J. R. JEFFREY.

CURRENT MOTOR.

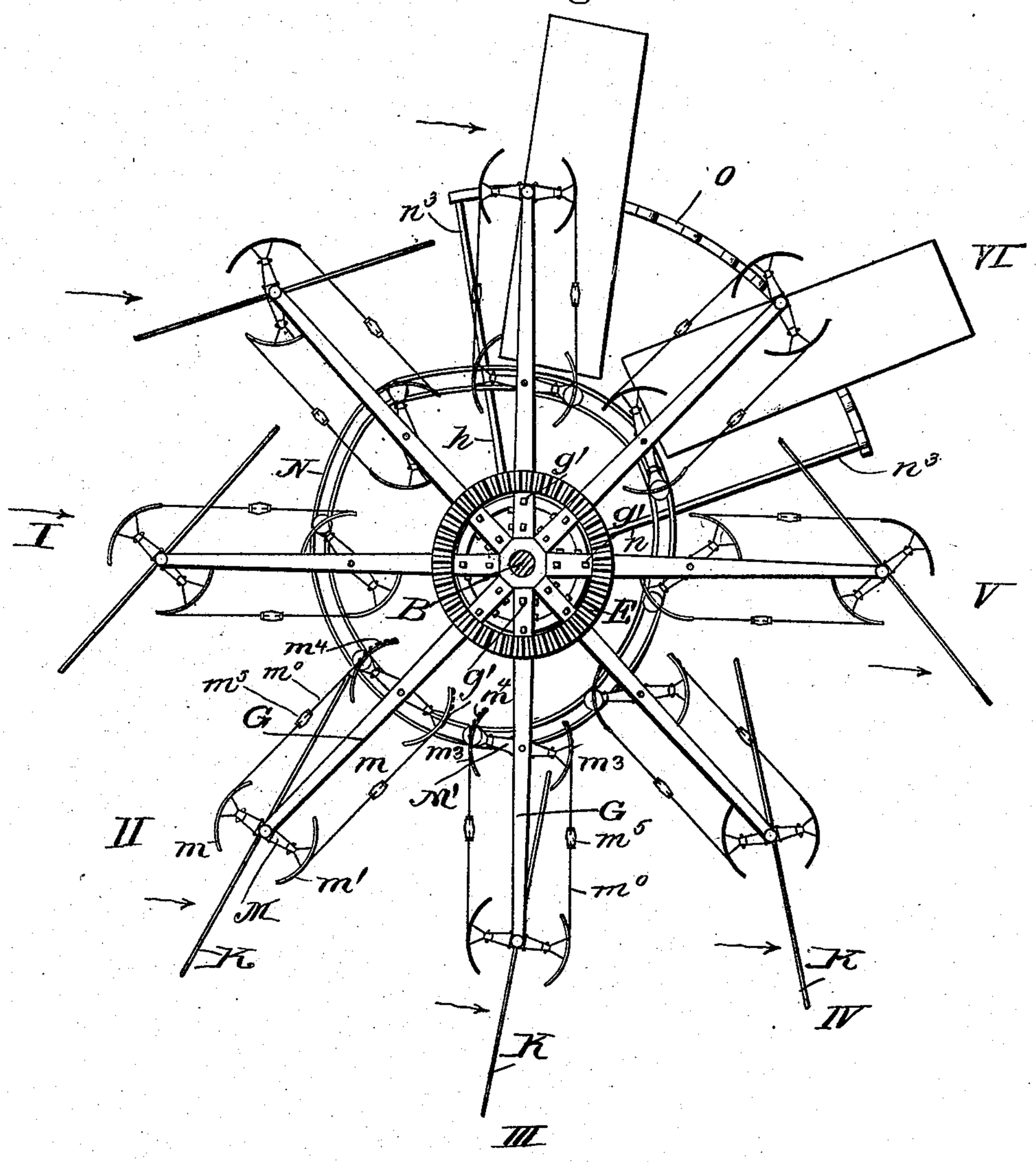
APPLICATION FILED SEPT. 26, 1905. RENEWED JULY 15, 1908.

899,987.

Patented Sept. 29, 1908.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES.

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3 SHEETS—SHEET 2.

Fig. 2

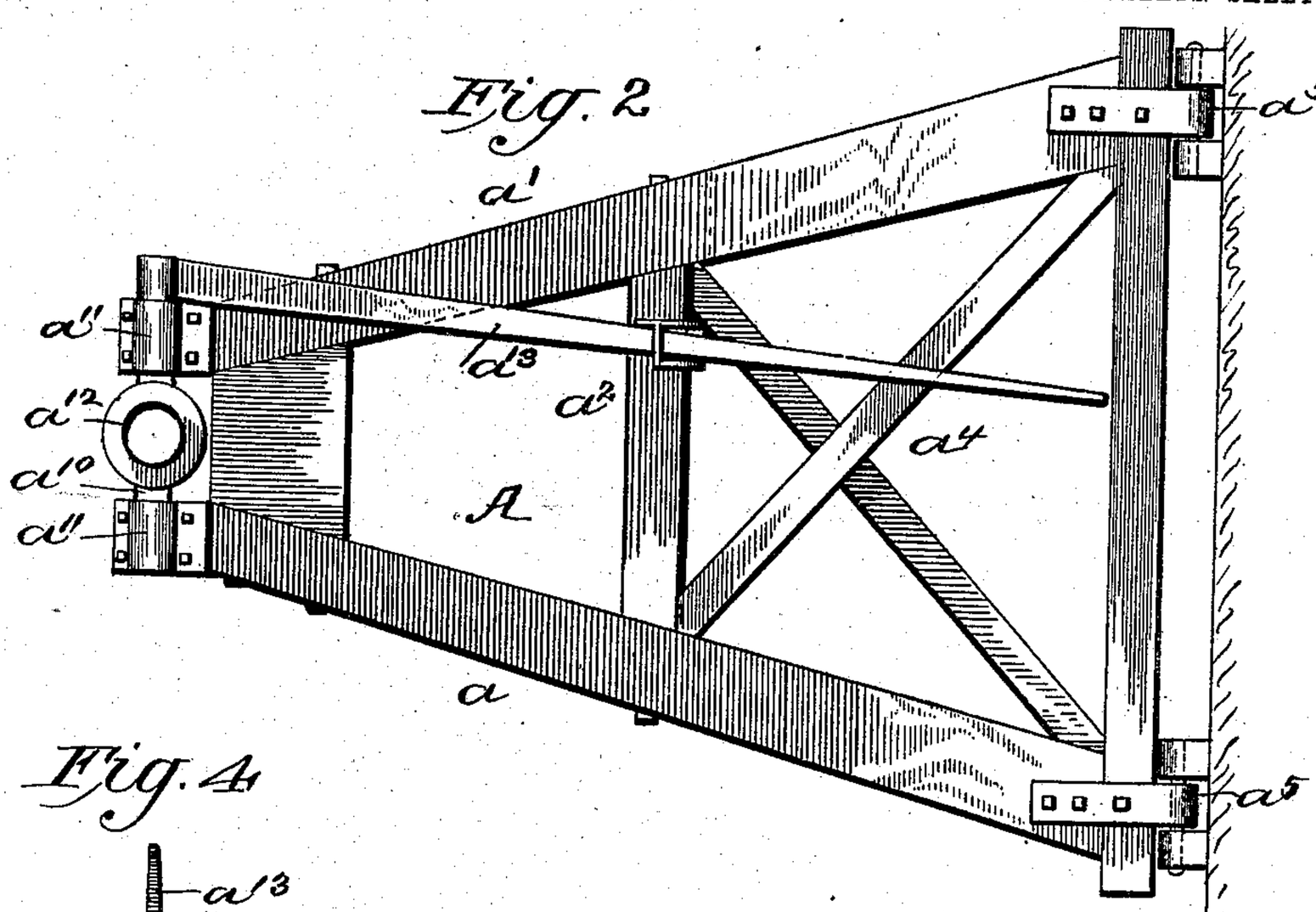


Fig. 4

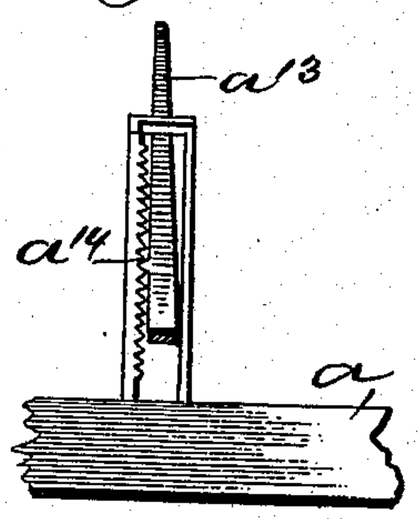


Fig. 3

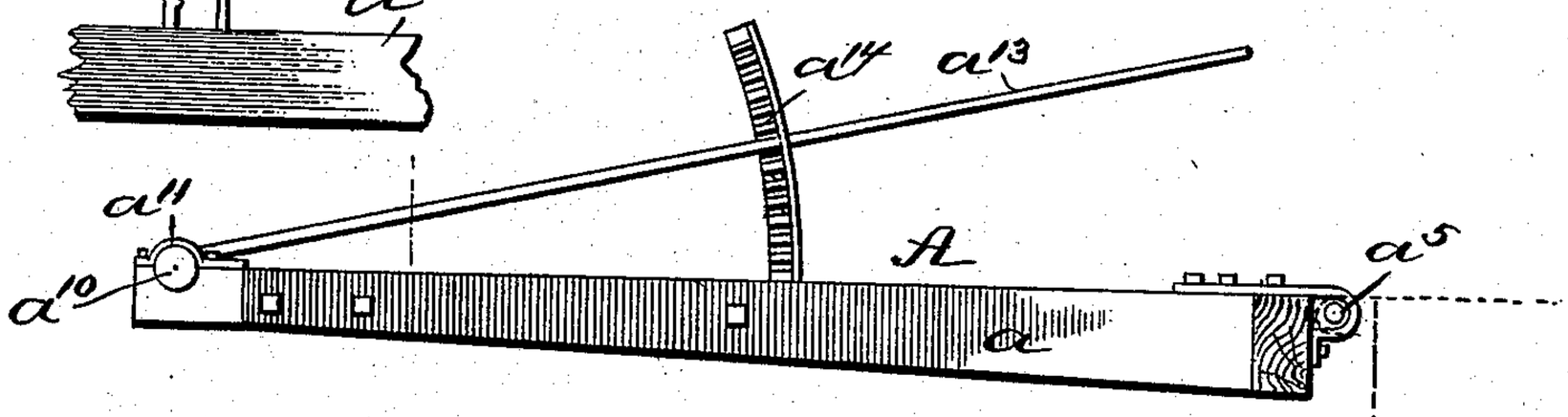


Fig. 6.

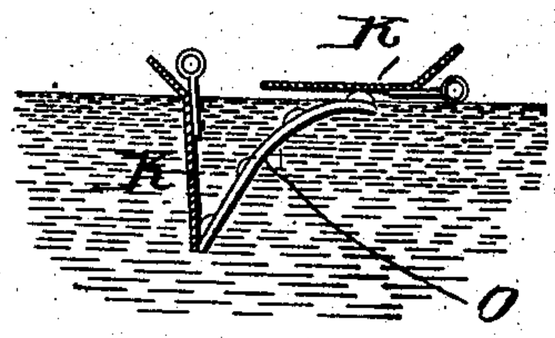
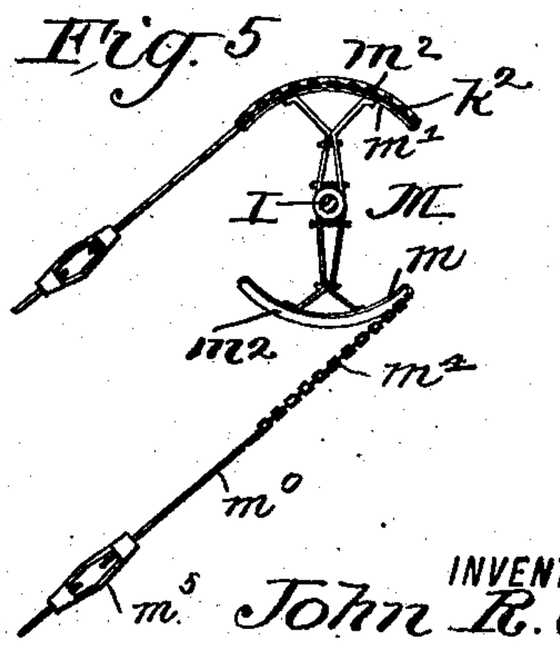


Fig. 5



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3 SHEETS—SHEET 3.

Fig. 7.

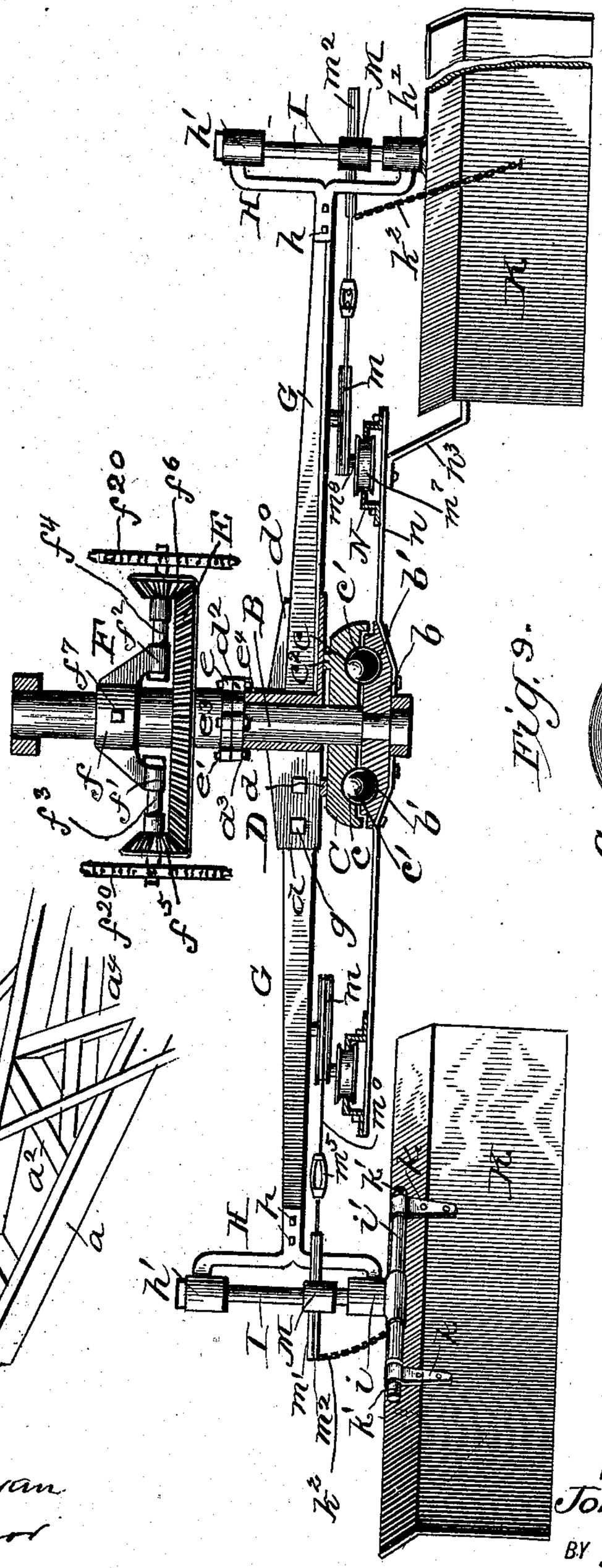


Fig. 8.

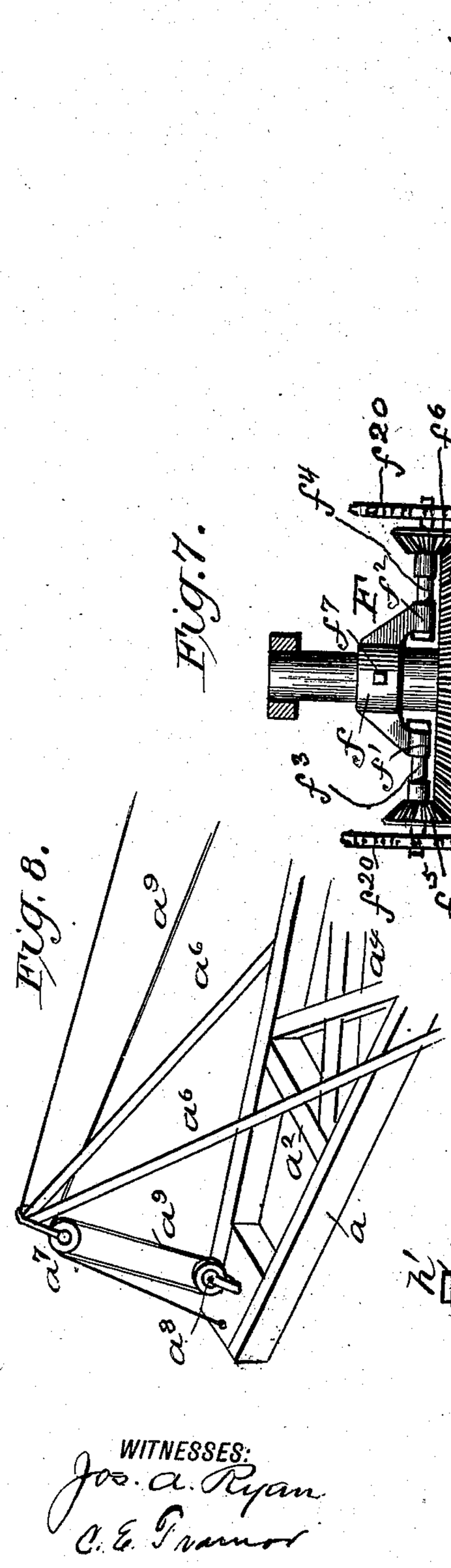
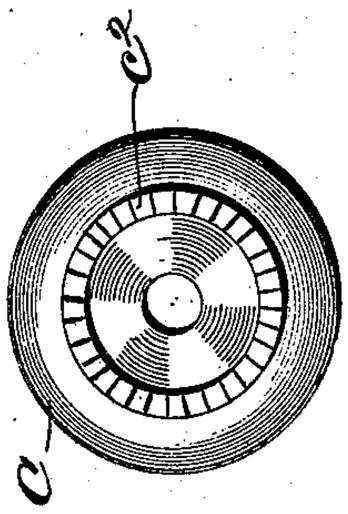


Fig. 9.



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JOHN ROBERT JEFFREY, OF FAIRVIEW, BRITISH COLUMBIA, CANADA.

CURRENT-MOTOR.

No. 899,987. Specification of Letters Patent. Patented Sept. 29, 1908.

Application filed September 26, 1905, Serial No. 280,128. Renewed July 15, 1908. Serial No. 443,687.

To all whom it may concern:

Be it known that I, JOHN ROBERT JEFFREY, a subject of the King of Great Britain, and a resident of Fairview, British Columbia, Canada, have invented certain new and useful Improvements in Current-Motors, of which the following is a specification.

My invention is an improvement in current motors and consists in certain novel constructions and combinations of parts hereinafter described and claimed.

Referring to the drawings forming a part hereof. Figure 1 is a plan view of my improved wheel. Fig. 2 is a plan view of the supporting frame. Fig. 3 is a side view of the same. Fig. 4 is a detail of the ratchet bar and lever. Fig. 5 is a detail of the vane shifting device. Fig. 6 is a side view of the outer track for elevating the vanes to a horizontal position. Fig. 7 is a side view of the wheel and connections. Fig. 8 is a detail perspective of the supporting frame and its elevating mechanism, and Fig. 9 is a top plan view of the cap.

In the practical application of my invention, I provide a wheel adapted to be supported horizontally in the current of a stream, motion being imparted to the wheel by the action of the moving current on a series of vanes secured to the periphery of the wheel.

A framework is provided for supporting the wheel comprising, in the present instance, a triangular framework A, composed of longitudinal beams a, a' secured together by the cross-bars a^2, and braced at the base by the diagonal bars a^4, the frame being hinged to any suitable structure on the bank by means of the hinges a^5. A pair of shears a^6 projecting outwardly from the bank, and having double blocks a^7 at their ends, is provided for raising and lowering the frame to correspond with different stages of water, a second block a^8 being attached to the frame, a cable a^9 being attached to the framework, interwoven in the blocks, and extended to the bank.

A shaft a^{10}, is journaled in bearings a^{11} on the outer ends of the longitudinal bars of the frame, and is provided with a central vertical bearing a^{12} for receiving the main shaft B on which the wheel is journaled. An arm a^{13} rigid with the shaft a^{10} is provided for tilting the wheel, a ratchet bar a^{14} secured to the framework being provided for retaining the bar in its adjusted position. A disk b, is secured to the lower end of the main shaft B and is provided upon its upper face with a groove b'. A cap C is loosely mounted on the shaft above the disk, having in its lower face a groove c registering with the groove b', the two forming a ball race provided with balls c'. The upper edge of the cap is provided with a clutch face c^2 for co-acting with clutch teeth d, on the lower edge of a hub D, having upon its upper surface radial ribs d^0, and being loosely mounted above the cap C. The upper edge of the hub is provided with radial lugs d^2 having end perforations d^3 and above the hub a gear wheel E is loosely mounted on the shaft, its lower edge being provided with radial lugs e corresponding to the lugs d^2, and having their end perforations e' registering with the perforations d^3, bolts e^3 traversing the registering perforations and being secured in place by nuts e^4.

A yoke F provided in its body portion with a bearing f for engaging the main shaft, is mounted above the gear wheel. The arms of the yoke are provided with bearings f', f^2 in which are mounted transverse shafts f^3, f^4, provided on their free ends with bevel gears f^5, f^6, meshing with the gear wheel E and with sprocket wheels f^{20}, a set-screw f^7 traversing the body portion of the yoke and engaging the shaft for securing the yoke in position. The sprocket wheels f^{20} are for the purpose of transmitting the motion of the wheel and may be connected by a suitable chain (not shown) to the mechanism to be driven.

Arms G are secured to the radial ribs on the hub and to the upper face of the hub by the transverse bolts g, and the vertical bolts g', respectively. The arms are formed of angle plates and to the outer ends thereof are attached yokes H by means of the bolts h. The arms of the yokes are provided with bearings h' in which are journaled vertical shafts I having attached to their lower ends a T-joint i in which is rigidly secured a cross-shaft i'.

Vanes K having the general form shown in Fig. 6 are attached to the cross-shaft i' by means of hinges k, collars k' being provided on the cross-shaft to maintain the hinge in proper relation to the shaft. Rock arms M are rigidly secured to the vertical shaft above the lower bearing, the ends of the rock arms being provided with segments m m', having grooved peripheries m^2. A chain k^2 extends

from one of the segments to the face of the vane, for limiting the backward motion of the vane with respect to the cross-shaft. Rock arms M′ are pivoted to the arms G, their free ends being provided with segments m^3. Chains m^4 attached to the remote ends of the segments are connected by means of rods m^0 and turn-buckles m^5 to similar chains on the remote ends of the corresponding segments on the same arm. An anti-friction roller m^7 is journaled on the pin m^8 projecting from the lower surface of the segment on the rock arm M′.

A cam track N is provided for engaging the friction rollers, to actuate the rock arms, the track being supported by braces n secured to the disk b in any suitable manner, the braces on one side of the wheel being extended as at n^3, for supporting the outer track O for engaging the vanes to swing them into a horizontal plane.

As will be seen from Fig. 1 the cam track N is arranged to maintain the vanes in such position that the force of the current will act upon them to the greatest advantage and that the direction of the force will be in the line of least resistance.

At station I, Fig. 1, the force of the current tends to drive the vane not directly before it, but to the right, that is, in the direction in which the wheel is moving. The same is true at station II, III and IV. At station V, the force of the current will also tend to drive the wheel in the same direction, while at station VI, the return motion commences, and the vanes are swung into a horizontal plane, in a position affording the slightest possible resistance to the action of the current.

It will be evident from the description, that while the vanes present a maximum of surface to the action of the water during their active period, they present a minimum of surface to the action of the water during their inactive period. When the vanes are at station I, for instance, the force of the current is neutralized by the resistance of the wheel, since the two forces are opposite and equal, and the reaction of the water diverted by the obliquity of the vane is the active force. This force is the resultant of the two forces and is tangent to the wheel. At station II the resultant of the forces acting upon the wheel is still tangent thereto and the same is true at every point during the active or operative period of the vanes. The cam track maintains the vanes at all times during the active period of the vanes in such position that the resultant of the forces acting upon the vanes is tangent to the wheel, and the outer track maintains the vanes during the inoperative period in the position of least resistance to the current.

My invention, while simple in construction, is very efficient in operation, and is entirely automatic in its action. No attention is required after the wheel is once lowered into the water.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A current wheel comprising a vertical shaft, means for supporting the shaft, a disk secured to the lower end of the shaft and provided with a groove in its upper face, a cap loosely mounted on the shaft, and provided with a groove in its lower face registering with the groove of the disk to form a ball race, balls in the grooves, clutch teeth on the upper end of the cap, a hub loosely mounted on the shaft, and provided on its lower edge with clutch teeth engaging with the teeth of the cap, radial ribs on the upper face of the hub, radially projecting lugs on the upper face of the hub, a gear wheel loosely mounted on the shaft above the hub and provided with radially projecting lugs corresponding to the lugs on the hub, bolts engaging perforations in the lugs of the gear wheel and hub for securing them together, a yoke having a body portion provided with a bearing for engaging the vertical shaft, and with arms provided with bearings, a set-screw for retaining the yoke in place, shafts in the bearings of the yoke arms, bevel gears on the ends of the shafts and meshing with the gear wheel, angle arms secured to the radial ribs of the hub, yokes on the ends of the arms, bearings on the arms of the yokes, stud shafts journaled in the bearings, cross-shafts secured to the lower end of the stud shaft, vanes hinged to the cross-shafts, rock arms secured to the stud shafts, segments on the ends of the arms, and provided with grooves on their peripheries, chains connecting the vanes to adjacent segments, rock arms pivoted to the angle arms, segments having grooved peripheral portions secured to the ends of the rock arms, a friction roller on one of the segments, chains connecting the remote ends of the corresponding segments on the two arms, a turn-buckle for adjusting the chains, supports secured to the disk on the main shaft, a cam track secured to the ends of the supports for engaging the friction rollers on the segments, extensions on the supports at one side of the wheel, and an outer cam track supported by the extensions, and adapted to elevate the vanes.

2. In a current wheel, the combination of a shaft, means for supporting the shaft, a hub journaled on the shaft, radial arms on the hub, vanes secured to the arms and normally depending vertically therefrom, means on one side of the wheel for varying the angle of the vanes with respect to the arms, and means on the opposite side of the wheel for swinging the vanes into a horizontal position.

3. In a current wheel, the combination of

a shaft, means for supporting the shaft, means for elevating and depressing the shaft, means for varying the inclination of the shaft, with respect to the supporting means, a hub journaled in the shaft, radial arms on the hub, vanes secured to the arms and normally depending vertically therefrom, means on one side of the wheel for varying the inclination of the vanes with respect to the arms, and means on the opposite side of the wheel for swinging the vanes into a horizontal position.

4. In current wheels adapted to be rotated by a current of water, the combination of a shaft, means for supporting the shaft, means for elevating and depressing the shaft, means for varying the inclination of the shaft with respect to the supporting means, a hub on the shaft, radial arms on the hub, vanes on the arms, means for varying the angle of inclination of the vanes with respect to the current, and means for swinging the vanes into a plane parallel with the direction of motion of the current.

5. In a current wheel, the combination of a shaft, means for supporting the shaft, a hub journaled on the shaft, a plurality of radial arms secured to the hub, vertical vanes pivoted to the outer ends of the arms, means for rotating the vanes on a vertical axis, and means for swinging the blades into a horizontal plane.

6. In a current wheel the combination of a shaft, a wheel journaled on the shaft, and provided with radial arms, vertical vanes pivoted to the ends of the arms, means for rotating the vanes in a vertical plane, and means for swinging the blades into a horizontal plane.

7. In a current wheel, the combination of the wheel, vanes on the wheel, and normally depending vertically therefrom, means on one side of the wheel to vary the angle of inclination of the vanes to the wheel, and means on the opposite side of the wheel to swing the vane into a horizontal position.

8. In a current wheel, the combination of the wheel, vanes on the wheel, means on the wheel actuated by the rotation thereof to maintain the vanes in a plane substantially perpendicular to the current on one side of the wheel, and means on the wheel and actuated by the motion thereof to swing the vanes into a horizontal plane on the opposite side of the wheel.

9. A current wheel comprising a shaft, means for supporting the shaft, radial arms projecting from the shaft, stud shafts journaled in the ends of the arms, cross shafts secured to the lower end of the stud shafts, vanes hinged to the cross shafts, arms secured by their centers to the stud shafts, and provided on their ends with segments, arms pivoted by their centers to the radial arms and having their ends provided with segments, chains connecting the remote ends of the corresponding segments on the two arms, a turn buckle for adjusting the chains, a friction roller on one end of the arm secured to the radial arms, and a cam engaging the roller whereby to swing the vanes on a vertical axis, and a second cam for engaging the vanes to swing them into a substantially horizontal plane.

JOHN ROBERT JEFFREY.

Witnesses:

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ERNEST PECK.