A. E. APEL.

BOAT.

APPLICATION FILED APR. 15, 1912.

1,042,636.

Patented Oct. 29, 1912.

2 SHEETS—SHEET 1.

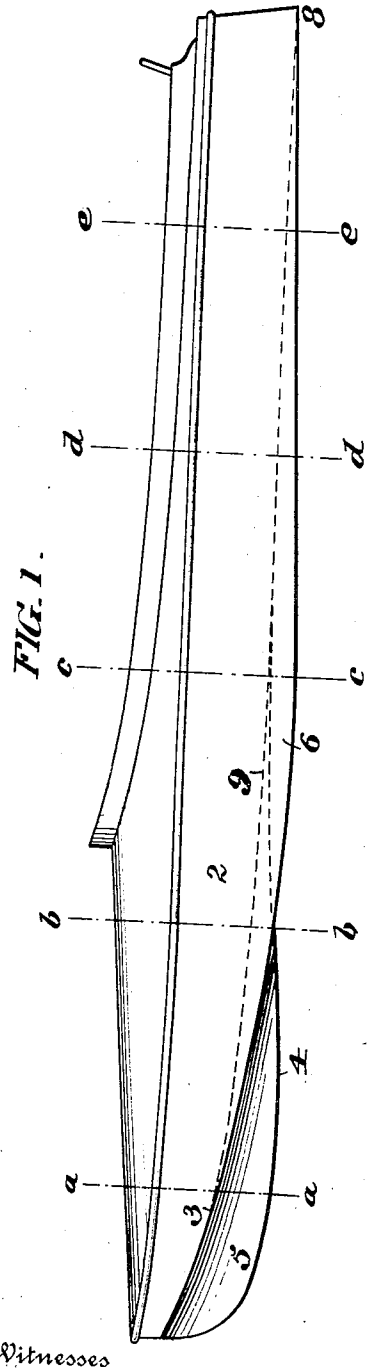

FIG. 1.

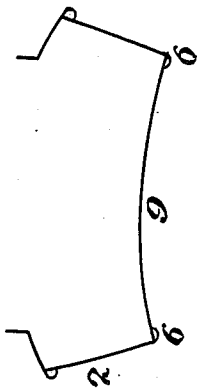

FIG. 5.

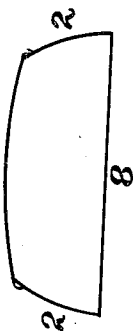

FIG. 7.

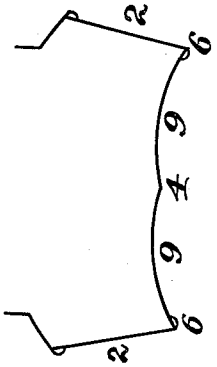

FIG. 4.

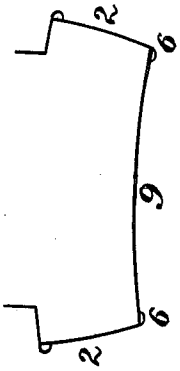

FIG. 6.

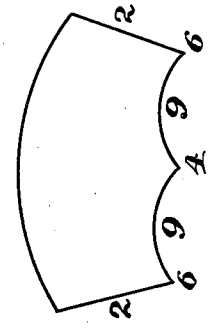

FIG. 3.

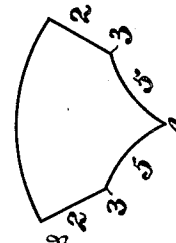

FIG. 2.

Witnesses

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2 SHEETS—SHEET 2.

FIG. 8.

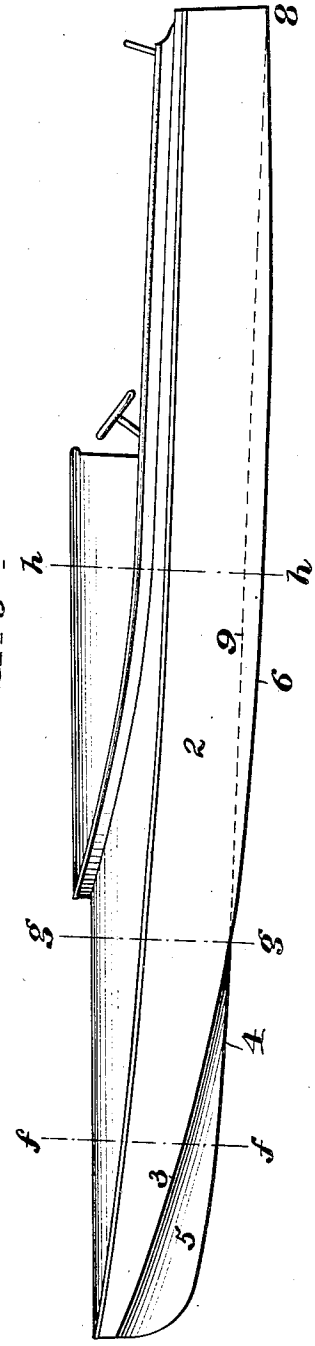


FIG. 10.

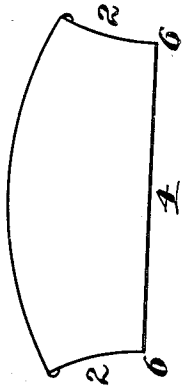


FIG. 12.

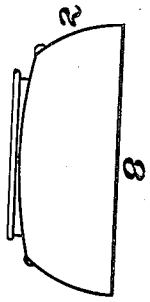


FIG. 9.

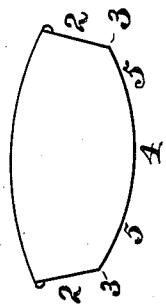
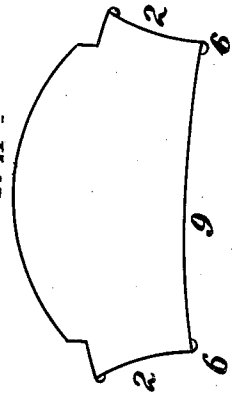


FIG. 11.



Witnesses

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BOAT.

1,042,636. Specification of Letters Patent. Patented Oct. 29, 1912.

Application filed April 15, 1912. Serial No. 690,701.

To all whom it may concern:

Be it known that I, ADOLPH E. APEL, citizen of the United States, and resident of Ventnor, county of Atlantic, and State of New Jersey, have invented an Improvement in Boats, of which the following is a specification.

My invention has reference to boats and consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings which form a part thereof.

The object of my invention is to provide a construction of boat which, under the application of power, will plane upon the surface of the water to constitute what is technically known as a hydroplane.

My invention, moreover, is intended to provide a construction which shall permit a very high speed to be obtained by the boat with a small expenditure of power, said result being secured by a special construction of the bottom of the boat which causes the hull to be lifted with respect to the surface of the water with such facility that not only is the boat capable of offering small resistance when driven at a rapid speed, but the efficiency of the boat when propelled shall be very high as compared with ordinary displacement boats or hydroplanes of ordinary construction.

My object is furthermore to so shape the bottom in respect to the sides and the keel that, while providing the suitable inclines in respect to the length of the boat for insuring the lifting factor when the boat is being propelled, I am also enabled to insure bodies of air passing under the bottom of the boat and being confined and guided thereby, so that in effect the boat travels over a large quantity of air when rapidly propelled, and thereby reduces the coefficient of friction between the boat and its support that would otherwise be the case if such air were not so provided. I am aware that air is admitted back of the steps of stepped hydroplanes by means of special contrivances for that purpose, taking the air from the inside of the boat, but in my present invention, while additional air may be supplied in such well known manner, I have not found such to be necessary, as the shape of the bottom of the boat embodying my improvements has, in practice, provided for receiving and confining all of the air that was necessary for the boat to secure the highest of speeds, thereby simplifying the general construction and improving the durability.

In embodying my invention in practice, I provide a construction of bottom in which the bottom edges of the sides begin at the bow considerably above the keel and gradually extend considerably below the keel amidship and preferably reduced as the stern is approached, whereby the bow portion of the boat has a bottom projecting below the sides and the amidship section has a bottom extending upward above the bottom edges of the sides to provide a longitudinal channel with confining side walls, and the stern at the transom is substantially flat, the construction being such, that the bow and forward portion act as a preliminary plane to lift the boat and permit the air to pass under the amidship portions, and the boat then to travel over such inflowing air confined by the sides while maintaining an inclined position, and so that the rear portion of the bottom acts as the plane upon which the highest speed is attained.

More broadly stated, my invention comprehends a hydroplane in which the sides extend below the bottom amidship of the boat, and in which the cross section amidship is such that the bottom of the sides or bilges is below the under surface of the bottom, and said bottom gradually extends below the side bilges in a direction toward the bow, and toward and approximating the side bilges at the stern. In a more restricted form, my invention comprehends the said construction when the bottom on each side of the keel is formed with a longitudinal grooved channel, said channels gradually flattening into a common surface as the stern is approached.

My invention also comprehends details of construction which, together with the features above specified, will be better understood by reference to the drawings, in which:

Figure 1 is a side elevation of a boat embodying my improvements; Figs. 2 to 6 inclusive are transverse sections on the dotted lines *a*—*a*, *b*—*b*, *c*—*c*, *d*—*d*, and *e*—*e*, respectively; Fig. 7 is an end view of the stern or transom; Fig. 8 is a side elevation of a boat embodying a modification of my invention; Figs. 9, 10 and 11 are cross sections of the boat shown in Fig. 8 taken on lines *f*—*f*,

g—*g* and *h*—*h*; and Fig. 12 is an end view or elevation of the stern or transom of said boat of Fig. 8.

Referring first to Figs. 1 to 7 inclusive, 2, 2 are the sides of the boat, and their general shapes may be as indicated in the various cross sections. The lower or bilge edge of these sides is inclined upward at 3 at the bow end and is lowest at amidship section, as indicated at 6, with a gradual rise to the transom at 8. Furthermore, the keel 4 projects greatly below the bilge line 3, 6, of the sides at the bow end of the boat, and extends upward above the horizontal plane of the bilges 6 from amidship of the boat to the transom. In this way, I provide at the forward part or bow of the boat a displacement action when the boat is at rest or running at slow speed, while amidship and under the rear or stern portion of the boat I provide a longitudinal hollow or grooved bottom which will not only confine the air but confine the water also, and furthermore, will provide in effect side keels which cause the boat to steer straighter under speed. More particularly referring to the cross sections of the boat at various places along its length, and as illustrated in Figs. 2 to 7 inclusive, it will be seen from Fig. 2 (section *a*—*a*) that the sides 2 are flared outward and the bottom from the bilges 3 are made substantially V-shaped, preferably curved inward, as at 5. In Fig. 3, (section *b*—*b*) it will be seen that the sides 2 have a more vertical position and the bottom edges or bilges 6, 6 are connected by two upwardly grooved portions 9, 9 uniting in the keel 4. These grooved portions 9, 9 are continuations of the V bottom portions 5. It will be noticed, however, at this point the keel 4 is in the same horizontal plane as the bottoms of the sides or bilges. It will be noticed from Fig. 1 that this cross section *b*—*b* is taken on the transverse plane which corresponds to where the keel crosses the bilges 6 in transverse elevation, and the result of this is that we have in the bow portion of the boat at each side of the keel a grooved bottom 9, 9 and also on an incline, as indicated by the dotted line 9 in Fig. 1. This inclined grooved portion extends back to the cross section *c*—*c* shown in Fig. 4, but as indicated in Fig. 1 and Fig. 4, the keel gradually becomes higher so that the transverse section of the grooved portions 9 becomes more flattened and blend in the middle; and at the cross section *d*—*d* shown in Fig. 5, these two grooved portions are blended into one transverse groove 9 extending from bilge to bilge and considerably more flattened. At the section *e*—*e* illustrated in Fig. 6, it will be seen that the grooved bottom 9 is still more flattened, and at the stern or transom shown in Fig. 7 the bottom becomes flat or substantially so. The dotted line in Fig. 1 extending from the stern and blending into the curved bilge 3 at the bow indicates the depth of the grooved portions 9 above the bilge portion of the sides and also indicates the gradual increase of the groove depth and then the gradual decrease thereof. Figs. 2, 3 and 4 illustrate the development of the double grooved bottom portions 5, 9; whereas Figs. 5, 6 and 7 illustrate the development of the single grooved portion and its blending into the flat portion at the stern. As these grooved portions 9 are first directed obliquely outward and downward, as in Fig. 2, and ultimately assume the horizontal arrangement opening downward as in Fig. 3, and with still further change, as indicated in Fig. 4. It will be understood that this gradual change of these grooved portions 9 produces in effect spiral channels upon each side of the bow portion and blending into a single wide channel at the cross section shown in Fig. 5 and corresponding to the section between the lines *c*—*c* and *d*—*d*.

With the construction above described, it will be seen that at the forward part of the boat there is provided, in conjunction with the displacement portion adjacent to the keel 4, the side inclined grooved portions 9 which are excellently adapted to receive air and water and to hold the same while the boat travels over them; and it will further be seen that these grooved portions 9 are extended backward to a point beyond the keel so that at moderate speeds they positively act as lifting planes and directing chutes for the water and air which make the boat ride very easily and with considerable stability. It will also be seen that as the boat lifts at the bow in assuming a planing position for higher speeds, the grooved portions 9, 9 will act as a most positive means of delivering air under the boat and above the water and providing a confinement of the said air between the boat and the water throughout approximately the whole length of the portion of the boat in contact with the water, thereby reducing the friction to a minimum. Furthermore, the confinement of the water under the rear portion of the boat when speeding (which is made possible by the fact that the bilges 6 extend below the bottom portion 9, as indicated in Figs. 5 and 6), will assist in raising the boat and maintaining its planing position with less power than would be the case if the water were permitted to relieve itself at each side between the lines *c*—*c* and *e*—*e* of Fig. 1, as was the common practice in hydroplanes prior to the date of my invention. An advantage in my construction over those forms of hydroplanes in which the water is relieved at each side of the boat by having the bilges at a less depth than the keel or at the same depth from the amidship portion back to the stern, is due

to the fact that, aside from confining the air and compelling the boat to travel over the film of air, the confining of the water by the lower bilges compels the boat to take the planing position at a lower speed than is possible with the former types of hydroplanes, and consequently the boat will arrive at its maximum speed more quickly and will also maintain that maximum speed with an expenditure of less power than is the case where the water and air are permitted to escape laterally from under the boat.

Referring to the modification of my invention shown in Figs. 8 to 12 inclusive, I have shown the same general construction of hull as that shown in Figs. 1 to 7, but in this case the double grooved portions indicated in Figs. 3 and 4 are not employed. Furthermore, the bow is shown with the bottom portion 5, 4, 5 (Figs. 1 and 9) which is rounded and gradually flattened to the point of the cross section *g*—*g*, in which it becomes a straight line, as indicated in Fig. 10; that portion in front of said line being downwardly curved, as in Fig. 2, and that portion to the rear of said line being upwardly curved as indicated in Fig. 4, and terminating in a flat portion 8 at the stern (Fig. 5). In this modification, the bottom portion of the bow 5, 4, 5 compares with the corresponding portion of the bottom of the bow 5, 4, 5 of Fig. 2, though it is not as sharp in its downward projection to the keel. Furthermore, the transverse section on line *g*—*g* of the modification, and which corresponds to the cross section *b*—*b* of Fig. 1, has the keel and bilges in the same plane, as in the case of Fig. 1, but it does not have the addition of the grooved portions 9, 9. The amidship section *h*—*h* shown in Fig. 11 approximates very closely the amidship and rear sections of Fig. 1 and shown in Figs. 4, 5 and 6. The general results attained in the commercial use of the boat shown in Figs. 8 to 12 inclusive is the same as that resulting from the use of the boat illustrated in Figs. 1 to 7 inclusive, but the special advantages secured by the double grooves 9, 9 in that portion of the boat where the amidship section leads forward into the bow section, and more fully illustrated in Fig. 3, are not fully secured in this modification shown in Fig. 8, because the directive effect of these grooves is not secured in the modification. It will therefore be understood that my invention in its highest perfection is embodied in the illustrations of Figs. 1 to 7 inclusive, and somewhat less secured by the construction or modification shown in Figs 8 to 12 inclusive. I also wish it to be understood that while the bottom adjacent to the transom is shown as flat and so indicated at 8, and is the form which I prefer, it is to be understood that I do not restrict myself in this particular, as it is evident that if the boat were slightly shortened with the construction otherwise as shown, there would result a slight upward curve in the bottom at the transom and this I do not consider would be a material objection. I also desire to point out that while the special advantages which I have described are secured by my improved construction of hull, the actual efficiency will vary somewhat with varying proportions, angles and curves given to the various parts illustrated and also by the conditions of load and displacement, and I therefore do not restrict myself to the exact proportions shown. I am also aware that it is possible to make additions or modifications to what I have herein defined as my invention, and I claim as my right to modify or add to the features which are so described so long as I do not depart from the spirit of the invention, as herein described and defined in the claims.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A boat hull having the bottom parts of the sides curved downward and then upward toward the stern and forming bilges constituting the lowest parts of the bottom for the greater and rear portion of the boat and also curved upward at the bow portion to a point above the normal water line, and in which the keel of the bow portion is extended downward below the level of the bilge lines of the sides and terminates at or near amidship, and that portion of the bottom from amidship extending rearwardly, approximately to the stern, is arranged as a single groove of relatively shallow depth and gradually decreasing transverse curvature with its highest portion above the level of the bilge lines of the sides and approximating the level of the bilge lines at the stern.

2. A boat hull having the bottom parts of the sides forming bilges constituting the lowest parts of the bottom for the greater and rear portion of the boat and curved upward at the bow portion to a point above the normal water line, and in which the keel of the bow portion is extended downward below the level of the bilge lines of the sides to a distance in advance of amidship and above the level of the bilge lines aft of amidship for a short distance only and the bottom surface rearward of the keel near amidship and extending approximately to the stern is arranged above the level of the bilge lines of the sides and upwardly curved transversely so as to provide a longitudinal bottom channel whose highest part is central from the bilges and the curvature decreasing toward the stern.

3. In a boat hull having the sides extending downward and forming bilges at their lowest part, which bilges are lowest rear-

ward from a point somewhat in advance of the amidship section and are highest at the bow portion, and in which the bottom of the bow portion between the bilges and extending rearward to approximately the amidship section is grooved on each side of the keel, the said grooves forming oppositely arranged spiral channels gradually turned from an oblique outward direction at the extreme bow portion to a substantially horizontal downward direction and substantially terminating at or adjacent to the amidship section, and in which further the under surface of the bottom from the amidship section rearwardly toward the stern has a longitudinal portion having a single transverse curvature which is higher than the level of the bilges from amidship rearward and which curved bottom is extended transversely downward to said bilges at each side to form a single confining channel or groove for the greater portion of the length of the bottom of the boat for the air and water over which the boat travels.

4. In a boat hull, the sides extending downward and forming bilges at their lowest parts, which bilges extend well below the level of the bottom and keel from a point somewhat in advance of the amidship section and extending rearwardly at this lower depth toward the stern and said bilges also extending forward from amidship toward the bow and high above the keel, and in which the lower part of the bow portion between the bilges and extending rearwardly to approximately the amidship section is grooved on each side of the keel, the said grooves forming oppositely arranged spiral channels gradually turned from an oblique outward direction at the extreme bow portion to a substantially downward direction at or adjacent to the amidship section, and in which further the surfaces of said grooves are blended into each other at or in advance of the amidship portion to form from that point rearwardly one continuous longitudinal downwardly directed grooved bottom portion extending transversely from bilge to bilge and rearwardly toward the transom for the greater length of the hull and with a gradually less transverse curvature as the transom is approached so that it approximates a substantially flat surface at the transom.

In testimony of which invention, I hereunto set my hand.

ADOLPH E. APEL.

Witnesses:
S. Eva Core,
Albert C. Stephany.