Aug. 7, 1945. C. C. SHEPPARD 2,381,622

BOAT

Original Filed Sept. 19, 1941 3 Sheets-Sheet 1

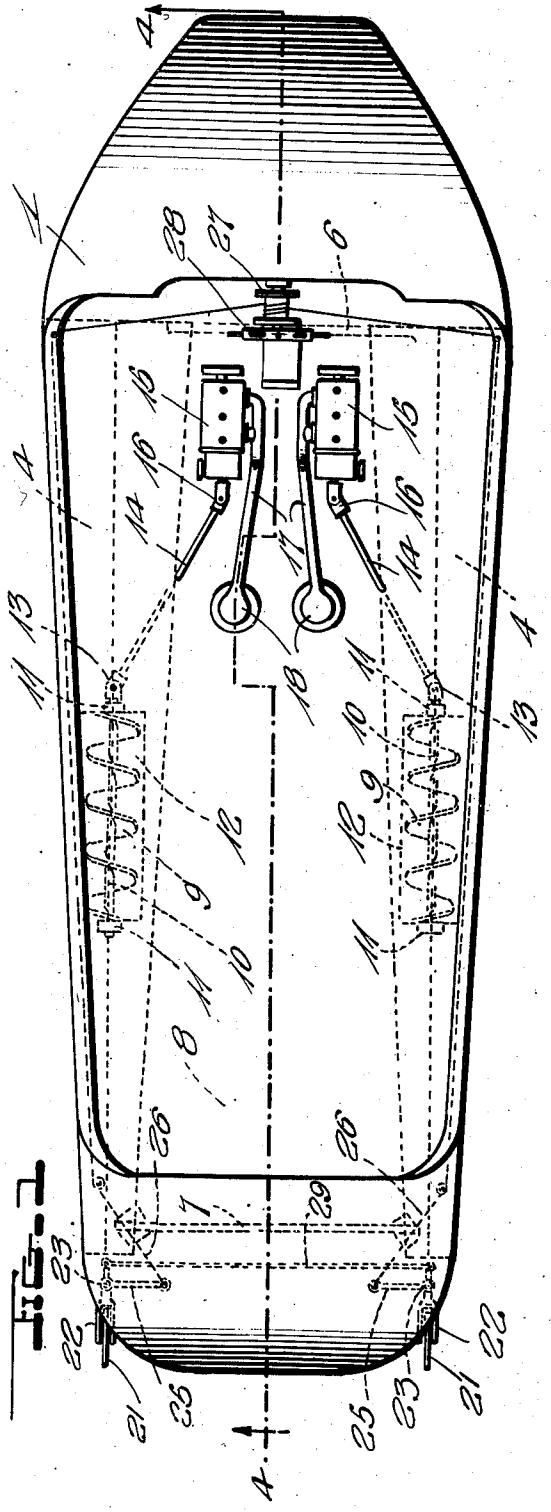


Fig. 1

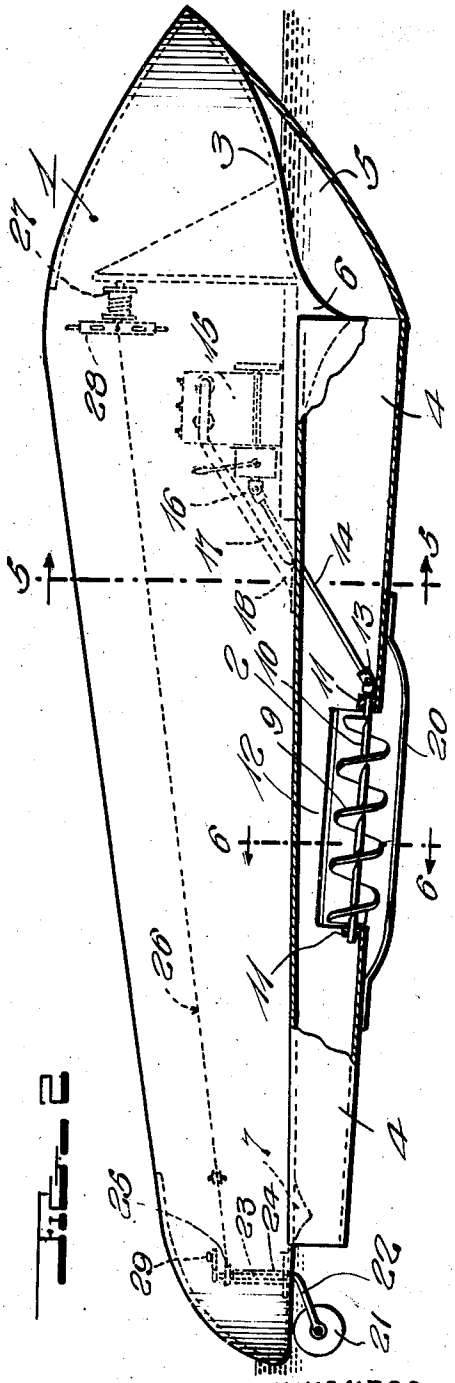


Fig. 2

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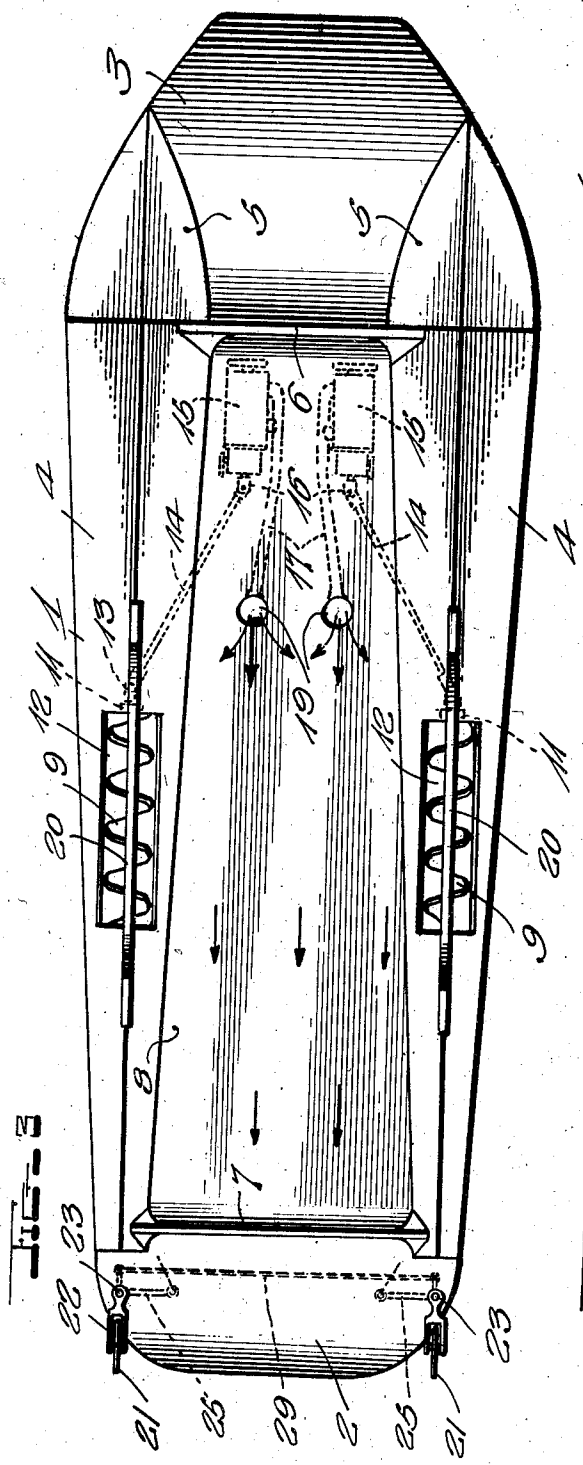


FIG. 3

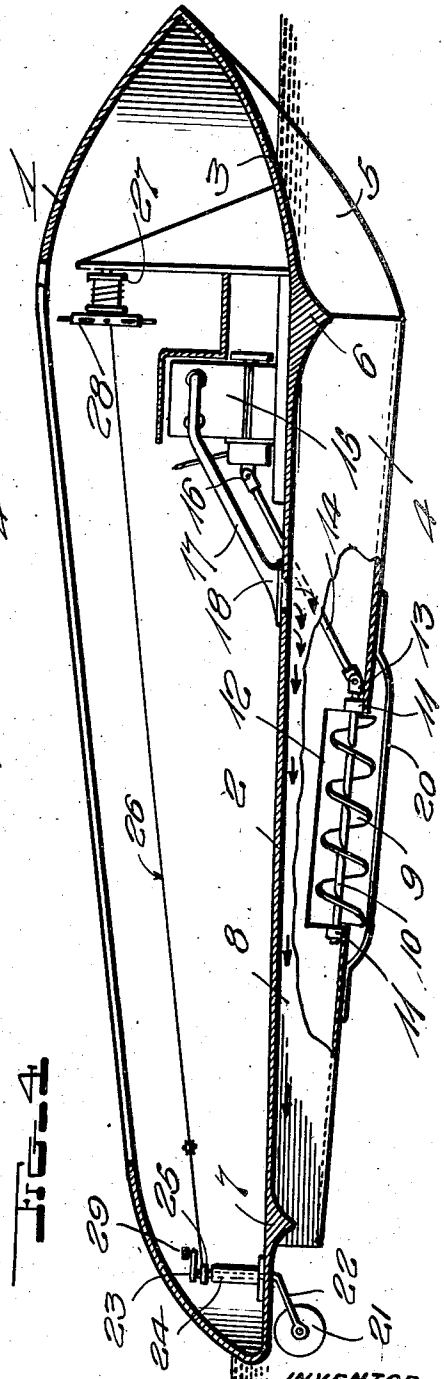


FIG. 4

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BOAT

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FIG. 5

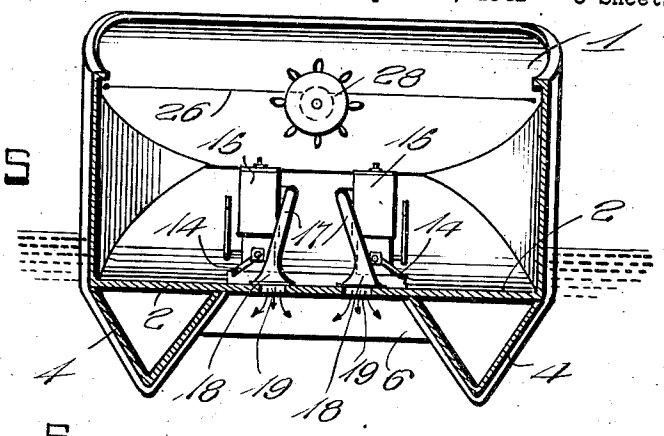


FIG. 6

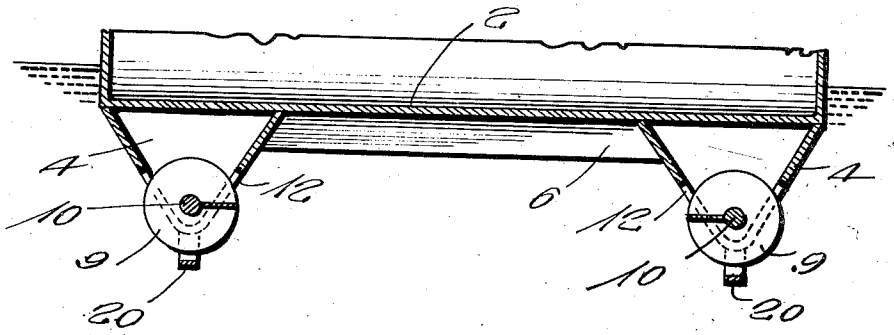
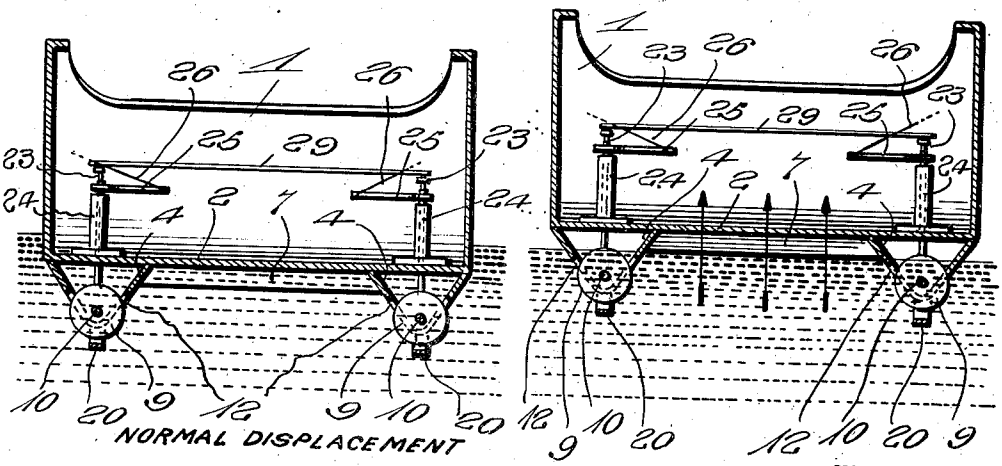


FIG. 8

FIG. 7



NORMAL DISPLACEMENT

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Patented Aug. 7, 1945 2,381,622

UNITED STATES PATENT OFFICE

2,381,622

BOAT

Creedy C. Sheppard, Fort Lee, N. J.

Substituted for abandoned application Serial No. 411,578, September 19, 1941. This application October 17, 1944, Serial No. 559,026

6 Claims. (Cl. 115—37)

This application is a substitute for application Ser. No. 411,578, filed September 19, 1941, for Boats, and the invention relates more particularly to that type including speed boats and sea sleds, it being one object of the invention to provide a boat of such construction that high speed or propulsion is obtained. While it has been stated that the improved construction is particularly adapted for speed boats and sea sleds, it is to be understood that it is not limited to this particular type of boat.

Another object of the invention is to provide a boat having its hull so constructed that it includes runners extending longitudinally thereof at opposite sides of its bottom and constituting streamlined shields for propellers housed therein and having portions protruding downwardly through openings formed intermediate the length of the runners.

Another object of the invention is to provide a boat wherein an air pocket is formed under the bottom of the boat between the runners to reduce friction between the water and bottom of the boat and thus aid in increasing the speed of the boat.

Another object of the invention is to provide the bottom of the boat with cross bars or strips extending transversely thereof between front and rear ends of the runners and constituting front and rear walls of the air pocket, the strips being of appreciably less depth than the runners and so formed in cross section that the boat may move rapidly through the water and air pass out from the pocket at the stern of the boat as it moves forwardly.

Another object of the invention is to provide a boat wherein engine exhaust is discharged into an air pocket under the hull for effecting increased buoyancy and, in the case of airplane pontoons, to increase the buoyancy and turbulence and decrease surface tension on take-off.

Another object of the invention is to so construct the boat that as its speed is increased, air and exhaust gases moving rearwardly in the air pocket will have a tendency to shift the boat upwardly and thus reduce its draft and, consequently, reduce frictional drag of the water upon the bottom of the boat.

Another object of the invention is to provide the boat with runners so formed that they taper rearwardly and thus impart a streamlined effect to the runners and also cause the pocket to gradually increase in width toward its rear end.

Another object of the invention is to minimize frictional thrust and turbulence as the boat is driven through the water and thus permit the boat to be propelled forwardly at increased speed with an engine of predetermined horsepower.

Another object of the invention is to produce a boat simple in construction, neat and attractive in appearance, and very sturdy.

In the accompanying drawings:

Fig. 1 is a top plan view of a boat of the improved construction.

Fig. 2 is a view showing the boat in side elevation with one of the pontoons or runners shown in longitudinal section.

Fig. 3 is a view looking at the bottom of the boat.

Fig. 4 is a sectional view taken longitudinally through the boat, on the line 4—4 of Fig. 1.

Fig. 5 is a sectional view taken transversely through the boat on the line 5—5 of Fig. 2.

Fig. 6 is a fragmentary sectional view taken transversely through the bottom of the boat, on the line 6—6 of Fig. 2.

Fig. 7 is a transverse sectional view showing the normal draft of the boat.

Fig. 8 is a similar view showing the draft of the boat when in motion.

The boat 1 may be of any length and beam desired and has a bottom 2 which is flat for the full width of the hull and also flat for approximately its entire length, the portion 3 of the bottom being curved upwardly so that, as the boat is propelled forwardly, water will flow easily under the bow thereof. Pontoons or runners 4 extend longitudinally of the boat along opposite sides of the bottom 2 and, from an inspection of Figs. 3 and 4, it will be seen that these pontoons or runners taper transversely toward their rear ends and also decrease in depth rearwardly. The runners are V-shaped in cross section, as shown in Figs. 5 through 8, and are hollow, each being closed at its ends and having its forward portion 5 curved upwardly and gradually reduced in width and depth to a point at its front end. By so forming the runners they will readily cut through the water as the boat is driven forwardly, and the curvature of the forward portion 3 of the bottom 2 and front end portions of the runners will impart a lift to the bow of the boat as it moves forwardly. Cross bars 6 and 7 extend across the under face of the bottom of the boat between front and rear end portions of the runners 4 and constitute end walls of a pocket 8 which extends along the bottom of the boat and gradually increases in width toward its rear end. The cross bars or front and rear walls are substantially V-shaped in cross section, as shown in Fig. 4, and from an inspection of this figure, it will be seen that when the boat is in motion, water and air may easily flow across these end walls. It will also be noted that since the pocket has end walls, air will be trapped in the pocket and air held therein when the boat slows down and is brought to a stop. The front wall 6 is deeper than the rear wall 7.

To force the boat through the water there

have been provided propellers 9 extending longitudinally of the runners and shown provided with shafts 10 rotatably mounted through bearings 11 at front and rear ends of openings 12 formed in the runners substantially midway the length thereof. While the propellers have been shown as helical blades formed solid with their shafts, it is to be understood that they may be in the form of helical strips welded at their ends to the shafts, or merely helical strips having stub shafts at their ends. The shafts 10 are spaced upwardly a very short distance from the lower edges of the runners and the propellers project downwardly through the openings 12 and outwardly from opposite sides of the runners, as shown in Fig. 6, so that as the propellers are turned, their blades act upon the water to drive the boat forwardly or rearwardly, according to the direction in which the propellers are rotated. Universal joints 13 connect forward ends of the propeller shafts with transmission shafts 14 which extend forwardly at an upward incline and through the bottom of the boat, their front ends being connected to shafts of engines 15 by universal joints 16.

The specific type of engines used is optional, according to the construction of the boat. They may be of the conventional fluid drive automobile type with crank shafts located in the pontoons and connected directly to the propellers, but in the illustration they have been shown located well forward of the boat and their exhaust pipes 17 extend rearwardly and terminate in enlarged mouths 18 secured about openings 19 formed in the bottom of the boat. The exhaust pipes may have communication with air pocket 8 through the bottom of the hull, as shown, through sides of the pontoons, or in any desired manner. Air and exhaust gases passing from the engines and discharged into the air pocket 8 flow toward the stern of the boat and escape from the pocket across the rear wall 7 thereof. Movement of air and exhaust gases through the air pocket toward the stern of the boat imparts a forward thrust to the boat and serves to increase forward speed of the boat as well as assuring a supply of air and exhaust gases in the pocket. The pocket is thus filled with air and exhaust gases and this eliminates direct contact of the bottom of the boat and upper portions of side walls of the runners with the water. Therefore, frictional resistance is decreased and the boat will be driven forwardly at high speed. As the speed of the boat increases, uplift is imparted to the boat and the draft is decreased from the normal draft level shown in Fig. 7, to that of Fig. 8, and, referring to Fig. 8, it will be seen that the only portion of the boat immersed in water are the lower portions of the runners. As the curved under surface 3 of the bow of the boat moves forwardly, a certain amount of air moves rearwardly across the front cross bar or wall 6 into the pocket 8, but the curved front face of this wall directs the water downwardly and imparts an uplift to the bow of the boat. The upwardly curved forward portions 5 of the runners also have a tendency to impart uplift to the bow as the boat moves forwardly. Guards 20, formed of bars or strips of strong metal, extend longitudinally of the runners under the openings 12 and the propellers 9, with their end portions curved upwardly and welded to the lower edge portions of the runners. These guards protect the propellers from damage by striking obstructions in the water and also permit the boat to cross shallow place or make a landing at a beach without damage to the propellers through contact with sand, coral, or the like.

To steer the boat, there have been provided rudders 21 in the form of discs rotatably mounted between the rearwardly extending forks 22 of rudder posts 23. The rudder posts extend vertically and are rotatably mounted through sleeves 24 secured to and rising from the bottom 2 of the boat about openings formed therein, and upper ends of the posts protrude from the sleeves and carry tillers 25 to which ends of the steering line 26 are attached. The steering line extends along sides of the boat and is wound about a drum 27 of the steering wheel 28 so that when the wheel is turned the tillers will be moved and the rudders adjusted to steer the boat. The rod 29 causes the two rudders to be simultaneously adjusted. It will be understood that a single rudder may be used instead of double rudders, if desired. Since the rudders are rotatably supported between the forks of the posts, they may turn about their axles as the boat is driven through the water, thus reducing frictional resistance of the rudders.

While it has been stated that the improved construction is particularly adapted for speed boats, there is another field for the invention in which the bottom air space is maintained continuously and used solely to decrease water drag and immersion of the boat. This field is typified by canal boats, ferries, landing barges, and the like, where heavy weights are to be carried, and also in instances where the water to be traveled is shallow. It is evident that by substituting air for water as the buoyant medium, the frictional drag is greatly reduced, permitting greater speed with less power. Further, in many cases the twin screw propulsion permits ready steering and maneuvering. The very shallow draft permits use for landing and in waters where conventional propellers would be fouled.

In the case of canal boats, a further advantage arises from the steady slip stream of the helical propellers creating less damage to banks and bottom than the turbulence of screw propellers which prevent their use in some waters. It is evident that utilizing the entire area of the barge having only narrow runners at sides and streamlined cross members fore and aft, a great percentage of the weight is air-borne. Also, in still waters, the depth of the air pocket need not be great, only enough to house small propellers so that moving parts are further from the bottom.

To minimize frictional resistance, the center lines of the pontoons are arranged parallel to the axis of the boat and the sides made symmetrical to them so that there is a constant streamline motion toward the rear of the boat.

I am aware that certain forms of sleds have been made in which a boat is cut in two longitudinally and the two sections transposed, leaving a flat outside and a curved inner section. It will be noted, however, that my invention differs in that the sides of the pontoons are symmetrical and the flow line of the water is parallel at all times to the axis of the boat. This form of structure lends itself readily to quantity production since the boat bottom is essentially flat with the runners attached thereto.

To secure more efficient propulsion, I propose that the present propellers be of helical form and mounted to operate in the section of the runners. This applies thrust directly in the line

of motion instead of at an angle as is required with a propeller shaft slanting downward as in the conventional form of boat.

A still further advantage of this propeller is that it is working at maximum efficiency. Engineers recognize that the normal form of screw propeller is a compromise one and that only one section works at maximum efficiency. At this point, the pitch is proportioned to the speed of the boat and there is very little slip. However, at points outside this diameter, it will be moving at higher velocity and at less efficiency while points inside this pitch will be moving too slow for good efficiency.

By using a small diameter helical propeller, the thrust can be concentrated along a very narrow area operated at maximum efficiency and an additional thrust obtained by the additional blades. Further, the turbulent effect of the improper proportions is minimized. With such a propeller mounted in the streamlined runner, the tendency of the water is to flow smoothly along without turbulence.

The effect of the turbulence on ordinary speed boats can be seen by observing the wake of the boat where the water is disturbed and thrown in all directions. A larger part of the energy is consumed in tossing the water around rather than in propelling the boat forwardly. While the boat construction may be mounted on ordinary runners, I prefer the twin type propellers shown. These may be driven by two separate engines synchronized, or with one engine with a driving gear.

Another field of usefulness for the invention is in the construction of pontoons for airplanes. In this case, surface tension of still water greatly retards take-off and provision of the air pocket will not only provide air buoyancy but the exhaust gases filling the pocket will break up the surface tension and enable the airplane to rise more easily and with less power.

Having thus described the invention, what is claimed is:

1. In a boat construction, a hull having pontoons extending along the under face of its bottom at opposite sides thereof and constituting buoyant runners, and cross bars extending across the bottom of the hull between front and rear end portions of the runners and constituting end walls for an air pocket having side walls formed by the runners, said runners being gradually reduced in width toward their rear ends whereby the top of the air pocket gradually increases in width toward its rear end, and the front cross bar being of greater depth than the rear cross bar.

2. In a boat construction, a hull having pontoons extending along the under face of the bottom thereof at opposite sides and constituting buoyant runners, and cross bars extending across the bottom of the hull between front and rear end portions of the runners and constituting end walls for an air pocket having side walls formed by the runners, said runners being substantially V-shaped in cross section and gradually reduced in width and depth toward their rear ends, and the front cross bar being of greater depth than the rear cross bar.

3. In a boat construction, a hull having pontoons extending along the under face of the bottom thereof at opposite sides and constituting buoyant members, and cross bars extending across the bottom of the hull between front and rear end portions of the runners and constituting end walls for an air pocket having side walls formed by the runners, said runners being substantially V-shaped in cross section and gradually reduced in width and depth toward their rear ends for substantially their full length and each having an upwardly extending forward end portion tapered to a point at its front end, and the front cross bar being of greater depth than the rear cross bar.

4. In a boat structure, a hull, hollow runners extending along the bottom of the hull at opposite sides thereof, cross bars extending across the under face of the bottom between front and rear end portions of said runners and, together with the runners, forming an air pocket closed along its sides and ends, said runners being substantially V-shaped in cross section and each formed substantially midway the length of the hull with a longitudinally extending opening through its side walls and lower edge, helical propellers rotatably mounted in said runners and extending longitudinally of the openings with their lower portions protruding through the openings, port and starboard engines in the forward portion of the hull, transmission shafts extending rearwardly from the engines through the bottom of said hull and into the hollow runners and connected with front ends of the propellers, and exhaust pipes for said engines extending rearwardly therefrom and through openings in the bottom of the hull for discharging exhaust gases into the forward portion of the air pocket in the direction of the rear end of the boat.

5. In a boat construction, a hull, hollow runners extending along the bottom of the hull at opposite sides thereof, cross bars extending across the under face of the bottom between front and rear end portions of said runners and constituting end walls of an air pocket having side walls formed by the runners, said runners being substantially V-shaped in cross section and gradually reduced in width toward their rear ends and each formed substantially midway the length of the hull with a longitudinally extending opening through its side walls and lower edge, the front cross bar being of greater depth than the rear cross bar, helical propellers rotatably mounted in said runners and extending longitudinally of the openings, and transmission shafts extending through the bottom of the hull and into the hollow runners and connected with said propellers.

6. In a boat construction, a hull, hollow runners extending along the bottom of the hull at opposite sides thereof, cross bars extending across the under face of the bottom between front and rear end portions of said runners and constituting end walls of an air pocket having side walls formed by the runners, said runners being substantially V-shaped in cross section and gradually reduced in width toward their rear ends, the front cross bar being of greater depth than the rear cross bar, and a power plant in the forward portion of said hull having exhaust means extending rearwardly therefrom for discharging exhaust gases into the forward portion of the air pocket in the direction of the rear end of the boat.

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