No. 667,017. Patented Jan. 29, 1901.

C. JASPER.

CURRENT MOTOR.

(Application filed June 27, 1900.)

(No Model.) 3 Sheets—Sheet 1

Fig. 1.

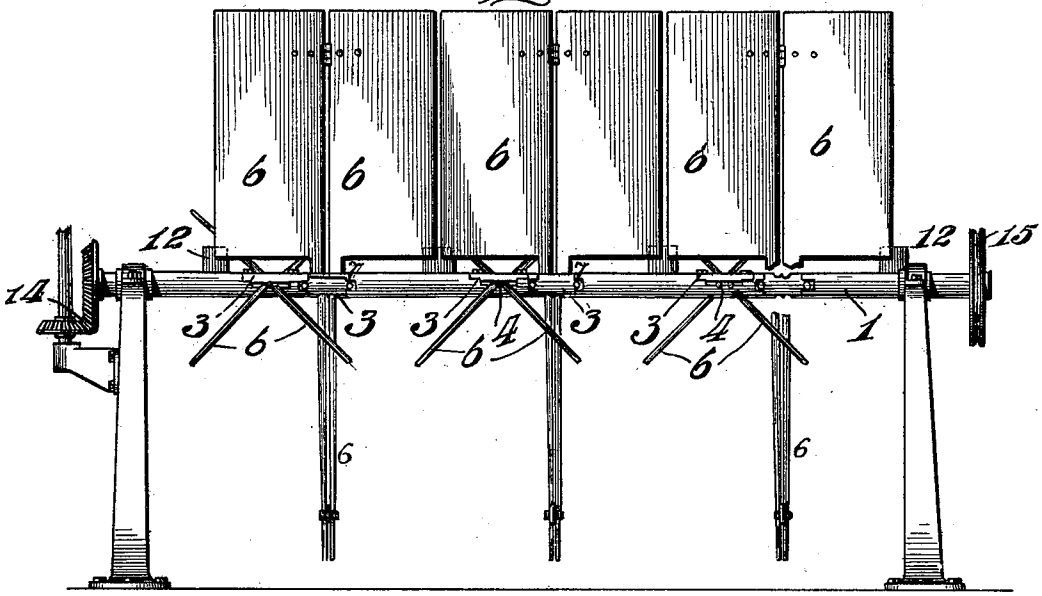


Fig. 2.

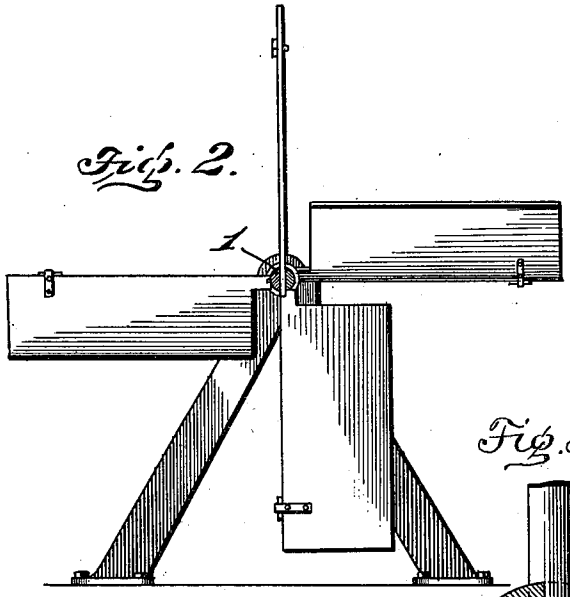


Fig. 4.

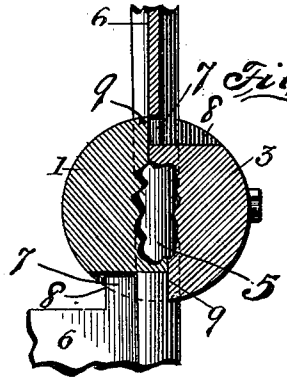
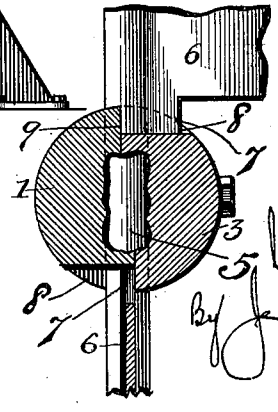


Fig. 3.



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No. 667,017. Patented Jan. 29, 1901.

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CURRENT MOTOR.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 11.

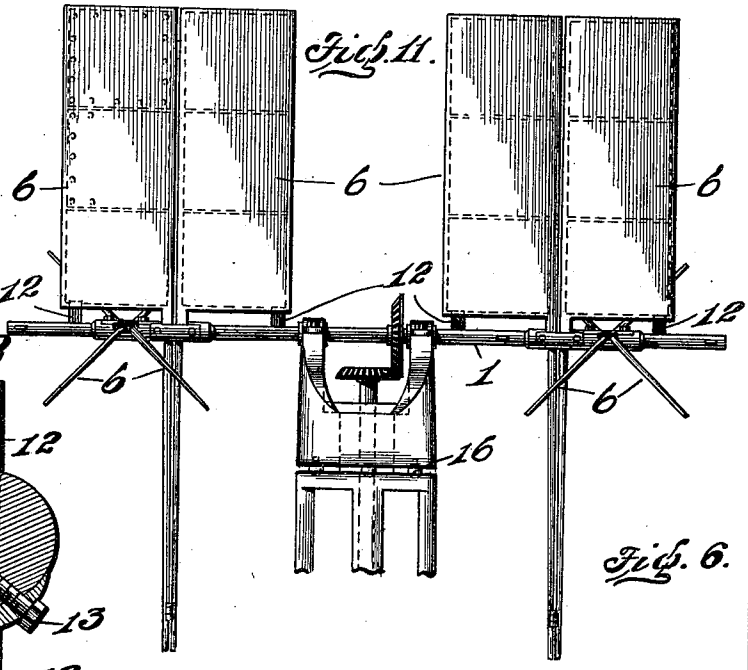

Fig. 13

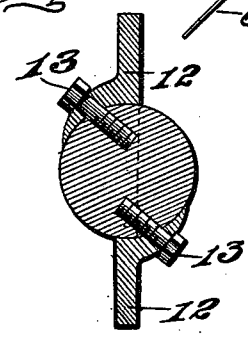

Fig. 6.

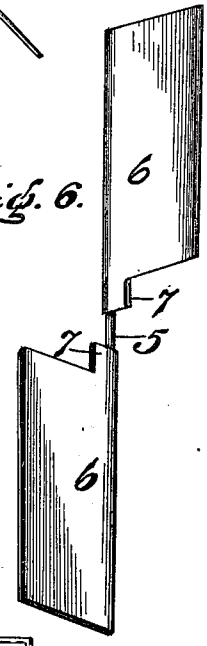

Fig. 5.

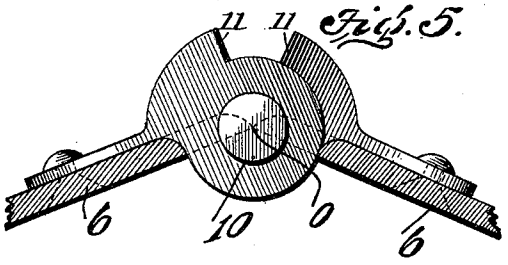

Fig. 12.

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No. 667,017. Patented Jan. 29, 1901.

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CURRENT MOTOR.

(Application filed June 27, 1900.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 9.

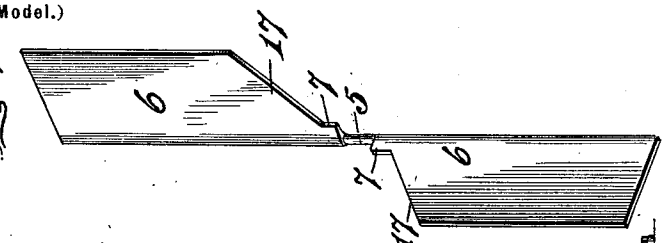


Fig. 8.

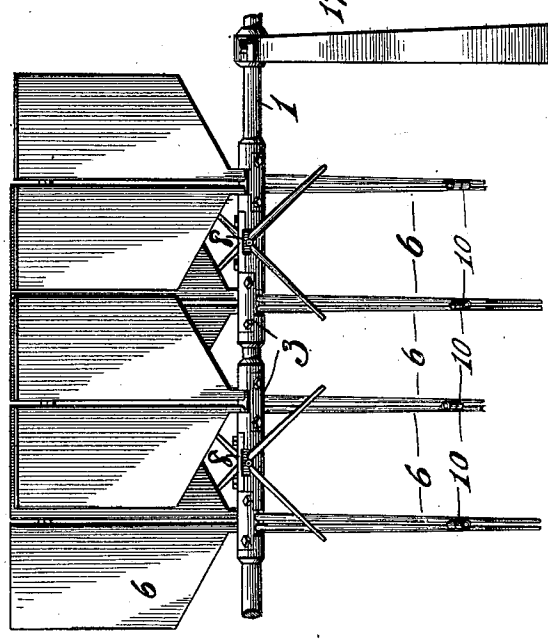


Fig. 10.

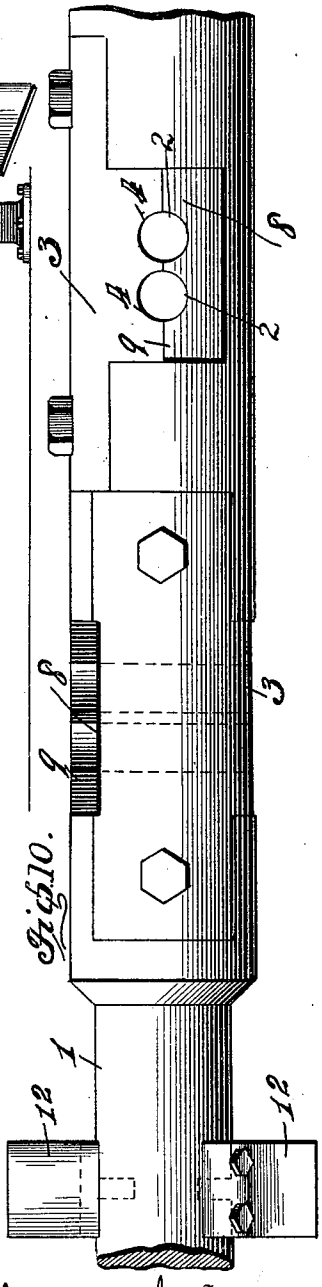
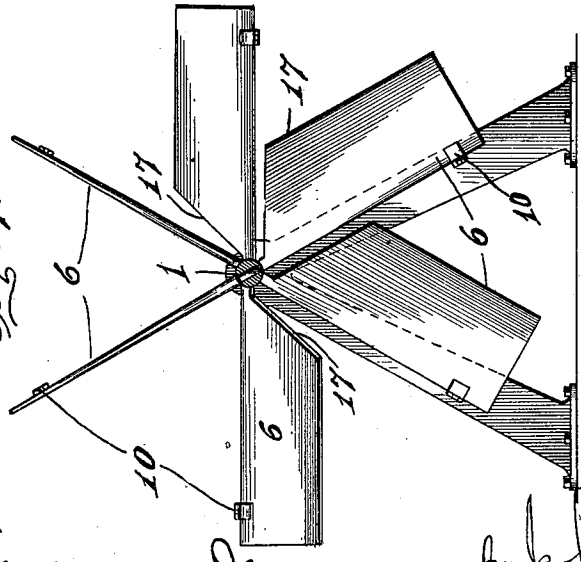


Fig. 7.



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UNITED STATES PATENT OFFICE.

CHARLES JASPER, OF SPOKANE, WASHINGTON.

CURRENT-MOTOR.

SPECIFICATION forming part of Letters Patent No. 667,017, dated January 29, 1901.

Application filed June 27, 1900. Serial No. 21,755. (No model.)

To all whom it may concern:

Be it known that I, CHARLES JASPER, a citizen of the United States, residing at Spokane, in the county of Spokane and State of Washington, have invented certain new and useful Improvements in Current-Motors, of which the following is a specification.

My invention relates to hydraulic motors of the type known as "submerged current-wheels," in which the non-acting blades have a feathering action in the water; and the object of my invention is to so construct and to so mount double-ended blades in hinged pairs that the feathering of one pair of blades will be caused by the action of the current in opening the other pair without the intervention of any means for effecting or controlling the blades in their opening and feathering movements, and this whether the incoming current acts upon the blades above their mounting-shaft or the outgoing current acts upon the blades below their mounting-shaft, and in either case continuing the same direction of the rotation of the wheel.

In the statement of my invention the following description, read in connection with the accompanying drawings, will enable any one skilled in the art to which my invention relates to understand its nature and to practice it in the form in which I prefer to employ it; but it will be understood that my invention is not limited to the precise form herein illustrated and described, as various modifications and equivalent changes may be made and adapted by the skilled constructor to carry out my invention—as, for instance, in its application to wind-wheels.

Referring to the drawings, Figure 1 represents in elevation a series of blades arranged in pairs constructed and mounted one pair at right angles to the other in accordance with my invention for operation as a submerged hydraulic motor, so that when one pair of blades is receiving the force of the current the other pair is feathering the current. Fig. 2 is a transverse section taken through the mounting-shaft at the seating therein of a double-ended blade. Fig. 3 shows, enlarged, a cross-section of the mounting-shaft at the seating therein of a double-ended blade. Fig. 4 is a like view, the blades being in different positions. Fig. 5, Sheet 3, is a detail showing the shouldered hinges of the double-ended blades. Fig. 6, Sheet 3, shows one of the double-ended blades and its mediate mounting-bearing and the seating-shoulders 7 7 thereof. Fig. 7 shows a transverse section, the blades having a construction of oblique ends, whereby they are adapted for triple radial arrangement in the shaft. Fig. 8 shows the same arrangement in side view. Fig. 9 shows one of the double-ended blades as constructed for use as in Fig. 8, whereby the blades open and close without striking each other. Fig. 10 shows, enlarged, a part of the mounting-shaft, the blades being removed to illustrate the mounting construction. Fig. 11 shows in side view the motor mounted for use as a wind-wheel, and Fig. 12 is an end view of the same; and Fig. 13 shows the mounting-shaft and the stops 12 thereon for supporting the open blades, as in Fig. 1.

The motor-power-transmitting shaft 1 may be suspended or supported by any suitable means, it being understood that such support must be in watercourses having sufficient depth and current to allow the blades to be submerged a sufficient depth to allow the rotation of the blades entirely below and free of surface drift and to utilize and transmit the power of the current. The shaft is mounted to rotate and is pierced transversely with holes 2, made in pairs quite close together and of semicircular form in cross-section, the shaft being recessed to expose the said semicircular holes at the side, as in Fig. 10. A box-cap 3, having corresponding semicircular recesses 4 4, is fitted and secured within said recess, forming thereby transverse holes in the shaft, as in Figs. 3, 4, and 10. These holes in pairs stand at right angles in the shaft, and the box-caps therefore are alternately on quarter sides of the shaft. Within these holes the blades are mounted mediately of their length and are free to turn therein with a blade projecting from the opposite sides of the shaft. A short bearing-shaft 5 for this purpose connects the two blades 6 6, so that they stand at right angles to each other, each having a shoulder 7 7 at the short shaft which forms the bearing on the

power-transmitting shaft for the double-ended blade and locks it within the walls of the shaft-hole. As shown, the shoulder is formed by the end of the blade; but it may be formed upon the shaft connecting the blades.

To allow the free turning of the shoulders, the shaft has flattened seats 8, which terminate in a wall 9, parallel with that of the shaft-hole, as in Figs. 3 and 4, and forms a stop against which the blade-shoulder 7 abuts in the open position of the blade, which position is parallel to the shaft, and the blade-shaft is thereby supported against twisting of the pressure at its bearing at the ends or lateral shaft-hole.

In the two functions of the blade-shoulders the blade-shafts are well supported in their seats against the pushing power of the current. These double-ended blades are arranged in pairs, so that one pair will open on one side of the shaft to receive the pushing force of the current, while the other pair will close flatwise to give them a feathering action in passing through the water. The blades are hinged at their outer ends, and this gives an effective bracing to the blades when open, as the hinges 10 have shoulders 11, Fig. 5, adapted for this purpose. To further brace and sustain the blades in their open position, stops 12 are provided on the shaft, against which the inner ends of the blades abut, as in Figs. 1 and 13. By this construction the blades of each pair are braced at their outer ends at their meeting edges and at their inner ends by the shaft-abutments 9 and 12 and the blade-shoulders 7, giving them a firm open relation to the shaft in resisting the force of the current. The abutments 12 may be mortised in the shaft and may be secured by a screw 13, passing through a foot-flange, as in Fig. 13.

Referring to Fig. 1, the power may be transmitted from the rotation of the mounting-shaft by the bevel-gear 14 or by the pulley 15 when the motor is used as a current-power; but as a wind-power the wheel is mounted in a rotating head 16, as in Figs. 11 and 12. In either case the blades connected, braced, and operating in pairs secure in their revolution the maximum force or power from the current or stream with the minimum of resistance therefrom.

Referring to Fig. 1, it is seen that three pairs of blades stand fully open above and completely closed below the power-transmitting shaft, while three other pairs of blades stand in horizontal positions, the opposite ends of which are half-open in their transition from the vertical positions in the revolution of the shaft. This change in the relation of the blades to each other and to the shaft is caused solely by the action of the current upon the blades, each blade having a quarter opening and closing motion determined and governed by the hinging of the blades, the shoulders on the inner ends of the blades, and the abutments on the power-transmitting shaft, and the closing of one pair, which limits the opening of the other pair. The pressure of the current upon the open blades will keep the opposite blades closed until, on the revolution of the shaft, the pressure upon the open surface has been taken off by reason of those blades having reached a horizontal position, from which horizontal position those open blades, by the pressure upon other open blades, will have in the meantime attained a vertical position backward against the current. This backward movement against the current will open the opposite ends of the blades and at the same time will be assisted in closing by the pressure of the current striking upon the opposite end of the paddle, which opens to catch the current as rapidly as the receding end will close to feather the current. In this way the opposite ends of any pair of blades render mutual assistance in opening and in closing, so as to produce rapid action and non-action of the blades in their relation with the current. The power of the wheel can be increased in proportion to the number of blades and their disposition on the shaft, and the rotation of the wheel may be maintained in the same direction by the ebb and flow of the tides. The incoming current, acting upon the open blades above the shaft, will be supplemented and continued by the outward or receding tide flowing against the open blades below the shaft. The structure may be set in a flume in which the pressure of the water upon the open blades below the shaft may be greatly increased by closing the space above the shaft except at such points at which the closed blades pass through in their backward movement.

In Figs. 7, 8, and 9 I have shown a construction in which the blades are arranged in triple radial sets, giving a more compact arrangement, but which thereby require the inner ends 17 of the blades to be shortened by oblique form to permit the blades to pass each other in their opening and closing actions in pairs. I prefer to make each double-ended blade of a single plate of steel formed with its mediate cylindrical shaft part and seating-shoulders and to hinge a pair of such blades together at their outer ends by pintle-hinges having shoulders which brace the outer ends of the blades when open and maintain their alinement while in full-open position. The application of the current to the open blades beneath the shaft or to the open blades above the shaft would depend on the necessity for the avoidance or interference with the wheel from surface drift material coming in contact with the blades. In places free from the possibility of such drift the application of the power to the lower blades would secure the greater force. The friction of the closed paddles passing backward through and against the current will be minimized by constructing the meeting edges of

the blades with sharp edges which cut their way through the water, as at *o* in Fig. 5. In the self-opening of the blades at one end of the pair and the self-closing thereby of the other ends of the blades the open blades at one end of the pair in reaching a point in their revolution where they begin a backward movement against the current will assist in closing them and of opening the blades at the other end of the pair, so that the blades mounted mediately of their length and hinged only at their outer ends will be easily controlled in their opening and closing by their rotation in the current, the blades of each pair being firmly supported only at the middle of their length. The pairs of blades are mounted and their widths are such that when open they will join and present a wall to the current, as in Figs. 1 and 8, while in the triple radial arrangement of the blades their bearings are equally disposed in different radii in the shaft and being thereby increased in number will present a greater number of walls to the current in the revolution of the shaft, the said walls being always in line with the shaft, as well as radial.

What I mean by being "in line with the shaft" is that all the blades in the same radii when open form a wall in the length of the shaft and extending from its periphery, so that all the force of the current is utilized upon a wall that may be as long as the shaft.

I claim—

1. In a current-motor and in combination with the power-transmitting shaft, a pair of double-ended blades, each having a mediate cylindrical bearing and a seating-shoulder at its junction with said bearing part and hinged together at their meeting edges at their outer ends, the said shaft having transverse holes to receive the mediate bearings and shoulders coacting with the seating blade-shoulders in the way and for the purpose stated.

2. In a current-motor and in combination with a power-transmitting shaft having transverse holes in pairs, a flat seating-surface and a shoulder at each end of the holes and a box-cap forming side walls for said holes, of a pair of double-ended blades having cylindrical bearings and seating-shoulders mediately of their length mounted to turn freely in said holes and hinged together at their outer ends.

3. In a current-motor and in combination with a power-transmitting shaft, a pair of double-ended blades mounted transversely therein, the blades of each pair adapted to turn freely therein, to open one pair of blades and to close the other pair by the force of the current, upon one pair, each pair of blades hinged at their outer ends and having a seating-bearing on the opposite sides of the shaft.

4. In a current-motor and in combination with the power-transmitting shaft, a pair of double-ended blades mounted to turn freely transversely therein, the blades of each pair hinged at their outer ends, having seating-bearings mediately of their length upon the shaft, their hinged meeting edges sharp to reduce their resistance in passing in closed relation through the water.

5. In a current-motor and in combination with a power-transmitting shaft, a series of double-ended blades, hinged together in pairs at their outer ends, mounted to turn freely in transverse bearings in said shaft mediately of their length, and arranged so that each alternate pair of blades will, in their revolution with the shaft, maintain open positions, under the force of the current, in a line parallel to the axis of the shaft.

6. In a current-motor and in combination with a power-transmitting shaft, a series of double-ended blades hinged together in pairs at their outer ends, mounted to turn freely in transverse bearings in said shaft mediately of their length and arranged in different radii in relation thereto.

7. In a current-motor, a power-transmitting shaft having transverse holes, in combination with double-ended blades hinged together at their outer ends mounted to turn freely in said holes, said blades having shoulders at their meeting edges, and the shaft having abutments arranged to engage the blade-shoulders and the ends of the blades.

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

CHARLES JASPER.

Witnesses:
GOLDIE I. DAVISON,
W. W. HINDMAN.