J. FRAME.

WAVE MOTOR.

APPLICATION FILED AUG. 30, 1912.

1,066,896.

Patented July 8, 1913.

4 SHEETS—SHEET 1.

Fig. 1.

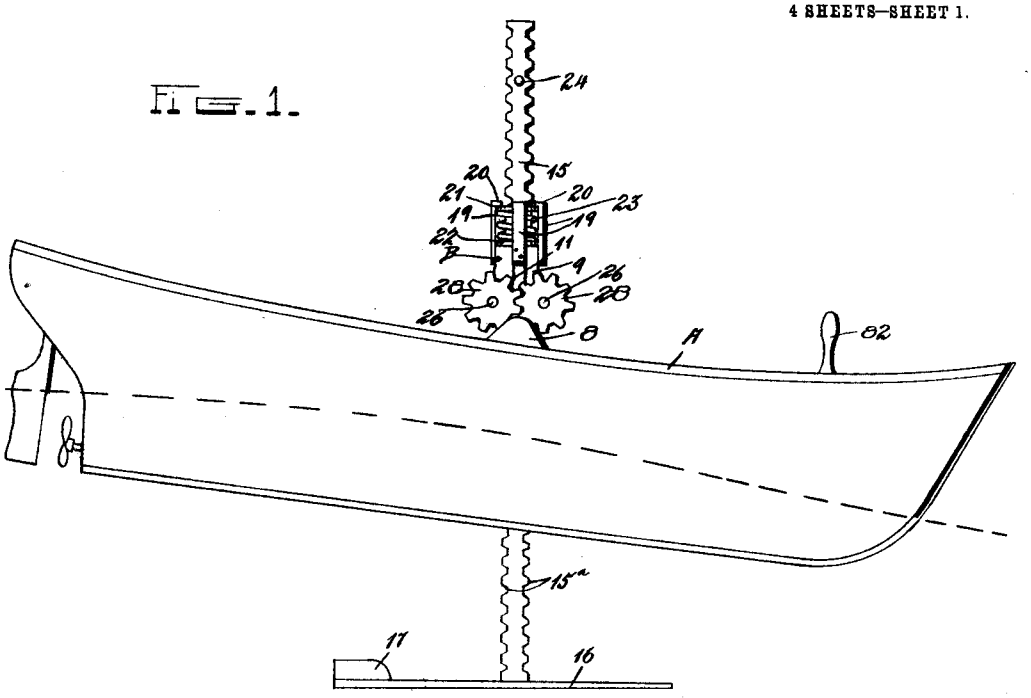
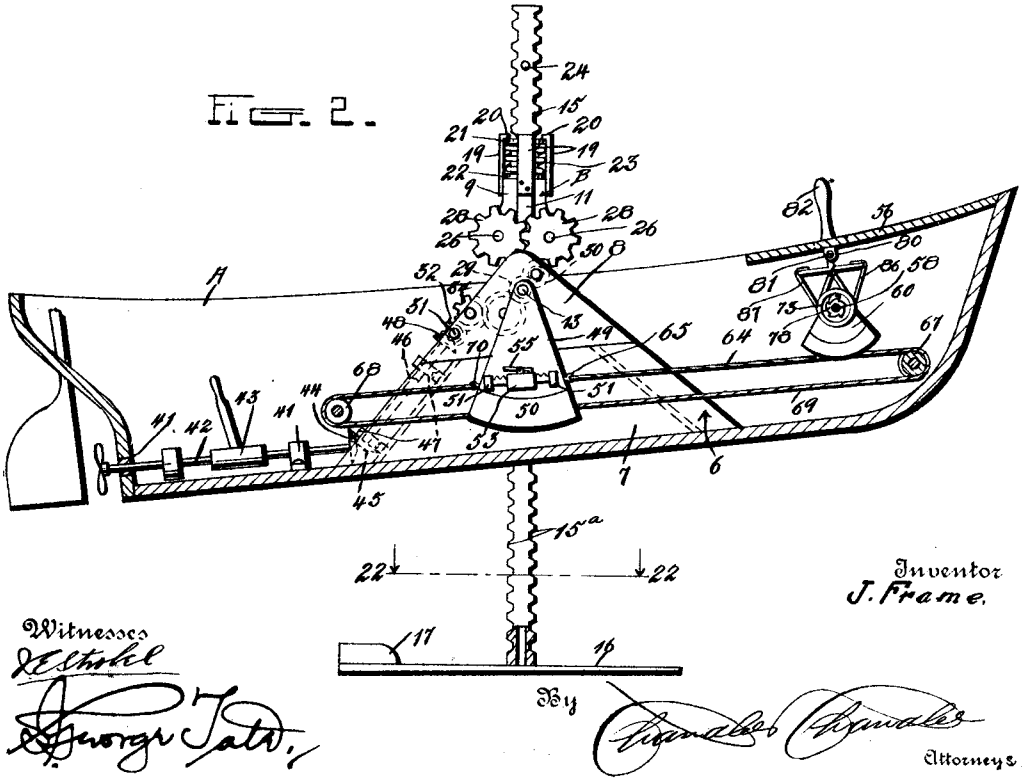


Fig. 2.



Witnesses

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4 SHEETS—SHEET 2.

Fig. 3.

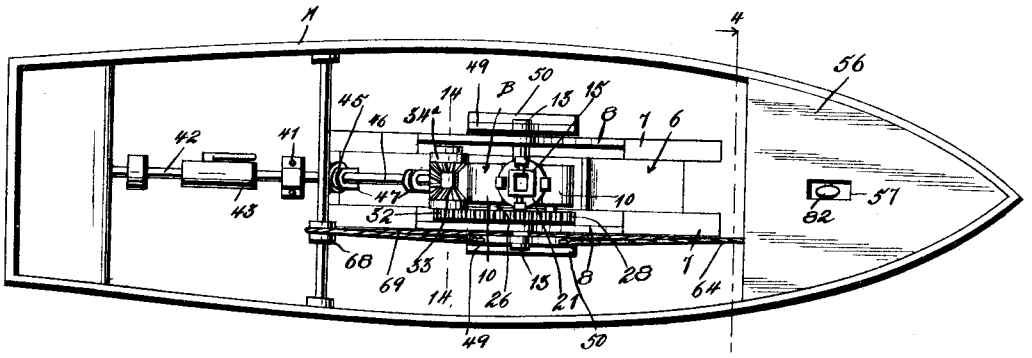


Fig. 4.

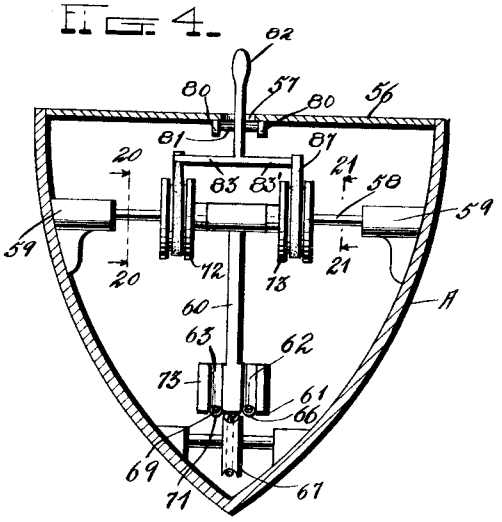


Fig. 15.

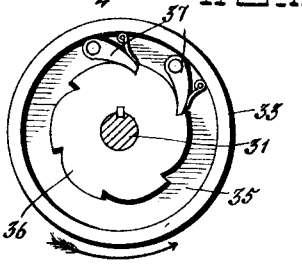


Fig. 16.

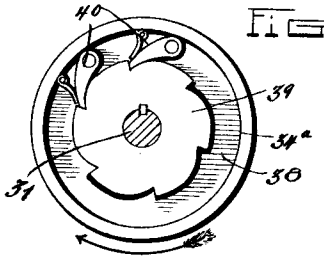
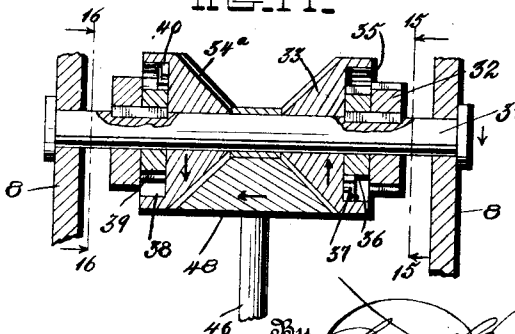


Fig. 14.



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4 SHEETS—SHEET 3.

FIG. 5.

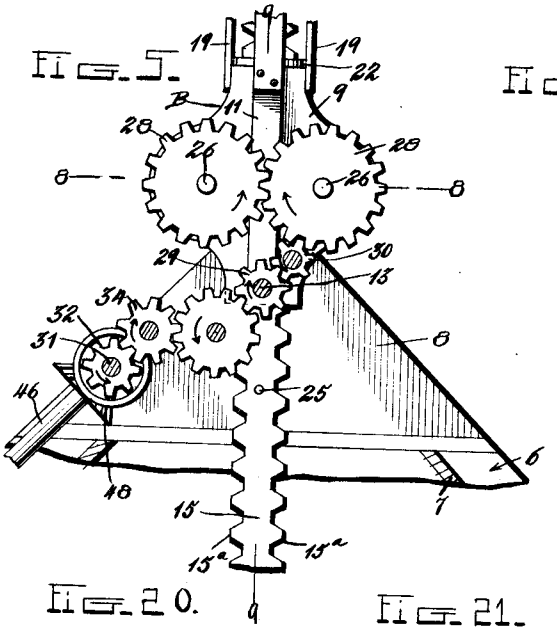


FIG. 6.

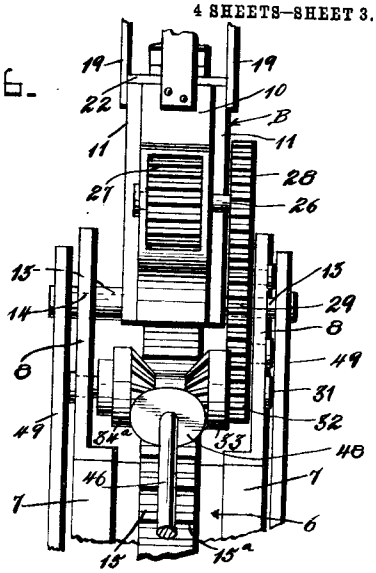


FIG. 20.

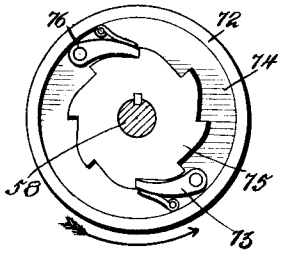
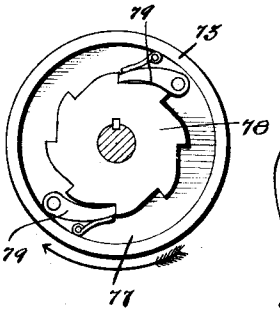


FIG. 21.



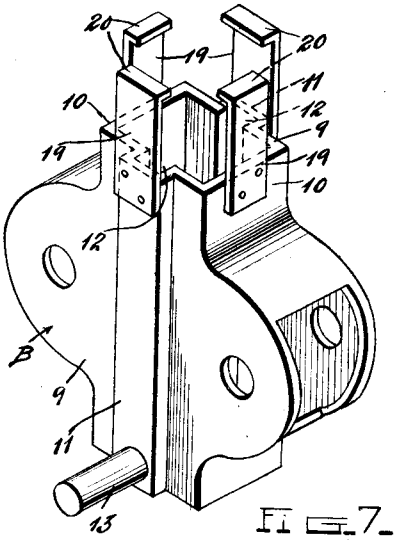


FIG. 7.

FIG. 8.

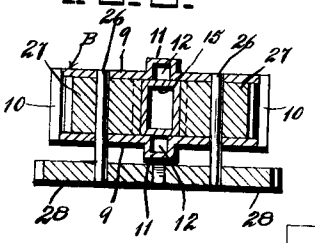
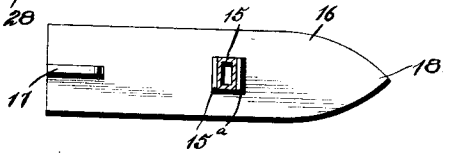


FIG. 22.



Witnesses

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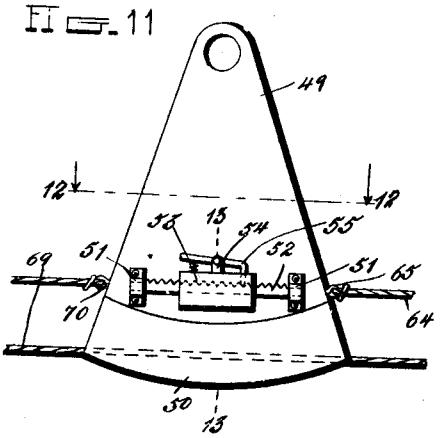
APPLICATION FILED AUG. 30, 1912.

1,066,896.

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4 SHEETS—SHEET 4.

Fig. 11



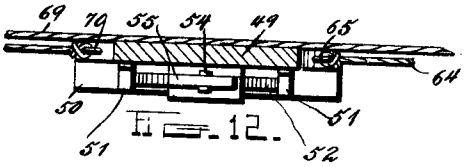
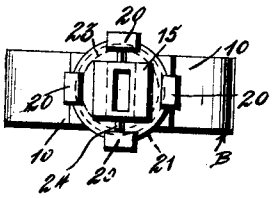


Fig. 12.

Fig. 10.



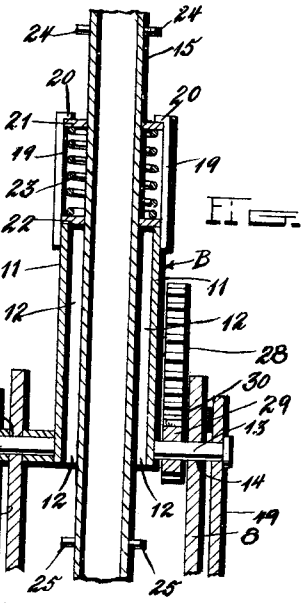


Fig. 9.

Fig. 17.

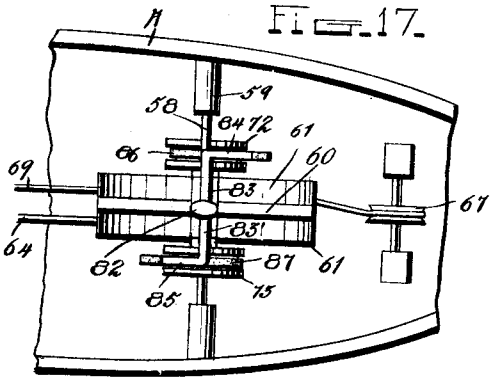


Fig. 18.

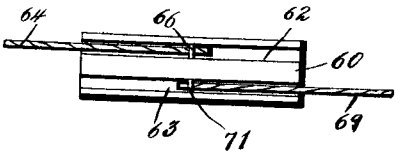
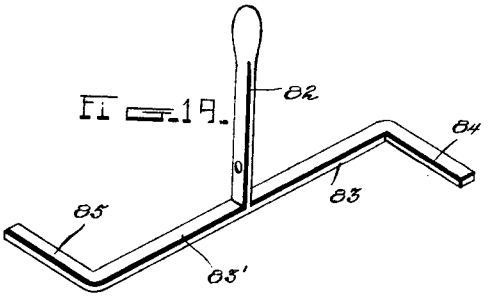


Fig. 19.



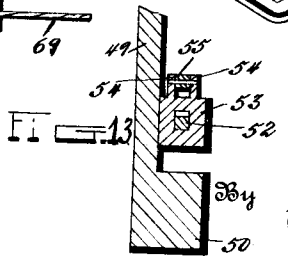


Fig. 13.

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UNITED STATES PATENT OFFICE.

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WAVE-MOTOR.

1,066,896. Specification of Letters Patent. Patented July 8, 1913.

Application filed August 30, 1912. Serial No. 717,901.

To all whom it may concern:

Be it known that I, JOHN FRAME, a citizen of the United States, residing at Searsport, in the county of Waldo, State of Maine, have invented certain new and useful Improvements in Wave-Motors; 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.

This invention relates to new and useful improvements in wave motors.

The principal object of the invention is to equip a boat with a motor of such construction as to drive the propeller shaft upon the rise and fall of the boat.

Another object of the invention is to provide a boat through which a vertically disposed rack bar projects and is held comparatively stationary by a novel means, and driving means for the propeller shaft supported by the boat and engaged with the rack bar and adapted to be actuated by said bar upon the rise and fall of the boat.

A further object of the invention is to provide a motor of the character described in which the rack bar is normally held in a vertical plane by a novel means irrespective of the pitching of the boat.

A still further object of the invention is to provide a motor of the character described, which is extremely simple in construction, is cheap to manufacture, and is positive in operation.

With these and other objects in view, the invention consists in the construction and novel combination of parts hereinafter fully described, illustrated in the accompanying drawings and pointed out in the claims hereto appended; it being understood that various changes in the form, proportion, size and minor details of construction within the scope of the claims may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawing: Figure 1 is a side elevation of a boat equipped with a motor constructed in accordance with my invention, Fig. 2 is a longitudinal sectional view therethrough, the boat being shown disposed at an opposite inclination, Fig. 3 is a top plan view thereof, Fig. 4 is a vertical transverse sectional view taken on the line 4—4 of Fig. 3, Fig. 5 is a detail enlarged side elevation of the driving mechanism, parts thereof being shown in section, Fig. 6 is an end elevation thereof, Fig. 7 is a perspective view of the casing, Fig. 8 is a detail horizontal sectional view taken on the line 8—8 of Fig. 5, Fig. 9 is a vertical sectional view taken on the line 9—9 of Fig. 5, Fig. 10 is a detail top plan view of the casing and rack bar, Fig. 11 is a detail side elevation of one of the balance weights, Fig. 12 is a horizontal sectional view taken on the line 12—12 of Fig. 11, Fig. 13 is a detail sectional view taken on the line 13—13 of Fig. 11, Fig. 14 is a detail sectional view taken on the line 14—14 of Fig. 3, parts thereof being shown in elevation, Fig. 15 is a detail sectional view taken on the line 15—15 of Fig. 14, Fig. 16 is a detail sectional view taken on the line 16—16 of Fig. 14, Fig. 17 is a top plan view of the structure shown in Fig. 4, Fig. 18 is a detail bottom plan view of the auxiliary weight, Fig. 19 is a perspective view of the auxiliary weight actuating hand lever, Fig. 20 is a detail sectional view taken on the line 20—20 of Fig. 4, Fig. 21 is a detail sectional view taken on the line 21—21 of Fig. 4, and Fig. 22 is a detail horizontal sectional view taken on the line 22—22 of Fig. 2.

Like reference numerals designate corresponding parts in all the figures of the drawings.

Referring to the drawings, A designates a float, such as, for instance, a boat, and this boat is provided with a central well 6. Secured to the upper edges of the side walls 7 of the well are brackets 8—8.

An open ended rectangular casing B is vertically disposed between the brackets 8—8, and this casing includes side walls 9—9 and end walls 10—10, the side walls 9 being pressed outwardly to form longitudinal ribs 11—11 and consequent grooves 12—12. Extending laterally from the lower ends of the ribs 11 are trunnions 13—13 which are respectively journaled in suitable bearings 14—14 formed in the bracket 8. As a result of this construction, the casing B is pivotally mounted for longitudinal swinging movements with respect to the boat A.

A hollow rectangular rack bar 15 is mounted for vertical movements within the well 6 and casing B, the length of said bar being such as to extend above and below the

boat A. Carried by the lower end of this bar is a horizontal plane 16 which is disposed longitudinally of the boat and is adapted to serve as a means to close the lower end of said rack bar. The rack bar 15 is connected to said plane at a point slightly in advance of the center thereof so as to act as a rudder and give horizontal direction to the travel of the plane when the boat is moving forward. Extending upwardly from the rear end of the plane is a longitudinally disposed vertical rib 17 which serves as a guide to assist the plane in running parallel with the boat. The forward end of the plane 16 is pointed, as at 18, to assist said plane in cutting through the water.

In order to limit the longitudinal movement of the rack bar 15 with respect to the boat A, a pair of fingers 19—19 are secured to the upper ends of the ribs 11 and end walls 10 of the casing B, said fingers extending upwardly from said casing and terminating at their upper ends in inwardly extending stops 20—20. Disposed around the rack bar 15 are upper and lower washers 21 and 22 respectively, the former bearing against the stop 20 and the latter against the upper end of the casing B. These washers are yieldably held in their respective positions by means of a coil spring 23. Extending laterally from the rack bar 16 are spaced sets of upper and lower pins 24 and 25, the former set being normally disposed above the stops 20 and the lower set being normally disposed below the casing B. When the boat A rises up along the rack bar 15, the pins 24 will be caused to engage the upper washer 21 and thereby compress the spring 23, said washer and spring serving to yieldably limit the relative movement between said rack bar and boat. When the boat A falls, the lower washer 22 will engage the lower pins 25, it being understood that the pins 25 will slide within the grooves 12 of the casing B. As a result, the spring 23 will be compressed and this spring and washer will serve to yieldably limit the relative movement between said rack bar and boat.

Journaled in the side walls 9 of the casing B and on opposite sides of the rack bar 15 are transverse shafts 26—26 and fixed upon these shafts within the casing B are pinions 27—27 which respectively engage the teeth 15^a of the rack bar 15. These shafts 26 extend outwardly from one side wall 9 of the casing B and fixed on said extended ends are gear wheels 28—28 which mesh with each other. Loosely mounted upon the trunnion 13 below said gear wheel 28 is a pinion 29 which is connected to one of said gear wheels 28 through the medium of a pinion 30 which is suitably journaled upon the casing.

Journaled in suitable openings formed in the brackets 8 is a transverse shaft 31, and fixedly mounted upon this shaft is a gear wheel 32, which meshes with the pinion 34. As a result the shaft 31 will be alternately rotated during the up and down movements of the boat A with respect to the rack bar 15. Loosely mounted upon the shaft 31 is a spaced pair of beveled gears 33 and 34^a. The outer face of the gear 33 is formed with a counterbore 35, and disposed within the counterbore and fixed to the shaft 31 is a ratchet wheel 36. Disposed within the counterbore 35 and pivotally connected to the gear 33 is a plurality of spring actuated pawls 37 which yieldably engage the teeth of the ratchet wheel 36. The outer face of the bevel gear 34^a is formed with a counterbore 38, and disposed within the counterbore and fixed to the shaft 31 is a ratchet wheel 39, the teeth of this wheel being oppositely disposed with respect to the teeth of the ratchet wheel 46. Disposed within the counterbore 38 and pivotally connected to the gear 34^a is a plurality of spring actuated pawls 40 which yieldably engage the teeth of the ratchet wheels 39.

Suitable bearings 41—41 are located in the stern of the boat A, and journaled in these bearings is a propeller shaft 42 which includes a reversing clutch 43 of any suitable construction. The forward end of the propeller shaft 42 carries a bevel gear 44 which meshes with a bevel gear 45 carried by an inclined shaft 46, said shaft being suitably supported in a bracket 47. Fixed on the upper end of the shaft 46 is a bevel gear 48 which is in mesh at all times with the bevel gears 33 and 34^a.

From the foregoing, it will be observed that when the boat A is elevated along the rack bar 15, the gear wheels 28, pinions 30, 29, 35, 34 and gear wheel 32 will be driven in the direction indicated by the arrows in Fig. 5 of the drawings. As a result, the shaft 31 will through the medium of the ratchet wheel 39 and pawls 40 rotate the bevel gear 34^a in a direction as indicated by the arrows in Fig. 16. At the same time, the pawls 37 of the bevel gear 33 will slide over the teeth of the ratchet wheel 36. Thus through the bevel gears 34^a and 48 the propeller shaft 42 will be rotated in one direction. When, however, the boat A is lowered with respect to the rack bar 15, the gear wheels 28, pinions 30, 29, 35, 34 and gear wheel 32 will be driven in a direction opposite the direction indicated by the arrows in Fig. 5 of the drawings. As a result, the shaft 31 will through the medium of the ratchet wheel 36 and pawls 37 rotate the bevel gear 33 in the direction as indicated by the arrow in Fig. 15 of the drawings. At the same time the pawls 40 of the bevel gear 34^a will slide over the teeth of the

ratchet wheel 39. Thus through the bevel gears 33 and 48 the propeller shaft 42 will be continuously driven in the same direction upon the rise of the boat A.

In order to hold the horizontal plane 16 in its proper or horizontal position regardless of the pitch of the boat A, the trunnions 13 of the casing B project beyond the brackets 8, and fixedly mounted upon said projecting ends are segmental shaped balance weights 49—49, the lower or base portion of each weight being formed with a lateral peripheral enlargement 50. This enlargement being arranged concentric with the trunnion 13, constitutes an additional weight for the counterweight 49. Secured to the outer face of each counterweight 49 above the enlargement 50 thereof is a pair of spaced brackets 51—51, and these brackets support a normally horizontal rack bar 52. Movably mounted upon this bar is a counterweight 53. Extending upwardly from the counterweight 53 is a bracket 54, and fulcrumed upon this bracket is a spring actuated pawl 55 which yieldably engages the teeth of the rack bar 52 to lock the counterweight 53 in any adjusted position along said bar. Now it is to be observed that when the boat is started forward or backward as the case may be, there is a tendency for the horizontal plane 16 to lag behind. As a result the plane will be disposed at an angle and consequently will act as a resistance to the passage of the boat. Therefore in order to retain the plane 16 in its horizontal position during the initial movement of the boat in either direction, the following mechanism is employed: Located in the bow of the boat A is a horizontal support 56 which is centrally formed with an opening 57, and disposed below the support is a transverse shaft 58, the ends thereof being journaled in suitable bearings 59—59 carried by the sides of the boat. Centrally fixed on the shaft 58 is an auxiliary segmental shaped weight 60, its lower or arcuate edge being formed with opposite enlargements 61—61. The lower faces of the enlargements 61 are formed with parallel grooves 62 and 63 respectively. A cable 64 has one end connected to an eye 65 carried by the adjacent side of a respective balance weight 49. The front end of the cable 64 extends into the groove 62 of the auxiliary weight 60 and has its end centrally secured therein by means of a screw-eye 66 or other suitable fastening means. An idler pulley 67 is suitably supported in the boat A in advance of the auxiliary weight 60, and an idler pulley 68 is also supported by the boat A in rear of the balance weight 49. A cable 69 has one end secured to an eye 70 carried by the opposite side of the balance weight 49 from the eye 65. This cable thence extends rearwardly and is trained around the idler pulley 68, the cable thence extending forwardly between the balance weight 49 and center sill 6. The cable thence extends forwardly around the idler pulley 67, and has its end arranged within the groove 63 of the auxiliary weight 60 and centrally secured in said groove by an eye 71.

Loosely mounted upon the shaft 58 on either side of the auxiliary weight 60 are brake drums 72 and 73 respectively. The drum 72 is formed with a counterbore 74, and disposed within this counterbore and fixed to the shaft 58 is a ratchet wheel 75. A plurality of spring actuated pawls 76 are disposed within the counterbore and are pivotally connected to the drum, and have yieldable engagement with the ratchet wheel 75. The drum 73 is likewise formed with a counterbore 77, and disposed within this counterbore is a ratchet wheel 78, the teeth of this wheel however being oppositely disposed with respect to the teeth of the ratchet wheel 75. Spring actuated pawls 79 are disposed within the counterbore 77 and are pivotally connected to said drum and have yieldable engagement with the ratchet wheel 78. Depending from the support 56 on either side of the opening 57 thereof are brackets 80—80, said brackets supporting a transverse pin 81, and upon this pin is fulcrumed a hand lever 82, the upper end thereof projecting above the support 56. Extending from the lower end of the lever are oppositely disposed lateral and transversely arranged arms 83—83′, the ends of said arms being oppositely bent longitudinally to form rocker arms 84 and 85 respectively. A brake band 86 is trained under the brake drum 72 and has its ends respectively connected to the ends of the rocker arm 84. A similar brake band 87 is trained under the brake drum 73 and has its ends respectively connected to the ends of the rocker arm 85.

From the foregoing, it will be observed that when the boat is started forwardly and it is desired to prevent the lagging of the horizontal plane 16, the hand lever 82 is tilted forwardly and as a result the rocker arm 85 will cause the brake band 87 to frictionally grip the brake drum 73, and thereby lock said drum against rotation. As a result, the tendency of the balance weights 49 to swing rearwardly will through the cable 64 tend to also swing the auxiliary weight 60 in a rearward direction, the movement of the latter, however, being prevented by reason of the ratchet wheel 78 engaging the pawl 79. Consequently the plane 16 is free to swing in one direction and locked against movement in the other and thus will be held in its proper relation with respect to the boat. When the boat is reversed, the plane 16 is held in its normal position against possible lagging by manipulating

the hand lever 82 in the reverse direction, this movement locking the drum 72 against rotation as will be readily understood.

By forming the rack bar 15 hollow, and closing the lower end thereof with the horizontal plane 16, a sufficient buoyancy will be given to said rack bar to prevent the latter from sinking should the upper pins 24 become broken.

What is claimed is:

1. The combination of a boat and its center well, a driven shaft supported by the well, a vertically disposed rack bar arranged within the well and having a relative loose connection therewith, a horizontal plane carried by the lower end of the rack bar and disposed below the boat for retaining said rack bar against vertical movement, said plane being centrally connected to the rack bar, a longitudinally disposed vertical rib extending upwardly from the rear end of the plane, and means supported by the boat and engageable with said rack bar for rotating the shaft continuously in one direction upon the rise and fall of the boat.

2. In a wave motor, the combination with a float including an opening, of a casing disposed above the opening and supported on the float for longitudinal swinging movements, a rack bar extending upwardly through the opening of the float and casing and having a relative longitudinal sliding movement therewith, a driven shaft carried by the float, a connection between the rack bar and shaft for continuously rotating the latter in the same direction upon movement of the float in either direction along the bar, means for retaining the bar against vertical movement, and balance weights carried by the casing for retaining the bar against longitudinal swinging movements.

3. In a wave motor, the combination with a float including an opening, of a casing disposed above the opening and supported on the float for longitudinal swinging movements, a rack bar extending upwardly through the opening of the float and casing and having a relative longitudinal sliding movement therewith, a driven shaft carried by the float, a connection between the rack bar and shaft for continuously rotating the latter in the same direction upon movement of the float in either direction along the bar, means for retaining the bar against vertical movement, balance weights carried by the casing for retaining the bar against longitudinal swinging movements, and means connected to one of said weights for locking the same against swinging movement in one direction with respect to the float during the initial starting movement of said float in either direction.

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

JOHN FRAME.

Witnesses:
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JAS. A. COLSON.

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