May 5, 1936. G. G. EDDY ET AL 2,039,586

PLANING BOAT

Filed May 23, 1935 2 Sheets-Sheet 1

Fig. 1.

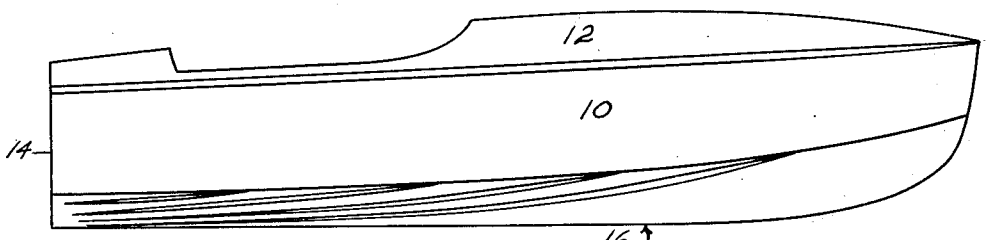


Fig. 6.

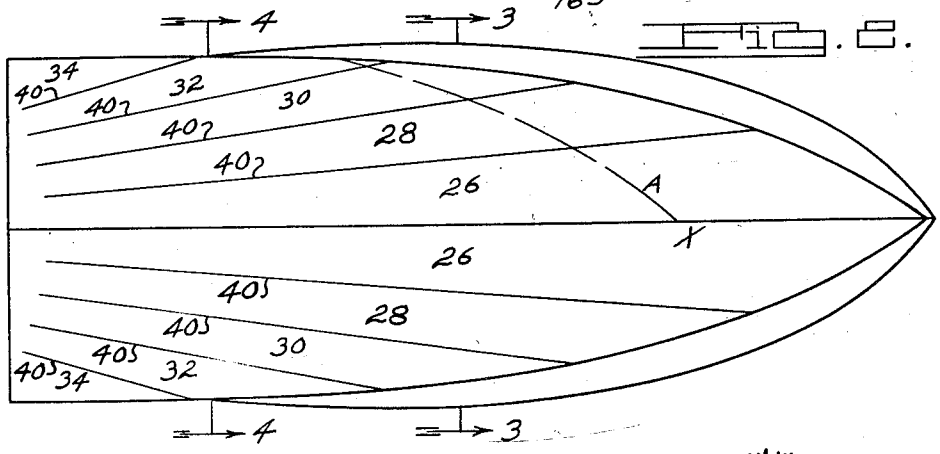


Fig. 2.

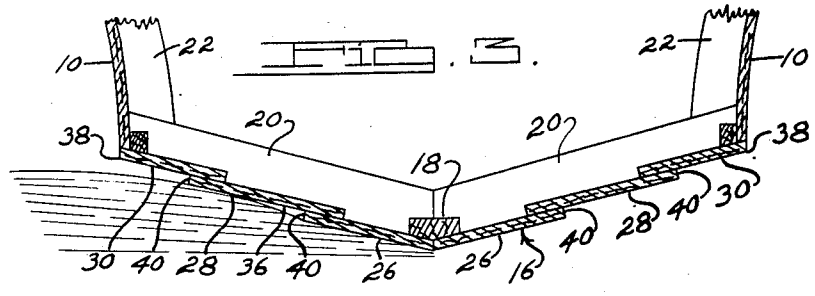
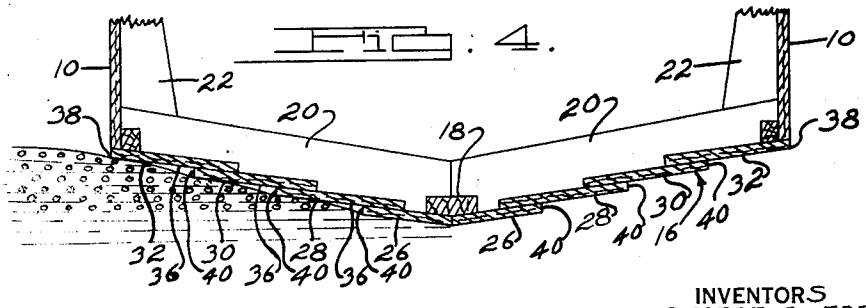


Fig. 4.



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May 5, 1936. G. G. EDDY ET AL 2,039,586

PLANING BOAT

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Fig. 5.

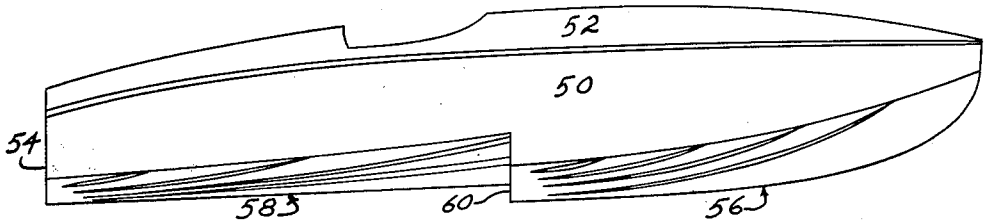


Fig. 6.

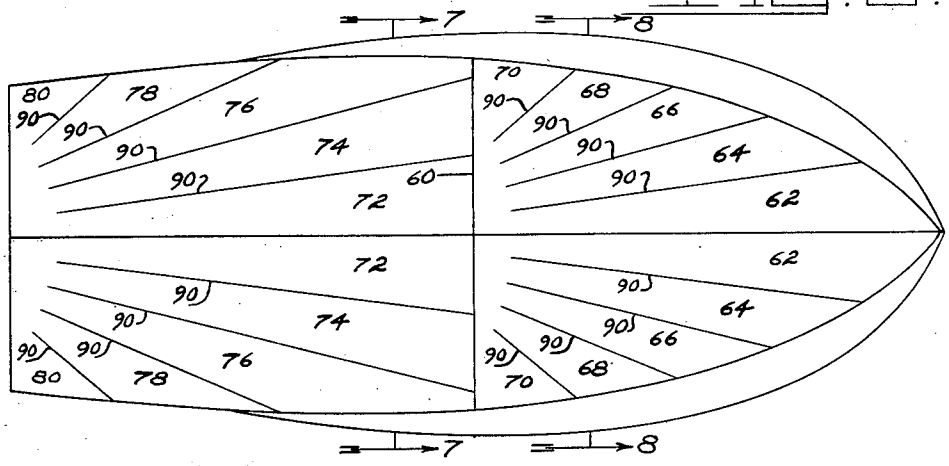


Fig. 7.

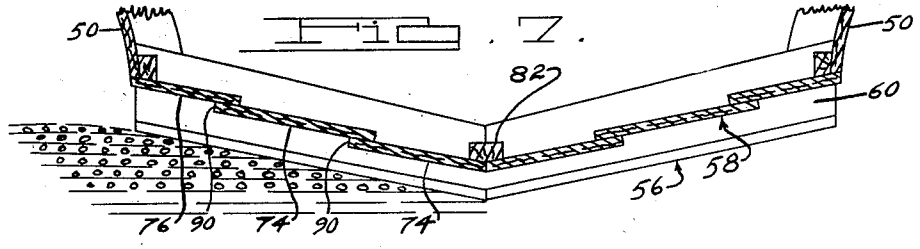
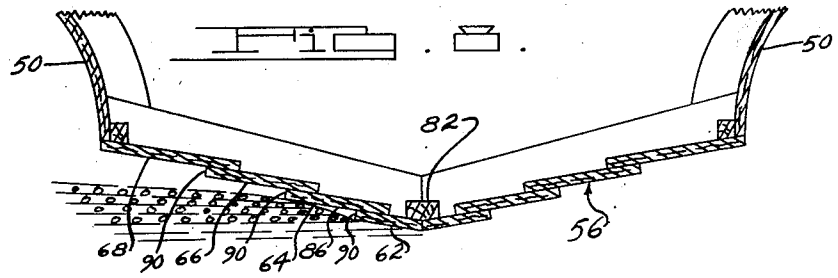


Fig. 8.



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Patented May 5, 1936 2,039,586

UNITED STATES PATENT OFFICE

2,039,586

PLANING BOAT

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Application May 23, 1935, Serial No. 22,977

18 Claims. (Cl. 114—66.5)

This invention relates to boats and seaplane pontoons of the type having a planing or hydrodynamic lifting reaction on the water when at speed, the principal object being the provision of a new and novel type of planing or lifting surfaces for boats of such types which include what are commonly known as V bottom boats and hydroplanes.

An object of the invention is to provide a novel form of planing or lifting surfaces for a boat of the type described by the use of which the area of wetted surface is considerably reduced, as compared with conventional constructions, during movement of the boat over and through the water.

Another object is the provision of a planing surface or surfaces for a boat of the class described by the use of which the entrance wave is prevented from coming in contact with the greater portion of those surfaces which it is not actually reacting against to produce lift.

Another object is to provide a planing surface construction for boats and the like so constructed as to utilize whatever hydrodynamic lifting effort is required and no more.

Another object is to provide a planing surface or surfaces for a boat which will so condition the water over and through which the boat passes as to reduce the surface frictional resistance of the boat to forward motion.

Another object is to provide a planing surface or surfaces by the use of which the water disturbance or wave-making resistance is considerably reduced, as compared to conventional constructions, during movement of the boat over and through the water.

Another object is to provide a planing surface or surfaces for a boat in which the tendency to compress the water against the planing surfaces or any part contiguous thereto during its movement outwardly from the keel is largely eliminated.

Another object is the provision of a planing surface or surfaces the use of which largely eliminates the adhesion of water to the bottom of the boat and the consequent abnormal raising of the entrance wave, thereby permitting the use of more efficient and more seaworthy shapes than are possible in conventional constructions.

Another object is to provide a planing surface or surfaces so constructed as to considerably reduce the air resistance of the boat to forward movement by permitting a part of the air that would normally be forced aside to pass under the boat.

Another object is to provide a novel form of planing surfaces for a hydroplane of the stepped type so constructed as to greatly reduce the disadvantages present in conventional constructions due to the formation of a low pressure region immediately back of such step or steps.

Another object is to provide a planing surface or surfaces for a boat of the class described having special provision for reducing the area in contact with the water in accordance with the weight and speed of the boat without impairing the lateral stability of the boat either in turning or moving in a straight line.

Another object is the provision of a boat planing surface or surfaces so constructed as to materially increase the directional stability over that obtained with conventional constructions.

Another object is to provide a planing surface or surfaces for a boat of the class described by the use of which the longitudinal stability is increased, as compared with conventional constructions, without increasing the area of wetted surface over that required for most efficient planing of the boat.

Another object is to provide a planing surface or surfaces for a boat of the class described so constructed as to convey air to those regions of the bottom normally in contact with the water, and such that the water in having a relative lateral flow with respect to such surface or surfaces will draw air with it and will cause it to be intimately mixed therewith during movement of the boat over and through the water.

Another object is the provision of a boat of the class described in which a series of generally longitudinally extending jogged surfaces are provided in the bottom thereof.

Another object is the provision of a boat of the class described having a planing surface or surfaces of the above described type in which the longitudinally extending jogs on opposite sides of the keel extend in either parallel relationship to the keel or in converging relationship toward the stern of the boat.

Another object is to provide a boat of the class described having a planing surface or surfaces of the above described type in which each of the generally longitudinally extending jogs is no greater in maximum depth than a distance equal to forty per cent of the width of the wider proximate planing surface.

Another object is the provision of a boat of the class described having a planing surface or surfaces formed of a plurality of relatively narrow planing surfaces extending generally longitudi-

nally of the hull, each of the latter planing surfaces being vertically displaced from the adjoining one in an upward direction laterally from the keel whereby to form a jog between each of said latter surfaces and which surfaces may be conveniently provided by suitably lapping the bottom planks of the hull.

Another object is to provide a boat of the class described having a planing surface or surfaces of the above described type so formed as to have the generally longitudinally extending jogs tapering in depth to zero at their rearward ends.

Another object is the provision of a boat of the class described having a planing surface or surfaces of the above described type so formed as to have the generally longitudinally extending jogs tapering in depth to zero at both ends.

Another object is to provide a boat of the class described having a planing surface or surfaces of the above described type so formed as to have each of the generally longitudinally extending relatively narrow planing surfaces merging into a common plane with the remaining planing surfaces on the corresponding side of the keel at its rearward end.

The above being among the objects of the present invention, the same consists in certain novel features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawings, and then claimed, having the foregoing and other objects in view.

In the accompanying drawings which illustrate suitable embodiments of the present invention and in which like numerals refer to like parts throughout the several different views:

Fig. 1 is a side elevational view of a planing or semi-planing type of boat, commonly known as a V bottom boat, in which a suitable embodiment of the present invention is incorporated.

Fig. 2 is a bottom view of the boat shown in Fig. 1.

Fig. 3 is an enlarged transverse sectional view of the boat shown in Figs. 1 and 2 taken on the line 3—3 of Fig. 2.

Fig. 4 is an enlarged transverse sectional view of the boat shown in the previous figures taken on the line 4—4 of Fig. 2.

Fig. 5 is a side elevational view of a boat of the single-step hydroplane type, embodying the present invention.

Fig. 6 is a bottom view of the boat shown in Fig. 5.

Fig. 7 is an enlarged transverse sectional view of the boat shown in the previous two figures taken on the line 7—7 of Fig. 6.

Fig. 8 is an enlarged transverse sectional view taken on the line 8—8 of Fig. 6.

Ideally, a boat having a bottom consisting of one or more flat or nearly flat planing or lifting surfaces, when propelled at speed on the water, would move over the surface of the water rather than through it. Due, however, to the facts that water is a fluid, that the boat has mass or weight, that surface friction occurs between the wetted surface of the boat and the water, and that therefore there is a tendency to displace water, ideal planing never actually occurs. The proximity to which ideal planing is approached is dependent upon the relationship which exists between the mass of the boat, the speed, and the hydrodynamic reaction characteristics of the planing surface or surfaces of the boat.

It is also true in practically all constructions that an entrance wave is created at the line or point where the entering edge first impinges upon the water. This wave is deflected by the force of forward movement of the boat hull in a generally outward, upward and rearward direction in relation to the hull. This wave, therefore, comes in contact with the planing surface or surfaces and in conventional constructions remains in continuous contact with the planing surface to the outer edges of same. For purposes of analysis, the lift or planing effort created by the entrance wave can be considered as an adjunct to that created by certain of the other hydrodynamic reaction phenomena related to the planing surface or surfaces and the forward movement of the boat. It is our theory that this wave factor is of great importance in the action of planing boat surfaces on and in the water, because the outward, upward and rearward movement of the water contained therein not only produces lift, which is a planing aid, but also because it produces increased wetted area due to its adhesion to the planing surfaces and consequently increased resistance to forward movement.

Among the principal objects of the present invention are the elimination of the greater part of that portion of the wetted area due to adhesion and the consequent abnormal raising of the entrance wave, increase of the effective lifting or planing effort created by the entrance wave, and substantial reduction of that portion of the remaining wetted area not producing an effective planing or lifting effort. In other words, one theory of our invention is to so form the planing surfaces as to utilize whatever hydrodynamic lifting effort is required to maintain the boat at the most efficient point of planing, and no more, and to eliminate as far as possible any contact of the hull with the water not directly utilized for lifting purposes.

Specifically, the manner in which this result is accomplished is to form each major lifting or planing surface of a multiplicity of smaller planing surfaces whose greatest dimensions lie in generally longitudinal directions with respect to the length of the boat and preferably vary from parallel relationship with the keel to complementary diagonal relationship on opposite sides of the boat, each of the latter planing surfaces being vertically displaced from the adjoining ones in an upward direction laterally from the keel thereby forming a jog between each of the latter planing surfaces, which jogs taper in depth to zero at their rearward terminations in the rearward portion of the major lifting or planing surface. To facilitate such a construction in lightly built boats it will often be most practical to taper the depth of the jogs to zero at their forward ends also, thereby eliminating the necessity for notches to receive the plank ends in the bilge frame members where such members may be too light for such notches.

The action of such a construction in the water is considerably different from that of constructions heretofore proposed. Upon impinging at the keel or entering edge and being deflected in a relatively outward, upward and rearward direction, the water, due to its own inertia, is freed of contact with the planing surface of the boat at the point or points where these jogs occur, which greatly reduces the area of wetted surface and therefore the resistance of the boat to forward movement.

With such construction at certain speeds and on certain portions of the bottom the deflected

water will leave the jog and flow relatively outwardly and rearwardly again coming in contact with the next laterally outward planing surface and leaving this latter planing surface, flow outwardly and rearwardly again coming in contact with the next outward planing surface, this action continuing until the water has passed the portion of the bottom formed by the generally longitudinally extending jogs, or has passed the bilge extremities of the boat, or by its own inertia takes a course not in contiguity with the surface of the bottom. The effectiveness of the generally longitudinally extending jogs and planing surfaces in controlling the direction of the relatively moving water under the bottom is enhanced by tapering the jogs from their maximum depth at their central or forward portions to zero at their rearward ends in the rearward portion of the bottom at or near which point they cease to be of value, thereby greatly reducing the wave-making resistance of the boat to forward movement.

Another important result of such construction is that the generally longitudinally extending jogs, which are open to the atmosphere at their forward ends at least in the bow portion of the bottom, are constantly containing air over the greater part of their lengths when the boat is at speed and these jogs, in tapering to zero depth at their rearward ends, constantly induce such air into intimate mixture with the boundary layer of water in the form of small bubbles. The result of such section is that the rearward portion of each major lifting or planing surface which contributes least to the efficient planing of the boat moves substantially over and through a layer of water containing air in bubble form which offers less resistance than water of normal consistency.

As the relatively moving water under the boat progresses toward the bilge its direction of motion decreases in angularity with the longitudinal axis of the boat and in our preferred embodiment of the present invention, to maintain the jogs at or near their most efficient angle with this relative flow of water, they are decreased in angularity with the beam of the boat successively outwardly and rearwardly.

In the ordinary type of stepped hydroplane construction as conventionally practiced, the forward motion of the boat creates a region of reduced atmospheric pressure back of the step or steps and the stern. This low pressure region, in attempting to relieve itself, draws both air and water into the space behind such step or steps or stern, and tends to draw the surface water up into contact with the bottom of the boat, thereby creating resistance to forward motion to a much greater degree than would occur were this low pressure eliminated. The present invention is of material advantage in this respect as the generally longitudinally extending jogs in combination with the rearward movement of the water and air relative thereto as above explained induces a considerable amount of air that would ordinarily be forced aside to pass under the boat thereby relieving to a great extent the region of low pressure that would ordinarily exist back of such step or steps or stern.

Referring now to the drawings and particularly to Figs. 1 to 4 inclusive, it will be noted that there is shown in these figures a boat of the planing or semi-planing type having a single major planing area, the particular type of boat shown being what is commonly known as a V bottom boat. In the usual construction of this type of boat, the bottom portions of the bow sections are usually arranged in V formation and generally flatten out as they approach the stern section which is usually approximately flat or at least is a very flat V. The boat shown in Figs. 1 to 4 inclusive is of this general type in that its lower surfaces in the bow sections are arranged in generally V relation and the stern sections are more nearly flat. The boat shown includes sides **10**, deck **12**, stern **14**, and bottom indicated generally as at **16**. As indicated in Figs. 3 and 4, the boat is preferably provided with a keel **18** or equivalent structure and ribs or frame members **20** and **22** of a suitable nature. Each side of the bottom **16** on opposite sides of the keel **18** is complementary to the other side, both sides being symmetrically arranged with respect to the keel and to a vertical plane passing through the keel longitudinally thereof. Each half of the bottom **16** on opposite sides of the keel **18** is formed of a plurality of smaller planing surfaces **26**, **28**, **30**, **32**, and **34**, each of which extends longitudinally to diagonally of the boat and is separated from the next adjacent planing surface by an upward jog **40**, the vertical surfaces of such jogs facing outwardly and tapering in depth to zero at their rearward ends in the stern portion of the bottom **16**.

In the drawings in accordance with our preferred embodiment of the present invention, it will be noted that the jogs **40** decrease in angularity with the beam of the boat successively outwardly and rearwardly.

It is to be noted that the jogs **40** are of a material depth over a considerable part of their lengths and which depth may, in actual practice, equal the thickness of the bottom planks which form the planing surfaces **26**, **28**, **30**, **32**, and **34** over a considerable part of the length of each jog, and the utilization of which bottom planks thereby offers a simple and ready means for effecting the desired result.

In the operation of the above described boat, and referring particularly to Fig. 2, let it be assumed that with the boat at speed the water will first impinge upon the boat at a point on the keel such as X. The impingement of the water on the boat will cause what is commonly known as an entrance wave to be created and which entrance wave will be deflected and have a relative flow along a line such as A rearwardly, outwardly and upwardly with respect to the bottom of the boat. In conventional constructions, this entrance wave which necessarily spreads as it moves relatively rearwardly, outwardly and upwardly, will remain in contact with the bottom of the boat for the full distance from the keel to the outer edge of the bilge, even when such edge is well above the normal surface of the water over and through which the boat is moving. The reason for this occurrence in conventional constructions is that the bottom of the boat is a smooth unbroken surface and the adhesion of water to such a surface carries the entrance waves on up the bottom until it is finally freed at the outer edge of the bilge.

Now in accordance with the present invention when incorporated in a boat of the type shown in Figs. 1 to 4 inclusive, when the boat attains its speed the bow will tend to lift and the boat will tend to have a planing action on the water. Accordingly, due to the fact that the water has an outward, upward and rearward movement relative to the bottom of the boat, there will be a reaction between the bottom of the boat and

the water such as is illustrated on the left hand side of Fig. 3.

Referring now to Fig. 3 it will be noted that due to the outward, upward and rearward motion of the water relative to the bottom of the boat, and particularly when the boat is at speed, the water in passing outwardly, upwardly and rearwardly over the outward edge of the surface 26 will not strike the surface 28 until it reaches a point thereon materially spaced from the jog 40 separating these two surfaces and consequently will leave a portion such as 36 of the area of surface 28 free of contact with the water. The size of the area 36 will depend upon the vertical dimension of the jog 40, the angle which the jog 40 makes with the direction of motion of the water, the degree of V in the bottom of the boat, and the weight, breadth and speed of the boat.

This entrance wave in having a relative rearward, upward and outward flow with respect to the bottom of the boat will then flow rearwardly, upwardly and outwardly over the surface 28 until it reaches the next outward jog 40 separating the surface 28 from the surface 30 at which point it will break away from the surface 28 and flow directly outwardly and rearwardly without coming in contact with the surface 30 and consequently will not wet such surface nor burden it with its resistance, assuming that the surface 30 as represented in this section is above the normal surface of the water over and through which the boat is moving. Consequently, in the condition assumed in Fig. 3, the only wetted portion of the bottom of the boat in the section which this figure represents will include only the surface 26 and a part of the surface 28, and the wetted area of the bottom of the boat will therefore be materially reduced over the corresponding wetted area of boats having bottoms of conventional construction.

It may here be noted that the area 36 previously referred to, which is not in contact with the relatively moving water under the boat when the boat is at speed, will continue to exist over a large part of the length of each planing surface.

Referring now to Fig. 4, it is assumed that the outer edge of the bilge 38 is below the normal surface of the water over and through which the boat is moving. Consequently, the water which is moving relatively outwardly, upwardly and rearwardly is in contact with the full width of the surface 26 and with a portion of the width of each of the surfaces 28, 30 and 32, which includes the full breadth of the bottom of the boat at this section. The jogs 40, which taper in depth to zero at their rearward ends and are therefore shallower in the section which this figure represents than in the section represented by Fig. 3, induce increasing amounts of the air which they are constantly containing into intimate mixture with the boundary layer of water in the form of small bubbles, which reaction is represented on the left hand side of Fig. 4.

The result of this action is that the boat moves substantially over and through a layer of water containing air in bubble form which offers less resistance to forward motion than water of a normal consistency. It is our theory that this presence of an aerated layer of water for the boat to ride on is one of the reasons why a boat built in accordance with the present invention is capable of attaining a greater speed than when built in accordance with conventional constructions, power and load being equal.

Another important result of tapering the depth of the jogs 40 to zero at their rearward ends, this construction reduces the amount of lateral displacement of the relatively moving water under the rearward portion of the bottom which effects a material reduction in the wave-making resistance of the boat to forward motion.

An important general result of the construction provided by the present invention, the elimination of the greater part of the burdening effects of water adhesion makes possible the use of distinctly convex shapes in the bottom portions of the bow and midship sections resulting in easier and drier riding and materially increased speed and seaworthiness over that obtained with boats having bottoms of conventional construction.

Referring now to Figs. 5 to 8 inclusive of the drawings, it will be noted that in these figures a planing or semi-planing type of boat is represented of the single step type, that is a boat having a single transverse step. The boat shown includes sides 50, deck 52, stern 54, and a bottom including two major planing areas indicated generally as at 56 and 58 separated from each other by a transverse step 60. Each of the major planing areas 56 and 58 closely follows the general construction of the entire bottom 16 of the boat described in connection with Figs. 1 to 4, inclusive. In other words, the bow portion 56 is formed of a series of smaller planing surfaces 62, 64, 66, 68, and 70 symmetrically arranged in complementary relation on opposite sides of the keel 82 and extending diagonally and longitudinally of the boat, each of such planing surfaces being separated from the next adjacent planing surface by an upward jog 90, the vertical surfaces of such jogs facing outwardly and tapering in depth to zero at their rearward ends in the rearward portion of major planing area 56.

Similarly, major planing area 58 is formed of a series of smaller planing surfaces 72, 74, 76, 78, and 80 symmetrically arranged in complementary relation on opposite sides of the keel 82 and extending diagonally and longitudinally of the boat, each of such planing surfaces being separated from the next adjacent planing surface by an upward jog 90, the vertical surfaces of such jogs facing outwardly and tapering in depth to zero at their rearward ends in the rearward portion of major planing area 58.

In the drawings in accordance with our preferred embodiment of the present invention it will be noted that the jogs 90 in each major planing area decrease in angularity with the beam of the boat successively outwardly and rearwardly.

It is to be noted that the jogs 90 are of a material depth over a considerable part of their lengths and which depth may, in actual practice, equal the thickness of the bottom planks which form the planing surfaces 62, 64, 66, 68, 70, 72, 74, 76, 78, and 80 over a considerable part of the length of each of such jogs, and the utilization of which bottom planks thereby offers a simple and ready means for effecting the desired result.

The bottom of this boat in passing over and through the water effects a reaction as is represented on the left hand sides of Figs. 7 and 8, generally similar to that effected by the construction previously described in connection with Figs. 1 to 4 inclusive, in that the water has a relative flow rearwardly, upwardly and outwardly with respect to the keel, and because of this relative movement it loses contact with the bottom of the boat at each jog 90 thus producing an area 86, as repre-

sented in Fig. 8, free of contact with the water similar to **36** in Figs. 3 and 4.

Likewise the jogs **90**, which taper in depth to zero at their rearward ends, induce increasing amounts of the air which they are constantly containing into intimate mixture with the boundary layer of water in the form of small bubbles, thus producing an aerated layer of water for the boat to ride on.

In this type of boat as previously mentioned the reaction of the boat with the water when at speed tends to create a region of reduced atmospheric pressure immediately to the rear of the transverse step **60** and this reduced pressure in attempting to relieve itself tends to draw the water up into contact with the rearward major planing area **58** at a point much closer to the transverse step **60** than would otherwise be the case, the result of such tendency when unchecked being to increase the water adhesion effect and the wetted area of the boat bottom and correspondingly decrease its speed. When the bottom of the boat is constructed in accordance with the present invention sufficient of the air contained in the jogs **90** is carried rearwardly along the forward major planing area **56** to the region back of the transverse step **60** to largely relieve the low atmospheric pressure at this point, thereby greatly reducing the detrimental effects which would otherwise exist in considerable degree.

Although we have shown but two specific examples of the present invention in connection with the drawings, it will be apparent that the teachings herein will be sufficient to permit one skilled in the art to adapt the inventive thought to like devices of different types of construction, and accordingly it is to be understood that formal changes may be made in the specific embodiments of the invention described without departing from the spirit or substance of the broad invention, the scope of which is commensurate with the appended claims.

We claim:—

1. A boat of the planing or semi-planing type having substantially the entire bottom surface thereof comprised of a plurality of diagonally and longitudinally extending distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces merging at its rearward end into a plane common to the rear ends of the remaining planing surfaces on the corresponding side of said keel, and each of said planing surfaces being separated from the next adjacent planing surface by a relatively sharp outwardly facing jog except at said rearward end.

2. A boat of the planing or semi-planing type having substantially the entire bottom surface thereof comprised of a plurality of diagonally and longitudinally extending distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces being separated from the next adjacent planing surface by a relatively sharp outwardly facing jog over the greater part of its length, each of said jogs tapering in depth to zero at its rearward end, and said jogs decreasing in angularity with the beam of the boat successively toward the stern.

3. A boat of the planing or semi-planing type having substantially the entire bottom surface thereof comprised of a plurality of diagonally and longitudinally extending, generally vertically offset, distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces merging at its rearward end with the remaining planing surfaces on the corresponding side of said keel, and each of said planing surfaces being separated from the next adjacent planing surface over the greater part of its length by a relatively sharp outwardly facing jog not greater in maximum depth than a distance equal to forty percent of the width of said planing surface.

4. A boat of the planing or semi-planing type having substantially the entire bottom surface thereof comprised of a plurality of diagonally and longitudinally extending, generally vertically offset, distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces merging at its rearward end into a plane common to the rear ends of the remaining planing surfaces on the corresponding side of said keel, each of said planing surfaces being separated from the next adjacent planing surface over the greater part of its length by a relatively sharp jog outwardly facing not greater in maximum depth than a distance equal to forty percent of the width of said planing surface, said jogs decreasing in angularity with the beam of the boat successively toward the stern.

5. A boat of the planing or semi-planing type having substantially the entire bottom surface thereof formed of a plurality of diagonally and longitudinally extending planks arranged in complementary relation on opposite sides of the keel of said boat, the downwardly presented face of each of said planks being separated from the downwardly presented face of the next adjacent plank over the greater portion of its length by a relatively sharp jog, each of said jogs being terminated at its forward end by the bilge of said boat and tapering in depth to zero at its rearward end in the stern portion of said bottom surface, the vertical surfaces of said jogs facing outwardly.

6. A boat of the planing or semi-planing type having substantially the entire bottom surface thereof formed of a plurality of diagonally and longitudinally extending, substantially flat distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, at least some of said planing surfaces terminating at their forward ends adjacent the bilge of said boat and merging approximately into a plane at its rearward end common to the rear ends of the remaining planing surfaces on the corresponding side of said keel, each of said planing surfaces being separated over the greater part of its length from the next adjacent planing surface by a relatively sharp outwardly facing jog, and said jogs tapering in depth from the maximum at their central portions to zero at their ends.

7. A boat of the planing or semi-planing type having substantially the entire bottom surface thereof formed of a multiplicity of diagonally and longitudinally extending distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces terminating at its forward end adjacent the bilge of said boat and merging at its rearward end into a single surface common to the rear ends of the remaining planing surfaces on the corresponding side of said keel, each of said planing surfaces being separated from the next adjacent planing surface over the greater part of its length by a relatively sharp jog, each of said jogs terminating at its forward end adjacent the

said bilge and at its rearward end in the stern portion of said bottom surface, said jogs tapering in depth from the maximum at their central portions to zero at their ends, and said jogs decreasing in angularity with the beam of the boat successively toward the said stern.

8. A boat of the planing or semi-planing type having substantially the entire bottom surface thereof formed of a multiplicity of diagonally and longitudinally extending distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces terminating at its forward end adjacent the bilge of said boat and merging at its rearward end into a plane surface common to the rear ends of the remaining planing surfaces on the corresponding side of said keel, each of said planing surfaces being separated from the next adjacent planing surface by a relatively sharp outwardly facing jog not greater in maximum depth than a distance equal to forty percent of the width of said planing surface, each of said jogs terminating at its forward end adjacent the said bilge and at its rearward end in the stern portion of said bottom surface, and said jogs tapering in depth from the maximum at their central portions to zero at their ends.

9. A boat of the planing or semi-planing type having substantially the entire bottom surface thereof formed of a multiplicity of diagonally and longitudinally extending distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces being substantially flat in transverse section and merging at its rearward end in a plane common to the rear ends of the remaining planing surfaces on the corresponding side of said keel in the stern portion of said bottom surface, each of said planing surfaces being separated from the next adjacent planing surface by a relatively sharp jog not greater in maximum depth than a distance equal to forty percent of the width of said planing surface, each of said jogs terminating at its rearward end in the stern portion of said bottom surface, said jogs tapering in depth from the maximum at their central portions to zero at their ends, and said jogs decreasing in angularity with the beam of the boat successively toward the said stern.

10. A boat of the planing or semi-planing type having substantially all of that portion of the bottom thereof adapted for continuous contact with the water when at speed formed of a plurality of longitudinally separate major planing areas, each of said major planing areas comprised of a multiplicity of diagonally and longitudinally extending distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces merging at its rearward end in a plane common to the rear ends of the remaining planing surfaces on the corresponding side of said keel in the rearward portion of the corresponding major planing area, each of said planing surfaces being separated from the next adjacent planing surface by a relatively sharp outwardly jog, and each of said jogs tapering in depth to zero at its rearward end in the rearward portion of the corresponding major planing area.

11. A boat of the planing or semi-planing type having substantially all of that portion of the bottom thereof adapted for continuous contact with the water when at speed formed of a plurality of longitudinally separate major planing areas, each of said major planing areas comprised of a multiplicity of diagonally and longitudinally extending distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces being substantially flat in transverse section, each of said planing surfaces merging at its rearward end into a plane common to the rear ends of the remaining planing surfaces on the corresponding side of said keel in the rearward portion of the corresponding major planing area, each of said planing surfaces being separated from the next adjacent planing surface by a relatively sharp jog, each of said jogs tapering in depth to zero at its rearward end in the rearward portion of the corresponding major planing area, and said jogs decreasing in angularity with the beam of the boat successively toward the rearward end of the corresponding major planing area.

12. A boat of the planing or semi-planing type having substantially all of that portion of the bottom thereof adapted for continuous contact with the water when at speed formed of a plurality of longitudinally separate major planing areas, each of said major planing areas comprised of a multiplicity of diagonally and longitudinally extending distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces being substantially flat in transverse section, each of said planing surfaces merging at its rearward end into a plane common to the rear ends of the remaining planing surfaces on the corresponding side of said keel in the rearward portion of the corresponding major planing area, and each of said planing surfaces over the greater portion of its length being separated from the next adjacent planing surface by a relatively sharp outwardly facing jog not greater in maximum depth than a distance equal to forty percent of the width of said planing surface.

13. A boat of the planing or semi-planing type having substantially all of that portion of the bottom thereof adapted for continuous contact with the water when at speed formed of a plurality of longitudinally separate major planing areas, each of said major planing areas comprised of a multiplicity of diagonally and longitudinally extending distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces being separated from the next adjacent planing surface over the greater portion of its length by a relatively sharp jog not greater in maximum depth than a distance equal to forty percent of the width of said planing surface, each of said jogs tapering in depth to zero at its rearward end in the rearward portion of the corresponding major planing area, said jogs decreasing in angularity with the beam of the boat successively toward the rearward end of the corresponding major planing area.

14. A boat of the planing or semi-planing type having substantially all of that portion of the bottom thereof adapted for continuous contact with the water when at speed formed of a plurality of longitudinally separate major planing areas, each of said major planing areas comprised of a multiplicity of diagonally and longitudinally extending planks arranged in complementary relation on opposite sides of the keel of

said boat, the downwardly presented face of each of said planks being separated from the downwardly presented face of the next adjacent plank over the greater portion of its length by a relatively sharp jog, each of said jogs tapering in depth to zero at its rearward end in the rearward portion of the corresponding major planing area, and the vertical surfaces of said jogs facing outwardly.

15. A boat of the planing or semi-planing type having substantially all of that portion of the bottom thereof adapted for continuous contact with the water when at speed formed of a plurality of longitudinally separate major planing areas, each of said major planing areas comprised of a multiplicity of diagonally and longitudinally extending distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces being substantially flat in transverse section and being separated over the greater portion of its length from the next adjacent planing surface by a relatively vertically directed, outwardly facing sharp jog, and said jogs tapering in depth from the maximum at their central portions to zero at their ends.

16. A boat of the planing or semi-planing type having substantially all of that portion of the bottom thereof adapted for continuous contact with the water when at speed formed of a plurality of longitudinally separate major planing areas, each of said major planing areas comprised of a multiplicity of diagonally and longitudinally extending distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces being separated over the greater portion of its length from the next adjacent planing surface by a relatively sharp jog, said jogs tapering in depth from the maximum at their central portions to zero at their ends and decreasing in angularity with the beam of the boat successively toward the rearward end of the corresponding major planing area.

17. A boat of the planing or semi-planing type having substantially all of that portion of the bottom thereof adapted for continuous contact with the water when at speed formed of a plurality of longitudinally separate major planing areas, each of said major planing areas comprised of a multiplicity of diagonally and longitudinally extending distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces being substantially flat in transverse section and being separated over the greater portion of its length from the next adjacent planing surface by a relatively sharp outwardly facing jog not greater in maximum depth than a distance equal to forty percent of the width of said planing surface and said jogs tapering in depth from the maximum at their central portions to zero at their ends.

18. A boat of the planing or semi-planing type having substantially all of that portion of the bottom thereof adapted for continuous contact with the water when at speed formed of a plurality of longitudinally separate major planing areas, each of said major planing areas comprised of a multiplicity of diagonally and longitudinally extending distinct planing surfaces arranged in complementary relation on opposite sides of the keel of said boat, each of said planing surfaces being separated from the next adjacent planing surface over the greater portion of its length by a relatively sharp outwardly facing jog not greater in maximum depth than a distance equal to forty percent of the width of said planing surface, said jogs tapering in depth from the maximum at their central portions to zero at their ends, and decreasing in angularity with the beam of the boat successively toward the rearward end of the corresponding major planing area.

GEORGE G. EDDY.
CHARLES DOUGLAS VAN PATTEN.