R. P. ERHARD.

HYDROPLANE.

APPLICATION FILED DEC. 1, 1920.

1,424,811.

Patented Aug. 8, 1922.

3 SHEETS—SHEET 1.

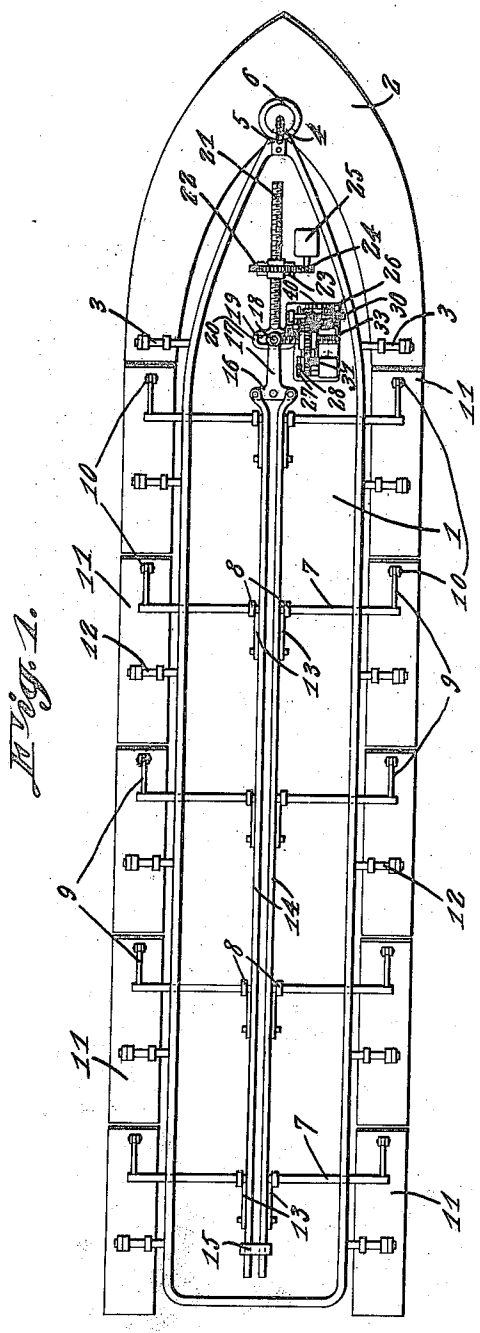


Fig. 1.

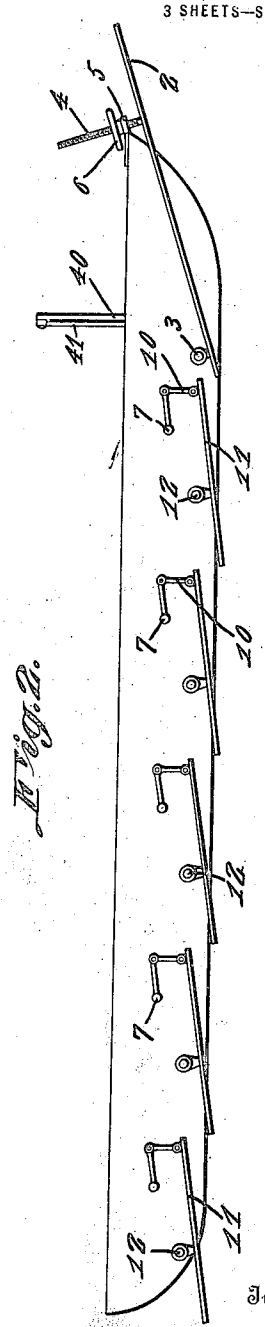


Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 4.

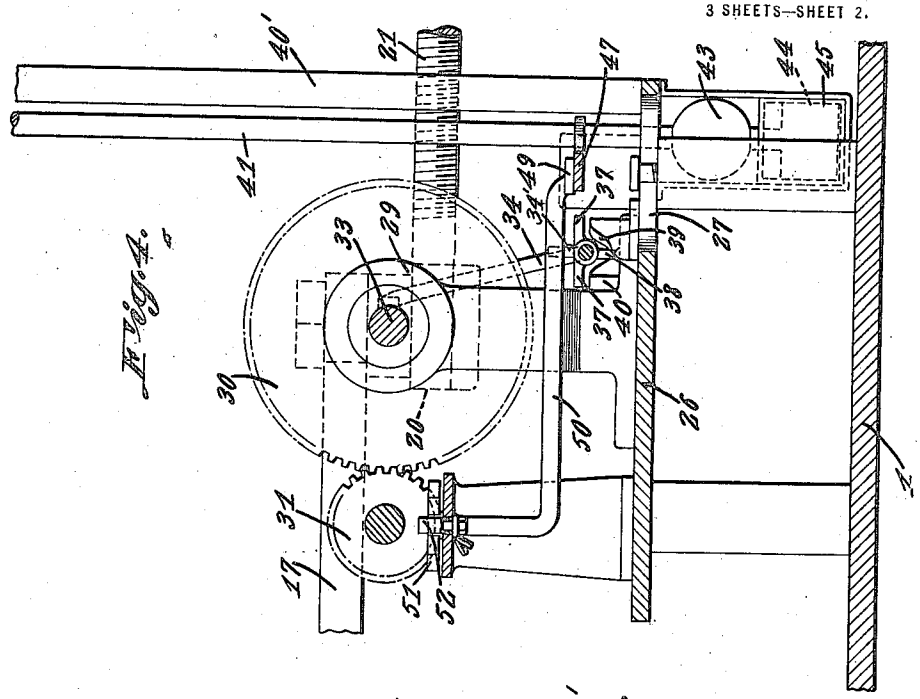
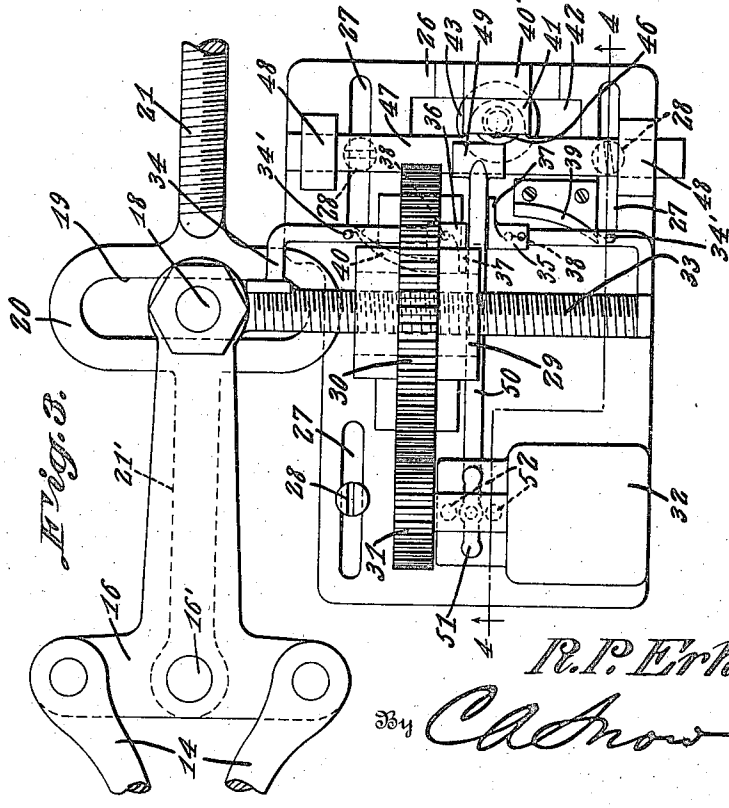


Fig. 3.



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3 SHEETS—SHEET 3.

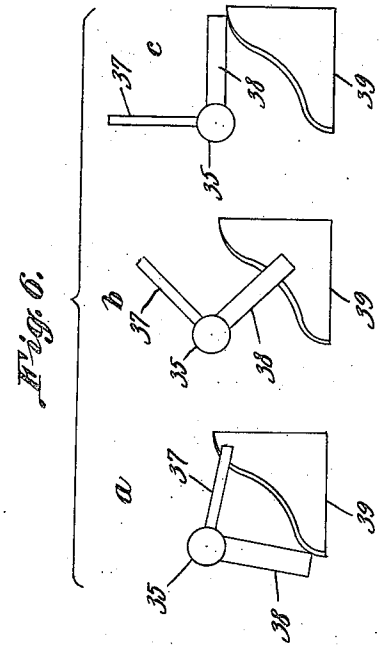


Fig. 6.

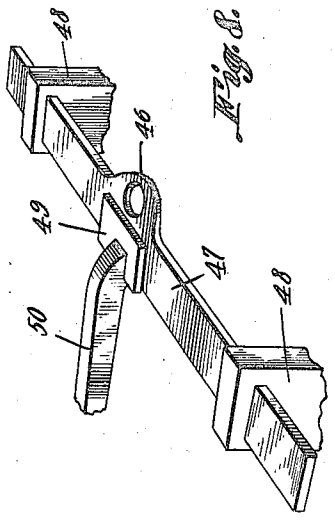


Fig. 8.

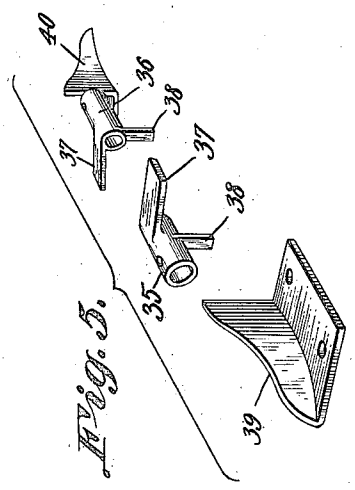


Fig. 5.

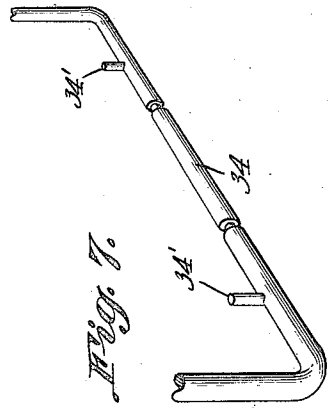


Fig. 7.

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UNITED STATES PATENT OFFICE.

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HYDROPLANE.

1,424,811. Specification of Letters Patent. Patented Aug. 8, 1922.

Application filed December 1, 1920. Serial No. 427,567.

To all whom it may concern:

Be it known that I, ROBERT P. ERHARD, a citizen of the United States, residing at Juniata, in the county of Blair and State of Pennsylvania, have invented a new and useful Hydroplane, of which the following is a specification.

This invention relates to hydroplanes, one of its objects being to provide pendulum controlled stabilizing means whereby tiltable planes located along the sides of the hull of the machine can be operated automatically for the purpose of maintaining the device substantially on an even keel.

A further object is to provide motor propelled means whereby all of the tiltable planes can be shifted simultaneously to vary their angle of incidence, such actuation of the planes being independent of the pendulum controlled mechanism for maintaining the lateral balance.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that, within the scope of what is claimed, changes in the precise embodiment of the invention shown can be made without departing from the spirit of the invention.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings—

Figure 1 is a plan view of the hydroplane having the present improvements combined therewith.

Figure 2 is a side elevation thereof.

Figure 3 is an enlarged plan view of the mechanism employed for maintaining the lateral balance.

Figure 4 is a section on line 4—4, Figure 3.

Figure 5 is a detail view showing the cam plate and the arms cooperating therewith, the several parts being detached.

Figure 6 is a view showing in diagram the relative positions of one of the cams and the arms cooperating therewith while the upper arm is being swung upwardly to active position.

Figure 7 is a perspective view of a portion of the yoke and showing the upstanding pins thereon and the grooved portions on which the arm carrying sleeves are to be swiveled.

Figure 8 is a perspective view of the slidable bar, the friction shoe engaging the same, and the pendulum engaging eye.

Referring to the figures by characters of reference 1 designates the hull of the hydroplane the bow of which is straddled by a front plane 2 preferably pointed and the rear ends of which are mounted to swing upon laterally extending arms 3 projecting from the sides of the hull. To the front portion of this plane is connected a threaded stem 4 guided within a bracket 5 projecting from the bow of the hull and this stem is engaged by a hand wheel 6 in the form of a nut which, when rotated, will cause the screw to move upwardly or downwardly, thereby varying the angle of the plane 2 relative to the horizontal. This front plane is thus constantly under the control of the operator and can be set at any desired angle either during or prior to the operation of the hydroplane.

Extending transversely within the hull 1 at regular intervals are shafts 7 arranged in pairs and each shaft has a crank arm 8 at its inner end and another crank arm 9 at its outer end, said outer end being supported beyond the side of the hull 1. Each of the crank arms 9 is connected by a link 10 to the forward portion of a plane 11 extending under the projecting portion of the shaft 7 and tiltably mounted on an arm 12 projecting laterally from the hull. The planes along each side of the hull are so proportioned that when they are horizontally disposed their ends come close together, as will be apparent by referring to Figure 2. The crank arms 8 at the inner ends of the shafts 7 are connected by links 13 to parallel bars 14 which extend longitudinally within the hull and are mounted at their rear ends in a guide 15 while the front ends of the bars are pivotally connected to the oppositely extending arms of a centrally fulcrumed lever 16. This lever has a forwardly extending arm 17 provided at its front end with a bolt 18 adapted to slide within a slot 19 extending transversely within a head 20. This head is located on a rod 21′ on which the lever 16 is fulcrumed at 16′ and extending in the opposite direction from the head is a threaded stem 21 which stem projects through a gear 22. This gear has threads therein so that when the gear is rotated in one direction or the other the stem 21 will be shifted longitudinally. This gear 22 is mounted in a bearing 23 whereby it is held

against sliding movement with the stem 21. A small gear 24 meshes with the gear 22 and is driven by a motor 25. Thus it will be seen that by operating the motor motion will be transmitted therefrom through the gears to the stem 21 and said stem will be shifted longitudinally so as to thrust against or pull upon the arm 17 and cause the bars 14 to move either rearwardly or forwardly in unison. Obviously the links 13 will thus pull or thrust upon the crank arms 8 and cause the shafts 7 to rotate in unison, thereby producing uniform tilting movement of all of the planes 11 at the two sides of the hull. In this way the angle of incidence of the planes can be quickly varied so that the planes will exert the desired lifting action upon the hydroplane when forced forwardly through the surface of the water.

Mounted on the hydroplane at one side of the stem 21 is a base plate 26 having longitudinal slots 27 into which project guide bolts 28 or the like. This plate is movable along lines parallel with the stem 21 and is provided with an upstanding bearing 29 in which is mounted a gear 30 held against lateral movement by the bearing 29. A gear 31 meshes with gear 30 and is adapted to be driven by a motor 32. Gear 30 is mounted on and engages a threaded stem 33 supported transversely above the plate 26 and connected, at one end, to the bolt 18. Thus it will be seen that when the stem 21 is shifted longitudinally so as to actuate the shafts 7 in the manner hereinbefore described, the plate 26 will also be shifted longitudinally therewith and upon the guide bolts 28 by reason of the connection between the transverse stem 33 and the bolt 18.

Secured to the end portions of the stem 33 is a transverse yoke 34 the intermediate portion of which is above and parallel with the plate 26. Swiveled on this intermediate portion of the yoke adjacent the center thereof are spaced sleeves 35 and 36 each of which has upper and lower fingers 37 and 38 extending therefrom. Upstanding pins 34′ are provided on the yoke near the sides thereof.

Secured on the plate 26 adjacent the sides thereof and below the yoke are lifting cams 39 and 40 extending into the paths of the lower fingers 38 of the sleeves 35 and 36.

A standard 40′ is mounted on the plate 26 and has a pendulum 41 suspended therefrom, this pendulum working within an opening 42 in the plate 26 and being provided below the ball 43 of the pendulum, with a paddle 44 adapted to work back and forth within a transverse trough 45 containing a heavy fluid such as mercury, oil or the like.

The pendulum 41 extends through an eye 46 extending from a bar 47 which is slidable within guides 48 on plate 26 and extends transversely of the plate. This bar is engaged by a shoe 49 provided at one end of a switch arm 50 which extends over the intermediate portion of the yoke 34 and extends from a switch 51 carried by the motor 32. The shoe 49 frictionally engages the bar 47 so that the two will move together under usual conditions but are free to slide one on the other, when one is subjected to more than normal resistance. The switch is of such type that, when swung in one direction will cause the motor to drive in one direction, and, when swung to the opposed extreme position will reverse the operation of the motor. Contacts for the switch 51 have been indicated at 52.

When the switch is in neutral position so that the motor 32 is not energized, it lies over the space between the fingers 37, as shown in Figure 3 and the pendulum hangs vertically. Should the machine tilt laterally in one direction the pendulum, by remaining vertical, would hold the bar 47 against transverse movement but the bar 47 and the parts carried thereby would shift laterally. The first portion of this movement would shift the switch 51 but further movement in the same direction would cause the shoe 49 to shift its position from the center of the bar 47. The movement of the switch would cause the motor 32 to drive in one direction thereby actuating the threaded stem 33. Thus the arm 17 will be pulled or pushed, according to the direction of rotation of the gear 30, causing relative movement of the bars 14 in opposite directions and causing the planes 11 at the low sides of the hydroplane to tilt upwardly at their forward ends while the planes 11 at the high side of the hydroplane will tilt downwardly. These planes will thus cooperate to restore the lateral balance of the hydroplane and during such restoration the pendulum 41 will cause the bar 47 to drag the shoe 49 with it back toward and past its neutral position and reverse the motor. When the mechanism is brought back to its central position one of the fingers 38 which has moved with the yoke 34 past the outer or low end of its cam plate 39 or 40, will ride on said cam plate so as to swing the arm or finger 37 upwardly as shown in Figure 6 successively from position *a* to positions *b* and *c*, and the switch arm 50 will come against the elevated finger 37. Thus the relative positions of the bar 47 and shoe 49 will be changed until the shoe is again centered on the bar in its original position. At this time the switch arm will be in its neutral position and the lower finger 38 connected to the active arm 37 will drop off of the large end of the cam plate and leave the switch 51 in neutral position until another lateral tilting of the machine results in the further actuation of the parts. By means of the cams and the fingers 37

the shoe 49, if shifted away from the center of the bar 47, will be restored to such central position, as will be obvious.

By providing the upstanding pins 34′, when the pendulum moves to the right and the shoe 49 is also moved to the right, the motor will start to move the stem 33 to the left as heretofore explained. If the tilting is not reversed, however, the adjacent pin 34′ will come against the arm 50 and stop the motor before any damage is done.

What is claimed is:

1. The combination with the hull of a hydroplane and tiltable planes at the sides thereof, of motor propelled means for tilting the planes at one side of the hull oppositely to the planes at the other side of the hull, and motor propelled means for shifting all of the planes simultaneously upwardly and downwardly at their front ends.

2. The combination with the hull of a hydroplane, of a series of tiltable planes at each side of the hull, separate longitudinally movable bars within the hull, means for transmitting motion from the bars to the respective series of planes to raise or lower the front ends of the planes, motor propelled means for shifting the bars simultaneously in one direction to raise or lower the front ends of said planes in unison, and pendulum controlled motor operated means for shifting the bars in opposite directions respectively for raising the front ends of the planes at one side of the hull and lowering the front ends of the remaining planes.

3. The combination with the hull of a hydroplane, of a series of tiltable planes at each side of the hull, separate longitudinal bars upon the hull, means operated by the bars for tilting the planes of the respective series, a lever connecting the bars at one end, an arm extending from the lever, a motor operated screw feed engaging the arm for shifting the bars simultaneously in either direction to simultaneously tilt the planes of the two series, and pendulum controlled motor operated means for shifting the lever relative to the screw feed for actuating the bars in opposite directions respectively to shift the planes of one series oppositely to the planes of the other series.

4. The combination with the hull of a hydroplane, of a series of tiltable planes at each side of the hull, separate bars extending longitudinally of the hull, means operated by the bars for tilting the respective series of planes, a lever connecting the bars, a screw for shifting the lever to move the bars in opposite directions respectively, a motor for actuating the screw, a pendulum, a switch controlled by the pendulum for reversing the motor, and means for bringing the switch to neutral position when the hull is brought to an even keel.

5. The combination with the hull of a hydroplane, and a series of planes at each side of the hull, of separate bars, means operated by the bars for tilting the respective series of planes, a lever connecting the bars, and means for swinging the lever to move the bars in opposite directions, said means including a screw connected to the lever, motor actuated means for shifting the screw, a bar movable with the pendulum, a motor switch, an arm extending therefrom and frictionally engaged by the bar, spaced arm engaging fingers movable with the screw and mounted for rotation into and out of the path of the arm, and lifting cams for actuating said fingers to bring the arm to neutral position when the hull is brought to an even keel.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

ROBERT P. ERHARD.

Witnesses:

CHARLES J. MCCULLOUGH,

D. LLOYD CLOYCOMB.