

(No Model.)

J. S. WORCESTER:
PROPELLING AND STEERING APPARATUS FOR VESSELS.
No. 580,566. Patented Apr. 13, 1897.

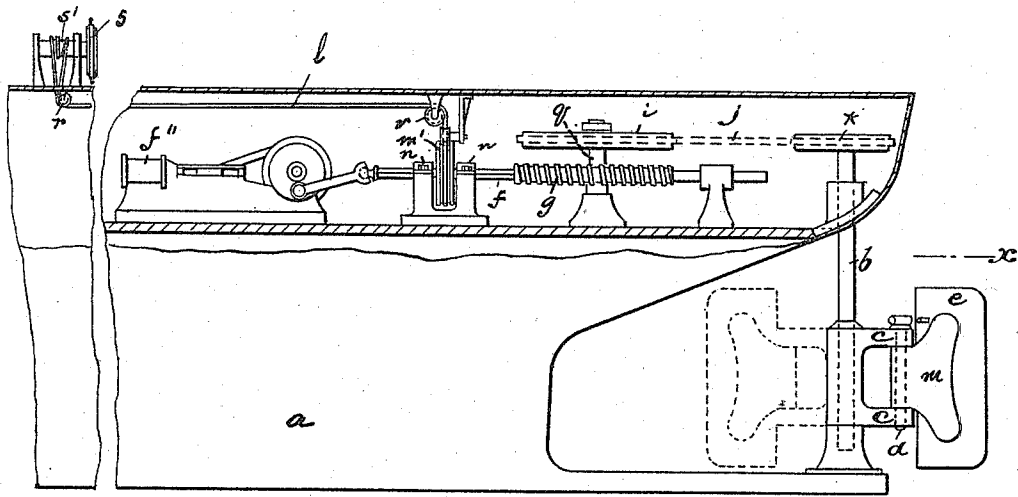


Fig. 2.

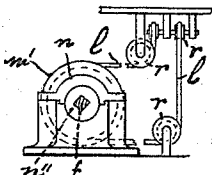


Fig. 4.

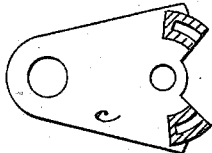


Fig. 5.

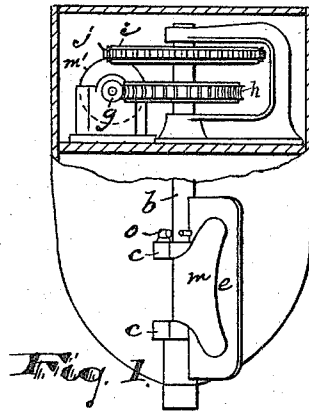


Fig. 1.

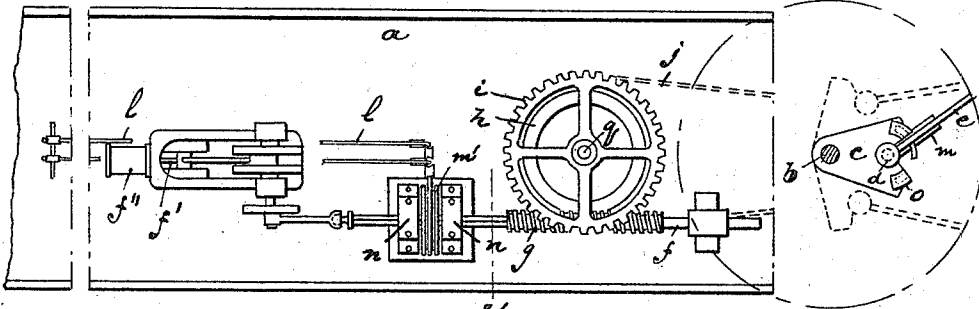


Fig. 3.

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JAMES S. WORCESTER, OF NEWARK, NEW JERSEY.

PROPELLING AND STEERING APPARATUS FOR VESSELS.

SPECIFICATION forming part of Letters Patent No. 580,566, dated April 13, 1897.

Application filed May 6, 1896. Serial No. 590,420. (No model.)

To all whom it may concern:

Be it known that I, JAMES S. WORCESTER, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Propelling and Steering Apparatus for Vessels; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The object of this invention is to secure a greater speed in boats, floating craft, or vessels; to reduce the cost of propulsion; to secure a saving in the amount of fuel required to travel a given distance through the water; to obtain a smooth motion of the boats and thereby a more pleasurable sailing, and to secure other advantages and results, some of which will be referred to hereinafter in connection with the description of the working parts.

The invention consists in the improved propelling apparatus for boats or other sailing vessels and in the arrangements and combinations of parts, all substantially as will be hereinafter set forth, and finally embraced in the clauses of the claim.

Referring to the accompanying drawings, in which like letters of reference indicate corresponding parts in each of the several views, Figure 1 is a rear or stern elevation of a boat. Fig. 2 is a side view of the stern end of the vessel. Fig. 3 is a diagrammatic plan of a portion of the said vessel, a certain oscillating and reciprocating shaft being in horizontal section, taken at line *x*, Figs. 1 and 2. Fig. 4 is a detail section taken at line *y*, and Fig. 5 is a detail showing in plan and section a certain oscillating arm having sockets or cylinders to receive certain piston-like arms upon the propelling-blade to cushion the vibrations of the latter.

In said drawings, *a* indicates the boat or floating vessel, which may be of any construction or of large or small size, at the stern of which is arranged a vertical oscillating shaft *b*, which is given an oscillating motion by any suitable motive means, such as a

steam-engine, as shown in Fig. 2, or other form of engine suited to the requirements.

Upon the oscillating shaft *b*, where it projects beneath the stern of the vessel, are arranged or formed laterally-projecting arms *c c*, which oscillate with said shaft and at their outer or projecting ends are perforated to receive a pivotal shaft *d*, on which a rigid or inelastic blade is arranged and moves with the arms *c c* and to a limited extent is independent of said arms.

The shaft *b* has suitable bearings in the vessel, which may be constructed and disposed in any suitable manner. Means for operating said shaft will be hereinafter described.

The propelling-blade *e* is arranged between the arms *c c* on the shaft *d*, and said arms are constructed so as to form stops or limiting projections, or, perhaps, more properly, propelling projections *o*, between which the blade is free to oscillate independent of the arms and thus when said arms are given an oscillatory stroke by the operating means the blade, retarded in its movements by the water, remains stationary until engaged by the propelling projections *o*, when said blade is given its operative stroke with the oscillating shaft and its arms; but when this operative stroke is begun it is evident that the propelling-blade will be in a position such as illustrated in Fig. 3, when said blade lies at an angle to the axial line of the arms, said blade lying back from said axial line and presenting an inclined surface to the line of movement of the vessel.

The stop projections or propelling-bearings *o* of the arms may be cushioned by rubber or may be in the form of sockets, into which the water enters, as will be understood upon reference to Fig. 5, the propelling-blade *e* being provided with piston-like projections *p*, which enter the said sockets and press against the water, which also serves as a cushion to break the jar or concussion due to the impact. The action of the propelling-blade on the arms *c c* and its shaft *d* is thus rendered noiseless and smooth, and the action of the blade will not be so transmitted to the vessel as to be objectionably apparent to the passengers or occupants.

The blade is preferably made of sheet metal

made rigid and inflexible by strengthening ribs, castings, or plates *m*, so that the full force of the oscillating shaft, when the propelling projections are brought into operative contact with the blade, may be exerted in securing propulsive force and not be lost because of the blade flexing under the resistance of the water. The said plates *m* preferably provide the bearings in which the shaft or pivot *d* is arranged.

The oscillating shaft *b* may be operated by hand-power when employed in connection with small craft or by steam or other source of power.

I provide means whereby the field of action of the propelling-blade and oscillating shaft *b* may be changed in their relations to the body of the vessel to effect a steering action upon said vessel, whereby its direction of movement may be changed at will, the steering being accomplished without the use of a special rudder and the retardations of movement due to its use.

The propelling-blade is by my improvements caused to move in various fields or paths, which may be changed from one side of the center line of movement, little or much, to the other side, and the direction of movement of the vessel correspondingly changed.

The construction of the steering apparatus employed in the drawings to illustrate the invention and at the present time preferred is shown more clearly in Fig. 3, where *f* indicates a reciprocating shaft movable longitudinally by hand or by any motive appliance common in mechanics. The said reciprocating shaft *f* may be swiveled or otherwise connected with a piston *f'*, given a back-and-forth movement in connection with a steam-cylinder *f''* of an engine, or it may be otherwise operated. Said reciprocating shaft or rod *f* is preferably angular, as shown in Fig. 4, and is arranged to slide in cylindrical bushings *n''*, arranged in boxes *n*, as indicated in Fig. 4. On said rod or shaft *f* is arranged a fixed sleeve *g*, having screw-threads which engage or mesh with the threaded periphery of a worm-wheel *h* to occasion a slow turning of the said worm-wheel and its shaft *q* when said sleeve is turned in the steering operation. The sleeve serves both in the operation of oscillating the propelling-blade in its propelling operations and in changing the field of action of said propelling-blade in the steering operations.

On the shaft *q* of the worm-wheel is arranged a sprocket-wheel *i*, which receives a chain *j*, extending to another sprocket-wheel *k* and the reciprocating shaft *b*. Said chain *j* transmits the desired movements from the sprocket-wheel *i* to sprocket-wheel *k*, from which said movements are transmitted to the reciprocating shaft *b* and arms *c* thereon.

To change the path of the blade and effect a steering of the vessel in one direction or the other or to reverse the movement of the vessel, I turn the shaft or rod *f* and its sleeve

g, employing any suitable steering-wheel *s* or device in doing so. Motion is transmitted from said wheel *s* to the shaft *f* by means of a rope *l* or similar connection and a wheel or pulley *m'*, the latter being arranged loosely on the angular shaft *f*, so that the said shaft may reciprocate longitudinally through said wheel *m'*, the perforation in said wheel being also angular in correspondence with the shape of the shaft, so that when said wheel or pulley *m'* is turned said shaft and its bushings *n''* in the boxes or bearings *n* will be turned also to effect a turning of the sleeve *g*, worm-wheel *h*, sprocket-wheel *i*, and the parts in train therewith.

The wheel or pulley *m'* is arranged between the boxes or bearings *n* to prevent lateral displacement. The rope or connection *l* may be arranged over sheaves *r* in directing it to and from the drum *s'* of the steering-wheel.

In operating the device, when the same is of the construction shown in the drawings, the engine, by means of the reciprocating piston and suitable connections, gives a reciprocating movement to the shaft *f* and the sleeve *g* fixed thereon. This last in turn gives oscillating movements to the worm-wheel *h*, sprocket or chain wheel *i*, chain *j*, sprocket-wheel *k*, shaft *b*, and its arms *c*, and the propelling-blade *e*, the last, however, being free to admit a limited independence of movement, so that the said blade can assume opposite inclinations to the axial planes or lines of the arms and shaft preliminary to effecting the operative reciprocating strokes, as will be understood.

The rigid propelling-blade having the inclinations to the axial lines of movement described will not bend under the resisting stress of the water, and as a result the full force of the blade is expended in exerting a propulsion upon the vessel, by which the speed of the vessel is materially increased over those in which elastic propelling-blades are employed, as I have proved by experiment.

To steer the vessel, the wheel *s* is turned by the pilot or tillerman, and with it the wheel or pulley *m'*. This action affects the worm-wheel *h*, sprocket-wheel *i*, chain *j*, sprocket-wheel *k*, shaft *b*, arms *c*, and blade *e* to turn them a greater or less degree, so that the field of action of the propelling-blade is changed to effect a steering or reversing of the vessel.

While I have shown and described one arrangement of parts by which the desired results may be accomplished, I am fully aware that the parts may be modified and some dispensed with without departing from the spirit or scope of the invention, and therefore I do not wish to be understood as limiting myself by the positive terms employed in the foregoing description, excepting as the state of the art may require.

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

1. In combination with a boat or floating craft, an oscillating shaft having laterally-

extending arms on which is pivoted a rigid propelling-blade adapted to assume positions in planes which cross the radial planes of the said oscillating shaft, substantially as set forth.

2. In combination with a boat or floating craft, of an oscillating shaft having arms *c*, extending from said shaft, and near their extremities provided with pivotal bearings and stops or propelling-bearings for engaging the blade and forcing it to move with said arms, said propelling-blade comprising a rigid plate of a strength sufficient to resist the water-pressure without bending, fastened pivotally upon said arms, and operating means, substantially as set forth.

3. The combination with a boat or vessel, of an oscillating shaft and a propelling-blade oscillated thereby, of a reciprocating threaded shaft arranged on suitable bearings in said boat, means for reciprocating and means for turning the said shaft in its bearings, a worm-wheel engaging said threaded shaft, and means for transmitting the oscillating motion of the said worm-wheel to the oscillating shaft and its propelling-blade, substantially as set forth.

4. The combination with the boat or floating vessel, of an oscillating shaft and its propelling-blade, of the sprocket-wheel *k*, chain or connection *j*, a sprocket-wheel *i*, on shaft *g*, with worm-wheel *h*, longitudinally-recipro-

cating shaft *f*, adapted to turn pivotally in its bearings and having threaded sleeve *g*, means for reciprocating and means for turning said shaft, substantially as set forth.

5. In combination with the vessel, of an oscillating shaft free in its bearings to admit of a turning beyond a given limit of oscillating movement, a propelling-blade oscillating with said shaft, means for oscillating said shaft and means for turning said shaft beyond the given limit of oscillation whereby the field of oscillation of the propelling-blade is changed, substantially as set forth.

6. In combination with the vessel, of an oscillating shaft having arms and a propelling-blade pivotally arranged thereon and limited in its pivotal movements, the limiting means being cushioned to prevent undue concussion, substantially as set forth.

7. In combination with the vessel, of an oscillating shaft having recessed arms and a propelling-blade pivoted on said arms and having piston-like projections engaging the recessed arm, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 27th day of April, 1896.

JAMES S. WORCESTER.

Witnesses:

CHARLES H. PELL,
C. B. PITNEY.