J. C. BUNNELL.

WATER MOTOR.

APPLICATION FILED JULY 1, 1915.

1,200,308.

Patented Oct. 3, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

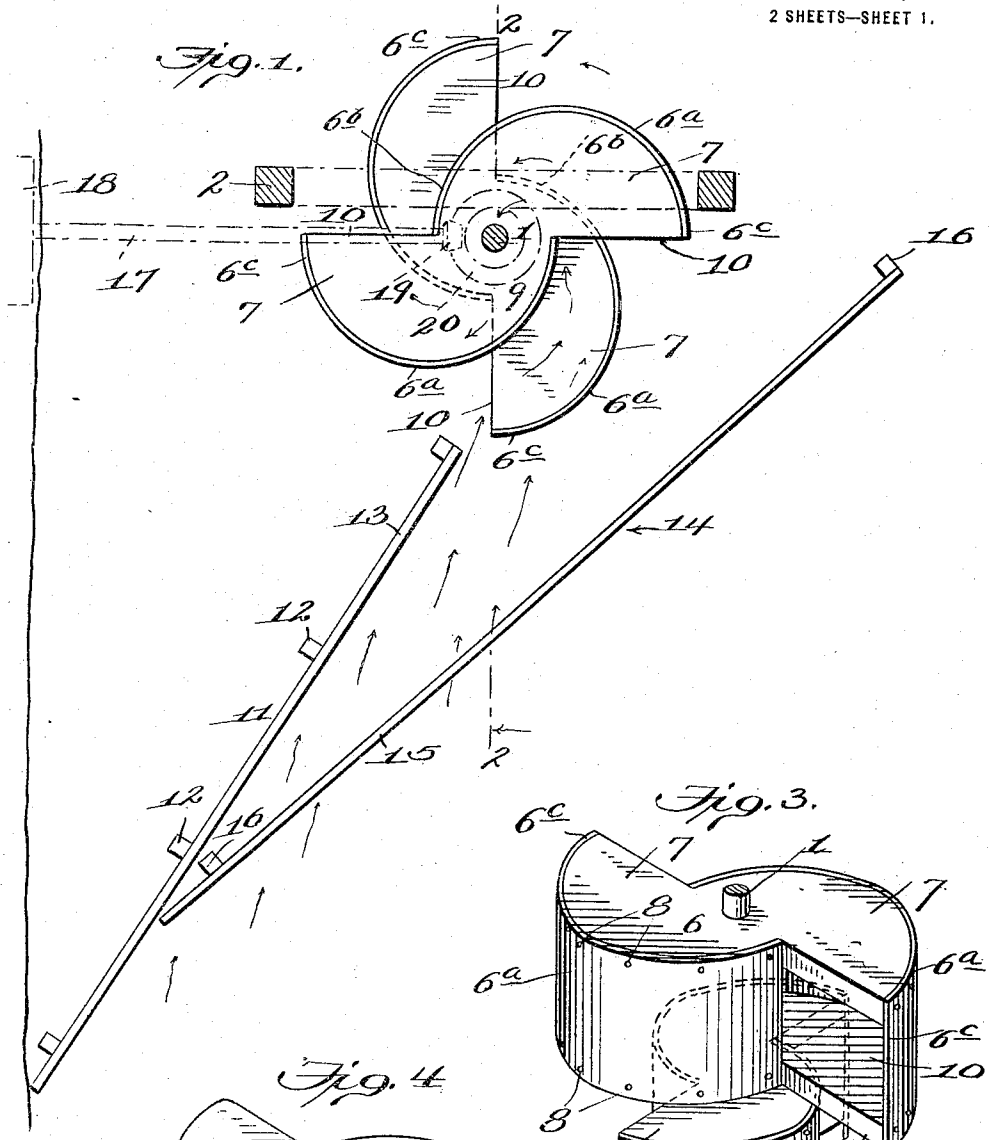
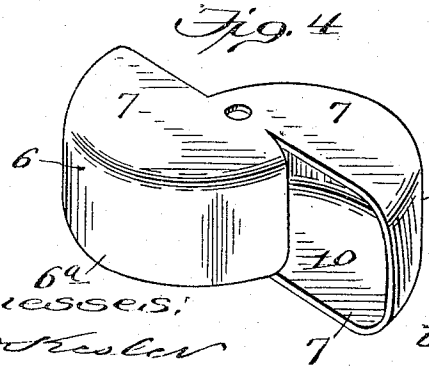


Fig. 3.

Fig. 4



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2 SHEETS—SHEET 2.

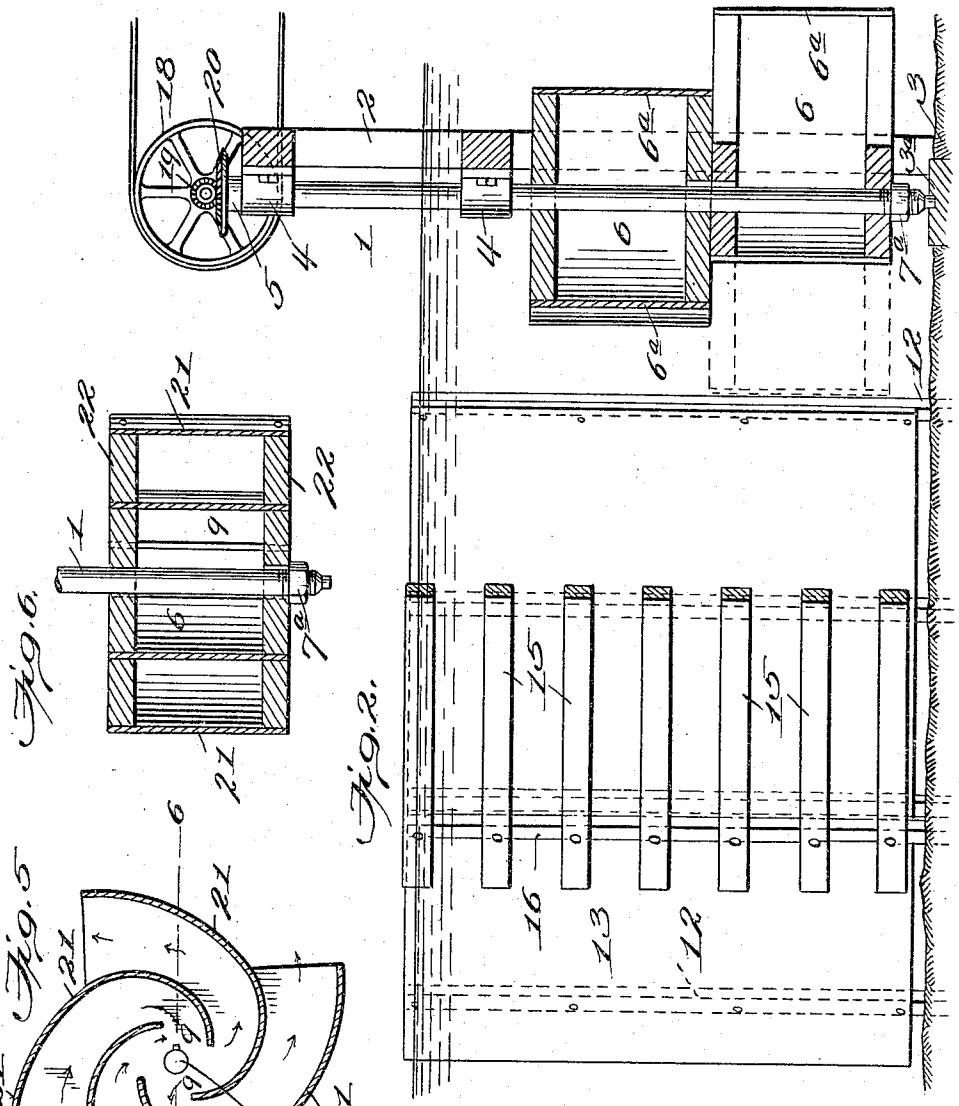


Fig. 2.

Fig. 6.

Fig. 5

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UNITED STATES PATENT OFFICE.

JOHN C. BUNNELL, OF BOISE, IDAHO.

WATER-MOTOR.

1,200,308. Specification of Letters Patent. Patented Oct. 3, 1916.

Application filed July 1, 1915. Serial No. 37,562.

To all whom it may concern:

Be it known that I, JOHN C. BUNNELL, a citizen of the United States, residing at Boise, in the county of Ada and State of Idaho, have invented new and useful Improvements in Water-Motors, of which the following is a specification.

This invention appertains to water motors, or to that class of inventions commonly known as "wave" motors. However, the present invention is not particularly designed to be actuated by the movement or rolling of the waves, but to be actuated by the constant or steady flow of the current of rivers, canals or the like. These types of motors are especially intended for raising or pumping water for irrigating, or for generating power for various other purposes.

The motors heretofore constructed for this purpose have consisted of motor wheels revolving on a horizontal shaft and provided with a plurality of blades or paddles adapted to be partially submerged under the surface of the water and actuated by the flowing current.

An object of the invention is to produce a device of the character mentioned through which the greatest efficiency of motive power from a current of water may be obtained, the operation of said device not being affected or adjustment being required by the rise and fall of the tide.

With the above object in view, the invention consists in a plurality of propelling blades or scoops mounted on a vertical shaft and entirely submerged in a river, canal, or the like, said blades or scoops forming communicating passages through which the current of water passes and acts thereupon for rotating the shaft.

A particular feature of the invention resides in so constructing the blades that when the water enters in the passage formed by one of the blades, it is discharged into and through the passage formed by the other blade and acts thereupon to assist in revolving or rotating the propelling blades on their axes in the right direction.

A further feature of the invention resides in providing a current deflector or means for directing the current to act upon said propelling blades, and in providing means for preventing debris, or the like, from being carried by the current into contact with and through the blades of the motor.

With the above and other objects in view, the invention further consists in a certain novel arrangement of parts and combination of elements hereinafter more fully described and pointed out in the appended claims.

Referring to the drawings which form part of the specification: Figure 1 is a diagrammatic view illustrating the invention with some of the parts broken away, and shown in dotted lines, to afford a clear understanding of the invention; Fig. 2 is a sectional elevation taken substantially on line 2—2 of Fig. 1 and illustrating the invention in operative position in a stream of water; Fig. 3 is a detail perspective view of the motor wheel or propelling blades, as shown in Figs. 1 and 2; Fig. 4 illustrates a slightly modified construction of the motor propelling blades or scoops, as shown in Fig. 2; Fig. 5 illustrates a still further modified construction of the motor wheel consisting of a plurality of blades or scoops; and Fig. 6 is a vertical section taken on line 6—6 of Fig. 5.

Like reference characters denote like parts throughout the specification and drawings.

The numeral 1 indicates the motor shaft suitably supported in vertical position by the uprights or frame-work 2, rested and suitably anchored to the river bed, as indicated at 3. The means for supporting the shaft 1 in position may be of any suitable construction, for instance, may consist of a concrete foundation for supporting the lower end of the shaft with vertical uprights, or suitable means, for supporting the upper end of the shaft; or may consist of a suitable float designed to maintain the motor wheel in a submerged and vertical position in the river. In the present instance, the shaft 1 is secured to the uprights 2 by means of the bearings 4 suitably secured to the latter, and disposed near the upper end of the shaft 1. The shaft is slidable within the bearings and has its upper end formed with a collar 5 adapted to engage and rest upon the upper bearing 4. The lower extremity of the shaft, as here shown, is reduced and rests in a recess formed in a suitable footing which is anchored in the river bed, as shown at 3^a in Fig. 2.

The shaft 1 has keyed thereupon the twin propelling blades or scoops 6 providing a water wheel to be acted upon by the current. One or more of the twin scoops 6 may be carried or disposed on the shaft, as desired,

and since, as here shown, the lower end of the shaft is provided wth a threaded nut 7ª, any desired number of the twin scoops or blades may be positioned upon the shaft or removed therefrom, as occasion may require. In shallow streams, one set of blades may be found sufficient, however, in deeper streams, the sets may be increased as may be desirable or necessary.

In Figs. 1, 2 and 3, the motor wheel is shown as consisting of a plurality of sets of twin propelling blades 6 adapted to radiate from the shaft 1. Each set of blades comprises a pair of oppositely disposed curved blades or scoops 6ª so arranged, relative to the shaft 1, as to have their radii increasing outwardly therefrom, although the individual construction or shape of each scoop 6ª, shown in Figs. 1, 2 and 3, is of an arch and semi-circular formation, which, as is to be understood, may be varied as desired. The inner and outer ends of each of the curved blades 6ª are arranged to lie upon opposite sides of the shaft 1 and upon a line extending diametrically through the shaft. The inner ends 6ᵇ of the blades are spaced from the shaft 1 but to a less degree than their respective outer ends 6ᶜ.

A further description of the position of the blades with respect to each other may be given by stating that the two curved blades 6ª are disposed on opposite sides of the shaft, the inner end 6ᵇ of one blade and the outer end 6ᶜ of the other blade lying upon a line radiating from the shaft, while the other inner and outer ends of said two blades 6ª lie upon a line radiating from the shaft in a direction diametrically opposite to said first-mentioned radial line; or, in other words, the inner ends of the two curved blades 6ª overlap each other and lie on opposite sides of the shaft 1 in spaced relation thereto. Two segmental sections 7 joined together, or preferably integral, at one of their ends and substantially outlining an **S** formation form the sides of the blades or scoops, as shown in Fig. 1, and are secured thereto by screws or other fastening devices 8. The segmental sections 7 are provided at their junction with an aperture for the reception of the shaft 1, and are keyed to the shaft to rotate the same together therewith.

The water wheel thus produced consists of two scoop-shaped members 6 forming a passage 9 therein communicating with the water openings 10. When more than one set of scoops or blades 6 are used upon the shaft 1, the former are arranged horizontally at right angles to each other. By this arrangement the greatest amount of power and efficiency can be obtained from the present device. As indicated by the arrows in Fig. 1 of the drawing, the current of water flowing into the water entrance 10 of one of the twin scoops 6 acts upon the curved blade or back 6ª to rotate the same upon its axis. On account of the curved back or blade 6ª, the water is deflected and passes through the passage 9, formed in the scoop, to be discharged through the other water opening 10 of said twin scoops 6, as indicated in Fig. 1. It will be obvious that the water current passing through the passage 9 from the water entrance 10 first acts upon the first curved blade or back 6ª to rotate the scoop upon its axis, and is then deflected, on account of its curved or deflecting surface, to direct the pressure of said current upon the second curved blade 6ª, in such a manner as to assist in the rotation of the scoop before being discharged through the discharge end 10. It will be further apparent that the water openings 10 alternately become inlet entrances and discharge ends for the water as the twin scoop is revolved and each individual scoop brought into position. In view of the rounded surfaces of the blades 6ª, the latter meet with little or no resistance in the water during the rotation of the water wheel. It should also be noted, that the entire water wheel is to be submerged in the stream or river and that any number of twin scoops may be applied to this shaft, as desired, so that the operation of the same will not be affected by the rising and falling of the tide.

It is contemplated in connection with the invention to provide a current deflector 11 of any suitable construction adapted to be positioned at an angle to the water wheel, as shown in Fig. 1, for directing the current into the entrance opening 10 of the scoop 6, and in view of the position of the deflector 11, the water will be discharged from the opposite water opening 10 into dead water, as may be seen from Fig. 1. The deflector, preferably, consists of a plurality of vertical uprights 12 having secured thereto by any suitable means the sheet metal plates 13. To prevent debris, and the like, from being carried into contact with and through the scoop 6, a rack or screen 14 is provided in advance of the water wheel and disposed at an angle thereto and to the deflector 11. The rack 14, as here shown, preferably, consists of a plurality of spaced bars 15 supported by the uprights 16, it being understood that the uprights 12 of the deflector and the uprights 16 of the rack are embedded in the bottom of the river or stream.

Any suitable or approved means may be provided for transmitting power from the shaft 1. In the present embodiment, the said means comprises the shaft 17 provided upon one end with a pulley 18 and upon the other end with a gear 19 adapted to mesh with a bevel gear 20 rigid upon the upper end of the shaft 1.

In Fig. 4, a slight modification of the

twin propelling scoop or blade is shown. In this embodiment, the back or curved blade 6^a and the segmental sections 7 are formed integral. In this construction, the curved back 6^a will be curved also in cross section and, therefore, offers less resistance to the water and gives less friction to the passage of the water through the scoop.

In Figs. 5 and 6, another embodiment of the invention is shown. This embodiment contemplates a slight modification of the construction and arrangement of the water wheel or scoop 6. In this instance, the scoop consists in a plurality of curved blades 21 radiating from the shaft 1 and having their ends disposed on opposite sides of the shaft and in a line diametrically extending therethrough, the inner ends of the scoop being spaced to a less degree than the outer ends from the shaft. In this form of the invention the curved blades of the scoop are not confined to a half circle, as shown in Figs. 1, 2 and 3, but may have their radii increase outwardly, thus having their outer ends providing substantially tangential scoops or funnels with respect to the shaft 1. Segmental sections 22 are secured to the upper and lower edges of the blades 21, in a manner similar to that shown in Figs. 2 and 3, for providing suitable water passages. The segments 22 are adapted to have the shaft 1 extend therethrough and be rigidly secured thereto, whereby the wheel is supported in position.

Having thus described my invention, it is believed that a full and clear understanding of the same may be had, and it is to be understood that the invention is not limited to the precise and exact construction herein shown and described, but that certain changes may be resorted to that fall within the legitimate scope of the appended claims.

What is claimed is:—

1. A motor of the class described comprising, a shaft, a twin propelling blade adapted to be carried upon said shaft, each blade consisting of a curved plate disposed on opposite sides of the shaft and radiating therefrom with their concave surfaces substantially opposing, and substantially semi-circular plates secured to said curved plate and to said shaft, said semi-circular plates forming the side walls of said blade.

2. A motor of the class described comprising, a shaft, a twin propelling blade secured to the shaft, each blade comprising a curved plate, said plates being arranged on opposite sides of the shaft with their concave surfaces opposing, the inner and outer ends of both plates in a line extending diametrically through the shaft, and means for securing said plates in a position oppositely radiating from said shaft, the concave surfaces of said plates being adapted to be successively operated upon by a current of fluid whereby said shaft is rotated.

3. A motor wheel comprising, a substantially S-shaped member having a passage therethrough and openings in the ends of said member, and a shaft having said member secured thereto, the ends of said S-shaped member being adapted to be successively moved in position to allow fluid current to flow through said passage and act upon the curved walls thereof, whereby the shaft is rotated.

4. A motor wheel comprising a substantially S-shaped member having a passage therethrough and openings in the ends of said member, a shaft having said member secured thereto, the ends of said S-shaped member being adapted to be successively moved in position to allow fluid current to flow through said passage and act upon the curved walls thereof, whereby the shaft is rotated, and current deflecting means for directing an increased pressure of fluid upon the end of said member moved into position to be operated upon.

5. A motor wheel comprising, a shaft, a pair of propelling blades secured to the shaft and having a substantially S-shaped passage extending through both of said blades, the ends of said passage being extended through said blades and adapted to be successively moved into position to allow fluid current to flow through said passage and act upon the curved walls thereof, whereby said blades and shaft are rotated.

6. In a motor of the class described, a shaft, a propelling wheel secured to the shaft and comprising a plurality of substantially curved plates arranged to have their opposite ends disposed on opposite sides of the shaft, and means for securing said plates in position radiating from said shaft, the concave surfaces of the plates being adapted to be successively operated upon by a current of fluid whereby the shaft is rotated.

7. In a motor of the class described, a shaft, a propelling wheel secured to the shaft and comprising a plurality of curved plates arranged to have their opposite ends disposed on opposite sides of the shaft, and means for securing said plates in position radiating from said shaft, the inner and outer ends of oppositely radiating plates in a line extending diametrically through the shaft, the concave surfaces of the plates being adapted to be successively operated upon by a current of fluid whereby the shaft is rotated.

8. A motor of the class described comprising a shaft, a propelling wheel secured to the shaft and comprising a plurality of substantially curved plates, said plates being arranged to have their opposite ends

disposed on opposite sides of and spaced from the shaft, and means for securing said plates in position relative to the shaft, the concave surfaces of the plates being adapted to be successively operated upon by the current of fluid whereby the shaft is rotated.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN C. BUNNELL.

Witnesses:
ARTHUR FRAZIER,
WALTER HAYDEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."