No. 764,741. PATENTED JULY 12, 1904.

C. A. MANKER.

MEANS FOR NAVIGATION.

APPLICATION FILED DEC. 17, 1902.

NO MODEL. 2 SHEETS—SHEET 1

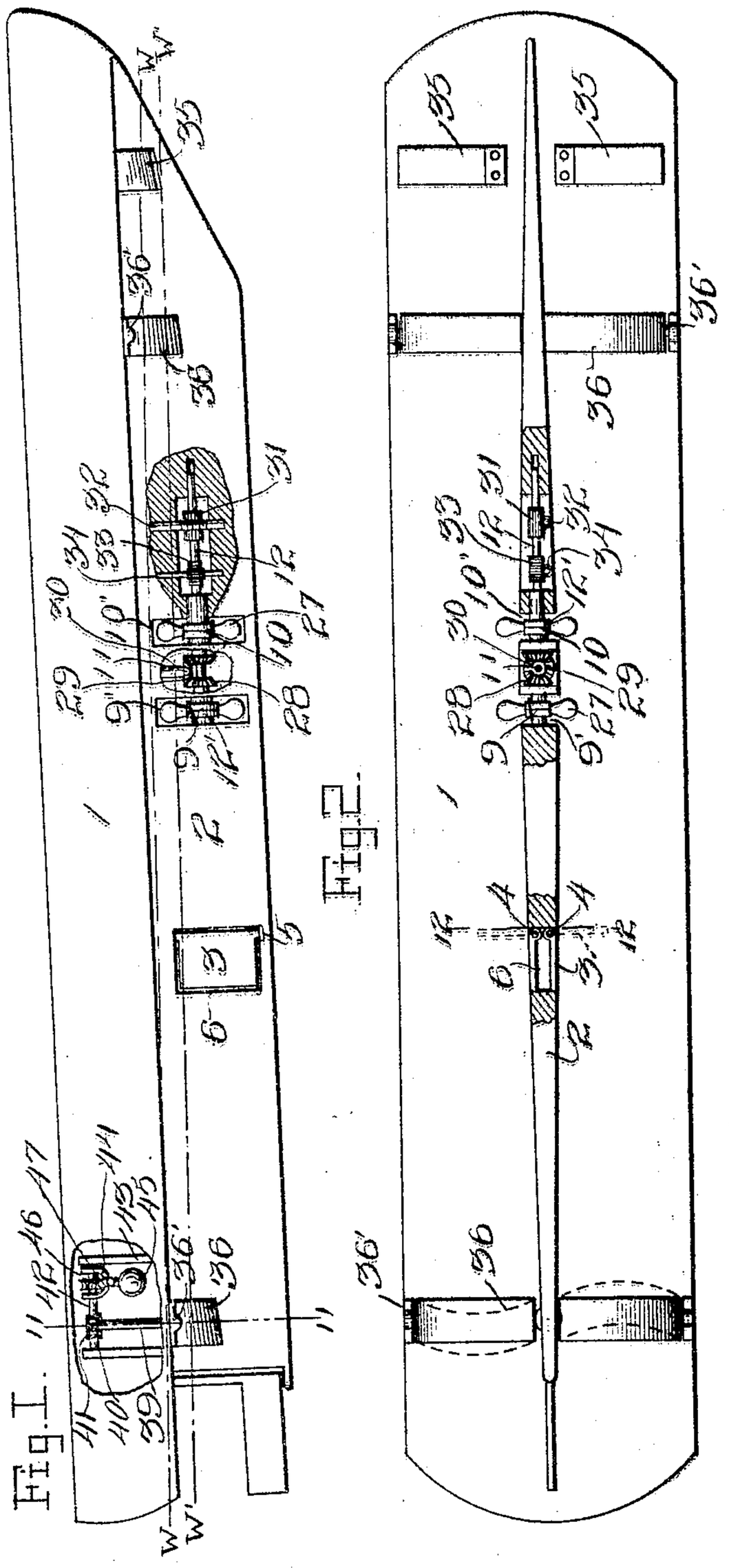

Fig. I.



Fig. II.

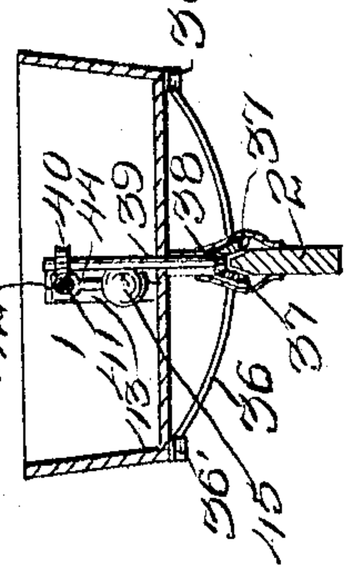

Fig. III.

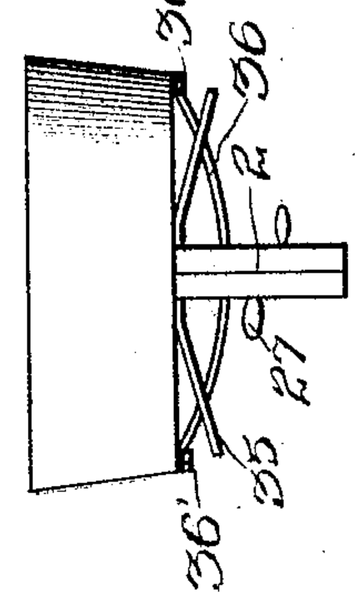

Fig. IV.

Witnesses
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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 5.

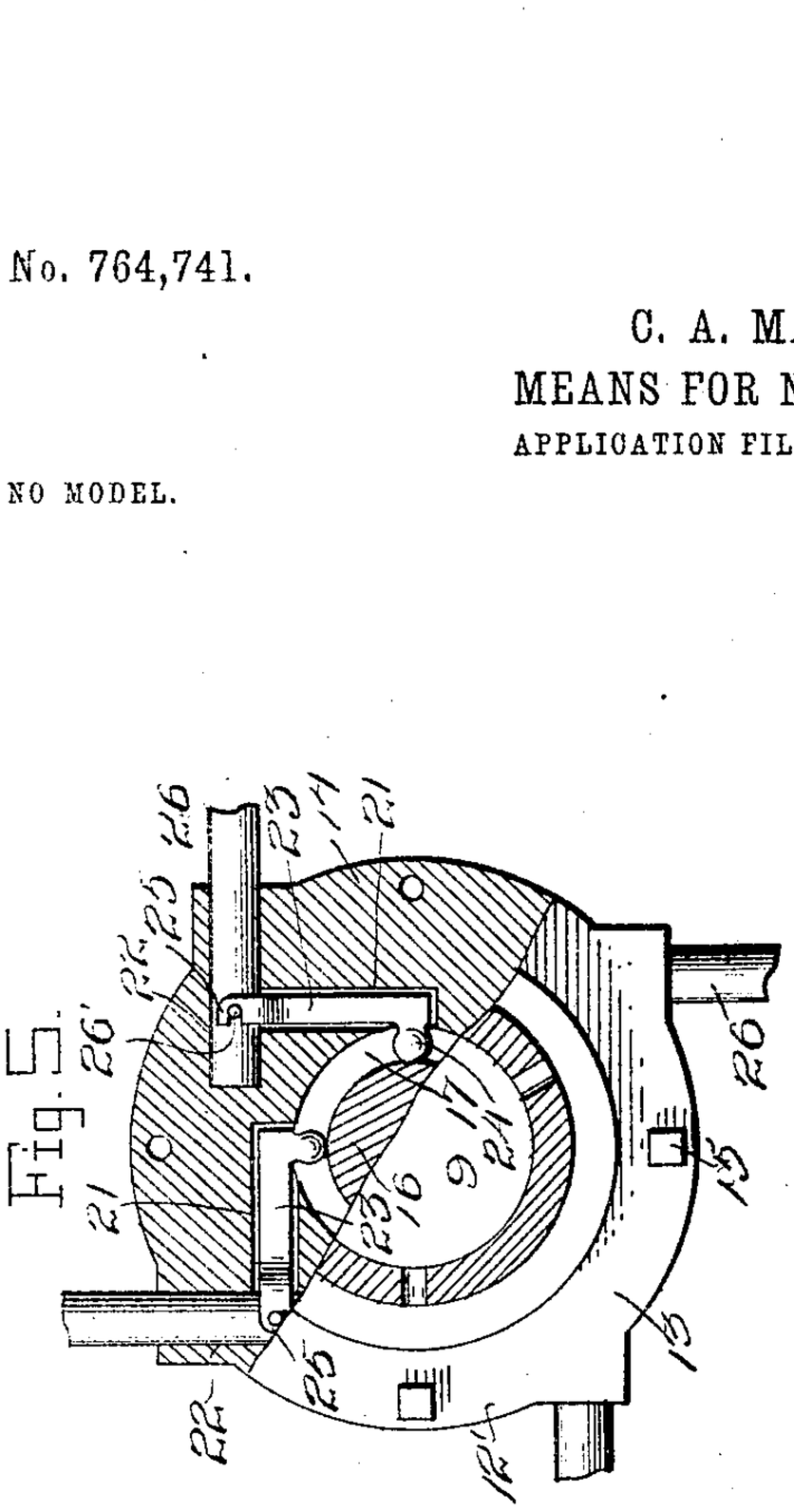



Fig. 4.

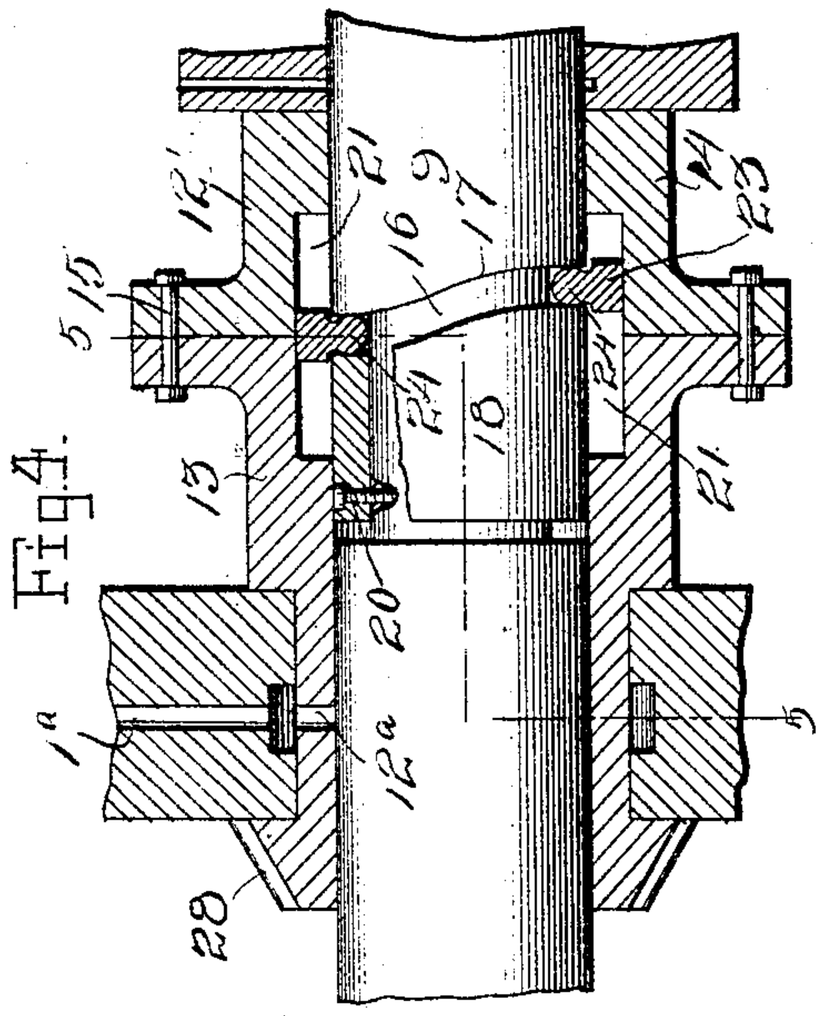



Fig. 7.

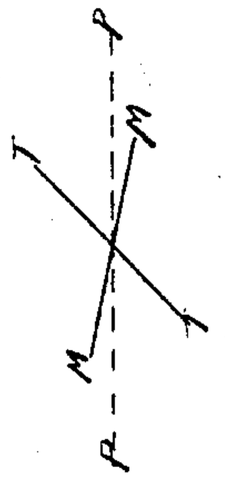



Fig. 6.

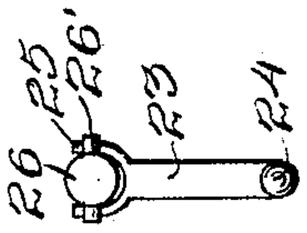
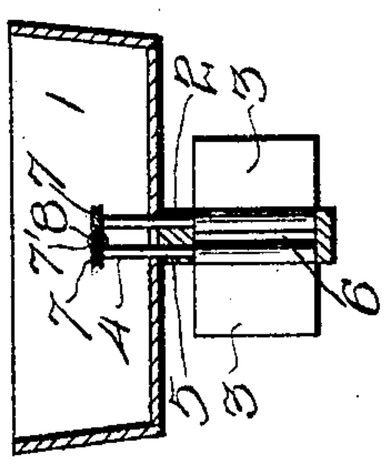



Fig. 12.




Witnesses

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No. 764,741. Patented July 12, 1904.

# UNITED STATES PATENT OFFICE.

CAREY ALAN MANKER, OF PEARL, ILLINOIS, ASSIGNOR TO MANKER-HEAVNER NAVIGATION COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF ARIZONA TERRITORY.

## MEANS FOR NAVIGATION.

SPECIFICATION forming part of Letters Patent No. 764,741, dated July 12, 1904.

Application filed December 17, 1902. Serial No. 135,643. (No model.)

*To all whom it may concern:*

Be it known that I, CAREY ALAN MANKER, a citizen of the United States, residing at Pearl, in the county of Pike and State of Illinois, have invented certain new and useful Improvements in Means for Navigation, of which the following is a description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to marine and other vessels of transportation, one of its objects being to provide means other than those of flotation for sustaining the vessel and securing a diminution of resistance while the vessel is being propelled forward, an improved propeller being employed as part of such means by which a lifting action, lost in the common screw-propeller, is secured and utilized to reduce displacement while the vessel is in motion.

A further object is to provide means for adjusting the propeller mechanism to drive the vessel at different speeds and reverse the course of the vessel and means for maintaining a proper degree of stability of the vessel, as well as other features whereby displacement is materially reduced or practically eliminated and greater speed allowed.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a vessel embodying my invention, certain portions appearing in section for clearer illustration. Fig. 2 is a bottom plan view of the same, a portion of the keel appearing in horizontal section. Fig. 3 is a view in elevation looking toward the bow or front end of the vessel. Fig. 4 is a longitudinal section, on an enlarged scale, through the propeller mechanism. Fig. 5 is an irregular transverse section taken on line 5 5 of Fig. 4. Fig. 6 is a detail view of one of the propeller-blade cranks, showing the connecting inner end of the blade-staff. Fig. 7 is a diagrammatic illustration showing differentiated pitch of the propeller-blades as varying in the down and up strokes. Figs. 8, 9, and 10 indicate diagrammatically different courses for the cam-groove in the propeller-shaft, each line representing the course of the cam in its path around the shaft as if said cam were spread out on a plane surface, Fig. 10 representing the extended form of the cam-groove shown in Fig. 4. Fig. 11 is a cross-section on line 11 11 of Fig. 1, and Fig. 12 is a cross-section on the line 12 12 of Fig. 2.

Referring now more particularly to the drawings, 1 denotes the hull of the vessel, which is preferably of the flat-bottomed type, as clearly shown in Figs. 2 and 3, and is provided with a longitudinal ballasting-keel 2, which may be of any approved construction. I may use a single central keel, as here illustrated, or two keels—one on each side of the center line of the vessel—on the plan of a double-ballasted catamaran, and the keel or keels may be attenuated to reduce water resistance to the desired degree. At one or more points on the keel are resistance plates or wings 3, fixed at one end to shafts 4, turning in suitable bearings 5, so as to allow the wings to fold within a transverse opening 6 in the keel parallel with said keel, so as to offer no resistance to the movement of the vessel. On the shafts are worm-gears 7, meshing with a worm 7′ on a shaft 8, by which the wings may be swung outward and folded. When the wings are swung outward, they extend at right angles to the keel and present their broad surfaces to the water or medium through which the vessel is passing, so as to cause sufficient resistance to bring the vessel to a quick stop when the propelling power is shut off.

*w w* and *w′ w′* designate the normal and running water-lines and indicate the extent of elevation of the vessel when being propelled through the water.

9 and 10 denote propellers which revolve in opposite directions in transverse openings 9′ 10′ in the keel 2 and which receive motion from a common power-shaft 11. These propellers are alike in construction, and a description of one will therefore suffice for both. On a shaft 12, which is common to the two propellers and which is rotatably and slid-

ably mounted in suitable bearings, is a hub 12′, composed of coupled sections 13 and 14, flanged for the passage of bolts or other suitable fastenings 15. That portion of the shaft which lies within this hub has a reduced portion 16, which at one end is grooved to form the base and one side wall of a camway 17, which is completed by a collar or sleeve 18, whose end edge opposite the said side wall of the cam groove or way is curved to conform thereto and form the opposite side wall. The sleeve is held rigidly in position by screws or other suitable fastenings 20. In the hub are formed tangential chambers 21, which intersect the groove 17, and transverse sockets 22, and in said chambers are cranks 23, each having at one end a lateral ball or head 24, projecting into the groove 17 and having its opposite end projecting into the adjacent socket 22 and forked, the members of the fork being formed into hooks 25, engaging pins or projections 26′ on a shaft or staff 26, journaled to oscillate in the socket 22 in a plane at right angles to the shaft 12 and provided at its outer end with a propeller-blade 27. Any desired number of these staffs and their propelling-blades may be used, and it will be observed that in the revolution of the hub 12′ the shaft 26 will be oscillated in the sockets 22 to varying degrees in their path of movement, thereby causing the blades to be set at different angles at different points in their circular course. The two hubs 12′ carry at their adjacent ends miter-gears 28, meshing with an interposed gear 29 on a power-shaft 30, driven by a suitable engine, whereby the said hubs are revolved in opposite directions. Oil-chambers $1^a$ and $12^a$ in the keel-wall and hub 12′ adapt the hub and shaft 4 to be conveniently lubricated from within the vessel.

In the operation of the propellers about the shaft 12 the oscillation of the blades causes a greater pitch to be had on the descending strokes of the blades than on their upstrokes, thus getting a lifting action on the downstroke, while the ascending blade is allowed to come upward on the line of least resistance or at such an angle as will allow of an impingement of the water against the under side of the ascending blade, thus resulting in lifting as well as propelling the vessel. It will be observed that this variation of blade pitch on the two sides is occasioned by the cam being so angled or formed that a portion of the cam is located in a plane different from the opposite portion of the cam, causing the blades on one side to have a maximum pitch for the described purpose and those on the opposite side to have a minimum pitch to take the course of least resistance. Hence there is a counterpoise action of the descending and ascending blades in impingement against the water or medium in which they are moving by which the propeller and vessel to which they are applied are constantly buoyed and sustained, so that the displacement and resistance of the medium through which the vessel is passing is materially reduced, owing to the decrease in the action of the inertia of the water against the vessel. Fig. 10 illustrates in diagram the course of the form of cam shown in Fig. 4 as if said cam were spread out on a plane surface. By the use of this form of cam I obtain an even impingement of the blades during the space of arc described by nearly a half-revolution of the propeller-blade on each side of the propeller, the variation from that position being indicated by the curved portion of the cam, during which time the blade is varying from impingement at maximum on its under side as it descends to maximum against its under side while ascending, the blade having exchanged lower for upper side in going down and coming up, there being a maximum impingement throughout the whole time that the cam lies in a vertical cross-section, thus getting an even propelling and lifting action of the blades instead of attaining maximum efficiency at one point only of revolution. Figs. 8 and 9 illustrate that the cam may be varied in annular outline from the form shown in Fig. 10. It will be understood that the blades of the two propellers 9 and 10 are so relatively arranged that both propellers will operate to propel the vessel in one and the same direction notwithstanding their revolution in reverse directions and that they maintain a proper balance or equilibrium of buoyancy or lifting action.

The shaft 12 may be rotated or oscillated through half-revolution by means of a worm-gear 31 and worm-shaft 32 to reverse or change the cam in such manner that on reversing the revolution of the propellers the vessel may reverse its course. Such reversal of the cam is essential for backing, as by the backward revolution of the propeller the boat would otherwise be drawn down instead of buoyed or elevated. The shaft 12 is also longitudinally adjustable by means of a specifically-different form and arrangement of worm-gear 33 and worm-shaft 34, whereby on a sliding movement of said shaft the crank-arms 23 will oscillate the blades to change their pitch and adapt the propeller to propel the boat at different speeds.

35 and 36 denote hydroplanes or impingement-plates. The hydroplanes 35, of which a pair are here shown as located at the bow end of the vessel, consist of plates secured at one end to the bottom of the vessel on opposite sides of the keel 2 and extending downwardly and laterally in opposite directions, said blades projecting forward at an upward angle of inclination and having their front edges tapered or suitably reduced to pass freely through or readily "cut" the water. Any desired number of sets or pairs of these plates 35 may be employed. The plates 36 are longitudinally curved and are employed in pairs, two pairs

or sets being here shown as employed, one at the bow and the other at the stern. They are arranged so that the blades of each pair lie end to end transversely of the vessel and form a bow-shaped member. The said plates 36, like the plates 35, also extend on an upward and forward inclination, and the two sets of plates 35 and 36 on the forward movement of the vessel impinge upon the water at such an angle as to cause the vessel to slide upward, as it were, on the body of water, thus, as will be readily understood, supplementing the lifting action of the propellers to reduce or eliminate displacement of the hull, allowing of greater speed than if the water had to be moved by the vessel displacing its weight therein. This lifting action of the propellers and hydroplanes serves to throw the center of gravity above the plane of the propellers, so that the vessel unless restrained would tend to turn over. I therefore construct the hydroplanes in such manner that they will neutralize the action of gravity and restore the equilibrium. It will be observed that the outward and downward inclination of the blades 35 is such that when the vessel rolls to one side the plate 35 on the ascending side is thrown out of the water or at least into less dense water, while its companion plate on the descending side impinges in deeper and denser water, thus impinging greater on the descending side to lift and restore equilibrium. The plates 36 are adapted to perform the same function and are automatically governed to keep the vessel "trimmed" or in erect condition. To this end the plates 36 are journaled at their ends in bearings 36′ to oscillate in a vertical plane to throw their front edges upward or downward and are provided at their inner ends with miter-gears 37. These gears 37 mesh with an intermediate actuating gear or pinion 38, mounted upon the lower end of a shaft 39. On the upper end of this shaft 39 is a worm-gear 40, which receives motion from a worm 41 on a horizontal longitudinal shaft 42, journaled in bearing-brackets 43. When this shaft 42 is turned in one direction or the other, the shaft 39 will also be turned, and the two plates 36 will be swung in opposite directions, one upward and the other downward, as indicated by dotted lines at the rear of Fig. 2, thereby causing one plate to buoy up and the other to pull down, as will be readily understood, the plate upon the ascending side of the keeling vessel being turned downwardly to resist upward movement, while that on the descending side is given a greater upward inclination to adapt it to yield a greater lifting or buoying action, whereby any keeling of the vessel beyond a certain point is prevented, so that the vessel cannot turn over. Suspended from the shaft 42 is a swinging yoke 44, carrying a ball or heavy weight 45, that is adapted to swing transversely of the vessel 1. Carried by this yoke is an adjusting-pinion 46, actuated by a crank-shaft 47, locked in adjusted position in any approved way. This pinion 46 meshes with a gear on shaft 42, by which the latter may be turned to adjust the plates 36 to normally stand at any desired pitch or angle while the weight 45 hangs plumb in vertical position. When the vessel rolls, the ball or weight 45 swings and operates the plates 36 to cause them to resist the rolling motion. On account of the inclination and contour of the plates 35 and 36, it will be seen that in case of the vessel inclining to one side or the other the effect of said plates is to right its position by impingement of the plates on the water as the vessel moves forward. These plates may be placed at any desired position between the bow and stern, as may also the propellers, and by means of the adjusting device and weight it will be clear that the plates 36 may be adjusted to stand at such an angle as best adapted to side drafts or currents of wind and water and that the plates will be automatically actuated to right the vessel to prevent the same from capsizing under the action of the wind or waves or from other causes.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

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

1. A vessel provided with propulsive means to propel and lift or buoy the vessel, hydroplanes on opposite sides of the vessel for supplementing the lifting or buoying action of said propulsive means, and means governed automatically by the action of gravity under the heeling or listing of the vessel to one side or the other to shift the hydroplanes relatively to each other to secure a lifting action on one side and a drawing-down action on the other side of the vessel to counteract such heeling or listing.

2. A vessel having a pair of rotary bladed propellers, means for simultaneously varying the pitch of the blades of said pair of propellers so that the descending blades of each propeller will impinge against the medium through which the vessel is moving and both buoy and propel said vessel, while the ascending blades move with a minimum of resistance, means for simultaneously rotating said propellers in opposite directions, the lifting action of the oppositely-rotating propellers maintaining an equilibrium of buoyancy, and

means for further changing the pitch of the planes and simultaneously reversing the operation of said propellers.

3. A vessel provided with a propeller, adapted to both propel and buoy the vessel, resistance devices disposed on opposite sides of the center line of the vessel to supplement the buoying action of the propellers, and means for simultaneously adjusting the resistance devices on both sides of the center line to cause the same to pull down on one side of the vessel and to lift on the opposite side of the vessel, thereby counteracting overstrain.

4. A vessel provided with a propeller adapted to both propel and buoy the vessel, resistance devices to supplement the buoying action of the propeller, said resistance devices being pivotally mounted and arranged transversely of and upon the bottom of the vessel to project beyond opposite sides of the center line thereof, and means for simultaneously swinging said resistance devices in reverse directions to cause one to pull down on one side of the vessel and the other to lift on the opposite side of the vessel, thereby counteracting overstrain.

5. A vessel provided with a propeller adapted to both propel and buoy the vessel, resistance devices to supplement the buoying action of the propeller, said resistance devices being pivotally mounted, and means for swinging said resistance devices to cause one to pull down on one side of the vessel and the other to lift on the opposite side of the vessel, said means including a gravity element operatively connected to said resistance devices, substantially as described.

6. A vessel provided with a propeller adapted to both propel and buoy the vessel, resistance devices to supplement the buoying action of the propeller, said resistance devices being pivotally mounted, and means for swinging said resistance devices to cause one to pull down on one side of the vessel and the other to lift on the opposite side of the vessel, said means including a gravity-swinging element operatively connected to said resistance devices, and means for adjusting the resistance devices to stand at desired angles, substantially as described.

7. A vessel provided with a propeller having propelling-blades, a normally stationary cam for guiding said blades to vary their pitch in their course of revolution to both propel and buoy the vessel, means for axially adjusting the cam to reverse the operation of the propellers, and means for adjusting the cam at an angle to its plane of axial adjustment to vary the normal pitch of the blades, substantially as described.

8. A vessel provided with a propeller having propelling-blades, a normally stationary shaft, a cam carried by said shaft for guiding the propelling-blades to vary their pitch in their course of revolution to both propel and buoy the vessel, means for turning said shaft to axially adjust the cam to reverse the operation of the propellers, and means for sliding the shaft longitudinally for adjusting the cam to vary the normal pitch of the blades.

9. In a vessel, propelling mechanism comprising a normally stationary shaft, hubs mounted on said shaft, gearing for rotating the hubs in reverse directions, propeller-blades carried by the hubs, cams upon the shaft for guiding said blades to vary their pitch in their course of revolution to both propel and buoy the vessel, and means for longitudinally adjusting the shaft to change the normal pitch of the propeller-blades.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CAREY ALAN MANKER.

Witnesses:
G. M. MANKER,
A. A. MANKER.