

J. GOODRICH.  
Endless-Chain Propeller.  
No. 210,685. Patented Dec. 10, 1878.

Fig. 1.

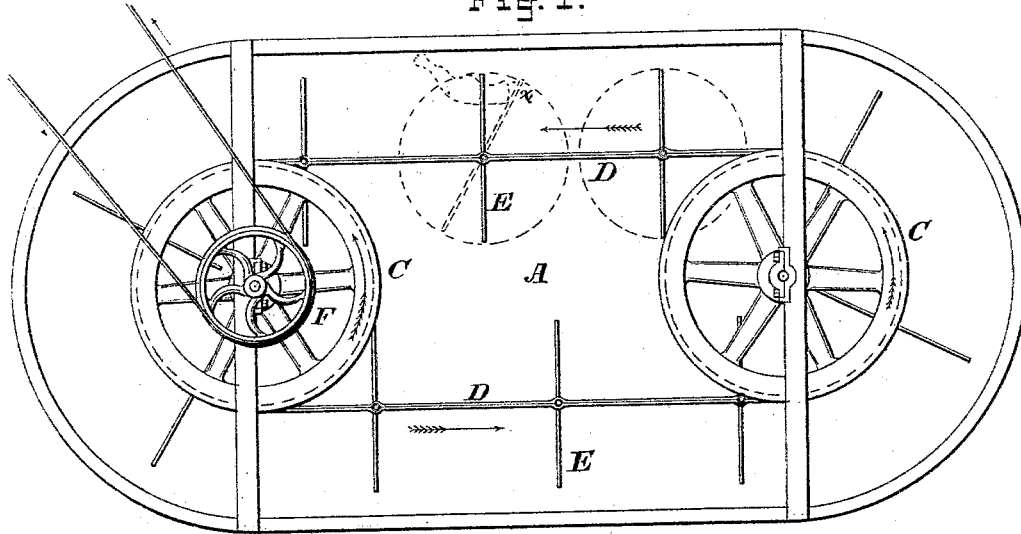


Fig. 2.

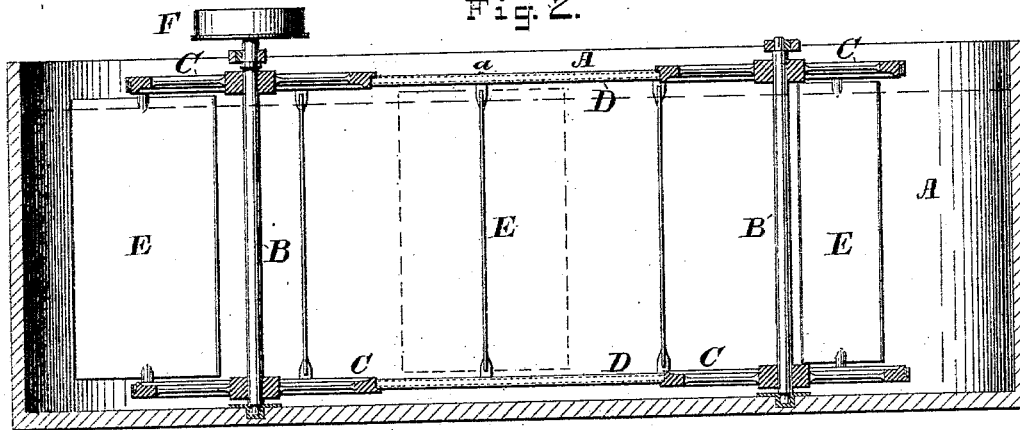
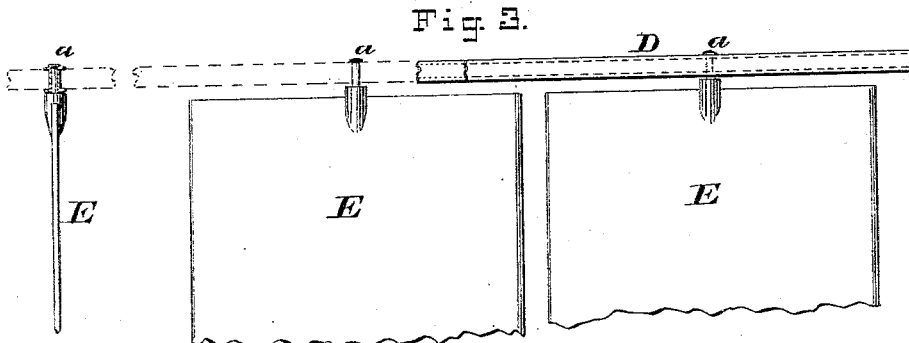


Fig. 3.



ATTEST:

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Thomas P. Pemberton

INVENTOR:

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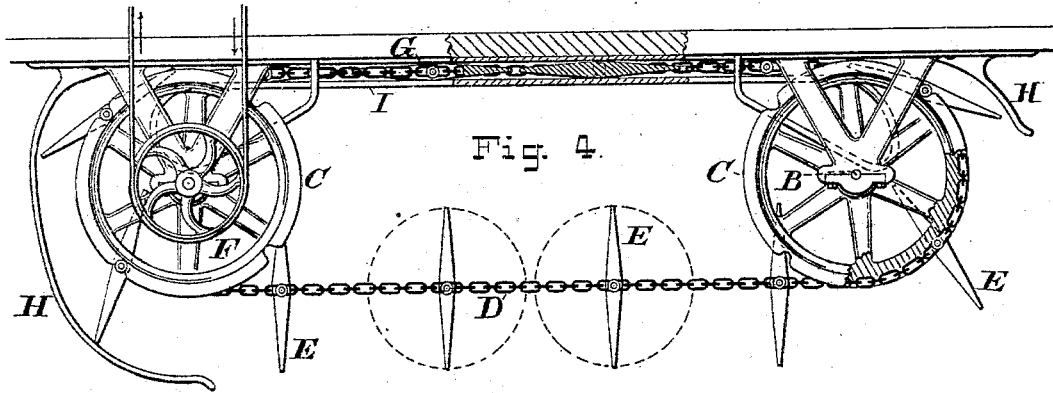


Fig. 5.

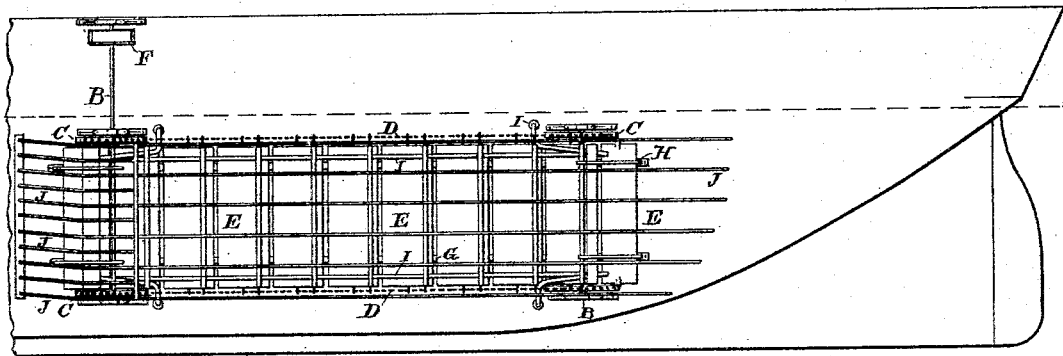
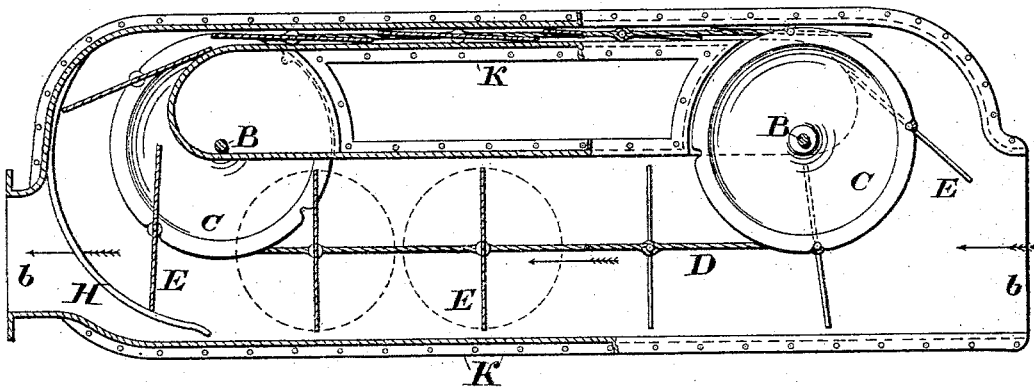


Fig. 6.



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Arthur C. Frazer.  
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# UNITED STATES PATENT OFFICE.

JOSEPH GOODRICH, OF HENRY, ASSIGNOR OF A PART OF HIS RIGHT TO JAMES B. WALLER AND C. B. GOODRICH, OF SAME PLACE, AND WM. R. GOODRICH, OF KEWANEE, ILLINOIS.

## IMPROVEMENT IN ENDLESS-CHAIN PROPELLERS.

Specification forming part of Letters Patent No. **210,685**, dated December 10, 1878; application filed May 21, 1878.

*To all whom it may concern:*

Be it known that I, JOSEPH GOODRICH, of Henry, in the county of Marshall and State of Illinois, have invented a Mechanical Movement, of which the following is a specification:

This invention relates to a movement or device which may be adapted, with slight and unimportant modifications, to many useful purposes, among which are agitation of fluids, as in churning, propelling vessels in liquids, producing a current in fluids in one direction, and serving as a motor to be actuated by a passing current.

The invention consists, essentially, in blades provided with pivots, arranged in their prolonged axes so that they will be balanced or in equipoise on the pivots. These pivots have bearings in endless belts or chains running on sheaves or pulleys, so that when the latter are rotated the blades are carried around with the chains, but are entirely free to rotate on their pivots, so that, should they meet an irregular obstruction, they will readily turn aside, but when drawn through the fluid they will invariably oppose their full surfaces to the same, and stand with their planes at right angles to the direction of motion.

It also consists in certain constructions whereby the blades are "feathered," or turned edgewise with the direction of motion on one side, so as not to offer any resistance in returning, all as will be hereinafter more fully set forth.

In the drawings, Figure 1 is a plan of my movement. Fig. 2 is a vertical mid-section of the same. Fig. 3 is a detail view on a larger scale. Fig. 4 is a plan view illustrating the feathering mechanism. Fig. 5 is an elevation, showing the application of my movement to the propulsion of vessels; and Fig. 6 shows the movement arranged as a blower.

Let A represent any form of vessel capable of containing a fluid, and B B vertical shafts with bearings therein. On these are mounted sheaves or pulleys C C, one at the bottom and one at the top of each shaft. D D are endless chains or belts of some suitable flexible mate-

rial, provided with bearings for the pivots or journals *a a* of the blades E E. These blades are thin, and the pivots are set in the ends equidistant from the edges—*i. e.*, so that their axes of rotation are at right angles to the direction of their intended motion.

The pulleys may be caused to rotate through a belt-pulley, F, on one of the shafts B, or in any other way.

When the blades are wholly or partially submerged, as they may be, in fluid in the vessel A, and the pulleys are rotated, they will present their broadest surfaces to the fluid and resist their passage through it, thus agitating it greatly and producing a continuous current in one direction, which may be broken up by reversing the motion. At the same time, if a blade should meet with any obstruction or obstacle to its movement, it will readily turn aside and avoid injury, as indicated in dotted lines at *x* in Fig. 1.

If it be desired to drive the fluid before the blades in one direction only, an arrangement like that shown in Fig. 4 may be used to turn them edgewise to the direction of motion when moving back on the inactive side.

This feathering arrangement may consist of a bar or bars, G, or their equivalents, ranged along parallel to the line of movement and to the peripheries of the pulleys. These simply act to prevent the floats from assuming a position at right angles to the line of the chains or belts D D.

Any continuous obstruction may serve as equivalents of the bars G, as the side of a vessel, or a wall, or a bulk-head.

To direct the blades in properly toward the bars G, I employ one or more curved guards, H H, fixed in substantially the position shown. These guards may be a prolongation of the bars G, or may be distinct from them, as desired, and I prefer to make them of spring-steel or other elastic metal or material, so that in case a blade should get jammed against them they will yield sufficiently to release it. I is a guard outside of the feathered blades, supplementary to the bars G.

Instead of being the driver, my device or

machine may be driven by a passing current, and power be thus communicated through the pulley F.

In Fig. 5 I have shown my movement or apparatus applied to the propulsion of vessels. In this case no material departure is required from the arrangement shown in Fig. 4. In such an application a guard, J, may be required to keep the blades clear of drift and other obstructions. With my construction and arrangement of the blades the vessel may be backed by reversing the motion quite as easily and readily as it can be propelled forward, and the blades will readily turn out of the way and measurably avoid injury if they strike any floating obstacle or fixed obstruction, as a pier.

By properly inclosing the movement, as shown in Fig. 6, it is adapted to serve as a blower. In this case K represents an ordinary trunk, and *b b* the inlets and outlets. The blades may travel in either direction.

If preferred the pivots *a a* may be fixed in the endless chains and have bearings in the blades instead of as shown. I prefer to arrange the blades with their axes vertical, or nearly so, when used to propel a vessel, but in other applications their position is of little importance.

I am aware that chain propellers with floats have been constructed in which guiding blocks or arms attached to the axes of the floats or blades constrain the latter at all times to properly present themselves to the water; but I am not aware that an arrangement of blades, as here presented, free to rotate, at least a portion of the time, without mechanical restraint of any kind to keep them properly presented to the water, has ever before been used.

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

1. The mechanical movement or motor herein described, consisting of blades so pivoted as to be in equipoise or balance, and free to ro-

tate on their axes, without guides or other mechanical constraint, between endless traveling chains or belts running on sheaves mounted on shafts having fixed bearings, substantially as set forth.

2. The combination of the pivoted blades E E, arranged so as to be in equipoise or true balance on their pivots, free to rotate and without guides or other mechanical constraint, with the endless chains or belts D D and pulleys C C, when all are arranged to operate substantially as set forth.

3. The combination of the pivoted blades hung upon vertical pivots, so that they may be in equipoise with the vertical shafts B B, horizontally-rotating pulleys C C, and endless chains D D, when arranged in such a manner that the axes upon which the blades rotate will be perpendicular with the surface of the water, or nearly so, substantially as set forth.

4. Two or more endless belts or chains around sheaves, in combination with bars G, or other equivalent obstructive device, arranged parallel, or nearly parallel, and close to the chains on one side, and two or more blades, E E, hung and arranged to rotate freely on axial pivots *a a*, and without guides or other mechanical constraint, when moving in one direction, and to be feathered by the bars G and constrained to move edgewise in the other direction, substantially as set forth.

5. An arrangement consisting of a series of blades pivoted between two endless traveling chains on the prolonged axes of the blades, so that they may be in equipoise and free to rotate in either direction, and also free to turn and avoid any floating obstacle, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JOSEPH GOODRICH.

Witnesses:

OLE H. HOLBERG,  
HENRY CONNETT.