J. C. CALDWELL.

PROPELLING OR POWER GENERATING MECHANISM.

APPLICATION FILED APR. 19, 1912.

1,067,897.

Patented July 22, 1913.

4 SHEETS—SHEET 1.

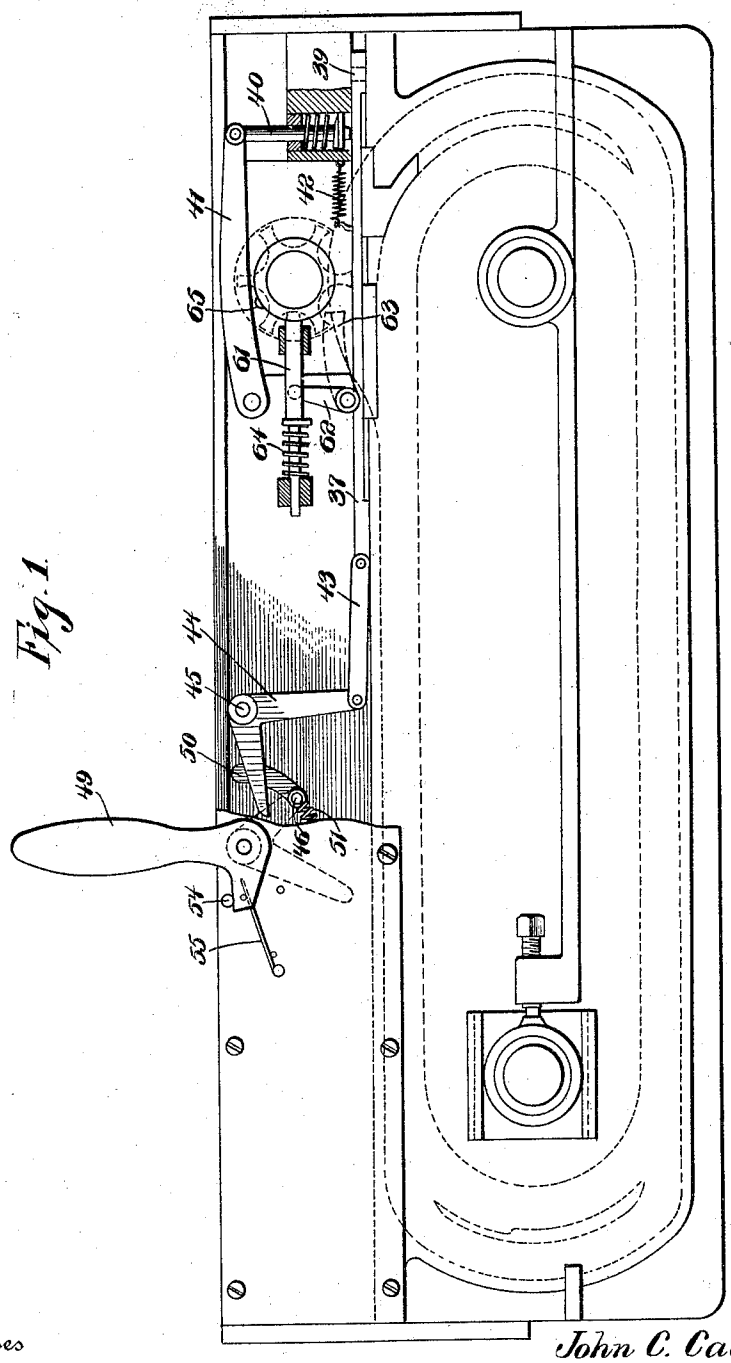


Fig. 1.

Witnesses

Wm. H. Mulligan.

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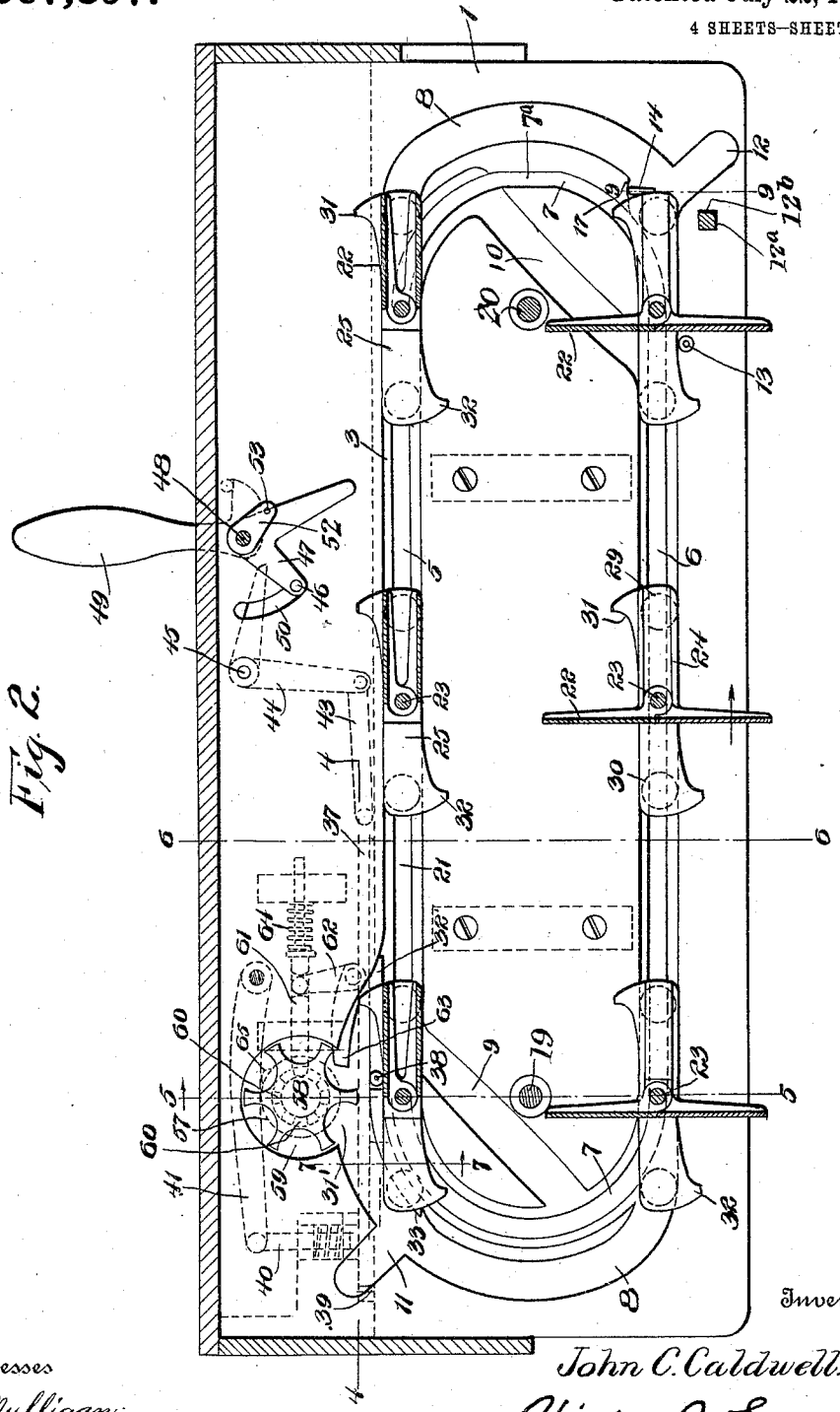


Fig. 2.

Witnesses

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4 SHEETS—SHEET 3.

Fig. 3

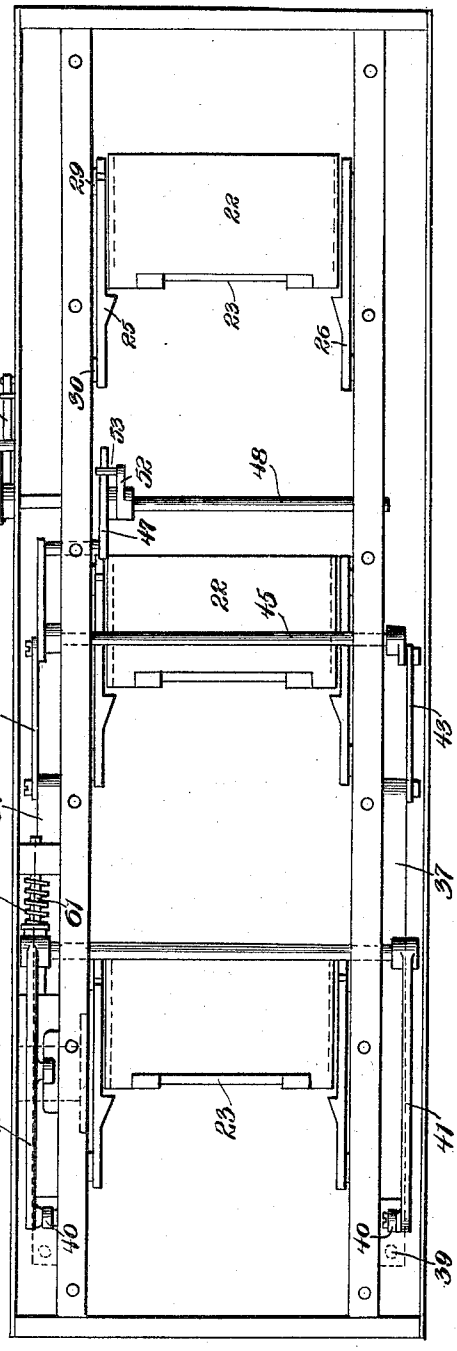
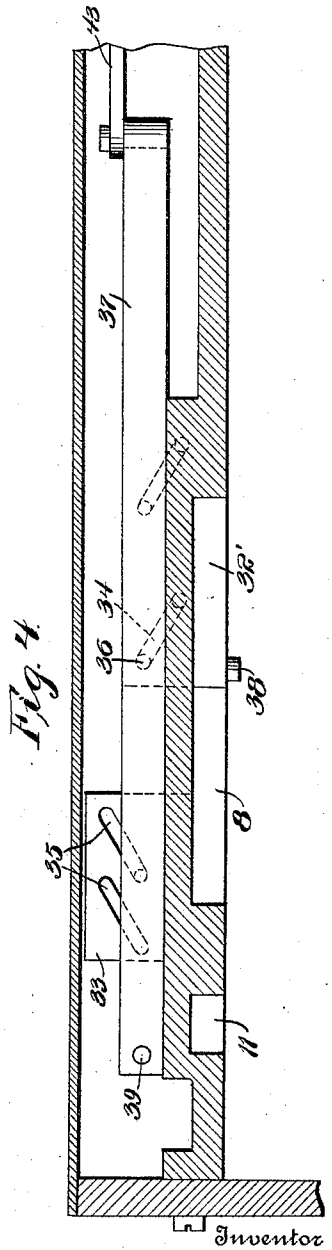


Fig. 4.



Witnesses

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4 SHEETS—SHEET 4.

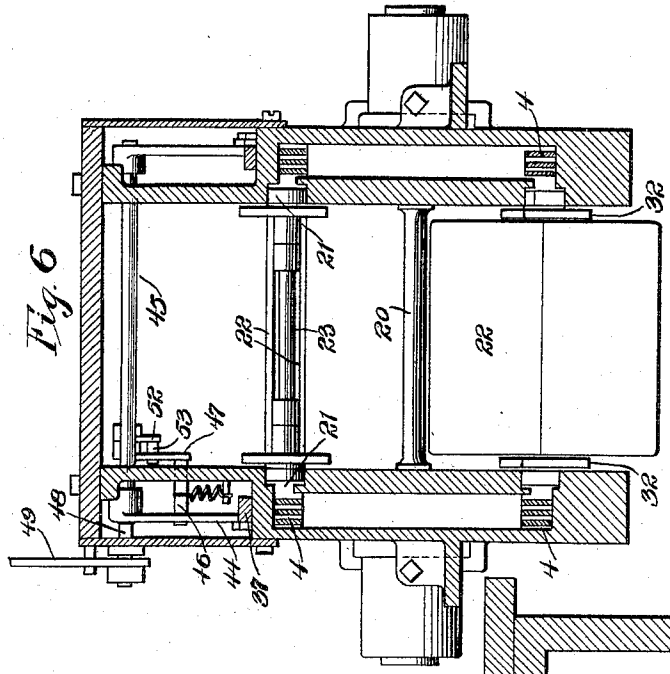


Fig. 6

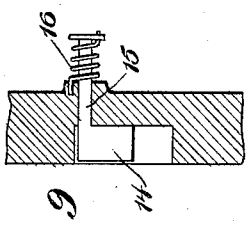


Fig. 9

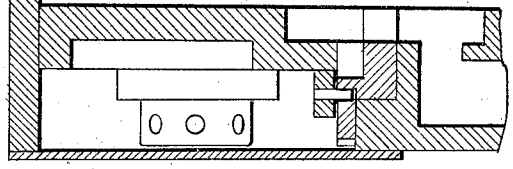


Fig. 7

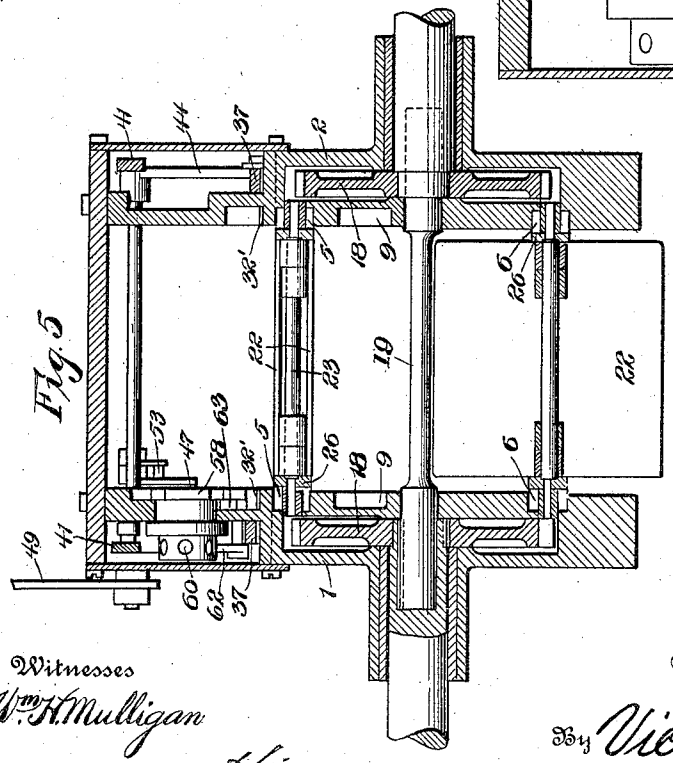


Fig. 5

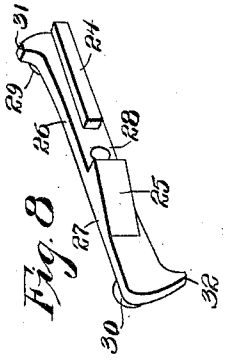


Fig. 8

Witnesses

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UNITED STATES PATENT OFFICE.

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PROPELLING OR POWER-GENERATING MECHANISM.

1,067,897. Specification of Letters Patent. Patented July 22, 1913.

Application filed April 19, 1912. Serial No. 691,954.

To all whom it may concern:

Be it known that I, JOHN C. CALDWELL, a citizen of the United States, residing at Beaumont, in the county of Jefferson and State of Texas, have invented new and useful Improvements in Propelling or Power-Generating Mechanism, of which the following is a specification.

This invention relates to propelling mechanism for air and marine craft, and particularly to that type of propelling mechanism in which feathering blades are mounted for travel upon an endless carrier movable in a substantially elliptical orbit, the blades automatically opening for action at the outset of their working course of travel and automatically feathering at the outset of their return course of travel.

One object of the invention is to provide a simple, reliable and efficient type of propelling mechanism which is susceptible for use upon either air or marine craft.

Another object of the invention is to provide a propelling mechanism of this character which may be reversed for back propulsion without reversing the engine.

Still another object of the invention is to provide a propelling mechanism which will run backward without injury in the event of casual reverse movement of the engine, as in case of "back firing" when a gasolene engine is employed.

Still another object of the invention is to provide a propelling mechanism which will utilize all of the effective working force of the engine.

Still another object of the invention is to provide reversing mechanism which limits the reverse action to a single orbit of movement of the propellers and which then automatically resets the propelling mechanism for a forward driving action.

A still further object of the invention is to provide means for preventing the propellers from slamming or hammering in the operation of shifting them end for end in passing from the active or working to the inactive or nonworking stretches of the endless carrier.

A still further object of the invention is to provide a construction of mechanism which, with slight modifications, is adapted for efficient use as a tide motor operative on the back and forth tidal flow of the water of a stream to supply power for domestic, commercial or other purposes.

With these and other objects in view, the invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Figure 1 is a side elevation, partly in section, of a propelling mechanism embodying my invention. Fig. 2 is a vertical longitudinal section of the same, showing the mechanism and one set of blades as arranged for forward propulsion. Fig. 3 is a top plan view of the propelling mechanism with the top of the frame or casing removed. Fig. 4 is an enlarged detail section on the line 4—4 of Fig. 2. Figs. 5 and 6 are vertical transverse sections on the lines 5—5 and 6—6 of Fig. 2. Fig. 7 is a section on the line 7—7 of Fig. 2. Fig. 8 is a perspective view of one of the arms of a propeller. Fig. 9 is a detail section on the line 9—9 of Fig. 2.

In carrying my invention into practice, I provide a suitable frame structure including spaced side walls 1 and 2, in the inner faces of which walls are formed duplicate elliptical guide channels 3 for endless carrier chains 4, each of said guide channels comprising upper and lower longitudinal, parallel main portions 5 and 6 terminally connected by inner and outer curved end portions 7 and 8. The forward end of the upper longitudinal or horizontal portion of each guide channel is further connected with the lower end of the front end portion 7 by a diagonal groove or channel 9, while the rear end of the lower longitudinal or horizontal portion of each guide channel is connected with the upper end of the rear end portion 7 by a diagonal groove or channel 10. At or near the respective upper and lower ends of the front and rear outer portions 9 of the channels are provided pockets or recesses 11 and 12, which are inclined at an obtuse angle to the perpendicular plane of the shafts of the adjacent wheels of the endless carrier. Arranged at or adjacent to the points of communication of the horizontal portion 6 of the channels with the lower ends of the inner rear portions 7 are deflecting pins or projections 13, while disposed at the rear ends of said portions 6 adjacent the pockets 12 are switches or deflec-

tors 14. Each of these switches or deflectors comprises a normally vertical plate carried by a shaft 15 pivotally mounted in the adjacent wall of the frame, a spring 16 being arranged to act upon said shaft to normally maintain said switch plate in a depending position above the upper front portion of the contiguous pocket 12. Said switch plate is adapted to swing rearwardly over the pocket and upwardly into the lower end of the rear guide groove 8, and is adapted to swing upwardly and forward into a receiving recess 17.

Arranged adjacent the inner walls of the recesses 12 are stop blocks or members 12^a having abutting faces 12^b arranged in parallel relation to substantially straight portions 7^a of the outer walls of the grooves 7, which surfaces 12^b and 7^a are also parallel with the perpendicular plane of the shaft or axis of the adjacent wheels of the endless carrier, as hereinafter described.

The chains 4 pass around opposed pairs of sprocket wheels 18 mounted on transverse shafts 19 and 20 and travel in slots or grooves 21 of reduced width formed in the inner walls of the portions 5, 6 and 7 of the elliptical guide channels, said chains thus having a fixed path or orbit of movement. One of the shafts, as the front shaft 19, projects exteriorly at one or both sides of the frame and may be directly coupled by a driving crank to the engine or motor, so that all of the effective power of the latter may be utilized.

Arranged at suitable spaced intervals between and connected with the carrier chains are propellers, each comprising a pair of blades 22 hingedly mounted upon a transverse rod 23 fixed to the chains, said blades being adapted to swing freely in one direction to a substantially horizontal position against a stop 24 and in the reverse direction to a substantially vertical position against stops 25. The stops 24 and 25 are respectively formed or provided upon the arms 26 and 27 of duplicate carrier or controlling bars pivotally mounted upon the rod 23 and provided at their extremities with rollers 29 and 30 to travel in the guideways, said rods being also provided at their extremities with oppositely projecting hook shaped cam portions or deflecting lugs 31 and 32. These bars are adapted to be reversed end for end to reverse the propeller blades for a working action in either direction and a feathering action in the opposite direction, as hereinafter described.

In practice, any desired number of propellers may be employed, but in the present instance I have shown in Fig. 2 six propellers of the construction described arranged at regular intervals upon the endless chain carrier in such manner that one-half of the number of propellers will be in working position at a time while the remaining propellers are feathered. As illustrated in Fig. 2 the propellers upon the lower stretches of the carrier chain are in working position and moving from left to right to propel the vessel in a forward direction or to the left, while the propellers upon the forwardly moving upper stretches of the chain are folded or feathered for the return movement to diminish their resistance to passage through the air or water. As thus illustrated, the blades 22 on the working propellers project above and below their carrier arms in alinement with each other and rest against the stops 25, while the blades of the returning propellers are folded rearwardly to a substantially horizontal position against the shoulder 24, in which position they travel edgewise through the air or water and to which position they are automatically moved by the pressure of the air or water thereon. In their normal course of travel for forward propulsion each working propeller travels horizontally along the portions 6 of the guide-ways until the rollers 29 upon the arms 26 of the carrier bars contact with the switches or deflectors 14, which prevent said rollers from passing upwardly into the outer end grooves 8 and deflect the same downward into the pockets or recesses 12, in which they are momentarily held for a pivotal motion. As the rollers 29 enter said pockets 12, the projections 32 engage the pins 13, thus throwing the rear ends of the carrier bars upward so that the rollers 30 enter and travel upwardly in the diagonal grooves 10. In this position the carrier bars clear the stops 12^a and are inclined at an obtuse angle to their normal plane of travel, the rollers 29 being seated and retained in the pockets while the rollers 30 travel upwardly in the grooves 10. The arms 27 of the carrier arms are thus shifted to precede the arms 26 in the backward travel of the propeller, and as the rollers 30 travel up the guide grooves 10 and finally pass into the rear ends of the upper horizontal guide-way portions 5, the rollers 29 pass from the pockets 12 and travel upwardly through the outer rear end portions 8 of the guide-ways until the propeller finally becomes a part of the return stretch of the endless carrier and travels forwardly on the return movement, in which the blades thereof are feathered as hereinbefore described. Upon the passage of the rollers 29 beyond the switches 14, the latter are returned to their normal position by the spring 16. The pockets 12 are made comparatively deep and with their entrance portions substantially underlying the lower ends of the division walls between the slot portions 7 and 8, so that the rollers 29 will be pocketed and held for the pivotal motion and retained during the entire travel of the rollers 30 through

the diagonal slots 10, thus diminishing the liability of said rollers 30 slamming or hammering against the said division walls between the guide-way portions 7 and 8 near the end of the pivotal motion of the propeller. As the rollers 30 reach mid position in the grooves 10 and come into longitudinal alinement with the pockets, the lower ends of the carrier bars gradually swing toward the faces 12^b of the stops 12^a, with which they finally contact when the rollers 30 pass into the upper portions of the grooves 7. At this stage the rollers 30 contact with the slightly flattened portions 7^a of the grooves 7, so that while the rollers 29 are moving out of the pockets the propeller will travel substantially parallel with the axis 20 of the sprocket wheels around which the endless carrier is passing. By this means an easy release of the rollers 29 and movement of the same into the guide portions 8 is effected, and at the same time the rollers 30 are prevented from violently striking the surfaces 7^a, whereby in the described shifting motion of the propellers in passing from the working to the non-working stretch of the endless carrier hammering or racking of the propeller mechanism will be avoided, greater ease of operation insured and a smooth running motion produced.

The forward ends of the grooves 5 in the respective walls communicate with the adjacent ends of the grooves 7, 8, and 9 through recesses 31′ in the respective side walls. Controlling each of these recesses is a pair of gates 32′ and 33 mounted to slide laterally into and out of said recesses. These gates are respectively provided with sets of diagonal or obliquely arranged slots 34 and 35 receiving pins 36 on a longitudinally movable slide bar 37. The slots in the two gates extend in opposite directions, so that said gates will be alternately projected and retracted by reverse movements of the bar. The gate 32′ controls communication between the groove 5, recess 31′, and groove 8, while the gate 33 controls direct communication between the groove 5 and groove 8. The gate 32′ is normally retracted in the adjustment of the parts for a forward propulsive action and is provided with a laterally projecting contact pin or deflector 38, while the gate 33 is normally projected in such adjustment of the parts and is curved on an arc to form a part of the division wall between the grooves 7 and 8. The two slide bars 37 are provided at their forward ends with keeper openings 39 adapted to be engaged by a spring actuated locking pin 40 connected with a pivotally mounted operating arm 41, said openings 39 normally lying at a point in advance of said pin, in which position the slide bars are held by retracting springs 42. The rear ends of the slide bars are connected by links 43 with the normally vertical lower arms of bell crank operating levers 44 mounted on a transverse shaft 45 for movement in unison. The horizontal arm of one of the levers 44 is arranged to be engaged by a contact pin 46 on the short arm of a substantially L-shaped trip lever 47 mounted loosely on a short shaft 48 to which is rigidly connected a reversing or setting lever 49. The pin 46 moves in a guide slot 50 in the adjacent side wall and is connected with a spring 51 whereby the lever 47 is normally held in retracted position, out of the path of movement of the projections 31 and 32 on the propeller carrier bars. Connected with the shaft 48 is a crank arm 52 carrying a pin 53 engaging the long arm of the lever 47, whereby upon a rearward movement of the reversing lever 49 the lever 47 may be adjusted so that its long arm will hang vertical and in the path of movement of the projection 31, while the pin 46 will be moved upwardly into contact with the lever 44. The lever 49 is normally held retracted against a stop 54 by a retracting spring 55.

Journaled in the frame above one of the recesses 31′ is a rotary member 57 carrying a wheel or disk 58 having an annular series of pockets or recesses 59 equal in number to the propellers on the endless carrier, which pockets are adapted to be engaged under certain conditions by the rollers 29 of the adjacent carrier arms to turn or rotate said wheel. The said rotary member is also provided with a series of keeper sockets 60 arranged opposite the pockets and equal in number thereto, which sockets are adapted to be engaged by a locking pin or plunger 61 connected by a crank arm 62 with an upwardly movable trip arm 63 and normally held projected by a spring 64. On said rotary member is further provided a releasing lug or projection 65 adapted when the rotary member has made one complete revolution to engage and lift the arm 41 to retract the locking pin 40.

When it is desired to reverse the propellers for backward propulsion, the lever 49 is moved forward to set the lever 47 so that it will be rocked by the projection 31 upon the first feathered propeller coming in contact therewith, whereby the lever 44 will be operated to shift the slide bars 37 rearwardly until the openings 39 come into register with the locking pins 40, which are projected into locking engagement therewith by their spring, thus holding the slides in their adjusted position. In the normal movement of the parts for forward propulsion as before described, the gate 32′ is projected and the gate 33 retracted, whereby the rollers 30 on the propellers are permitted to enter the grooves 8 and enter the recesses 11, while the gate 32′ prevents the rollers 29 from entering the recesses 31 and causes

the same to pass downward through the diagonal grooves 9, in which operation the projections 31 engage and are deflected downward into said grooves 9 by the pins 38. On the rearward movement of the slides, however, the gate 32′ is retracted and the gate 33 projected, whereby in the travel of the returning propellers the rollers 30 are prevented from entering the grooves 8 and recesses 11 and are caused to travel down into the grooves 7, while the rollers 29 are permitted to pass upwardly into the recesses 31 and thence into the grooves 8, and are so caused to move by the previous down travel of the rollers 30 in the grooves 7 and the swing of the propeller carrier arms on the rods 23. Through this change in the direction of travel of each propeller in passing from non-working to working position, the propeller is reversed end for end, so that the arms 27 instead of the arms 26 will be in an advanced position in the rearward travel of said propellers on the lower stretch of the endless carrier. Hence the blades on such stretch of the carrier will feather and become inactive, while the blades of the propellers on the upper stretch of the endless carrier will be moved to working position, thus adjusting the propelling mechanism for backward propulsion. In the present construction the propellers operate in reverse position during a single course or orbit of travel, at the end of which they are automatically reset for forward propulsion again, but the backward motion may be continued at the end of each orbit of reverse motion by adjusting the lever 49 to set the gates for the reverse action, as will be readily understood. As each propeller passes the wheel 58 and swings on its supporting rod 23, the roller 30 on the adjacent arm 28 first engages the trip 63 and retracts the locking bolt 61, and then passes into the first adjacent recess 59 of the wheel 58, and turns said wheel the space of one tooth or recess, at which time the bolt 61 again locks the wheel from movement. This action continues until all of the propellers, six in number, have traveled in reversed position past said wheel and turned the same a corresponding number of times, whereby the wheel is given a complete revolution. As the rotary member turns the releasing projection 65 turns therewith and on the final movement of the wheel said projection engages and lifts the arm 41, thus retracting the locking pin 40 and releasing the slides 37 which are returned to normal position by the springs 42, whereby the parts will be reset for adjustment of the propellers for forward propulsion again, in which the gate 32′ is projected and the gate 33 retracted, as before described. As, however, the propellers are reversed end for end from their normal position, a second reversing action is necessary to readjust them for forward propulsion. This is accomplished by again throwing the reversing mechanism into operation, by which the propellers will be turned end for end to their normal or original position and reset for forward propulsion. After all six propellers during this action have passed the resetting mechanism and effected the release and retraction of the slides and the restoration of the gates to normal position, the conditions first described will be reëstablished for a continuance of the forward propulsive action of the propellers, as will be readily understood.

It will be apparent that the construction described allows the propellers when set for either a forward or a rearward driving action to travel with the chains in a direction reverse to their normal direction of travel in the event that the chains should be casually run backward from any cause, as by the reversal of the engine from back firing in the use of a gasolene motor, the advantages of which will be appreciated.

While I have described and shown an apparatus primarily adapted for use as a propeller, the same apparatus, with slight changes or modifications, may be employed as a current or tide motor by simply dispensing with the grooves 7 and 10, pockets 12, stops 12ª, projections 13 and the reinforcing mechanism, so as to allow the propellers to travel in a fixed guide-way formed by the grooves 5, 6, and 8 without the end to end shifting action. The propellers upon one stretch of the chain of the carrier will thus operate as propelling members when the tide or current is flowing in one direction, while the propellers upon the other stretch will feather, while a reverse action will take place when the current or tide is running in the opposite direction without changing the direction of motion of the propelling mechanism, so that power may be applied and transmitted from one of the shafts for domestic or commercial use. Where the current of a stream runs constantly in one direction, the mechanism disclosed may be employed to secure a constant driving and power supplying action, in which event the reversing mechanism may be dispensed with, while the means for shifting the propellers end to end may be employed to secure a feathering action of the propellers on the return stretch. I, therefore, do not limit the invention in use strictly to a mechanism for propelling vehicles, as it may be employed wherever tide or current motion of a stream is available to furnish power for general use.

Having thus described the invention, what I claim as new is:—

1. A propelling or power generating mechanism comprising an endless carrier

having a fixed orbit of movement, propellers mounted on the carrier, each including blades pivoted to swing to an operative position on the working stretch of the carrier and to feather or fold on the return stretch of the carrier, and means for reversing the propellers end for end to vary their direction of working motion.

2. A propelling or power generating mechanism comprising an endless carrier having a fixed orbit of movement, propellers pivotally mounted upon the carrier so as to be reversible end for end to vary their direction of working movement, said propellers including blades pivoted to swing to an operative position on their working movement and to fold or feather on their return movement, guiding means for maintaining a continuity of action of said propellers, and means forming part of said guiding means for shifting the propellers end for end to vary their direction of working motion.

3. A propelling or power generating mechanism comprising an endless carrier having a fixed orbit of movement, propellers provided with pivoted blades adjustable to an operative position on their working motion and to fold or feather automatically on their return motion, said propellers being pivotally mounted upon the rotary carrier for end to end adjustment to vary their direction of working motion, guiding means for maintaining a continuity of motion of the propellers, and means forming part of said guiding means for shifting the propellers end for end to vary the direction of their working motion.

4. A propelling or power generating mechanism comprising an endless carrier having a fixed orbit of movement, feathering propellers pivotally supported by the carrier for adjustment to forward or backward propelling position, means for guiding the propellers for a working motion in one direction, or adjustment for working motion in the reverse direction, said means including means for shifting said propellers, and automatic means controlled by the propellers for returning said shifting means to normal position.

5. A propelling or power generating mechanism comprising an endless carrier having a fixed orbit of movement, reversible feathering propellers mounted upon the carrier, means for shifting said propellers for either a forward or backward propelling action, and means controlled by the propellers for returning the shifting means to normal position.

6. A propelling or power generating mechanism comprising an endless carrier having a fixed orbit of movement, propellers pivotally mounted on the carrier for adjustment to reverse working position and provided with feathering blades, guiding means for maintaining a continuity of movement of the propellers, switch mechanism forming part of said guiding means for reversing the direction of motion of the propellers, and means controlled by the propellers for automatically retracting said switch mechanism.

7. A propelling or power generating mechanism comprising an endless carrier having a fixed orbit of movement, propellers provided with feathering blades and pivotally mounted on the carrier for end to end adjustment to vary their direction of working motion, guiding devices upon the propellers, a guideway provided with portions for the normal travel of the propellers to maintain them in forward propelling position, said guideway having portions for coaction with the guides upon the propellers to shift said propellers for a reverse action, switch mechanism coöperating with the latter-named portions of the guideway for the purpose set forth, means for setting the same for action, and means controlled by the propellers for automatically retracting said switch mechanism.

8. A propelling or power generating mechanism comprising an endless carrier having a fixed orbit of movement, propellers provided with feathering blades and mounted upon the carrier, said propellers being bodily adjustable end to end to reverse working position, means for maintaining a prescribed course of travel for the propellers for the continuous forward propulsion, switch mechanism coöperating therewith for shifting the propellers for backward propulsion, means for setting said switch mechanism, means for locking the same in set position, and means for releasing said switch mechanism and returning the same to normal position, said means being operated by the propellers for maintaining the same in backward propelling position for a prescribed period.

9. A propelling or power generating mechanism comprising a frame having an endless guideway provided with horizontal upper and lower portions and curved end portions, an endless carrier, reversible propellers mounted on the carrier and provided with rollers to traverse said trackway, and controlling means for shifting said propellers for either a forward or a backward motion, said propellers being adapted to feather on their return portion of movement in either direction of propelling motion.

10. A propelling mechanism comprising an endless carrier having a fixed orbit of movement, propellers provided with feathering blades and pivotally mounted on the carrier for end to end adjustment to vary their direction of working motion, guiding

devices upon the propellers, a guideway provided with portions for the normal travel of the propellers to maintain them in forward propelling position, said guideway having portions for coaction with the guides upon the propellers to shift said propellers for a reverse action, and means coöperating with said guides and guideway portions to control the swing of the propellers on their shifting motion.

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

JOHN C. CALDWELL.

Witnesses:
B. E. McFADDEN,
HAL. G. LAND.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."