improvements in water-wheels; and the object of my invention is to so arrange the buckets on the wheel proper that at least one bucket will at all times be in full operation and one or more buckets in partial operation, the further peculiarities of which will be hereinafter fully described, and pointed out in the claim.

In the accompanying drawings, forming a part of this specification, and on which like reference-letters indicate corresponding parts, Figure 1 represents a side view of a portion of a water-wheel with my improvements applied thereto; Fig. 2, an edge view of the same; Fig. 3, a plan view of two adjacent buckets and a section of the wheel proper on the line *x x* of Fig. 1, and Fig. 4, a view similar to Fig. 2, showing an arrangement of the buckets approximately in line at their entering edges.

The letter A designates a wheel proper mounted on its axle B and having a rim or face adapted to carry a series of buckets alternately arranged thereon, as shown in Fig. 2. A nozzle C is adjustably mounted in a bracket D, having set-screws D′, whereby the said nozzle may be adjusted to its correct position with regard to the buckets of the wheel proper. Any suitable form of buckets may be used, the lateral discharge-type being preferable, each having an entering edge from *a* to *b*, Fig. 3, and sharpened to a knife-edge to prevent obstruction to the entering water. A portion of this edge—namely, from *b* to *c*—may be designated as the "dividing-edge," and in the alternate series of buckets mounted on the wheel proper, this dividing-edge on each bucket is located in a common plane, as shown in Fig. 2, whereby the propelling stream of water projected from the nozzle C is divided as it strikes the buckets, and one half is received by the buckets on one side and the other half of the stream by the buckets on the other side of the nozzle and laterally discharged therefrom in opposite directions, as indicated in Fig. 2. The wheel is thus equally balanced against any strains tending to shift it on its axle, since half of the stream of water is deflected in one direction and half in the opposite direction, due to said arrangement of the buckets. It will also be observed from Fig. 3 that the entering edge of each bucket is flared or rounded outward from *c* to *a*, whereby a channel or notch between the series of buckets is formed, adapting the nozzle C to be placed in close proximity to the entering edges of the buckets and allowing of delivering the stream of water to said buckets in a solid compact condition. In order to catch all of the stream of water allotted to each bucket, it may be desired to extend the entering edges of the buckets slightly beyond the common plane before mentioned, so as to prevent the spray or broken particles of the stream from missing the buckets. In Fig. 4 it will be seen that the dividing or inner portion of the entering edge of each bucket extends slightly beyond the common plane before mentioned, and that the said dividing-edges are therefore approximately in a common plane.

In Fig. 2 it will be observed that two buckets E and F are in full operation and each receives its proportion of water—namely, approximately one-half of the propelling-stream. As the wheel revolves the bucket E′ will enter the stream and cut off a portion of the water from that side, while the bucket F still receives its full share. When E′ receives the full half of the stream, the bucket F′ will be about to enter and cut off a portion of the stream from the bucket F directly below it. In either instance, however, at least one bucket is in full operation, since it receives its full share of water, and one or more buckets will be in partial operation on the opposite side of the propelling-stream. In certain positions—such as shown in Fig. 2—both adjacent buckets will be in full operation. This regular impulse, due to the alternate arrangement of the buckets, is of especial importance, as hereinbefore mentioned.

Referring to Fig. 1, it will be seen that each bucket has a downward slant on its entering

edge, whereby the propelling stream will strike the entering edge of each bucket perpendicularly and continue such perpendicular impingement as the wheel rotates and brings the inner portion of said entering edge into the action of said stream—that is to say, the bucket F, for instance, will enter the stream of water, which will strike perpendicularly on its entering edge from *a* to *c*, and as the bucket descends the stream will be received by the dividing portion from *c* to *b*. In Fig. 1 the stream of water impinges on the inner portion of the dividing-edge of the bucket E and on the outer portion of said edge in the bucket F. When the stream arrives at the inner portion of the entering edge—namely, *b*—the bucket directly overhead will then come into the action of the water and the stream will be cut off from the lower bucket.

One of the advantages of thus constructing my water-wheel is its simplicity of construction and cheapness of cost in using single buckets, as above described. The steadiness of action of the wheel has already been mentioned. The position of the discharge end of the nozzle is indicated in dotted lines in Fig. 3, corresponding to its side elevation in Fig. 1, from which it will be seen that the form of the buckets, together with their arrangement in an alternate series, permits of a proximity of the nozzle to the entering edges of the buckets not otherwise attainable.

The buckets may be secured to the wheel proper by bolts A′ through lugs on said buckets or otherwise.

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

In a water-wheel, the combination of a series of buckets, each having an entering edge a part of which extends from the back toward the front of the bucket and the remainder of which is flared laterally and extends from the first portion a suitable distance along the front side of the bucket, and flared portions of the entering edges of all the buckets constituting an annular notch when the buckets are placed in an alternating annular series, with a wheel upon the rim of which said buckets are so located and secured and a nozzle whose discharge end is nearer to the periphery of the wheel than the extreme outer or front edge of the buckets by being located in said annular notch, so formed, whereby the water from the nozzle so enters the buckets that it properly spreads over the bowl or interior without splashing over any edge save the said discharge edges.

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

FRANCIS M. BOOKWALTER.

Witnesses:
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