

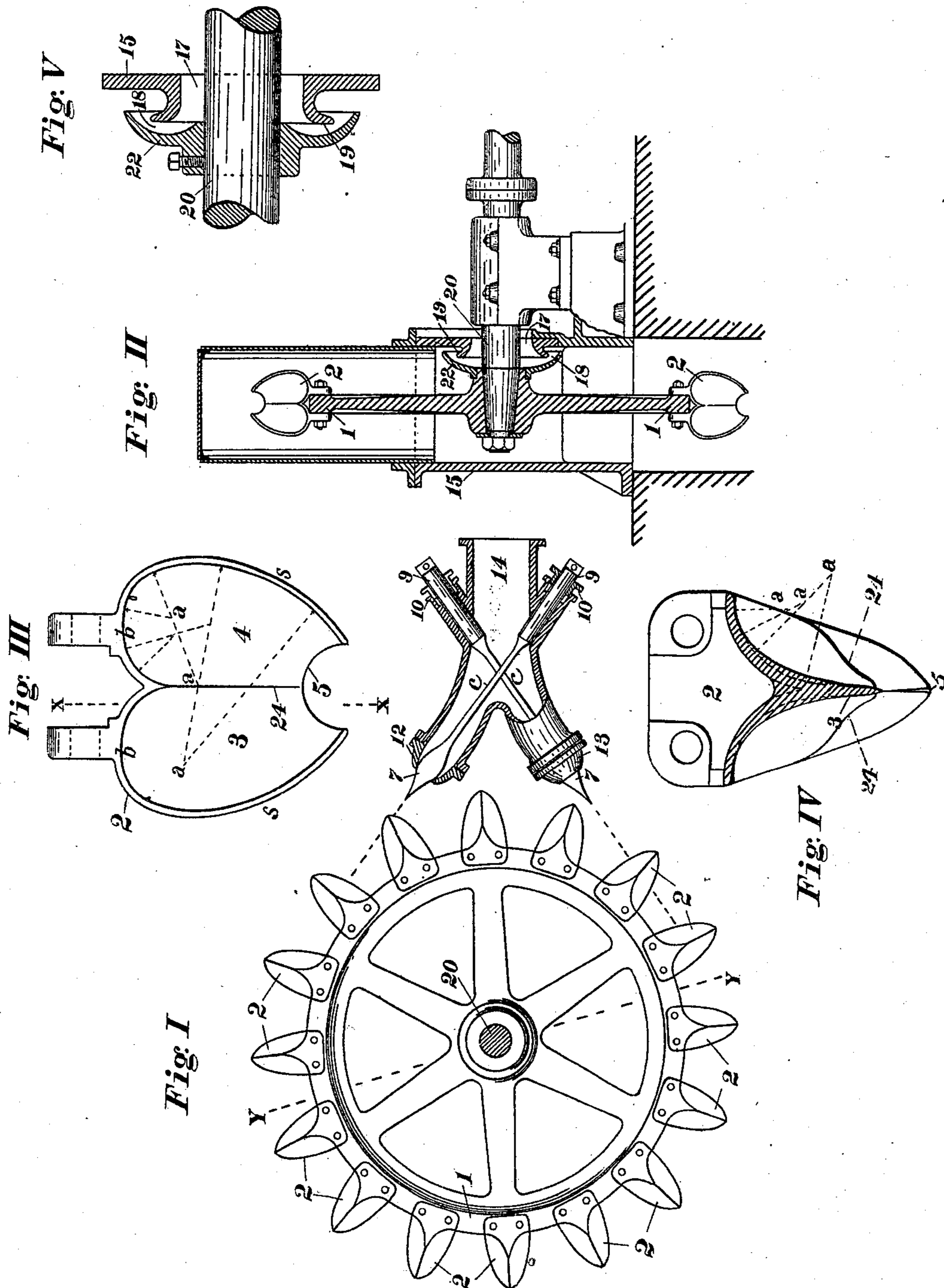
No. 684,800

Patented Oct. 22, 1901.

W. A. DOBLE.
WATER WHEEL.

(Application filed Feb. 16, 1900. Renewed Sept. 20, 1901.)

(Model.)



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM A. DOBLE, OF SAN FRANCISCO, CALIFORNIA.

WATER-WHEEL.

SPECIFICATION forming part of Letters Patent No. 684,800, dated October 22, 1901.

Application filed February 16, 1900. Renewed September 20, 1901. Serial No. 75,947. (Model.)

To all whom it may concern:

Be it known that I, WILLIAM A. DOBLE, a citizen of the United States of America, residing at San Francisco, county of San Francisco, and State of California, have invented certain new and useful Improvements in Water-Wheels; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to certain useful improvements in reversible tangential water-wheels impelled by regulable water-jets.

My improvement consists in a peculiar form of buckets for such wheels provided with a transverse dividing-lip or acute wedge between and forming a continuation of the bottom faces of the duplex buckets that will enter the jets or streams without disturbing the same at a desirable angle when the wheel is revolving in either direction; also, it consists in a special configuration of the buckets adapting them to the dual use and attaining in such use a full effect of the water's energy.

The objects of my invention are to utilize in the greatest degree possible the energy of the water applied to wheels of this class, to attain when required reversal of the motion of the wheel, and vary the amount of water applied without changing the velocity of either of the streams or impairing their efficiency.

To these ends I construct tangential water-wheels, their buckets, nozzles, and other accessories, as illustrated in the drawings herewith and forming a part of this specification.

Figure I is a side elevation of a reversible tangential water-wheel and the nozzles therefor constructed and arranged according to my invention. Fig. II is a vertical section through Fig. I on the line $y y$, and also through the casing inclosing the wheel. Fig. III is an enlarged front or face view of one of the buckets. Fig. IV is a section through Fig. III on the line $x x$. Fig. V is an enlarged section through an air-inlet at the side of the casing.

In reversible tangential water-wheels there have been the impediments that the buckets when made double-acting presented baffling-surfaces at the point of the bucket's entrance that more or less interfered with and destroyed in part the force of the jet or stream;

also, did not enter the stream by dividing it in one plane only, as in the present case. There was also the loss due to a tortuous and impeded approach of the water to one or the other of the nozzles, which rendered their effect different, and no means of regulating or changing the size of the jets or power of the wheels without considerable loss of the water's energy by disturbing the solidity and velocity of the stream. To evade these impediments and objections in practice, I place on the wheel-rim 1, when it is to be driven right and left, a series of double and oppositely-faced buckets 2, formed as illustrated in Figs. III and IV and corresponding in their contour, so far as practicable, to the water-wheel buckets shown and described in Letters Patent No. 633,184, issued to me on the 19th day of September, 1899, for an improvement in tangential water-wheels.

My improved bucket is essentially quadruple, consisting virtually of two double buckets placed back to back, said buckets having a common bottom, curved sides and edges or skirts s , and curved bases b , said double buckets being equal and similar in size and shape and alike on both front and rear faces, presenting the symmetrical heart-shaped configuration, with truncated apex, shown in Fig. III.

The ellipsoidal form of the hydraulic faces (indicated by the radii $a a a$ in Figs. III and IV and described in the Letters Patent hereinbefore referred to) is maintained throughout as far as possible, and at all points, except on the faces 3 and 4 of the bottom that form the surfaces of an acute wedge 5, that enters the stream transverse to its course and before any other portion of the hydraulic faces have been impinged upon. Rising out of the bottom of the buckets transverse to the wedge 5 in the central plane of the wheel is a second wedge-like partition 24, that divides the stream in the direction of its course into two parts that are reversed by the curves of the sides and skirts of the buckets in the usual manner of such buckets when of correct form. In cooperation with said double and oppositely-faced buckets mounted on a reversible wheel I employ a branched nozzle, as shown in Fig. I, the branches diverging by easy curves from the main nozzle, so as to send a stream tan-

gential to the pitch-line of the bucket centers in either direction, as desired. To regulate said discharge, there is mounted in each branch a spindle-shaped core-piece attached to a stem, and a piston whereby the said core-piece is balanced against the internal pressure, so that it is easily moved by hand or by any means external to the nozzle that may be convenient, and the quantity of the discharge is thereby perfectly controlled. To cooperate with said core-piece, the tip of each branch is made converging, so that a converging annulus or shell of discharge is obtained. The water after leaving the issue of the nozzle follows the spindle-shaped core-piece 7, reunites in a stream of solid section, and maintains its solidity and the impinging force due thereto for some distance and until fully arrested by the buckets 2. The core-pieces 7 are connected by stems *c* to pistons 9, passing through glands 10, and by reason of the opposite reaction of the water-pressure within the pipe 14 against the said core-pieces and pistons, respectively, are practically balanced against said pressure on well-known hydrostatic principles and move freely in either direction. These regulating core-pieces, with their functions and manner of operating, are fully set out and explained in an application for Letters Patent, serially numbered 733,854, filed by me on the 17th day of October, 1899, and as they do not, except by their combination, form a part of my present invention further description is not required.

By arranging the nozzles 12 and 13 as shown in Fig. I, at one side of the wheel 1 or at the top or bottom, as the circumstances of erection may determine, it will be seen that the course of the supply-water entering through the pipe 14 is but slightly deflected from its normal course and is directed alike to each nozzle.

To permit free entrance of air to supply that discharged by centrifugal effect of the wheels when they are inclosed, as shown in Fig. II, I provide at one or both sides of the casing 15 inlets, as shown enlarged in the detail drawing Fig. V and also in Fig. II.

The area of the inlet-ways 17 and 18 is made more or less as the speed of the wheel's revolution may require, and a curved ledge or lip 19 is formed on the inside of the casing 15 to catch and divert water that may drain down on the inside of the casing.

When the current of entering air is not enough to prevent water from escaping outward around the shaft 20, I provide a disk 22, preferably of dished form, as shown in Fig. V, attached to the shaft or to the nave of the wheel 1, which baffles and precipitates the spray or throws it outward radially by centrifugal force.

Referring further to the buckets 2, these are cut away at the bottom or their skirts are extended below the stream, as described and shown in Letters Patent No. 619,149, granted

to me on the 7th day of February, 1899, for an improvement in water-wheels, with the difference, however, that in the present case the stream is first cut or penetrated transversely instead of longitudinally, but in both cases in one plane and by one dividing edge or wedge. The transverse edge 5 is, as will be seen, a feature arising out of the buckets being dual or oppositely-faced and to be driven in either direction to reverse the motion of the wheel and of machinery connected thereto, as in the case of hoisting from mines, and also is a necessity in order to avoid baffling-surfaces.

It is obvious from the relative arrangement of the radially-placed buckets and the tangentially-directed nozzles 12 13, as shown in Fig. I, that the surfaces, front and rear, impinged upon must present the same relative angles to the streams discharged from the respective nozzles in order to obtain the reversible effect in equal degree. Hence the junction of the faces 3 4 of the bucket-bottoms, which forms the tip of the wedge 5, is in a radial line from the wheel's center.

Having thus explained the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a tangential water-wheel, a series of oppositely-faced buckets, alike on the opposite faces, said faces being double ellipsoidal recesses the bottoms of which join and form a transverse wedge radial from the wheel's center, substantially as specified.

2. In a tangential water-wheel a series of double-faced buckets presenting on each face a like form and contour, the bottoms terminating outwardly in a radial wedge with its edge transverse to the jet or stream, and second dividing-wedges central in the buckets set longitudinal to the course of the stream, substantially as specified.

3. A bucket for tangential water-wheels, of double ellipsoidal form on its skirts and bases, on opposite faces, the bottom surfaces forming an acute wedge to enter the stream transversely, and second dividing-wedges rising from said bottom surfaces on each side, for dividing the impinging stream into two parts, substantially as specified.

4. In a tangential water-wheel, a series of oppositely-faced buckets, alike on the opposite faces, said faces being double ellipsoidal recesses, the bottoms of which join and form a transverse wedge radial from the wheel's center, in combination with a branched nozzle discharging two jets tangentially to the pitch-line of the bucket centers, oppositely directed, and means for regulating the discharge from said branches, substantially as specified.

5. A reversible tangential water-wheel having a series of oppositely-faced buckets thereon, alike on the opposite faces, each face of double ellipsoidal form, a common bottom having faces forming a transversely-dividing wedge for the stream, in combination with a

branched nozzle, each branch discharging a jet tangential to the pitch-line of the bucket centers, oppositely to the other, and spindle-shaped core-pieces movably mounted in each
5 branch, to regulate the discharge therefrom, substantially as specified.

6. A reversible tangential water-wheel having a series of oppositely-faced buckets thereon, said faces similar and of double ellipsoidal
10 form, a transverse wedge-like bottom common to both, wedge-like partitions on each face in the central plane of the wheel, in combination with a branched nozzle, each branch
15 tially to the pitch-line of the centers of the

said buckets, oppositely to the other, and a movable spindle-shaped core-piece in each branch, with stems and balancing-pistons, each branch having a converging tip surrounding the core-piece, whereby the discharge-jets are made to impinge on the buckets in unbroken section, substantially as specified.

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

WILLIAM A. DOBLE.

Witnesses:

ALFRED A. ENQUIST,
ELMER WICKES.