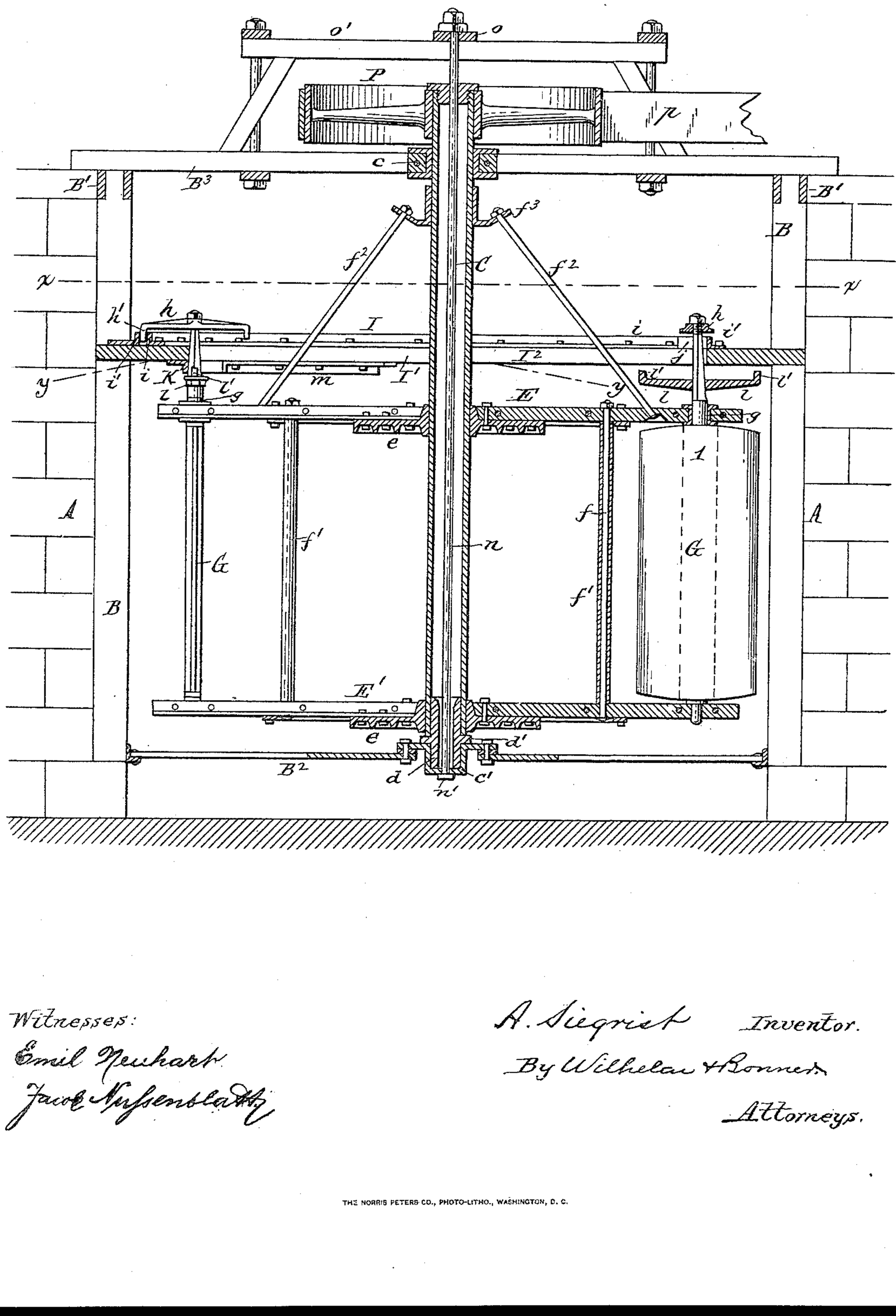
(No Model.) 2 Sheets—Sheet 1.

A. SIEGRIST.

CURRENT MOTOR.

No. 442,402. Patented Dec. 9, 1890.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

A. SIEGRIST.

CURRENT MOTOR.

No. 442,402. Patented Dec. 9, 1890.

Fig. 2.

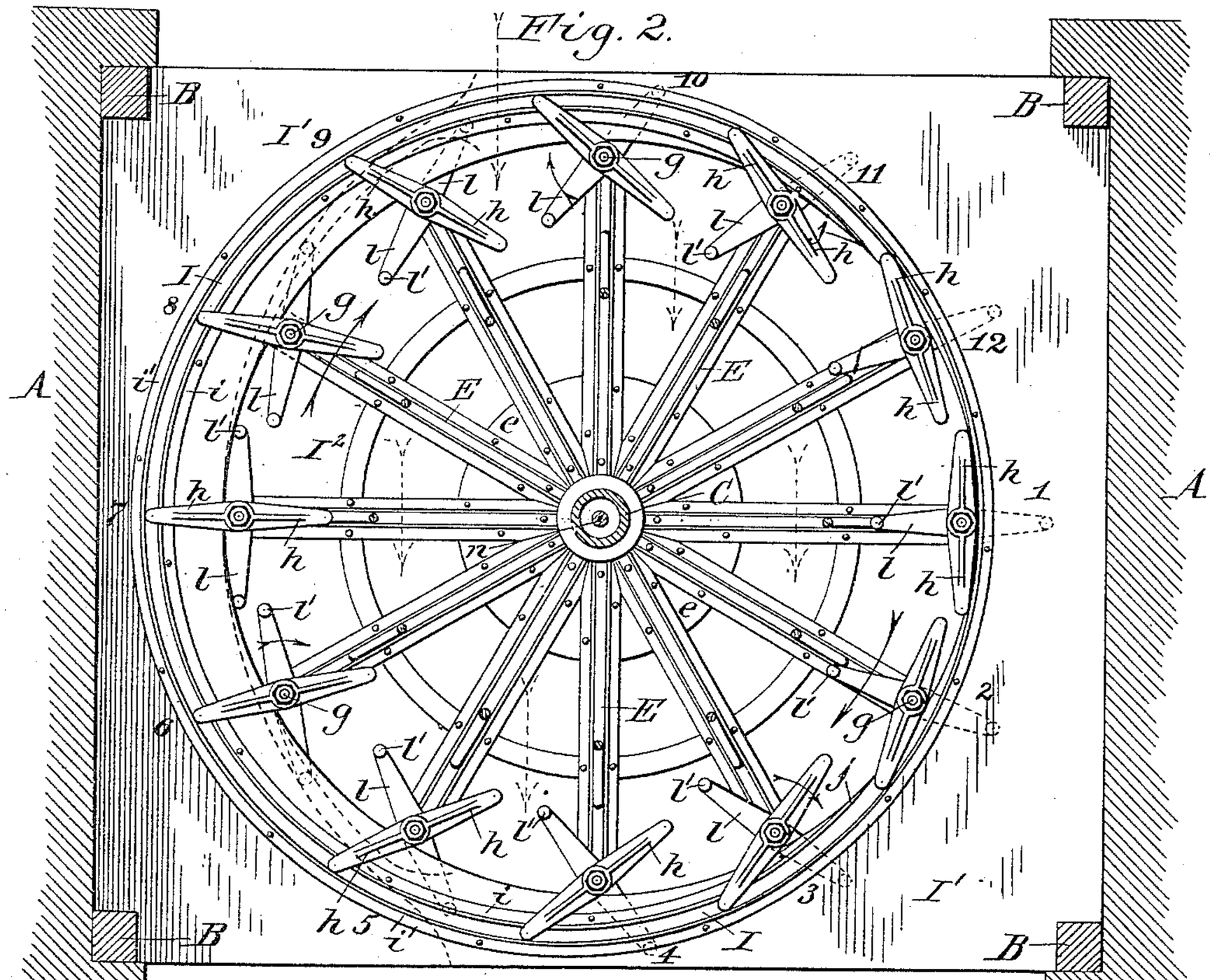
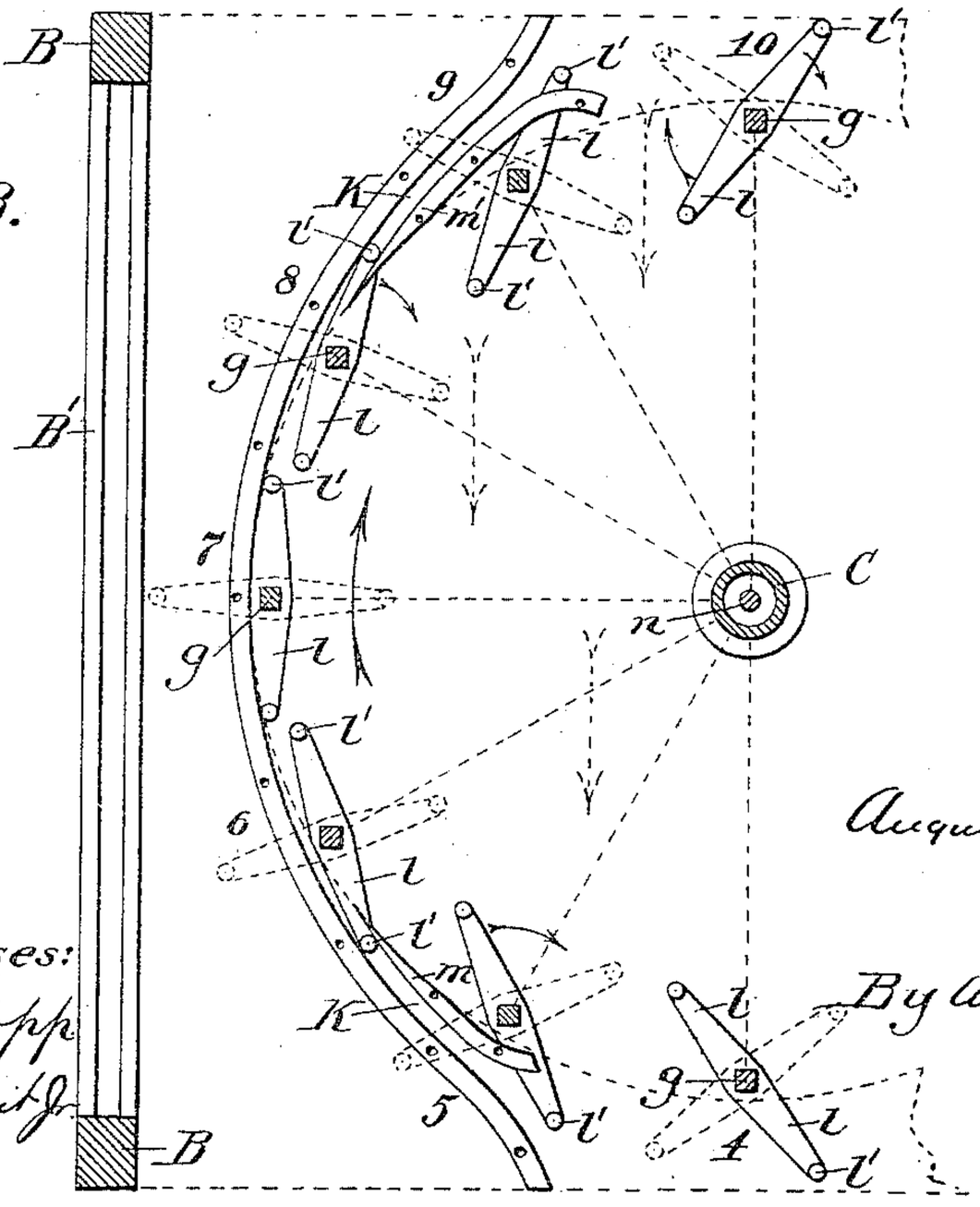


Fig. 3.



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UNITED STATES PATENT OFFICE.

AUGUST SIEGRIST, OF BUFFALO, NEW YORK.

CURRENT-MOTOR.

SPECIFICATION forming part of Letters Patent No. 442,402, dated December 9, 1890.

Application filed December 12, 1887. Serial No. 257,730. (No model.)

To all whom it may concern:

Be it known that I, AUGUST SIEGRIST, of Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Current-Motors, of which the following is a specification.

This invention relates to that class of current-motors which consist of a wheel having paddles or floats capable of turning on a central axis, and provided with mechanism whereby the paddles are presented with their broad faces to the stream in moving with the current, and with their narrow edges against the stream in moving against the current, so as to reduce the resistance of the paddles on the retreating side of the motor to a minimum and obtain the greatest possible percentage of power from the motor.

The object of my invention is to improve the means whereby the paddles are turned on their axis as the motor revolves, and also to improve the construction of the motor in several other respects.

The invention consists of the improvements which will be hereinafter fully set forth, and pointed out in the claims.

In the accompanying drawings, consisting of two sheets, Figure 1 is a sectional elevation of my improved current-motor. Fig. 2 is a horizontal section thereof in line *x x*, Fig. 1. Fig. 3 is a similar view in line *y y*, Fig. 1, looking downward, showing the auxiliary guide on the under side of the platform.

Like letters of reference refer to like parts in the several figures.

A represents the walls of a sluice, between which is arranged a vertically-movable supporting-frame which carries the parts of the motor. This supporting-frame is preferably composed of four uprights B, which are guided in suitable ways formed in the walls A, and are connected at their upper ends by cross-beams B′, and at their lower ends by an open horizontal frame B^2, composed of strong iron bars, preferably arranged in the form of a network and firmly braced.

B^3 represents cross bars or timbers secured to the upper end of the cross-beams B′ and resting with their end portions upon the walls A.

C represents the vertical shaft of the motor, which is made tubular and arranged at its upper end in a bearing *c*, secured to the cross-timbers B^3, and supported at its lower end in a socket or step-bearing *c′*, arranged centrally in the supporting-frame B^2. The hollow shaft C is provided in its lower end with a cylindrical wear block or plug *d*, which is seated in the step-bearing *c′*, and is provided with a collar *d′*, upon which the lower end of the shaft rests. By this construction the wear falls principally upon the plug *d*, which is readily renewed when worn.

E E′ represent two sets of radial arms secured at their inner ends to hub-flanges *e*, mounted on the shaft C. These arms are preferably composed of angle-iron, and the arms of the upper set E are connected with those of the lower set by vertical tie-rods *f*, the arms being held at the proper distance apart by tubular rods *f′* surrounding said tie-rods, as represented in Fig. 1.

f^2 represents inclined brace-rods secured at their lower ends to the upper set of arms E, and at their upper ends to a crown-collar f^3, mounted on the shaft C immediately below the bearing *c*.

G represents the upright paddles or floats, which are arranged between the upper and lower sets of arms E E′ and journaled in bearings formed in said arms. The upper journals *g* of the floats extend upwardly beyond the arms E, and each of said journals is provided at its upper end with a pair of horizontal shifting-arms *h*, having at their outer ends downwardly-projecting pins or studs *h′*.

I represents a curved horizontal guide arranged immediately below the shifting-arms *h* and supported upon a horizontal platform I′, secured to the uprights B of the motor-carrying frame. The guide I is approximately circular in form, and is arranged eccentrically with reference to the central axis of the motor. The guide I consists of a groove, in which the stud of one of the shifting-arms *h* of each paddle engages, and this groove is preferably formed by means of two concentric angle-irons *i i′*, as shown. The platform I′ is provided with a central opening I^2, through which the upper journals of the paddles pass. As the motor is rotated by the

current striking the paddles the latter are turned by the shifting-arms *h* and the stationary guide-groove I, the paddles as they reach the advancing side of the motor being held with their broad surfaces against the stream, while on reaching the retreating side of the motor their narrow edges are turned against the stream, so as to offer as little resistance as possible. In the drawings are shown twelve paddles, although a greater or less number may be employed, and for convenience and clearness in the description the points of the guide-groove at which the paddles stand in the drawings are numbered consecutively from 1 to 12. At point 1 the paddles are turned with their wide faces squarely against the current. At points 2 and 3 they are turned at such an angle with reference to the current that the latter exerts its force upon the paddles in the direction in which the motor should turn. At point 4 the paddles are presented to the current at an angle of forty-five degrees. At point 5 the narrow edges of the paddles begin to turn against the current, but are still partly effective. At points 6 and 8 they are nearly in line with the current, and at point 7 directly in line therewith. At these three last-mentioned points the resistance of the paddles is less than at any other points of the motor. At point 9 the paddles are again turned into a partly active position, at 10 they assume a position similar to that at point 4, being only reversed, and at points 11 and 12 they have the same relative position as at points 2 and 3.

The portion of the inner rail or angle-iron *i* of the guide-groove extending over the points 1, 2, and 12 is cut away, as shown at *j* in Fig. 2, to form an opening or passage in the guide-groove for the entrance and exit of the studs of the shifting-arms *h*, which is rendered necessary, in order to cause the paddles to revolve in the proper direction when they reach this part of the guide. As a paddle reaches this passage the stud of its rear shifting-arm *h* leaves the guide-groove I. At the point 1 the studs of both shifting-arms *h* are out of the groove, and the paddle is held against movement in either direction by the studs *h'* bearing against the outer rail *i'*. As the paddle approaches the point 2 its rear shifting-arm is swung inwardly, so as to move its stud beyond the path of the guide-groove I, while the stud of its front arm is still held against the outer rail *i'*, thereby guiding the stud of the front arm into the groove I, which latter now holds the paddle in the proper position until it reaches the point 5. At the points 1, 2, 3, 4, 10, 11, and 12 of the guide-groove the shifting-arms *h* stand at such an angle to the radii of the guide-groove that the studs *h'* of the arms tend to move in an arc which bisects the guide-groove at a sufficiently-abrupt angle to prevent undue play of the studs in the groove, but at the points 5, 6, 7, 8, and 9 the shifting-arms stand at such an angle to the groove that the studs *h'* have a tendency to describe an arc which is so nearly concentric with the guide-groove as to permit excessive play of the studs, and this play renders the paddles liable to be thrown out of their proper position and even reversed. To avoid this, an auxiliary curved guide K of larger radius than the adjacent portion of the main guide I is arranged on the under side of the platform I', extending from the point 5 to a short distance beyond the point 9, and each paddle is provided with an additional pair of shifting-arms *l*, arranged underneath the platform I' at right angles to the upper shifting-arms *h* and having upwardly-projecting studs *l'*, which bear against the auxiliary guide K, as shown in Fig. 3. The upper shifting-arms *h* are arranged at right angles to the paddles, and the lower arms *l* are arranged in line therewith, as clearly shown in Figs. 1 and 2.

On the inner side of the auxiliary guide K at the points 5 and 9 are arranged guards *m m'*. As a paddle approaches the point 5, the current tends to turn the paddle in a direction, whereby the stud of its lower rear arm *l* is moved out of the path between the guide K and the guard *m;* but just before this occurs the stud is guided into the groove between these parts, whereby the paddle is held in its proper position at this point. After the paddle has passed the guard *m* it is held against turning in either direction by both its studs bearing against the inner side of the guide K. At point 8 the stud of the lower front arm *l* of the float enters the groove between the guide K and the guard *m'*, while its rear arm is swung inwardly away from the guard and guide in a manner similar to that described with reference to the upper main guide I at point 2. As soon as the stud of the front arm *l* leaves the guide K the movement of the paddle is controlled by the upper shifting-arms *h*. In this manner the floats are controlled at the points 1 2 3 4 10 11 12 by the main guide I and upper shifting-arms *h*, and at the remaining points by the lower auxiliary guide K, guards *m m'*, and the lower shifting-arms *l*.

n represents a vertical lifting-rod arranged within the tubular shaft C and passing with its lower portion through an opening in the plug *d* and through the step-bearing *c'*. The rod *n* is provided at its lower end with a head *n'*, bearing against the under side of the step-bearing *c'*. The upper portion of this lifting-rod passes through a cross-piece O, secured to an elevated frame O', surmounting the timbers B^3. The entire motor, with its supporting-frame, may be lifted out of the water by means of the rod *n* for making repairs, the rod being provided at its upper end with an eye or other means, whereby it may be connected with the tackle of a hoisting-machine.

P is the main driving-pulley, mounted on the tubular shaft C, and from which the power is taken by a belt *p*.

I claim as my invention—

1. In a water-motor, the combination, with

a revolving wheel-frame, of a series of paddles, each journaled centrally in said supporting-frame, upper shifting-arms *h*, secured to the journal of each paddle, a stationary guide-groove I, in which one of the shifting-arms of each paddle engages, lower shifting-arms *l*, also secured to the journals of the paddles, and an auxiliary stationary guide K, with which said lower shifting-arms engage, substantially as set forth.

2. In a water-motor, the combination, with a horizontal revolving wheel-frame, of a series of vertical paddles, each journaled centrally in said supporting-frame, upper shifting-arms *h*, secured to the journal of each paddle, a stationary guide-groove I, in which one of the shifting-arms of each paddle engages, lower shifting-arms *l*, also secured to the journals of the paddles, an auxiliary stationary guide K, with which said lower shifting-arms engage, and guards *m m'*, arranged on the inner side of said auxiliary guide, substantially as set forth.

3. The combination, with the hollow shaft C and the socket or step-bearing *c'*, of the wear block or plug *d*, arranged in the lower end of the hollow shaft seated in said socket, and provided with a collar *d'*, upon which the lower end of the hollow shaft rests, substantially as set forth.

4. The combination, with the hollow shaft C and the socket or step-bearing *c'*, of the wear block or plug *d*, arranged in the lower end of the hollow shaft seated in said socket, and provided with a collar *d'*, upon which the lower end of the hollow shaft rests, and a supporting-rod *n*, passing through the tubular shaft and said step-bearing and provided at its lower end with a head resting against the under side of said bearing, substantially as set forth.

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