

Jan. 17, 1939.

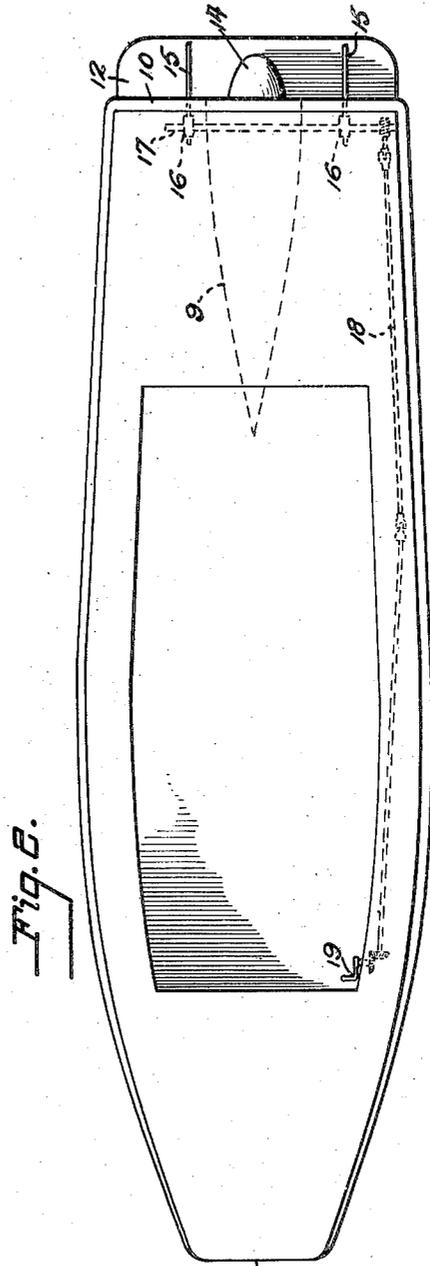
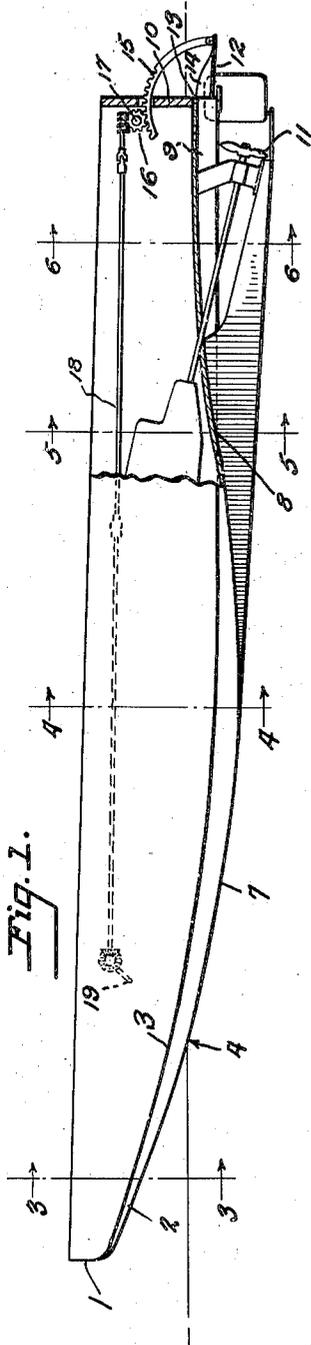
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BOAT HULL CONSTRUCTION

Filed Dec. 24, 1937

2 Sheets-Sheet 1



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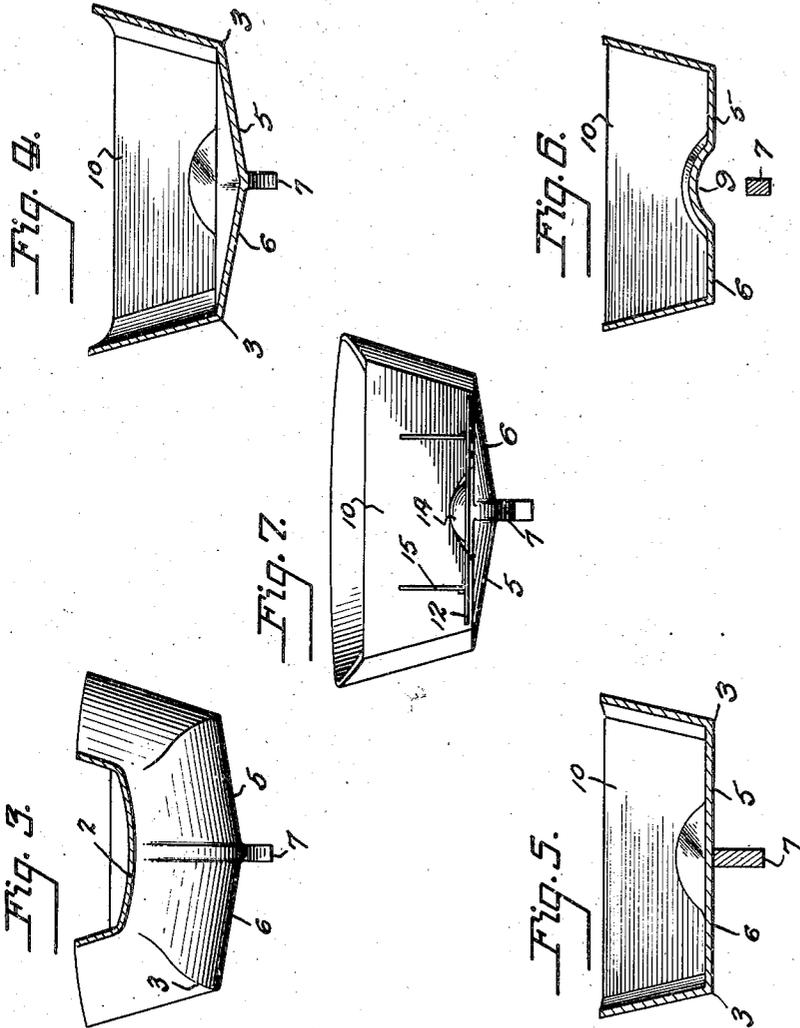
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UNITED STATES PATENT OFFICE

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BOAT HULL CONSTRUCTION

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Application December 24, 1937, Serial No. 181,690

7 Claims. (Cl. 114—66.5)

This invention relates to hull construction for boats. It has for its object to provide a hull so shaped and constructed, in the interest of increased speed, as to entrain under its forward section, a maximum quantity of air bubbles, to distribute these with maximum uniformity against the submerged surface of the hull whereby to minimize the skin friction between the hull and the water, and at the same time to assure a solid un-aerated column or body of water under the rear section for taking the thrust of the propeller.

Other objects of the invention relate to features of construction which permit shallow draft, promote easy riding, control planing, vary the virtual length of the boat, make for safety in colliding with and riding over derelict objects, and facilitate landings on shallow banks and beaches.

With these and other objects in view reference will now be had to the specification and the drawings throughout the several figures of which the same characters have been employed to designate identical parts:

Figure 1 is a side elevation of a boat hull embodying the features of the present invention;

Figure 2 is a plan view;

Figure 3 is a section taken along the line 3—3 of Figure 1, looking aft;

Figure 4 is a section taken along the line 4—4 of Figure 1;

Figure 5 is a section taken along the line 5—5 of Figure 1;

Figure 6 is a section taken along the line 6—6 of Figure 1; and

Figure 7 is a rear elevation.

Referring now in detail to the several figures, the numeral 1 represents the front end of the boat or bow log which is blunt or substantially rectilinear in a transverse direction so that it may be termed sled-shaped or scow-shaped or punt-shaped. The transverse curvature of the under-surface of the boat in the vertical plane of the bow log and for a distance rearward as far as the section 3—3 is smoothly curved as indicated at 2 in Figure 3, this curve gradually merging into an angular chine 3 or dead rise between the section 3—3 and the anterior portion 4 of the water line, the undersides 5 and 6 being straight in a transverse direction and making an angle with the keel 7 which angle increases to the midship section 4—4 and then gradually decreases to the point 8 on the section 5—5 at which point the bottom of the hull is transversely flat from chine to chine.

The keel 7 from the bow to midship section has a smooth continuous curve or rocker.

The water broken by the broad forefoot con-

stituted by the slight V-shape of the hull at the front water line by the forward motion of the boat is thrown up in the form of a spray or froth beneath the broad overhanging portion of the hull, and due to the relatively flat contour of this portion, the aerated water is not deflected sideways as with an ordinary sharp bowed hull, but it is swept under the front of the boat, a maximum amount of air being thus engulfed with the water which passes beneath the boat. This air in the form of bubbles continually travels towards the surface of the water up the V-shaped sloping under-surfaces of the hull on either side of the keel toward the chines. Thus the surface of the hull below the water line substantially as far back as the section 5—5 is not wet by a continuous film of water, but by a mixed film of water and air bubbles. This causes the skin friction between the surface of the hull and the water to be considerably reduced and thus increases the possible speed of the boat.

It is obvious to those skilled in the art that the intentional entraining of air beneath the boat would ordinarily be detrimental to speed on account of cavitation at the propeller in the absence of means for avoiding this condition. Such means are provided by the inclusion in the present invention of a trough or semi-tunnel 9 which extends along the middle beneath the rear section of the boat, beginning at the section 5—5 where the flat under-portion of the hull begins and opening through the stern or transom 10. The upper wall of the semi-tunnel follows the curvature of the keel 7 which reverses itself at the point 8. The principal object of the semi-tunnel is to bring up from the depths a column or body of solid, that is to say, un-aerated water in the path of the propeller. It is of course well understood that the semi-tunnel functions in this manner according to the principle that due to the forward motion of the boat a vacuum tends to be created in said tunnel, water from below being drawn up and held in said semi-tunnel in avoidance of the vacuum, and that the shape and mold and line of this semi-tunnel follow exact water flow lines, all sections being rounded and conformed, with the induction of water, combining all natural laws that would apply to prevent resistance, and relieve the possibility of the confinement of an air bubble, or, to those skilled in the art, and "air bind".

It will be understood that due to the elements as described, which determine the shape of the forward section of the hull, it entrains air and floats upon an aerated film, by means of which

the skin friction between the surface of the hull and the water is minimized, the bubbles continually escaping by rising from the region of the keel along the V-shaped slopes of the under-surface toward the chines. By the time the bubbles have passed the midship section 4-4, there is no air along that portion of the under-surface of the hull immediately forward of the semi-tunnel since the air has travelled a certain distance from the keel and there is a fan-shaped body of solid water in front of the semi-tunnel. The rising of solid water from the depths into the semi-tunnel prevents suction, which would otherwise be induced by the displacement of the rear section of the boat, from drawing the air backward into the path of the propeller 11.

The broad and substantially flat bow 1 in combination with the curvature or rock of the keel, together with the dead rise give the hull hitherto unusual seaworthy qualifications, and permit the boat to be exceptionally maneuverable. The combination of the aforementioned features with the semi-tunnel increases the speed of the boat in the manner described by causing it to travel upon a continual aerated surface while at the same time a solid column of water is provided to resist the thrust of the propeller.

All transverse sections through the hull posterior to the section 5-5 at which the semi-tunnel begins, are transversely flat, providing a flat area upon which the hull planes when the boat is under way.

The provision of the semi-tunnel 9 permits the propeller 11 to be mounted closer to the bottom of the boat, since the path of the propeller blades may be made to intersect the cross sectional area of the tunnel. This permits a boat of shallower draft than would otherwise be possible.

Referring to Figures 1, 2 and 7, the horizontally hinged rudder 12 is seen, mounted to swing upon an axis 13 at or above the top of the rear end of the semi-tunnel 9, the middle portion of the rudder being formed with an upwardly dished recess 14 coinciding in width and depth with the adjacent portion of the semi-tunnel so as to form a continuation thereof, said dished portion inclining downwardly toward the free edge of the rudder so as to receive an upward thrust from the slip stream of the propeller which assists the boat in planing. The rudder may be controlled by any convenient means such as toothed quadrants as shown in sketch and numbered 15, or simple rods connected with bell crank or right angle leverage arm, the control of which is accessible to the operator and has a convenient handle 19 through which it may be turned. When the rudder 12 is depressed, it has the effect of lifting the rear of the boat. When it is elevated it has the opposite effect. It is obvious to those skilled in the art that the horizontal rudder is a means for virtually varying the length of the boat.

The horizontal rudder is operated to adjust the balance of the boat according to the roughness of the water, the distribution of the load within the boat, the speed, and the desired angle at which the boat shall plane.

Due to its shallow draft and the relatively long overhang of the bow, this boat, if sturdily constructed, can safely collide with and pass over floating objects which would wreck a boat of ordinary construction and it can also be driven on to shallow banks or beaches so that the occupants can land dry-footed. Due to its shallow draft, broad forward construction and its ability to

plane, it is an extremely smooth riding design even in rough water. In view of its capability of aerating the film of water with which it makes surface contact and of providing solid water against which the propeller may work, it provides for an increase of speed over similarly powered craft of ordinary construction and if improvement of speed is not desired it permits a sturdier and heavier boat to be built without sacrifice of speed.

While I have in the above description defined what I believe to be a preferred and practical embodiment of the invention, it will be understood to those skilled in the art that the details of construction and the dimensions and arrangements of the several parts are to be considered as by way of example and not as restricting the invention as defined in the appended claims.

What I claim is:

1. Boat hull construction including a sled-shaped overhanging bow merging with a broad forefoot adapted to entrain and engulf beneath the hull aerated water churned up beneath the bow in the forward motion of the hull, an intermediate dead rise section providing laterally sloping surfaces directing the escape of the engulfed air laterally along the under-water surfaces of said intermediate section, a propeller at the rear, and a longitudinal tunnel recessed in the rear bottom of the hull beginning at a point forward of the propeller and being of progressively increasing cross section toward the rear, for inducting a body of unaerated water from the depths beneath the hull into the path of the propeller.

2. Boat hull construction including a sled-shaped overhanging bow merging with a broad forefoot adapted to entrain and engulf beneath the hull aerated water churned up beneath the bow in the forward motion of the hull, an intermediate dead rise section providing laterally sloping surfaces directing the escape of the engulfed air laterally along the under-water surface of said intermediate section, a longitudinal tunnel recessed in the rear bottom of the hull, a propeller mounted beneath the rear portion of said tunnel, said tunnel being of progressively increasing cross section in a direction toward the propeller, for inducting a body of unaerated water from the depths beneath said hull into the path of the propeller.

3. Boat hull having a longitudinal keel contour of smooth curvature extending downward from the bow to the midship section, thence upwardly to a point between the midship section and the stern, at which point the curvature is reversed, continuing to the stern in a substantially flat curve, said hull having a sled-shaped overhanging bow merging with a transversely broad curved under-surface forming a broad forefoot for entraining and engulfing aerated water churned up beneath the bow in the forward motion of the hull, said hull having a dead rise construction extending from a region between the bow and forward water line substantially to said point where the keel contour begins its reverse curvature, the chine lines intersecting a transverse straight line passing through the keel curve substantially at the point where it reverses, and extending to the stern at a lower level than the portion of the keel curve which lies rearwardly of the said point of reversal, the bottom of the hull being formed with a longitudinal tunnel beginning substantially at the said point of reversal of the keel curve, and opening at the stern, the upper wall of said

tunnel coinciding substantially with the keel curve rearwardly of its said point of reversal, a propeller, said tunnel drawing a body of unaerated water from the depths beneath said hull into the path of said propeller.

4. Boat hull having a longitudinal keel contour of smooth curvature extending downward from the bow to the midship section, thence upwardly to a point between the midship section and the stern, at which point the curvature is reversed, continuing to the stern in a substantially flat curve, said hull having a sled-shaped overhanging bow merging with a transversely broad curved under-surface forming a broad forefoot for entraining and engulfing aerated water churned up beneath the bow in the forward motion of the hull, said hull having a dead rise construction extending from a region between the bow and forward water line substantially to said point where the keel contour begins its reverse curvature, the chine lines intersecting a transverse straight line passing through the keel curve substantially at the point where it reverses, and extending to the stern at a lower level than the portion of the keel curve which lies rearwardly of the said point of reversal, the bottom of the hull being formed with a longitudinal tunnel beginning substantially at the said point of reversal of the keel curve, and opening at the stern, the upper wall of said tunnel coinciding substantially with the keel curve rearwardly of its said point of reversal, a propeller, said tunnel drawing a body of unaerated water from the depths beneath said hull into the path of said propeller, the chine lines rearward of said point of reversal extending substantially parallel to the normal plane of submergence of said hull, providing a substantially flat planing surface.

5. Boat hull construction including an overhanging bow, and a broad forefoot adapted to entrain and engulf beneath the hull aerated water churned up beneath the bow in the forward motion of the hull, an intermediate dead rise section providing laterally sloping surfaces directing the escape of the engulfed air laterally along the under-water surfaces of said intermediate section, a propeller at the rear, a longitudinal tunnel recessed in the rear bottom of the hull beginning at a point forward of the propeller and being of progressively increasing cross section toward the rear, for inducting a body of unaerated water from the depths beneath the boat into the path of the propeller, a horizontal rudder hinged at the rear of said hull and means for elevating and depressing said rudder.

6. Boat hull construction including an over-

hanging bow, and a broad forefoot adapted to entrain and engulf beneath the hull aerated water churned up beneath the bow in the forward motion of the hull, an intermediate dead rise section providing laterally sloping surfaces directing the escape of the engulfed air laterally along the under-water surface of the intermediate section, a propeller at the rear, a longitudinal tunnel recessed in the rear bottom of the hull beginning at a point forward of the propeller, and being of progressively increasing cross section toward the rear, for inducting a body of unaerated water from the depths beneath the hull into the path of the propeller, a horizontal rudder hinged at the rear of said hull on an axis substantially at the height of the upper wall of said tunnel, said rudder having a central recess forming a rearward extension of the upper portion of the wall of said tunnel, and control means for elevating and depressing said rudder.

7. Boat hull having a longitudinal keel contour of smooth curvature extending downward from the bow to the midship section, thence upwardly to a point between the midship section and the stern, at which point the curvature is reversed, continuing to the stern in a substantially flat curve, said hull having a sled-shaped overhanging bow merging with a transversely broad curved under-surface forming a broad forefoot for entraining and engulfing aerated water churned up beneath the bow in the forward motion of the hull, said hull having a dead rise construction extending from a region between the bow and forward water line substantially to said point where the keel contour begins its reverse curvature, the chine lines intersecting a transverse straight line passing through the keel curve substantially at the point where it reverses, and extending to the stern at a lower level than the portion of the keel curve which lies rearwardly of the said point of reversal, the bottom of the hull being formed with a longitudinal tunnel beginning substantially at the said point of reversal of the keel curve, and opening at the stern, the upper wall of said tunnel coinciding substantially with the keel curve rearwardly of its said point of reversal, a propeller, said tunnel drawing a body of unaerated water from the depths beneath said hull into the path of said propeller, the chine lines rearward of said point of reversal extending substantially parallel to the normal plane of submergence of said hull, providing a substantially flat planing surface, a horizontal rudder hinged at the rear of said hull, and means for elevating and depressing said rudder.

ANDREW J. HIGGINS.