No. 675,772. Patented June 4, 1901.

# A. FERGUSON.

## WATER MOTOR.

(Application filed Apr. 28, 1899.)

(No Model.)

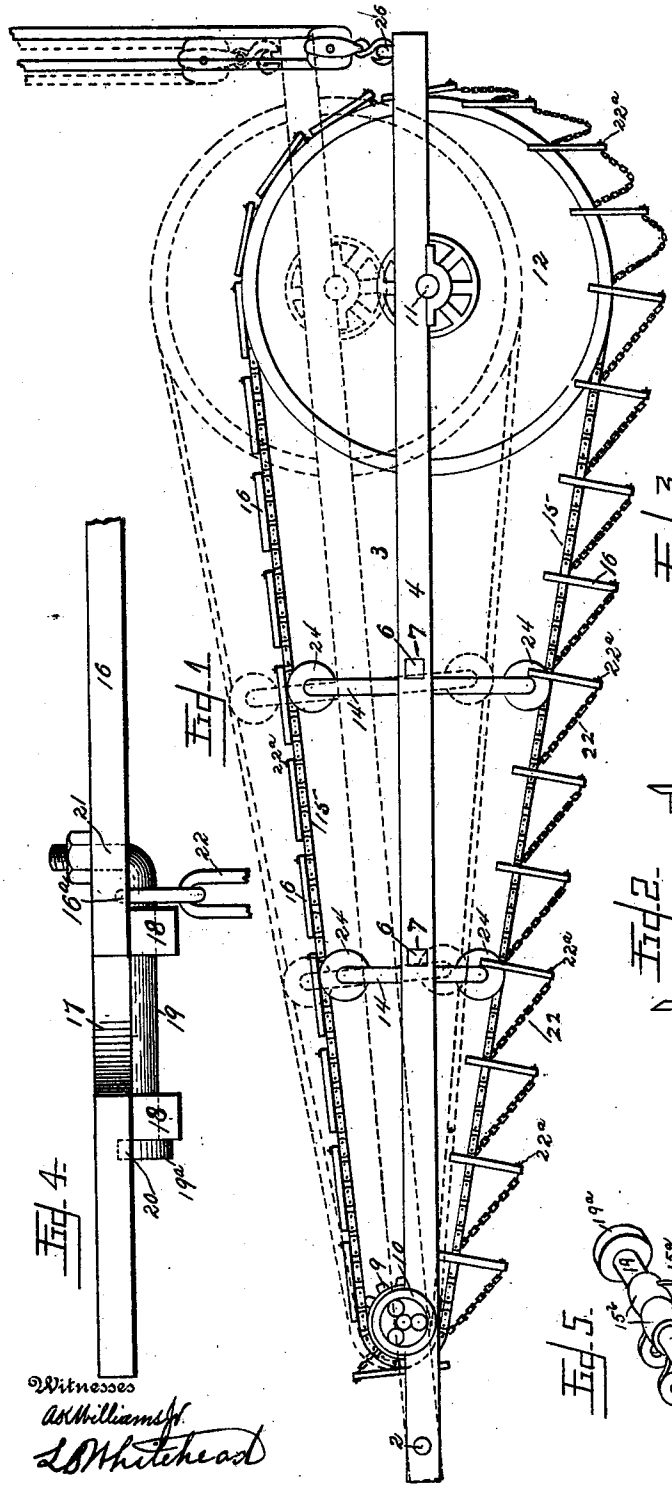

Fig. 1.

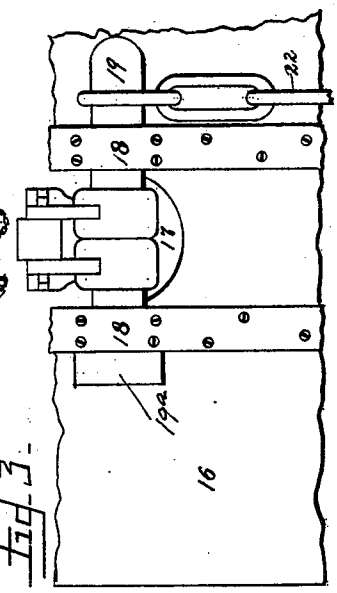

Fig. 3.

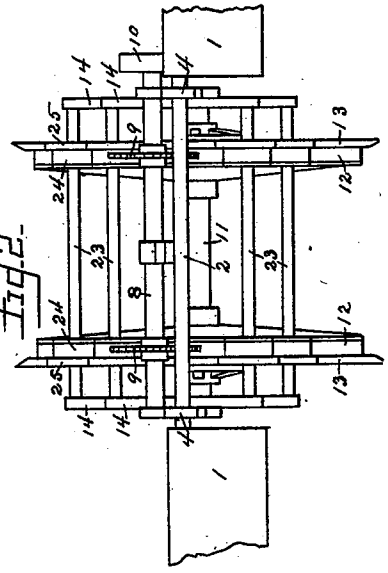

Fig. 2.



Fig. 4.



Fig. 5.

Witnesses
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# UNITED STATES PATENT OFFICE.

ALLEN FERGUSON, OF GLENNS FERRY, IDAHO, ASSIGNOR OF THREE-FOURTHS TO BENJAMIN G. MULLINS, OF BLISS, IDAHO.

## WATER-MOTOR.

SPECIFICATION forming part of Letters Patent No. 675,772, dated June 4, 1901.

Application filed April 28, 1899. Serial No. 714,814. (No model.)

*To all whom it may concern:*

Be it known that I, ALLEN FERGUSON, a citizen of the United States of America, and a resident of Thousand Springs, (Hagerman P. O.,) formerly of Glenns Ferry, Lincoln county, in the State of Idaho, have invented a new and useful Improvement in Water-Motors, of which the following is a specification.

This invention relates to that class of water-motors known as "current-motors," which receive power from a stream of water flowing horizontally by continuously presenting to it in consecutive order a series of blades obstructing the flow of the current.

My object is to provide a cheap and convenient water-motor which may be floated on streams and anchored at any convenient point ready for work, one which shall be simple in construction, consisting of few parts, and one requiring no great skill for its construction and management.

The nature of my invention will be set forth in the following specification and pointed out in the claims, the accompanying drawings forming a part of this specification.

For convenience of reference like numerals will refer to like parts throughout the various figures of the drawings, in which—

Figure 1 is a side elevation of my motor, the dotted lines showing it in its inoperative position. Fig. 2 is a front view thereof with the sprocket-chains and propelling-blades and the front end section of the float removed. Fig. 3 is a rear elevation of a part of one of the blades, showing the means by which the blades are attached to the sprocket-chains and the manner of attaching the upper ends of the intermediate chains. Fig. 4 is a top view illustrating the same, but with the sprocket-link shown in Fig. 3 omitted. Fig. 5 is a perspective view of the sprocket-link and the bolt shown in Fig. 3.

The numeral 1 designates the float, which may be made of lumber or logs. It is thought that a good size to make this float would be about three feet wide, eighteen inches deep, and thirty-four feet long. However, I do not wish to limit myself to any particular size of float or motor and simply mention this by way of suggestion, as the size will be determined by the size of the stream upon which the motor operates and by the amount of power desired to be obtained. Neither do I limit myself herein to any particular material to be used in the construction of any of the parts of my motor. Extending across the float between its two sides and near the front end thereof is a pivot-shaft 2, securely anchored at either end in said float.

The numeral 3 designates the frame of the motor proper, which frame is composed of sides 4, a rear end, and transverse strengthening-bars 6, said bars being received at either end by mortises 7, Fig. 1, in the sides of the frame.

Extending across the frame 3 near its front end is a shaft 8, suitably journaled in the sides of said frame and carrying two sprocket-wheels 9, rigidly attached thereto, and a driving-pulley 10 on the outer end of the shaft, which extends outwardly through one of said sides 4 a sufficient distance to receive said pulley. Extending across the rear part of said frame 3 and suitably journaled in the two sides thereof is a shaft 11, on which are mounted near either end two larger chain-wheels 12, which are provided with flanges 13. Immediately in front of the two middle transverse strengthening-bars 6 and rigidly attached to the sides 4 of the motor-frame at each end of said bars are vertical chain-supports 14. Two sprocket-chains 15 coöperate with the sprocket-wheels 9 at the front end of the motor and pass around the chain-wheels 12, at the rear end thereof. Said sprocket-chains carry a series of propelling-blades 16, disposed at equal intervals throughout the entire length of said chains. These blades are provided near each end and in the upper edges thereof with cut-away portions 17. On either side of each cut-away portion and on the rear side of the blade are transverse cleats 18, secured by screws, bolts, or other preferred means. The cleats are provided with cut-away portions sufficient to receive bolts 19, Figs. 3 and 4, which lie against the rear sides of the blades and extend across the cut-away portions 17. The heads $19^a$ of the bolts 19 are partly received by suitable recesses 20 in the blades, Fig. 4. The end of each bolt 19 is bent at a right angle to the main section thereof, and this end passes through a hole

21 in the blade to the front side of said blade, where it receives a nut. Intermediate chains 22 between successive blades serve as stays when the motor is in operation. The upper end of each chain 22 is attached to one of the bolts 19, between the bent end thereof and the adjacent cleat, as shown in Figs. 3 and 4. A small recess $16^a$ in the blade accommodates the end of the link which is received upon each bolt. Of course the bolts 19 may have one-half or more of the diameter of each embedded in the blades 16, if found desirable, in which case a suitable recess would be provided in each blade and the recesses in the cleats 18 would be correspondingly less.

That part of each bolt 19 which extends across the cut-away portion 17 of its blade 16 is adapted to be attached to one of the sprocket-chains and to connect the blade operatively to said chain, as follows: At each point where it is desired to attach one of the blades to one of the sprocket-chains said chain is provided with a link $15^a$. (Illustrated in Fig. 5.) The side sections of this link extend upwardly, and at the top of these extensions and integrally attached thereto are bearings $15^b$, adapted to receive the corresponding bolt 19, which works as a pintle therein. The bolt 19 is passed into its bearings $15^b$ before its end is bent at an angle, as shown. Next the end link of an intermediate chain 22 is passed over the bent end of the bolt, and said end is then passed through the corresponding hole 21 and the nut screwed on. Then the cleats are secured in proper position. One end of each blade is attached to one of the sprocket-chains and the other end to the opposite chain, so that the blades are transversely disposed between the two chains. Said propelling-blades being attached to said chains 15, as shown, it is apparent that the blades on the under side of the chain will hang down in the position shown in Fig. 1, so that when the motor is in its operative position—that is, with its front end turned upstream—the surface of each blade will form a plane transverse to the flow of the stream and at right angles to the plane formed by the surface of the water. In order to hold the lower flight of blades in this position, the intermediate chains 22 are employed. As already intimated, each blade is provided near either end thereof with one of these chains. The forward end of each chain is attached to one of the blades, near its top, by one of the bolts 19, as illustrated in Figs. 3 and 4. The rear end thereof is provided with an eyebolt which passes through an aperture at the lower side of the succeeding blade and receives a nut $22^a$, Fig. 1.

The vertical chain-supports 14 carry at their upper and lower ends transverse shafts 23, suitably journaled at either end in said supports. Rigidly attached to said shafts near their ends are idlers 24, provided with flanges 25. The vertical supports 14 extend upwardly and downwardly a sufficient distance to bring the wheels 24 into engagement with the sprocket-chains 15 when said chains are in their operative position on their respective sprocket and chain wheels, as shown in Fig. 1. The office of said vertical supports, with their wheels, is to prevent the top part of each chain from sagging, and more especially to prevent the lower side from being borne up by the current when the motor is running.

The rear end of the frame 3 is provided with a staple 26, designed to receive the hook of the block and tackle or other mechanism employed to hoist or lower the rear end of the motor. The pivot-shaft 2 near the front end of the float passes through apertures in the front ends of the sides 4 of the motor-frame, and said frame is thereby held in its proper relation to the float and readily permits of its rear end being raised or lowered.

When it is desired to put the motor into operation, it is suitably anchored or made fast with the front end upstream. The rear end of the frame 3 is then lowered till the sides 4 of said frame lie along the surface of the water, and since the chain-wheels at the rear of the frame are of a much greater diameter than the sprocket-wheels at the front it follows that each propelling-blade sinks deeper into the water than the one in front of it, and each blade on the lower side of the chains being held by its intermediate chain 22 in such position as to present a broadside to the current of the stream said blades present a large area of resistance and are effectively acted on by the water. When by the rotation of the wheels the blades are raised out of the water, they fold down on the top of the sprocket-chains, as shown in Fig. 1.

When it is desired to diminish the speed of the motor, this is accomplished by elevating the rear end of the frame 3, which diminishes the area of resistance offered to the flow of the stream. When it is desired to stop the motor, the rear end of the frame 3 is simply elevated till the blades are practically raised out of the water. The block and tackle preferably used for this purpose may be suspended from a cross-bar supported by two vertical beams, (not shown,) which rest upon the rear part of the float, or by other suitable means.

The organization is such that the simple flat frame 3, being normally horizontal, as shown in full lines in Fig. 1, supports the shafts of the sprocket-wheels and relatively large chain-wheels in substantially one and the same plane, and at the same time, owing to said relation of the wheels, the blades are effectively opposed to the water at different depths, so as to be simultaneously acted on by the current.

The chain-supports between the sprocket-wheels and chain-wheels being vertical and double-ended, as shown, the strain on one of each pair of their wheels is balanced by the strain on the other, and the reinforcement that would otherwise be necessary is avoided.

Having thus described said improvement,

I claim as my invention and desire to patent under this specification—

1. In a water-motor, the combination with sprocket-chains of blades having recesses in their upper edges, bolts extending across said recesses and through links of the sprocket-chains, each bolt having a right-angled end extending through the blade, an intermediate chain linked to each bolt near said right-angled end and attached to the next succeeding blade near its free edge, and suitable means for holding said bolts in position on the blades, substantially as hereinbefore specified.

2. In a water-motor the combination with a pair of sprocket-chains having bolt-engaging links of blades having recesses in their upper edges near each end thereof, bolts extending across said recesses and through said links, each bolt having a right-angled end extending through the blade, a link encircling each bolt near said right-angled end, and suitable means for holding said bolts in position on the blades, substantially as hereinbefore specified.

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

ALLEN FERGUSON.

Witnesses:

JAS. MCGONIGLE,

P. M. SULLIVAN.