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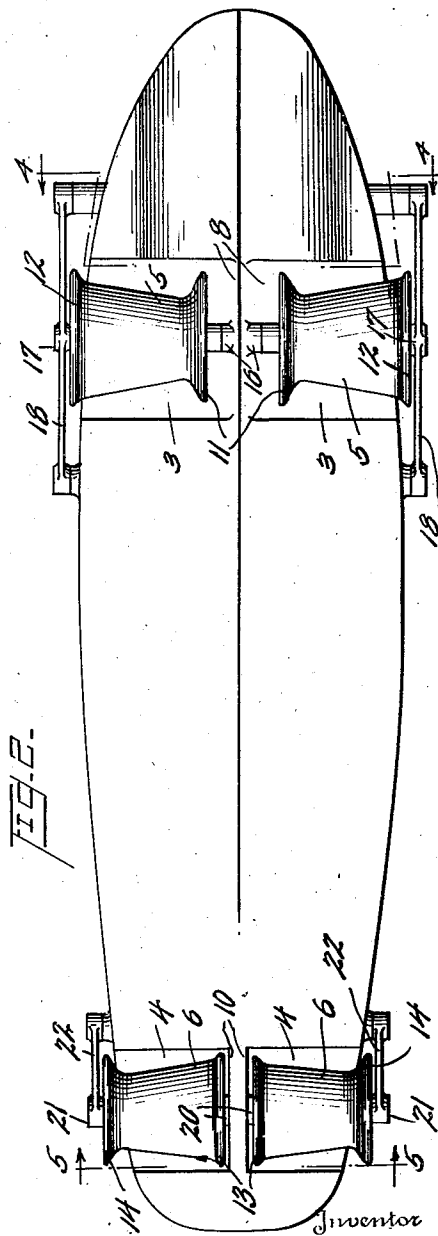
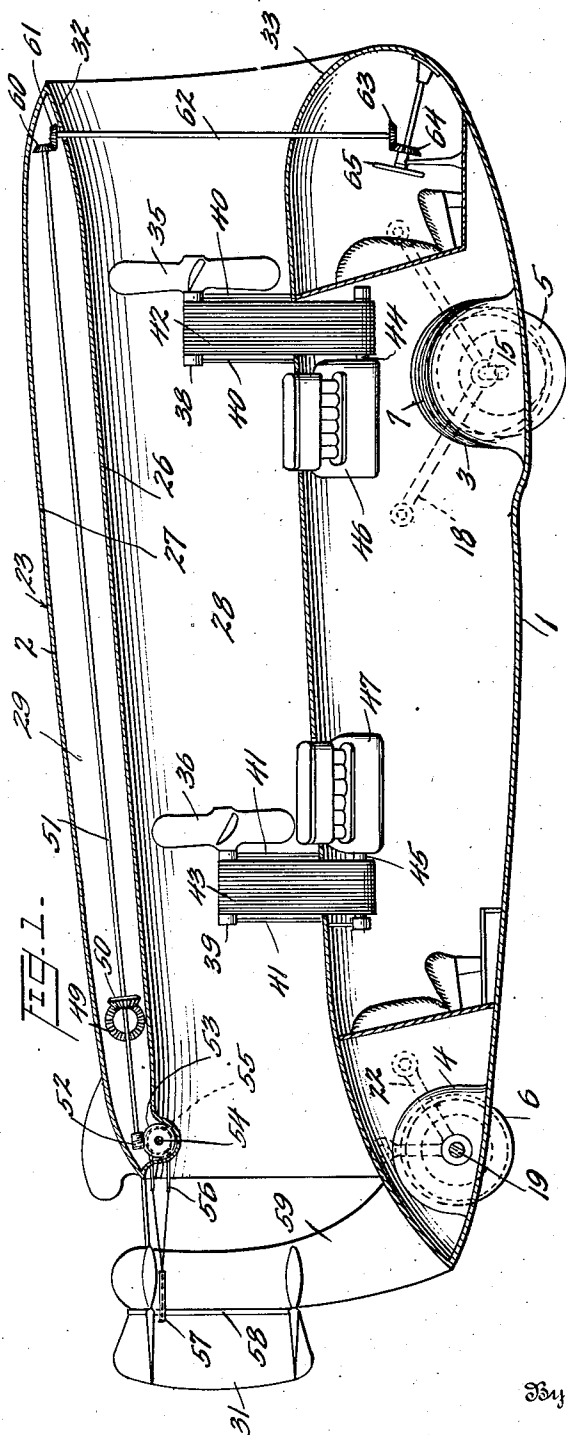
T. M. FINLEY

2,215,919

AEROMARINE BOAT

Filed Feb. 2, 1938

3 Sheets-Sheet 1



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By *Harry F. Riley* Attorney

Sept. 24, 1940.

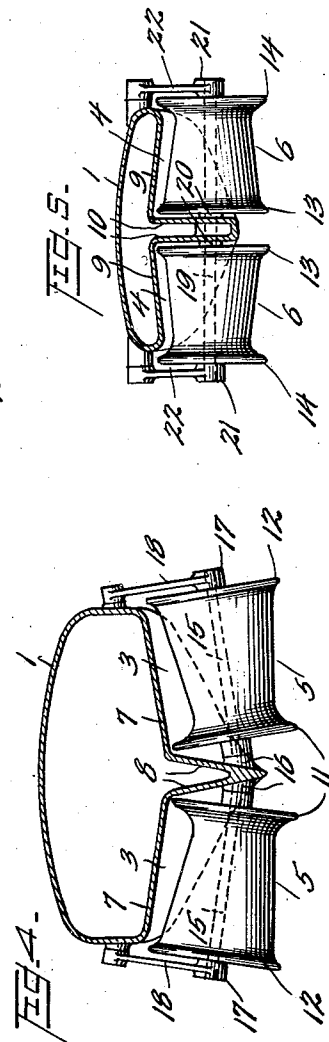
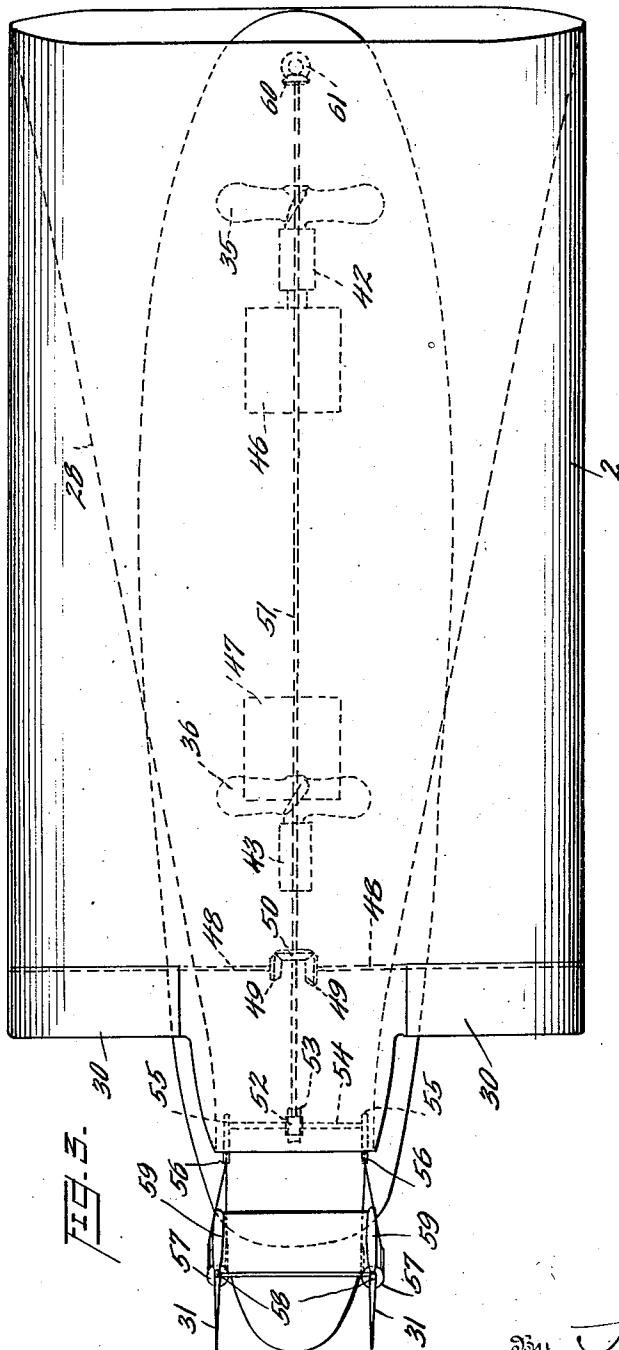
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3 Sheets-Sheet 2



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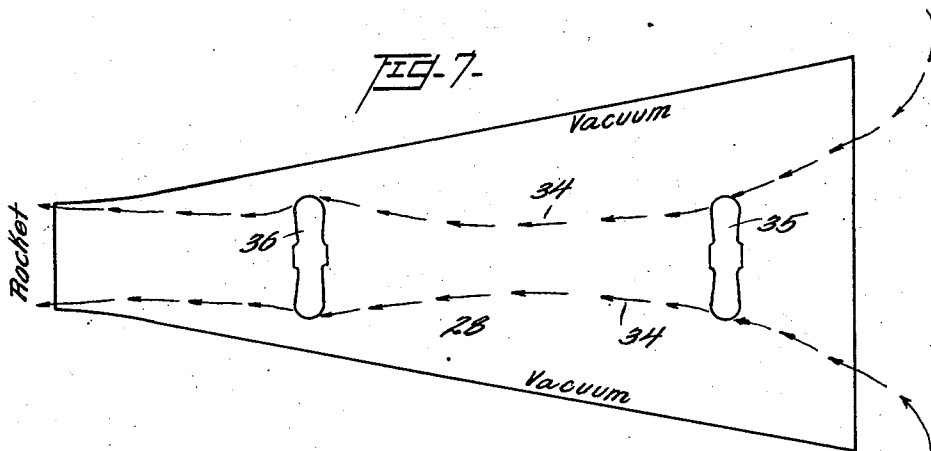
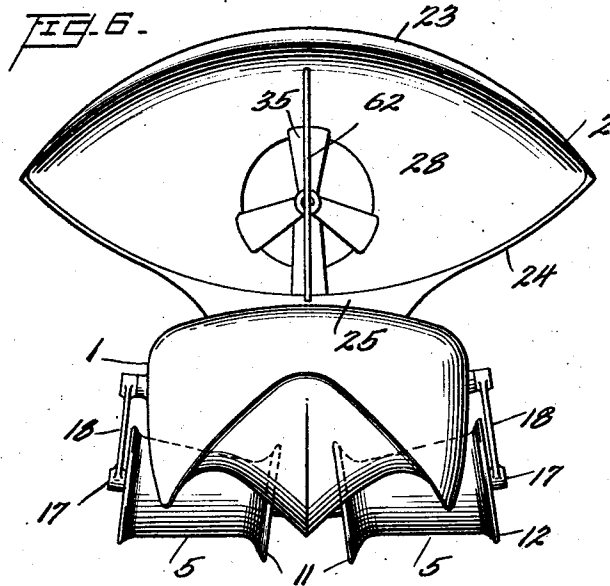
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AEROMARINE BOAT

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,215,919

AEROMARINE BOAT

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Application February 2, 1938, Serial No. 188,377

15 Claims. (Cl. 244—50)

The invention relates to an aeromarine boat.

It is an object of the present invention to provide a boat of great speed, relatively low horsepower and high safety element constructed and adapted to operate on the surface of the water and not in the water so that resistance to the forward movement of the vehicle is reduced to a minimum.

Another object of the invention is to equip the aeromarine boat with an airfoil adapted in the forward movement of the boat to sustain a portion of the weight of the body of the boat and its contents and contain an air tunnel of the type as shown, described and claimed in my copending application filed May 20, 1935, Serial No. 22,467, together with the associated means of propulsion, whereby great speed at the expenditure of a minimum amount of power is obtained as explained in the aforesaid application.

It is also an object of the present invention to eliminate to a great extent the resistance encountered by a boat incident to driving it through the water and to provide a drive entirely in the air above the surface of the water and substantially entirely out of contact with the same. The hull supports the load only when at rest or at very low speeds as the superstructure surrounding the tunnel or thrust tube is of airfoil design or lifting surface acting with the same effect as an airplane wing which will carry any amount of the total weight desired up to the point of actually lifting the entire machine into the air so that water resistance is almost entirely eliminated and air resistance ordinarily encountered is transformed into propulsive power.

It is also an object of the invention to equip the hull of the boat with peg drums tapered and provided at their ends with rims and characterized by a great floating power, the amount of which is determined by the number and size of the drums. The rims which are designed for a plurality of purposes are adapted to operate on hard surfaces such as sand and gravel bars, shoals, wharves, etc., thus affording protection against damage to their surfaces and also protecting the hull of the boat from underwater objects and surface floating objects and in addition preventing the drums from throwing sheet water in either direction and holding it confined underneath the drums.

With these and other objects in view, the invention consists in the construction and novel combination and arrangement 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 and 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 drawings:

Fig. 1 is a longitudinal sectional view of an aeromarine boat constructed in accordance with this invention.

Fig. 2 is a reverse plan view of the hull of the same.

Fig. 3 is a plan view of the aeromarine boat.

Fig. 4 is a transverse sectional view taken substantially on the line 4—4 of Fig. 2.

Fig. 5 is a transverse sectional view taken on the line 5—5 of Fig. 2.

Fig. 6 is a front elevation of the aeromarine boat.

Fig. 7 is a diagrammatic view illustrating approximately the slip stream and the vacuum areas of the tunnel.

In the accompanying drawings in which is illustrated one embodiment of the invention, the aeromarine boat comprises in its construction a hull 1 and an upper airfoil superstructure 2 united or connected with the hull at the top thereof in any desired manner. The hull 1 which is decked over is preferably of the conventional contour of the speed boat type but it may be of any desired form and in practice it is designed to be provided with entrance openings and closures, windows or portholes and other accessories are omitted for convenience of illustration to simplify the drawings. The hull which may consist of a shell as illustrated in the drawings is provided at the bottom with front and rear drum receiving pockets 3 and 4 of approximately semi-cylindrical form to provide housing cavities for front and rear drums 5 and 6. The front and rear drum receiving pockets or cavities 3 and 4 are open at the bottom and outer ends and have top and inner end walls as clearly illustrated in Figs. 4 and 5 of the drawings. The top walls 7 of the front pockets 3 incline upwardly and outwardly and the inner end walls 8 are arranged at an angle to each other and converge downwardly. The top walls 9 of the rear pockets have a slight downward and outward inclination while the inner end walls 10 are disposed vertically but the configuration of the pockets or cavities may be varied to suit the size and arrangement of the drums as will be readily understood.

The front and rear drums are reversely tapered and are of peg formation and are provided

at their inner ends and at their outer ends respectively with rims 11 and 12 and 13 and 14. The front drums are mounted on inclined shafts 15 which are journaled in suitable bearings 16 and 17. The inner bearings are carried by the hull centrally thereof at the inner walls 8 of the pockets 3, and the outer bearings 17 are carried by suitable brackets 18 preferably consisting of arms or braces extending upwardly at an angle to each other and suitably secured at their upper ends to the hull. The rear drums are mounted on a continuous horizontal shaft 19 journaled in central bearings 20 and outer bearings 21 of bearing brackets 22 constructed similar to the bearing brackets 18. The front and rear bearing brackets may be varied as to size and number of the braces or arms to secure the desired strength and rigidity. While a continuous horizontal shaft 19 is illustrated in Fig. 5 of the drawings, the rear drums may be mounted in any other desired manner. The pockets or cavities 3 and 4 as clearly shown in Figs. 4 and 5 of the drawings taper longitudinally to conform to the contour of the hull of the boat.

The peg drums 5 and 6 are characterized by great floating power depending on the size and number of the drums and while only front and rear drums are illustrated in the accompanying drawings, the number of pairs of drums and their arrangement may be varied. The inner and outer rims of the member of each pair of drums correspond in diameter for adapting the drum to roll on hard surfaces such as sand and gravel bars, wharves and other hard surfaces and at the same time they protect the surfaces of the drums and the bottom of the boat from damage from underwater and floating objects and at the same time the rims prevent the drums from throwing sheet water laterally of the boat and they hold the water and confine the same underneath the drums.

The front drums taper inwardly and are set at an inclination and incline downwardly and inwardly in opposite directions converging towards the central portion of the hull. The rear drums are tapered outwardly and are arranged horizontally. The particular arrangement of the front and rear drums facilitates the control of the boat. In making turns the boat is banked just as an airplane is banked. For example, consider that the boat is making a right turn, and will bank over on her right side. The left drums will lift either entirely out of the water or sufficiently high to lower materially resistance encountered, while the right drums will be submerged, greatly increasing their resistance. It will be obvious that the forward drum with its inwardly sloping surface will press the forward end of the boat towards the inner part of the circle of the turn; likewise, the rear drum on the right hand side will forcibly throw the rear end of the boat towards the outer rim of the circle, which double action of itself will completely turn the boat in a very small area.

The airfoil superstructure 2 is substantially prolate spheroid cross sectionally and it tapers laterally outwardly at each side of the center presenting an upper convex surface 23 and a lower convex surface 24 which is divided or interrupted by the central connection or connected portion 25 of the superstructure with the deck or ceiling of the hull. While curved convex surfaces are most advantageous in affording maximum lifting area the airfoil may of course be varied. The convex surface affords the maxi-

mum ground surface. The airfoil superstructure which may be of any preferred construction may conveniently consist of inner and outer shells 26 and 27 suitably connected at their sides and ends. The inner shell provides the contour of the air tunnel 28 and the outer shell supplies the contour of the airfoil. The intervening space 29 between the inner and outer shells of the airfoil superstructure provides convenient means for housing parts of the operating mechanism for ailerons 30 and air rudders 31 located at opposite sides of the rear end of the tunnel 28. The space 29 will also afford ample space for bracing the inner and outer shells should it become necessary because of the size of the boats.

The air tunnel 28 which is slightly flared at the top and bottom portions 32 and 33 at the entrance end in width tapers from the front to the rear end and has straight side walls converging as indicated in dotted lines in Figure 3 of the drawings and as diagrammatically shown in Fig. 7 of the drawings. In Fig. 7 of the drawings the slip stream is indicated by the arrows 34. Front and rear or fore and aft propellers 35 and 36 are shown but the number and size of the propellers may be varied to suit the capacity of the aeromarine boat and to produce a vacuum between the walls of the tunnel and the slip stream and a vacuum at the front end of the tunnel with the rocket effect where the slip stream emerges from the tunnel as explained in the aforesaid application.

The airfoil superstructure cooperates with the drums underneath the hull of the boat and renders the operation of the peg drums both in reducing resistance to the forward progress of the boat and in the control of the boat more effective. It relieves the aeromarine boat of the major portion of its weight and cargo and enables the drums to travel on the surface of the water and at the same time maintain constant contact with the surface of the water.

The form of the airfoil superstructure which in front elevation or cross section is of the general shape of a football seen in side elevation may be varied in contour both at the top and bottom surfaces. The top and bottom surfaces may be made to correspond exactly in shape with each other or they may be constructed with one or the other having a steeper pitch and a more rounded form with more square feet of area. The purpose of the shape of the airfoil superstructure is twofold; first, it furnishes more ground or lifting surface for air lift; second, it presents less surface to a side wind of high velocity that otherwise would have a tendency to blow the boat over on its side. Such a prolate spheroid may be so constructed that its side edges are not only sharp, but with its top surface steeper and having a greater area than its lower lifting surface so that when the boat is standing or running crosswise to a wind of high velocity the tendency will be to depress the edge facing the wind instead of moving such edge in an upward direction. Such prolate spheroid shape also tends to create a rarified air condition above the other side of the boat, which will assist in counteracting any tendency of the wind to throw the boat over on its side.

The top of the airfoil superstructure may be utilized for launching overloaded seaplanes, which would rise from the superstructure when the aeromarine boat attains high speed. This will afford an effective way for launching planes for the reason that the aeromarine boat can attain greater speeds on the surface of the water

in a shorter time than can be attained by a sea-plane. Also the airfoil superstructure will constitute a large factor in preventing the boat from sinking in case of injury to the hull. With the buoyant drums beneath the boat and the wide surface of the superstructure above the hull of the boat a commodious and efficient floatable structure would be provided and in practice means may be provided for enabling passengers and crew to be easily and quickly transferred from the hull of the boat to the superstructure. As such means does not constitute a portion of the present invention illustration thereof is deemed unnecessary and the advantages of the structure as shown will be clear.

The tunnel 28 through the superstructure in which the propellers operate is tapering or fan shaped or V-shaped in horizontal section. Its greatest transverse dimensions are at the front or contact end of the tunnel, and it then tapers at any desired degree to the extreme end of the boat and may be equipped with as many propellers as desired. All air displaced at the front end of the airfoil superstructure must pass through these high-powered propellers, thereby creating a vacuum along the tapering side walls and in front of the airfoil body or superstructure in the same manner as explained in the aforesaid application. The tapering or converging walls may taper vertically as well as horizontally, that is, the walls of the tunnel may be converged rearwardly above and below, as well as along the sides, or on the sides only, or above and below and not along the sides, as may be desired. Such tapering walls may also be regular or irregular. Fig. 3 shows the top of the airfoil body shorter than the bottom of the body at the front end of the same. The purpose of such construction is to prevent the propellers from lessening the density of the air which passes under the ground surface of the airfoil; otherwise, the lift would be reduced. At the same time they will affect the density of the air above the body with a tendency to reduce such density. It is obvious that this is an advantage.

The drums may be so arranged as to position and size as to give to the boat a longitudinal rocking effect the same as it will have transversely, as above described. This arrangement will facilitate the effects of the ailerons or elevator control planes by giving to them greater ease and latitude in reducing or increasing the pitch of the airfoil in operation, on principle of flying machines.

The propellers 36 and 37, which are of the type usually employed in airplanes, are mounted on short horizontal shafts 38 and 39, which are journaled in suitable bearings of spaced supports 40 and 41 and are connected by belts 42 and 43 with power delivery shafts 44 and 45 of internal combustion engines 46 and 47, but any other type of motor may be employed and any other means may be provided for transmitting motion from the motors to the propellers. The power units, which are more or less diagrammatically shown, may be mounted in any desired manner.

The ailerons 30 are mounted on aligned transverse shafts 48 journaled in suitable bearings of the airfoil superstructure and extending from the side edges of the airfoil to points adjacent the median plane of the same and provided at inner ends with bevel gears 49 which mesh with a bevel gear 50, of a central longitudinal shaft 51, located at the top of the airfoil superstructure in the space 29 between the inner and outer shells

26 and 27 and extending substantially the entire length of the same. The longitudinal shaft 51 which is designed to be journaled in suitable bearings is provided at its rear end with a worm 52, which meshes with a worm wheel 53 of a relatively short transverse shaft 54 of a length to extend substantially equal to the width of the rear end of the tunnel and designed to be journaled in suitable bearings. The rear transverse shaft 54 is provided at its ends with pulleys 55, which may if desired be in the form of sprocket wheels for positively meshing with belts or bands 56 arranged on said pulleys 55 and also on pulleys 57 of vertical shafts 58 of the air rudders 31. The pulleys 57 may also consist of sprocket wheels and mesh with chain portions of the bands or chain belts. When the longitudinal shaft 52 is rotated the ailerons and the air rudders are simultaneously operated similar to airplane controls, the aileron shafts being rotated in opposite directions by the bevel gearing. The air rudders are mounted on spaced supports 59 located at opposite sides of the rear end of the tunnel and mounted on and extending upwardly from the stern portion of the hull. The control means consisting of the ailerons and the air rudders may be mounted in any other suitable manner, and the illustration of these features is, therefore, more or less diagrammatic.

The front end of the longitudinal shaft is provided with a bevel gear 60, which meshes with a bevel gear 61 fixed to the upper end of a front vertical shaft 62. The front vertical shaft which extends from the top of the airfoil superstructure downwardly to the interior of the hull at the bow thereof is provided at its lower end with a bevel gear 63, which meshes with a bevel gear 64 suitably connected with a steering wheel 65. Various other means may be provided for operating the ailerons and the air rudders but the mechanism illustrated is advantageous and a suitable housing (not shown) for the front vertical shaft will operate as a strut for bracing the superstructure.

What is claimed is:

1. An aeromarine boat including a hull provided with transversely disposed drums arranged in pairs and the drums of each pair being tapered and progressively decreasing in diameter from one end to the other, each drum forming a truncated cone and provided at its ends with combined water confining and tread rims.

2. An aeromarine boat including a hull provided at the front and rear with transversely disposed drums arranged in pairs and each drum being tapered and progressively decreasing in diameter from one end to the other forming a truncated cone and each drum being provided at its ends with combined water confining and tread rims, the front drums being of greater size than the rear drums and set at an inclination and having their taper directed inwardly with respect to the boat and the smaller rear drums being substantially horizontal and having their taper directed outwardly.

3. An aeromarine boat including a hull and a rigid superstructure substantially rectangular in plan view and cross-sectionally tapered in opposite directions from the central portion to the side edges and connected along the central portion of its bottom with the hull and presenting at opposite sides of said central bottom portion integral laterally projecting wing formations extending the entire length of the superstructure and having lifting surfaces extending upwardly

and outwardly from the hull at an inclination to the side edges of the superstructure, said superstructure constituting an airfoil adapted to be acted on by the air when the boat is in motion, whereby the air will exert a lifting effect on the superstructure.

4. An aeromarine boat including a hull and an airfoil superstructure substantially rectangular in plan view and cross-sectionally tapered in opposite directions from the central portion to the side edges and connected along the central portion of its bottom with the hull and presenting at opposite sides of said central bottom portion integral laterally projecting wing formations extending the entire length of the superstructure and having lifting surfaces extending upwardly and outwardly from the hull at an inclination to the side edges of the superstructure, said superstructure constituting an airfoil adapted to be acted on by the air when the boat is in motion, whereby the air will exert a lifting effect on the superstructure, said superstructure being also provided with a single continuous unobstructed air tunnel tapered transversely from the center to the sides thereof, and a propeller operating in the tunnel for propelling the boat and arranged to create a vacuum at the leading edge of the superstructure.

5. An aeromarine boat including a hull and an airfoil superstructure substantially rectangular in plan view and laterally tapered on opposite sides of its center and provided with a single continuous unobstructed laterally tapered central air tunnel, said superstructure being connected along the central portion of its bottom with the hull and presenting at opposite sides of said central bottom portion integral laterally extending wing formations extending the entire length of the superstructure and having lifting surfaces extending upwardly and outwardly from the hull to the side edges of the superstructure, whereby when the boat is in motion the air will exert a lifting force against the bottom of the airfoil superstructure, and a propeller operating in the tunnel for propelling the boat and arranged to create a vacuum at the leading edge of the superstructure.

6. An aeromarine boat including a hull, and an airfoil superstructure substantially rectangular in plan view and laterally tapered in opposite directions from the central portion of the airfoil superstructure to the side edges thereof and having a lower convex surface, said airfoil superstructure being connected along the central portion of its bottom to the hull, and the side portions of its bottom surface forming integral laterally projecting wing formations of substantially uniform width and extending the entire length of the superstructure and having lifting surfaces extending upwardly and outwardly from the hull at an inclination to the side edges of the superstructure, whereby when the boat is in motion the air will act on said lifting surfaces and exert a lifting effect on the superstructure, and means for propelling the boat.

7. An aeromarine boat including a hull, and an airfoil superstructure substantially rectangular in plan view and laterally tapered in opposite directions from the central portion of the airfoil to the side edges thereof and presenting a convex upper surface, said airfoil superstructure being connected along the central portion of its bottom with the hull and presenting at opposite sides of said central bottom portion integral laterally projecting wing formations of substantially uniform width and extending the entire length of the

superstructure and having lifting surfaces extending upwardly and outwardly from the hull to the side edges of the superstructure, whereby when the boat is in motion the air will exert a lifting force against the bottom of the airfoil superstructure, and means for propelling the boat.

8. An aeromarine boat including a hull, an airfoil superstructure substantially rectangular in plan view and laterally tapered in opposite directions from the central portion of the airfoil superstructure to the side edges thereof, and presenting convex upper and lower surfaces said airfoil superstructure being connected along the central portion of its bottom with the hull and presenting at opposite sides of said central bottom portion integral laterally projecting wing formations of substantially uniform width and extending the entire length of the superstructure and having lifting surfaces extending upwardly and outwardly from the hull to the side edges of the superstructure, whereby when the boat is in motion the air will exert a lifting force against the bottom of the airfoil superstructure, and means for propelling the boat.

9. An aeromarine boat including a hull, an airfoil superstructure substantially oblong in plan view and cross-sectionally tapered from the central portion to the side edges of the airfoil superstructure, said airfoil superstructure presenting at opposite sides of its bottom integral laterally projecting wing formations of substantially uniform width and extending the entire length of the superstructure and having lifting surfaces extending upwardly and outwardly from the hull to the side edges of the superstructure, whereby when the boat is in motion the air will exert a lifting force against the bottom of the airfoil superstructure, and means for propelling the boat.

10. An aeromarine boat including a hull, an airfoil superstructure substantially rectangular in plan view and tapered in opposite directions from the central portion of the superstructure to the side edges thereof and provided with an inner shell defining a single continuous tunnel tapered rearwardly from front to rear in horizontal section, said superstructure being connected along the central portion of its bottom with the hull and presenting at opposite sides of said central bottom portion integral laterally projecting wing formations of substantially uniform width extending the entire length of the superstructure and having lifting surfaces extending upwardly and outwardly from the hull to the side edges of the superstructure, whereby when the boat is in motion the air will exert a lifting force against the bottom of the airfoil superstructure, and a propeller operating within the tunnel for propelling the boat and arranged to create a vacuum at the leading edge of the superstructure and the sides of the tapering tunnel.

11. An aeromarine boat including a hull, an airfoil superstructure tapered in opposite directions from the central portion to the side edges and provided with an inner shell defining a single continuous central tunnel tapered rearwardly in horizontal section and having substantially straight rearwardly converging side walls, said airfoil superstructure being connected along the central portion of its bottom with the hull and presenting at opposite sides of said central bottom portion integral laterally projecting wing formations of substantially uniform width extending the entire length of the superstructure and having lifting surfaces extending upwardly and outwardly from the hull to the side edges of the

superstructure, whereby when the boat is in motion the air will exert a lifting force against the bottom of the airfoil superstructure, and a propeller operating in the tunnel and arranged to

5 create a vacuum at the leading edge of the superstructure and the sides of the tapering tunnel.

12. An aeromarine boat including a hull, and an airfoil superstructure substantially oblong in plan view and cross-sectionally tapered from the

10 central portion to the side edges of the airfoil and provided with an inner shell defining a single continuous central longitudinal air tunnel tapered rearwardly and having walls converging in straight lines from the front end of the tunnel

15 to the rear end thereof, said airfoil superstructure being connected along the central portion of its bottom with the hull and presenting at opposite sides of said central bottom portion integral laterally projecting wing formations of substantially

20 uniform width extending the entire length of the superstructure and having lifting surfaces extending upwardly and outwardly from the hull to the side edges of the superstructure, whereby when the boat is in motion the air will exert a

25 lifting force against the bottom of the airfoil superstructure, and a propeller operating in the tunnel and arranged to create a vacuum at the leading edge of the superstructure and the sides of the tapering tunnel.

30 13. An aeromarine boat including a hull, an airfoil superstructure substantially oblong in plan view and cross-sectionally tapered from the central portion to the side edges of the airfoil superstructure and provided with a longitudinal tunnel,

35 said airfoil superstructure being connected along the central portion of its bottom with the hull and presenting at opposite sides of said central bottom portion lifting surfaces extending upwardly and outwardly from the hull, whereby

40 when the boat is in motion the air will exert a lifting force against the bottom of the airfoil superstructure, ailerons mounted on the superstructure at the rear end thereof, vertical air rudders located at opposite sides of the rear end

of the tunnel, control means connected with the rudders and the ailerons, and a propeller operating in the tunnel.

14. An aeromarine boat including a hull, an airfoil superstructure substantially oblong in plan view and cross-sectionally tapered from the

5 central portion to the side edges of the airfoil superstructure and provided with a longitudinal tunnel, said airfoil superstructure being connected along the central portion of its bottom with the hull

10 and presenting at opposite sides of said central bottom portion lifting surfaces extending upwardly and outwardly from the hull, whereby when the boat is in motion the air will exert a lifting force against the bottom of the airfoil superstructure,

15 ailerons mounted on the superstructure at the rear end thereof, vertical air rudders located at opposite sides of the rear end of the tunnel, control mechanism having a single operating member connected with the air rudders and the ailerons

20 for simultaneously operating the same, or either of them should the other become inoperative through injury, and a propeller operating in the tunnel.

15. An aeromarine boat including a hull, an

25 airfoil superstructure substantially oblong in plan view and cross-sectionally tapered from the central portion to the side edges of the airfoil superstructure and provided with a longitudinal tunnel, said airfoil superstructure being connected

30 along the central portion of its bottom with the hull and presenting at opposite sides of said central bottom portion lifting surfaces extending upwardly and outwardly from the hull, whereby when the boat is in motion the air will exert a

35 lifting force against the bottom of the airfoil superstructure, a propeller operating in the tunnel, vertical air rudders located at opposite sides of the rear end of the tunnel, ailerons located at the rear end of the airfoil superstructure, and

40 control mechanism for the rudders and the ailerons.

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