C. A. BARRON.

CURRENT MOTOR.

APPLICATION FILED OCT. 26, 1909.

995,419. Patented June 13, 1911.

3 SHEETS—SHEET 1.

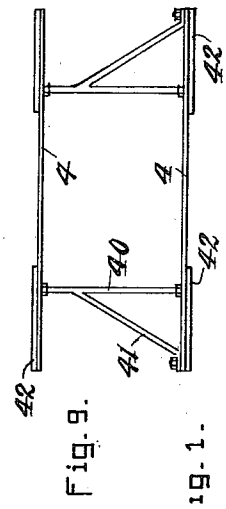

Fig. 9.

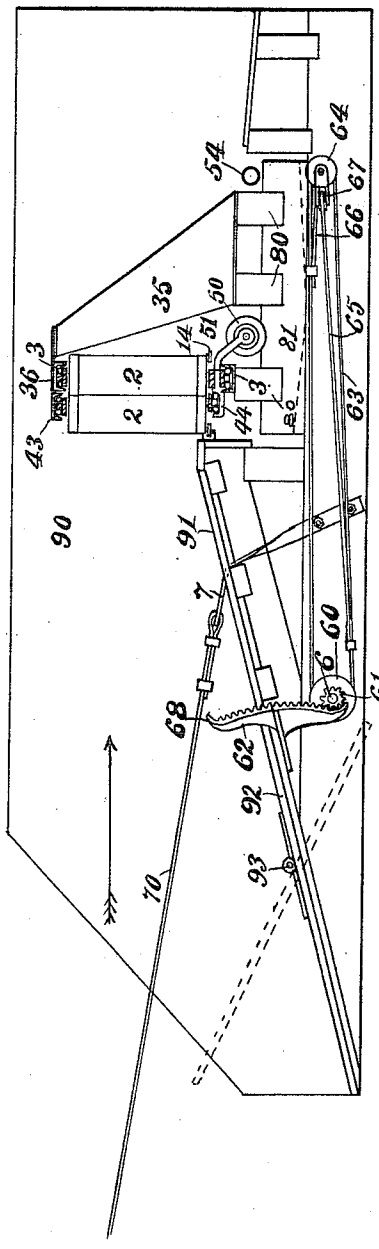

Fig. 1.

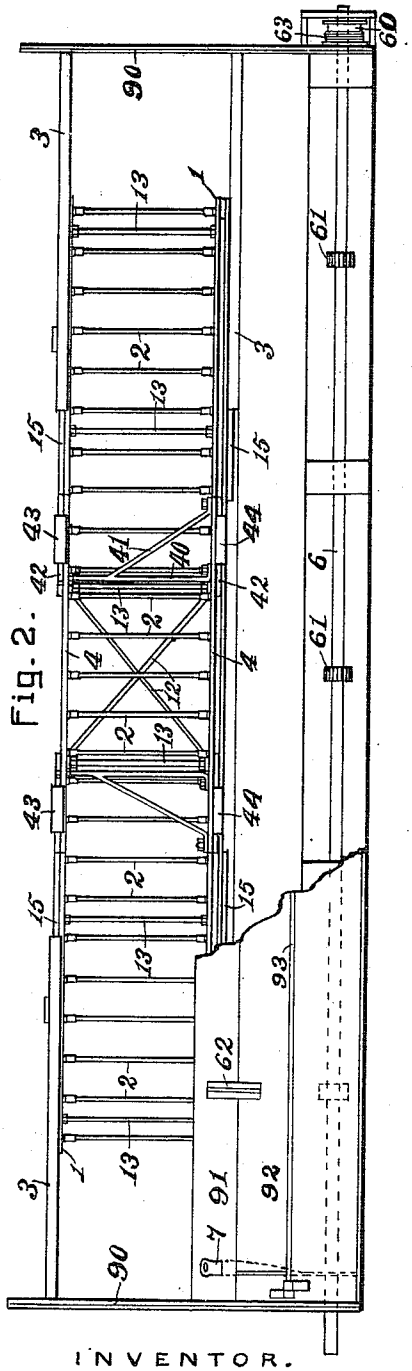

Fig. 2.

WITNESSES.

John W. Lowe

Robt. S. Young

INVENTOR.

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By Henry L. Reynolds.

his attorney.

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3 SHEETS—SHEET 2.

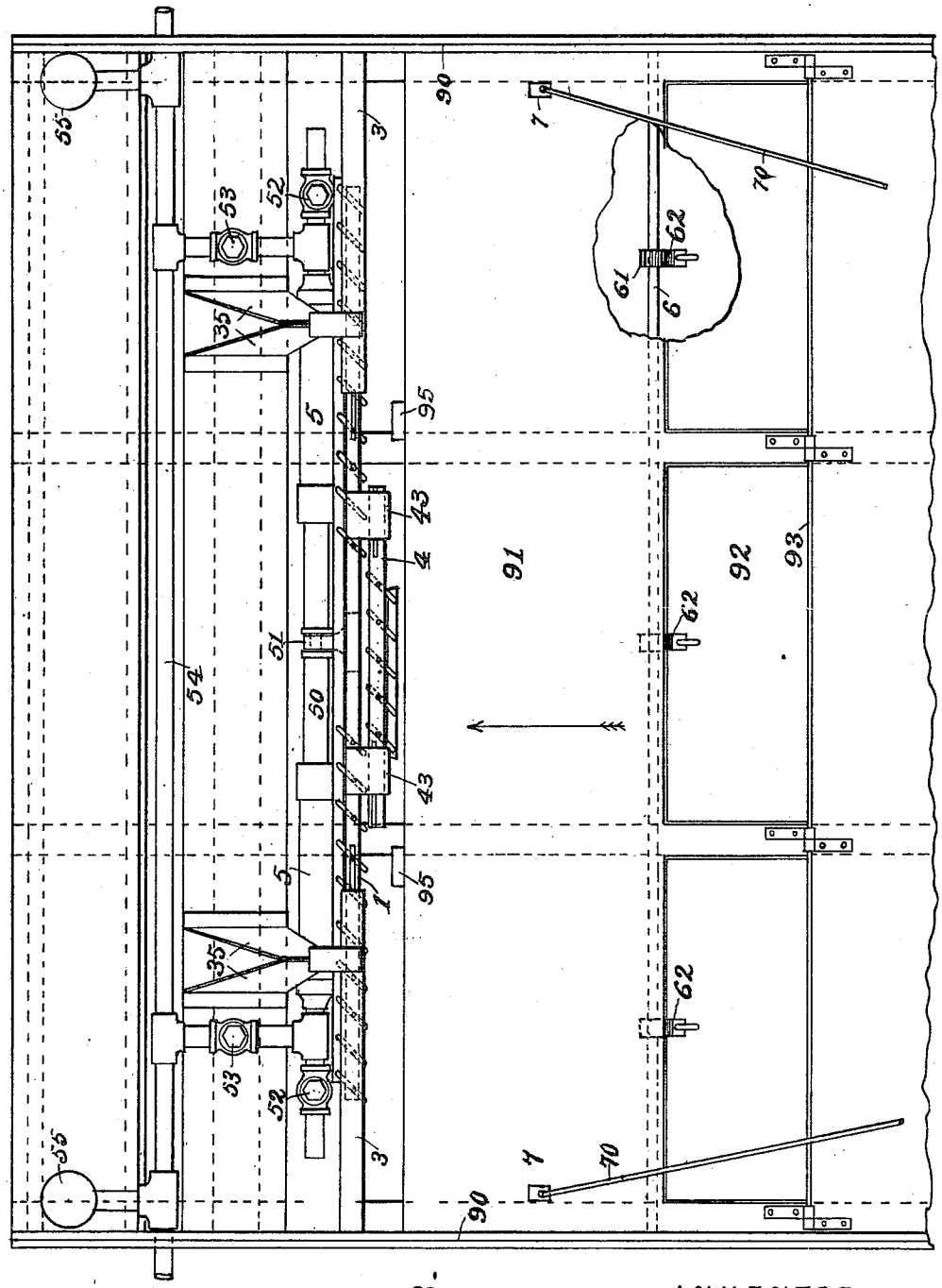

Fig. 3.

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3 SHEETS—SHEET 3.

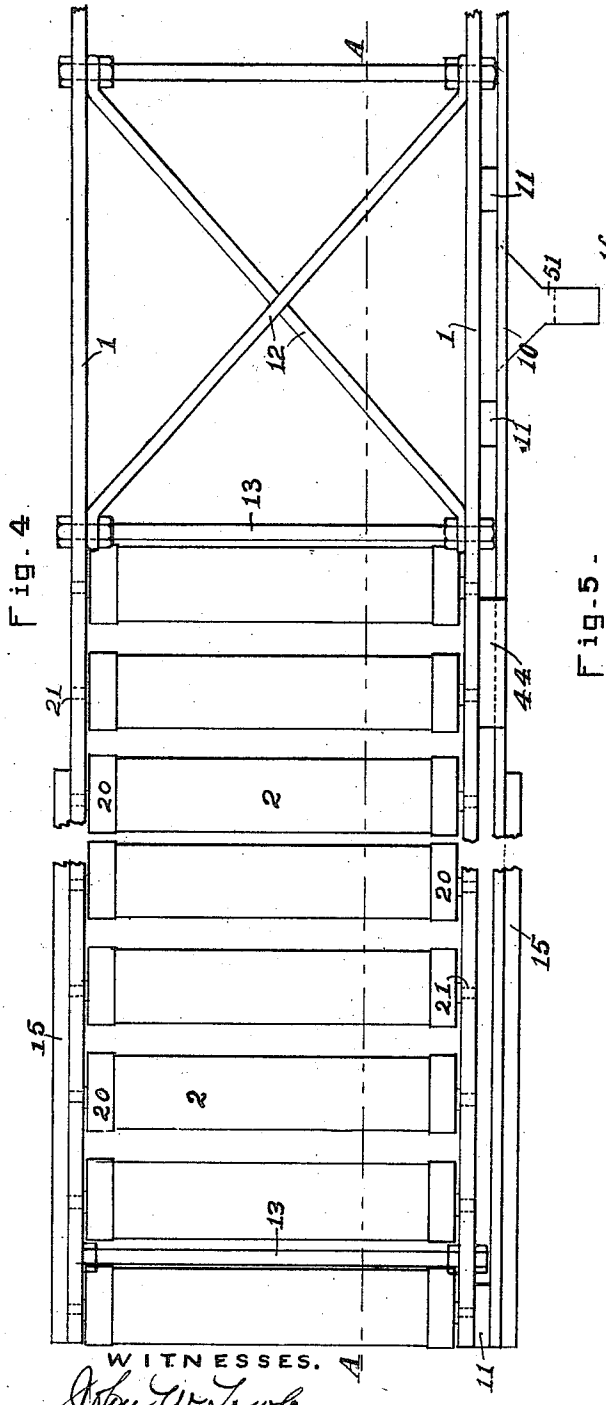

Fig. 4.

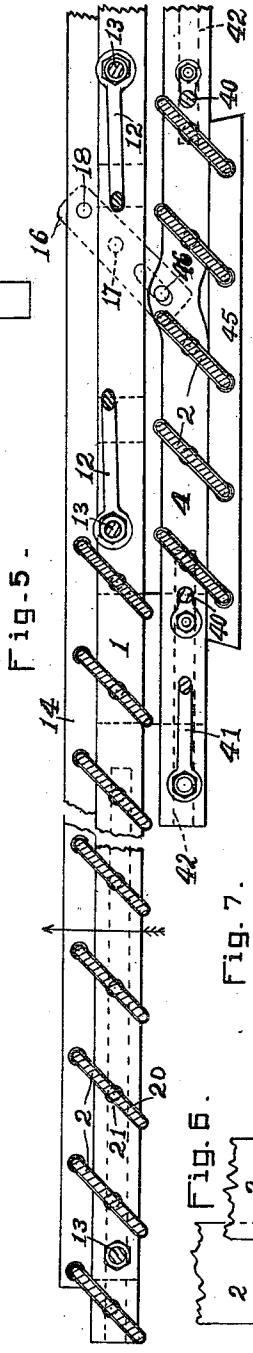

Fig. 5.

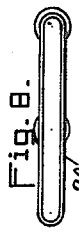

Fig. 8.

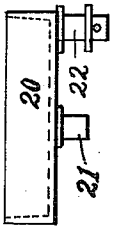

Fig. 7.

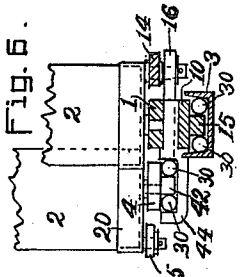

Fig. 6.

WITNESSES.

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Robt. S. Young

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UNITED STATES PATENT OFFICE.

CHARLES A. BARRON, OF SNOHOMISH, WASHINGTON, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CURRENT MOTOR COMPANY, OF TACOMA, WASHINGTON, A CORPORATION OF WASHINGTON.

CURRENT-MOTOR.

995,419. Specification of Letters Patent. **Patented June 13, 1911.**

Application filed October 26, 1909. Serial No. 524,759.

To all whom it may concern:

Be it known that I, CHARLES A. BARRON, a citizen of the United States, residing at Snohomish, Snohomish county, 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 an improvement in current motors or devices adapted to develop power from a flowing stream.

My invention comprises certain novel parts and combinations of parts which will be hereinafter described and particularly pointed out in the claims.

The object of my invention is to utilize a portion of the power which is contained in the current of a flowing stream, and to apply this to some useful purpose.

In the accompanying drawings I have shown my invention embodied in the form which is now preferred by me.

Figure 1 is an elevation of the form of my device which has been chosen for illustration, the near side being removed to reveal the working parts. Fig. 2 is a front elevation, parts of the apron and foundation frame or float being removed to better show its working parts. Fig. 3 is a plan view of my device. Fig. 4 is a front elevation of part of the main power frame, separated from the other parts. Fig. 5 is a plan in section, of the power developing members, (main and reversing frame and their blades) taken upon the line A, A, of Fig. 4. Fig. 6 is a sectional elevation of the lower parts of the power frames taken outside of the auxiliary or reversing frame. Figs. 7 and 8 are respectively elevation and plan of the pivot castings used to hold the wooden power blades. Fig. 9 is a front elevation of the reversing frame without its blades.

My invention belongs to that class of current motors in which the power developing members consist of a frame or frames mounted to reciprocate transversely of the current and contain pivoted blades adapted to lie at an angle to the current and to be reversed in their angular relation with the current at periodical times, whereby the frame is caused to reciprocate across the current. This frame may be maintained with its working parts just submerged in the water, but in the preferred form which is herein shown it is designed to be submerged until its supporting frame or foundation rests upon the bottom of the stream, where it remains unaffected by rise and fall of the water level and by floating drift. When mounted for operating in this submerged condition I provide it with means whereby it may be raised to the surface and maintained there at will, whereby it is accessible for inspection or repair.

The reciprocating frames which constitute the power developing members are shown separate from all other parts in Figs. 4 and 5. There are two of these frames, a main power frame and an auxiliary or reversing frame. The main frame consists of upper and lower bars 1, 1, connected by spacing bars or rods 13 and braced in their central part by rods 12. Between these bars are pivoted the blades 2 which are acted upon by the current to produce the power. This frame is mounted to slide between upper and lower guide ways, the bearing contact being upon balls interposed between the frame and the guide ways. Assembled views of these parts are shown in Figs. 1, 2 and 3, and the detailed structure of the lower bearing and sliding parts is shown in Fig. 6 upon a larger scale. Channel bars 3, 3, are fixedly supported, above and below, at each end of the frame 1, the channels thereof facing toward the center of the frame and serving as ball races. These channel bars need not extend entirely across the device, but may terminate at about a third of the distance from each side of the device, as has been shown, leaving a gap at the center. The channel bars 3 forming the lower ball-races are secured directly upon one of the cross timbers 80 which rest upon and are supported by the foundation or float structure. The channel bars 3 forming the upper ball-races are supported from the standards 35 which are secured to the two rear cross timbers 80. These timbers 80 are connected by timbers 81 which makes a removable and self-contained frame to which all the working parts are secured. I have shown the standards 35 as made of two pieces of boiler iron suitably flanged and secured and the connection with the channel bars 3 as by a bar 36 which is secured to the upper surfaces of both. The outer ends of the upper channel bars or ball-races 3, may be conveniently supported from the side walls 90 of the foundation or float. They may, however, with certain advantages, be

entirely unsupported except from the standards 35.

The upper side of the main reciprocating frame is composed of a single bar 1, while the lower side is composed of a like bar 1 and beneath this, a bar 10, which is secured to the bar 1 with spacers 11 interposed to keep them apart. At each end of the upper bar 1, upon its upper surface, is secured a bar or strip 15, extending as far inwardly from the ends as may be necessary to give the proper length of ball bearing. Similar bars 15 are secured in similar position, to the bottom of the bar 10 which forms a part of the lower side of the frame. This frame is placed within and between the upper and lower channel bars 3, balls 30 being interposed between the bars 15 and 1 of the frame and the channel bars, thereby forming ball bearings upon which the frame reciprocates.

The construction and mounting of the auxiliary or reversing frame is similar. This frame is shown detached in Fig. 9 and is composed of upper and lower bars 4, which are alike, connected by spacing rods 40 and braces 41, and has ball-race strips or bars 42 above and below at each end. This frame fits and slides within short ball-races 43, 44, which are secured respectively to the upper and lower bars 1 of the main power frame. Balls 30 are used in these race-ways as shown in Fig. 6. The auxiliary or reversing frame 4 is thus carried by the main frame and has a short reciprocating movement relative thereto as well as participating in the movements of the main frame. The amount of the relative movement of the two frames is controlled by the short lever 16 which is pivoted at 17 between the bars 1 and 10 which form the lower part of the main frame. At its forward end this lever is provided with a short slot which receives a pin 46 carried by the lower bar 4 of the reversing frame. The rear end of this lever 16 is pivoted at 18 to the bar 14 which is pivotally connected to the rear of each of the blades 2 carried by the main frame. The blades 2 which are pivoted in both the main frame and in the auxiliary or reversing frame, are the members which develop the power. These blades are preferably thin boards having their ends held in sockets in castings 20, which castings are each provided with a pivot journal or pin 21, a little to one side of the center of their length, and those upon the lower ends of the blades also have a pivot pin 22 at one end. The pins 21 are journaled in holes in the reciprocating frames, while the pins 22 enter holes in controlling bars. Those blades 2 which are pivoted in the main frame have their larger part extending rearwardly, or in the direction in which the water is flowing, and have their controlling bar 14 lying immediately back of the lower bar 1. Contact between these two bars will limit the angular swing of the blades. The blades 2 which are pivoted in the small or reversing frame, are placed with their major portion forward of their pivots with their controlling bar 45 lying in front of the lower bar 4 of the frame, contact between the two serving to limit the angle of swing of the blades 2.

With blades pivoted with the preponderance of area rearwardly of their pivots, as are those of the main frame, the effect of the current will be to swing and hold them in parallelism with the direction of flow of the water, in which position they can produce no power. With blades pivoted with the preponderance of area forward of the pivots, as are those of the reversing frame, the action of the current will be to turn them in an effort to swing this heavier side to the rear. The controlling bar 45 contacting with the frame bar 4 limits the angle of swing and therefore the effect of the current will be to turn these blades to the limiting angle and hold them there until positively reversed by some outside agency.

Because of the connection through the lever 16, the entire pulling power of the blades in the auxiliary or reversing frame is opposed to the turning action of the current upon the blades in the main frame. This pull is sufficient in amount to hold the blades of the main frame in their angular position in spite of the action of the current.

At such points that they will engage the ends of the controlling bar 45 of the reversing frame just before completion of the stroke in each direction, are placed the reversing stops 95, shown in Fig. 3. Contact with these reverses the blades of the small or reversing frame and these acting through the lever 16 in turn reverse the blades of the main frame. There will thus be produced a continuous reciprocating movement of the frames which may be utilized in many ways for power purposes.

The simplest and most obvious use for this power is to pump water. I have therefore shown a pump connected with the frame 1. The pump shown consists of two single acting cylinders 5, having plungers 50, which are actuated by an arm 51, secured centrally to the lower part of the main frame. The pump cylinders lie just back of and beneath the lower part of the frame 1 where they will not interfere with the free flow of water through the device. The water connections are with the outer ends of the pump cylinders, the suction containing a check valve 52 and the discharge a check valve 53. Other special forms of valves may be substituted for these. A cross pipe 54 connects the two sides. The discharge may be through an extension of this pipe in either direction. An air chamber or chambers may

be attached to the discharge pipe at any convenient place as at 55.

I mount the above described working parts, including the blade carrying frames, and the pumps, upon a frame which may be removed bodily from the float or foundation structure without affecting the adjustment or relationship of the operative parts. This frame consists of three timbers 80, extending transversely of the float when in position thereon, and the cross timbers 81 which bind them together. In putting this frame in the float or foundation structure, I prefer to have the bearing upon only two of the short cross timbers 81 and to have the bottom of one of these timbers cut away after the manner shown by dotted lines in Fig. 1, so that the frame has a three-point bearing and will therefore not be affected by the warping and twisting strains to which the float or foundation may be subjected. This method of mounting the working parts makes of them a self-contained structure in which cramping is not likely to cause any trouble.

The parts carried by the above frame include all the parts necessary to constitute an operative power device. They may be supported and mounted in a variety of ways and upon foundations which are stationary or movable, as circumstances may indicate to be best.

While I have herein shown only one form of mounting I do not wish to be confined to the use of this alone, but wish it understood that the power mechanism above described may be mounted as desired. The form of mounting which seems to be the most widely useful and adaptable to all conditions is that shown, which consists of a float or foundation structure designed, when the device is working, to rest upon the bed of the stream and provided with means whereby it may be made to rise to and float at the surface of the water or sink to the bottom at will.

The general features of this float comprise a timber and board platform having an inclined apron in its forward or upstream portion, a part of which apron is pivoted so that it may be turned to reverse the angle of the apron relative to the direction of current flow. The section 91 of the apron lying just forward of the power mechanism, as shown, in intended to be fixed. The section 92 extending from the section 91 to the forward or upstream edge is pivoted at 93 so that it may be turned from the normal or working position shown in full lines, to the position shown by dotted lines. In the former or working position the water flow, the direction of which is indicated by the arrow, will press and hold the whole structure down upon the bed of the stream, it being understood that the device is held by anchor lines extending upstream so that it cannot be carried down stream by the current. If now, the apron be turned into the position indicated by the dotted lines, the impact and pressure of the water beneath the up-turned pivoted portion of the apron will cause it to lift the upper edge of the float, whereupon the whole acts as a rudder or lifting plane to lift the machine to the surface and to maintain it there until the movable apron is turned downward, whereupon the whole device sinks to the bottom.

To control the position of this movable apron and thereby to control the rise and sinking of the device, I provide the following mechanism. A shaft 6 extends across the float just back of the rear edge of the movable apron. Upon the apron at its rear edge are secured toothed segments 62, which mesh with pinions 61 upon the shaft 6. Upon the shaft 6 is secured a short drum or pulley 60, of as large diameter as the space available will accommodate, to which are secured the ends of a wire rope or chain 63 which passes about a pulley 64 located to the rear. To each run of the rope or chain 63 is secured a rope, 65 or 66, which ropes lead through suitable guide pulleys, as 67, to the shore or other suitable point from which they may be manipulated. By pulling upon the line 65 when the device is down, the apron will be tilted up and it will be brought to the surface, while by pulling upon the line 66, the apron will be tilted down and the device will sink. It is thus possible to have the device operate resting upon the bottom of the stream, entirely submerged if the water is of sufficient depth, and yet have it easily accessible for inspection and repair. In this submerged condition it is beneath all drift, which will therefore do no damage, as it would be likely to do to any device which floated at the surface.

It will be noticed that the mounting of the blades in the main and reversing frame is opposite in this respect, that in the main frame the greater area of the blades is rearwardly or down-stream from their pivots, and in the reversing frame the greater area of the blades is forwardly or up-stream from their pivots. By the term "greater area" as herein used I mean that the area referred to has a greater moment or turning effect, whether this result is caused by an actual greater superficies, or by acting upon a lesser superficies through a greater arm. As a result of this method of pivoting the blades of the main frame at all times tend to draw into a position parallel with the direction of the current flow, while those in the reversing frame are held by the pressure of the water into whichever angular position they are placed by an outside means. The blades of the main frame are held in their working or angular position by reason of the fact

that the reversing frame is connected with their controlling bar so as to apply the entire pulling power of the reversing frame toward holding them in the angular position.

The anchor ropes by which the device is held in place may be attached at any convenient point. I have shown straps 7 secured to the frame and extending above the apron, to which ropes 70 are attached and lead upstream to any suitable anchor. I prefer to provide the float with side walls 90 which help to confine the water and make a short flume. They also serve as rudders to prevent side displacement by the action of the water upon the blades of the power frames.

What I claim and desire to secure by Letters Patent is:

1. A current motor comprising a main frame, a mounting for said frame permitting it to reciprocate across the current, a reversing frame mounted to reciprocate with the main frame, said frames each containing vertical blades pivoted therein and adapted to assume reverse angular positions relative to the direction of current flow, said blades in the main frame having their greater area rearwardly of their pivots and those in the reversing frame having their greater area forwardly of their pivots, and means connecting the reversing frame with the blades of the main frame to thereby control the angular position of the latter.

2. A current motor comprising a main frame and a reversing frame mounted to reciprocate across the current, said frames each containing vertical blades pivoted therein and adapted to assume reverse angular positions, said blades in the main frame having their greater area rearwardly of their pivots and those in the reversing frame having their greater area forwardly of their pivots, means connecting the reversing frame with the blades of the main frame to control their angular position, and a pump having direct operative connection with the main frame.

3. A current motor comprising a main frame and a reversing frame mounted to reciprocate across the current and to have a slight reciprocating movement relative to each other, said frames each having blades pivoted therein and adapted to assume reverse angular positions relative to the direction of the current flow, said blades in the main frame having their greater area rearwardly of their pivots and those in the reversing frame having their greater area forwardly of their pivots, means connecting the reversing frame with the blades of the main frame to control the angular positions of the latter, and fixed stops adapted to engage the blades of the reversing frame to reverse their angular position.

4. A current motor comprising a main and a reversing frame mounted to reciprocate across the current, said frames each containing blades pivoted therein and adapted to assume reverse angular positions relative to the direction of the current flow, said blades in the main frame having their greater area rearwardly of their pivots and those in the reversing frame having their greater area forwardly of their pivots, means connecting the reversing frame with the blades of the main frame to control their angular positions, a pump having the axis of its cylinder parallel with the direction of reciprocation of the main frame, and an arm carried by the main frame and engaging the piston rod of the pump.

5. A current motor comprising a main frame and a reversing frame, the latter being carried upon the main frame and adapted to have a limited reciprocal movement relative to the main frame, means for supporting the main frame to have a reciprocating movement transverse the current flow, blades pivoted in both said frames and adapted to be held in reverse positions at angles with the current flow, said blades in the reversing frame having their pivots placed so that they are held by the current in said angular positions, the blades in the main frame having their pivots placed so that the current tends to swing them parallel with its direction, and means connecting said reversing frame with the blades of the main frame and acting thereon to turn them against the action of the current thereon.

6. In a current motor, in combination, a frame having top and bottom members, blades pivoted between said members, means for reversing the angular positions of said blades relative to the direction of the current, fixed ball-races extending transversely of the current within which said frame slides, and balls or like rolling members between the frame and the said ball-races.

7. In a current motor, in combination, a frame having top and bottom bars, blades pivoted between said bars, means for holding said blades in angular position to the current, channel bars extending transversely of the current and embracing the top and bottom bars of the frame, longitudinal strips secured to said frame above and below and lying within said channel bars, and balls or like rolling members between said strips and the channel bars.

8. In a current motor, in combination, a supporting frame, two standards carried thereby, two sets of channel bars, one set carried directly upon said supporting frame and the other carried by the upper ends of said standards and having their channels facing toward each other, a power frame comprising an upper and a lower bar, longitudinal strips secured to the outer surfaces

of said bars and lying within the channels of said channel bars, blades pivoted between said upper and lower bars, and means for periodically turning and holding said blades at reverse angles with the current.

9. In a current motor, in combination, a main power frame having blades pivoted therein with the greater part of their area rearwardly of their pivots, supporting guides for said frame permitting its longitudinal reciprocation, a controlling bar pivoted to the rear part of each of said blades, and lying against the rear edge of the lower bar of the said power frame, a reversing frame mounted to reciprocate upon the main frame and forwardly thereof, a lever pivoted upon the main frame and to the controlling bar of the same frame and also having connection with the reversing frame, blades pivoted in the reversing frame with the greater part of their area forwardly of their pivots, a controlling bar connecting the blades of the reversing frame, and stops engaged by the said controlling bar of the reversing frame at each limit of its travel.

In testimony whereof I have hereunto affixed my signature at New York, N. Y., this 28th day of September 1909.

CHARLES A. BARRON.

Witnesses:
H. L. Reynolds,
Robt. S. Young.