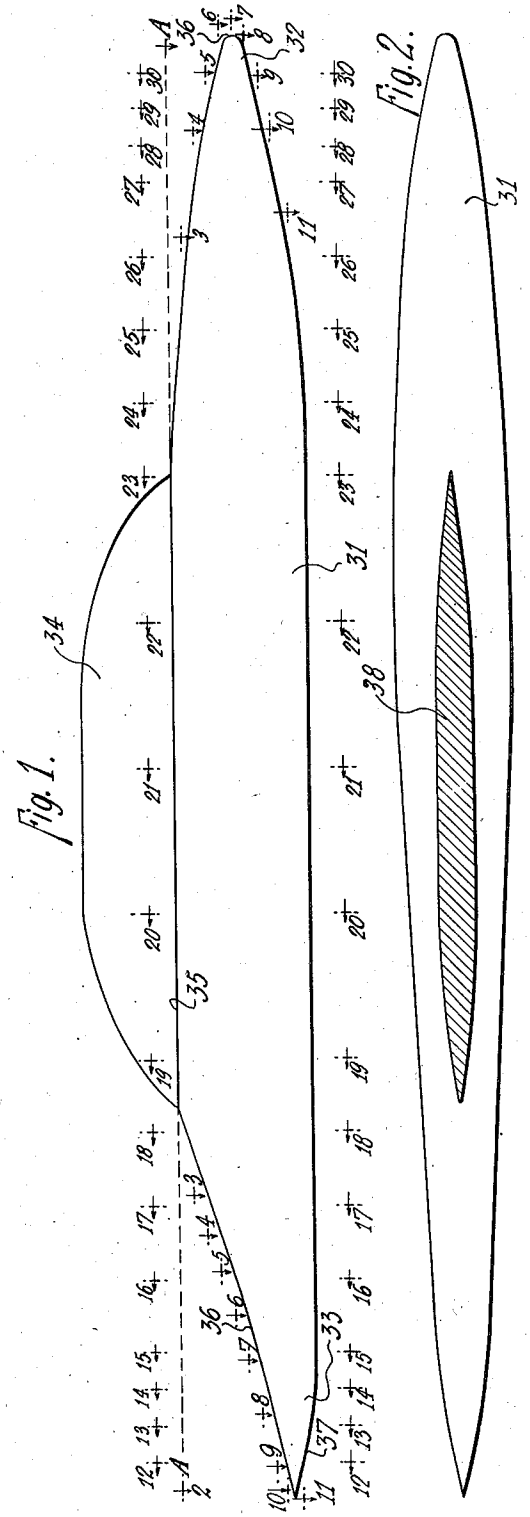
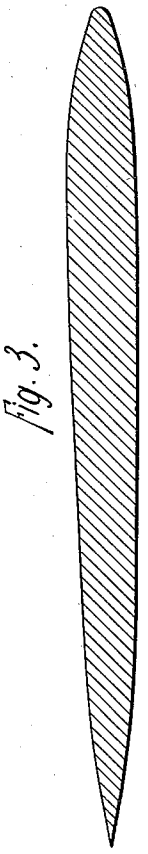
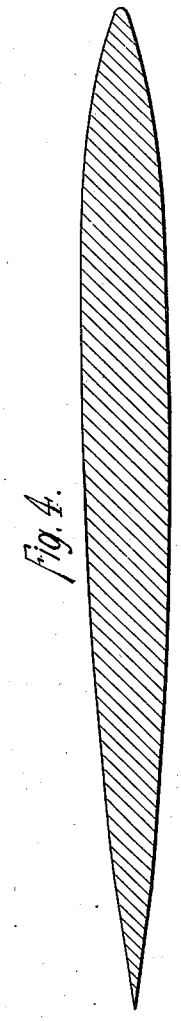
Dec. 7, 1937. R. ENGELMANN 2,101,613

HIGH SPEED SEAGOING SHIP

Filed Jan. 18, 1935 3 Sheets-Sheet 1







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HIGH SPEED SEAGOING SHIP

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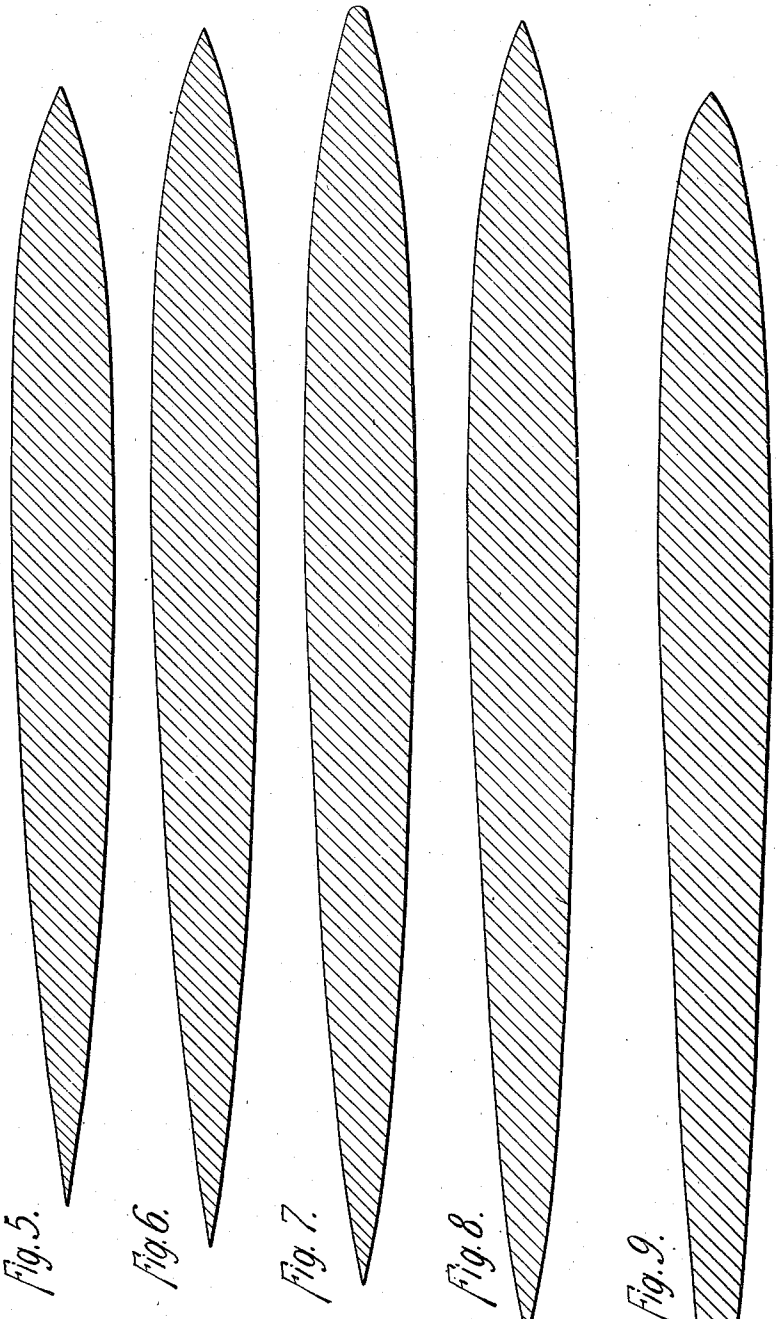

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

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HIGH SPEED SEAGOING SHIP

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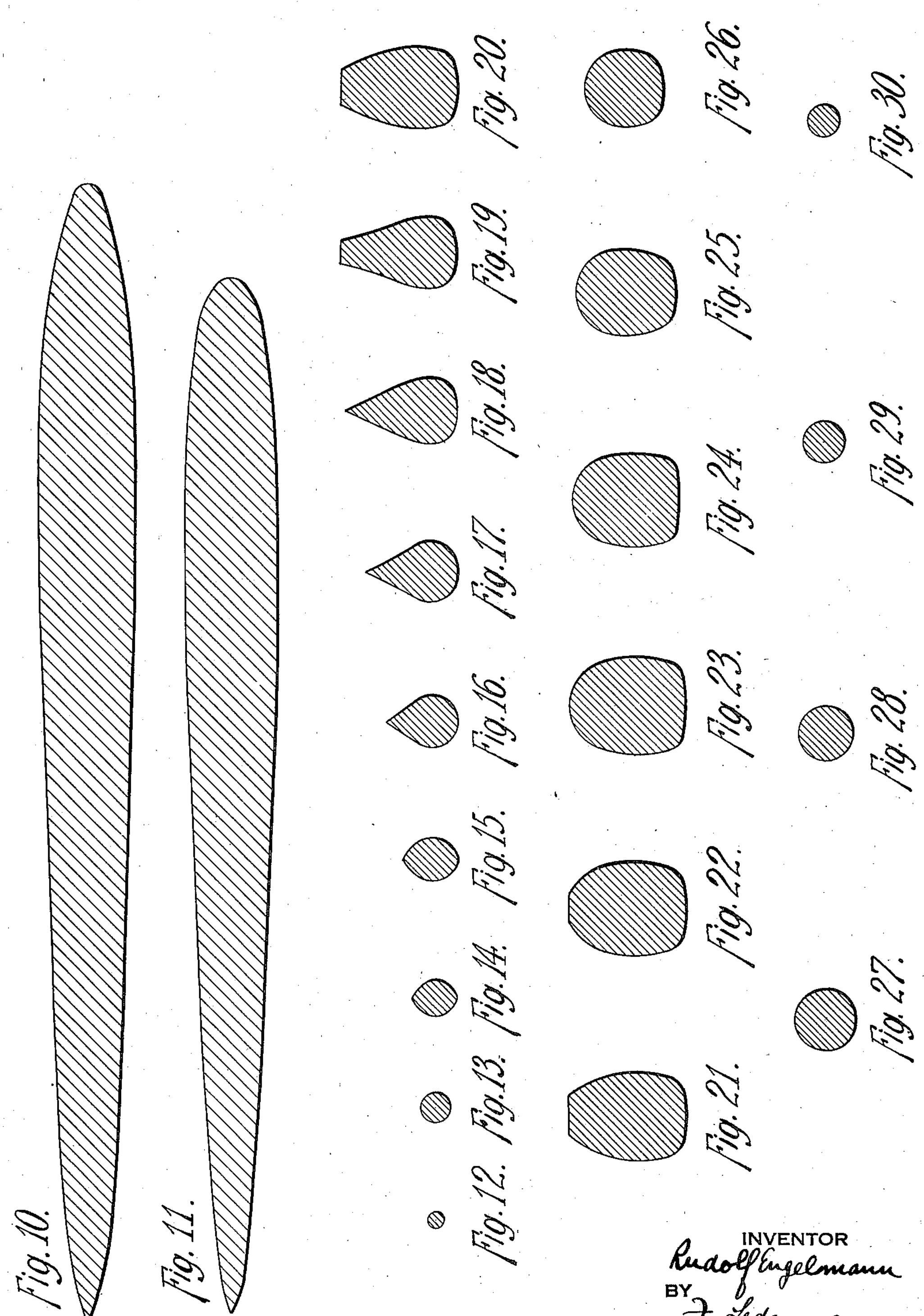

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2,101,613

HIGH SPEED SEAGOING SHIP

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Application January 18, 1935, Serial No. 2,315

14 Claims. (Cl. 114—59)

This invention relates to ships, and more particularly to seagoing ships of all kinds, the main object thereof being to provide a novel body for the ship as well as a novel superstructure with the aim—without diminishing the propeller efficiency—of attaining a far lesser resistance of both wind and water than seagoing ships of the usual type, with a consequently great increase in speed.

The body of the ship of the present invention is of the so-called spindle-shaped form; in other words, the body of the ship according to the above-mentioned object or spirit of this invention, has a substantially spindle-shaped form. But it is only by means of a special and particular form of such a substantially spindle-shaped body that the desired aims above set forth can be attained. Before the particular form wherein the invention consists, is described, the following two facts which are well known in the science of shipbuilding and marine engineering, are to be noted:

1. It is well known that the resistance to movement of a spindle- or torpedo-shaped body entirely submerged and traveling at high speed through the water, is less than that of a ship of the common type of form and shape which has the same displacement and is traveling at the same speed on the surface of the water.

2. It is also well known that, considering two spindle- or torpedo-shaped bodies of identical length and displacement and traveling at the same speed, but having each a particular individual form differing from the other, the difference in resistance between these bodies is for practical purposes insignificantly small, provided that they are submerged at least at such a depth beneath the surface that their movement does not cause any formation of waves on the surface.

It has, however, been hitherto unknown, what particular form a substantially spindle-shaped body must take, or in other words what particular transverse cross-sectional forms the spindle body must have at different positions throughout its length in order to provide a minimum of resistance when traveling in the water directly below the surface. In consideration of this latter point, it is to be noted that with two bodies having both a basically spindle-shape, the same displacement, the same length, and both traveling at the same speed directly beneath the water surface, variations from each other in shape and transverse cross-sectional forms will result in distinctly and importantly different amounts of resistance, which fact is not the case when the same bodies lie deep in the water as mentioned in point "2" above.

In considering ship bodies of a general spindle shape which travel in the water directly beneath the surface, it is of very great significance to the matter of resistance whether the body is throughout its length circular in transverse cross-section in the manner of a simple rotation-spindle, or whether it is of oval or elliptical transverse cross-section. It is also of great significance to the matter of resistance, whether, in the case of spindle bodies having oval or elliptical transverse cross-sections, the body lies with the longer axis of the elliptical transverse cross-sections vertical or horizontal in the water, and it is further of particular significance whether the greatest transverse cross-sectional area of the body is situated in the middle thereof, forward of the middle, or aft of the middle.

In consideration of the facts above set forth, and with the object of providing a ship capable of traveling on the surface of the seat at a very high speed with relatively a minimum expenditure of propelling power, the ship illustrated in the accompanying drawings, and described below, has been invented.

Referring briefly to the accompanying drawings, in which the entire ship is illustrated as though it were a solid body instead of a hollow shell, for the sake of clarity and simplicity in emphasizing the outline thereof,

Figure 1 is a side elevational view of the ship, the bow being at the right and the stern at the left.

Figures 2 to 11 are horizontal cross-sections on the lines 2—2 to 11—11 respectively of Figure 1.

Figures 12 to 30 are transverse cross-sections on the lines 12—12 to 30—30 of Figure 1.

Referring in detail to the drawings, the numeral 31 represents the body of a ship having the bow 32 and the stern 33, the superstructure being shown at 34. The horizontal line 35 separating the body 31 from the superstructure 34, lies in the same plane as the water surface represented by the line A—A, Figure 1, that is, the plane of the operating water line at which the surface of the water meets the ship under the conditions of load and speed at which the ship is designed to operate.

The tip of the nose 36 of the bow 32 is rounded, and, reading from right to left, Figure 1, the bow for a short distance has a circular transverse cross-section, as shown in Figures 30, 29, and 28. From the section 28—28, progressing from right to left, the cross-section of the body 31 becomes somewhat flattened at the sides to assume a slightly oval form, as shown in Figure 27. This oval, as well as the other cross-sections, is of greater height than width and its greatest width is below the water line. Between the sections 27—27 and 26—26 the sides of the body become more pronouncedly flattened so that the oval cross-section is more distinct at the section 26—26, Figure 26. At the same time the bottom

of the body between these sections also becomes flattened, so that at the section 26—26 it assumes the form shown in Figure 26. Both the oval form and the flattened bottom become more pronounced following leftward through sections 25—25, 24—24, 23—23, and 22—22, as shown in Figures 25, 24, 23, and 22, respectively. At the same time the body is widening and its cross-sectional area increasing, the maximum width of the body occurring at the section 23—23, Figure 23. It is to be noted that this section of maximum width occurs forward of the mid-point of the body. At the section 23—23, where the expanding circumference of the bow reaches the water line A—A, the superstructure 34 begins, and the top or back of the body 31 becomes flat and continues flat along the plane of intersection of the water line A—A with the body 31, as shown by the line 35, Figure 1. The flat top of the body at the section 22—22 is shown at the top of Figure 22. The width and the cross-sectional area of the body decrease progressively to the left, through Figures 22, 21, 20, 19, and 18, with the flat top gradually widening at first and then narrowing until it disappears just before the section 18—18. At the same time, through the sections represented by Figures 22–18, inclusive, the upper portion of the body decreases in cross-sectional area faster than the lower portion, with the sides of the upper portion becoming flatter so that at the section 18—18, Figure 18, the cross-section represents substantially that of an inverted spinning-top, that is, the sides of the body come to a point to form a peak. The cross-sectional area of the body 31 continues to decrease toward the left through all the sections represented in Figures 17–12, inclusive, and beginning between the sections 21—21 and 20—20, the bottom of the body becomes more rounded and gradually assumes the semi-oval form shown in Figure 15. The peaked sides shown in Figures 19–17, inclusive, become gradually more rounded as shown in Figures 16 and 15, so that at the section 15—15 the entire cross-sectional outline of the body is substantially oval but with the upper portion thereof less rounded than the lower. At the section 14—14 the cross-section has tapered into a substantially oval form as shown in Figure 14. To the left of section 14—14 the oval shape of the outline gradually blends into a circular form, so that at the section 13—13 the cross-section is truly circular, as shown in Figure 13. The circular cross-section remains from that section through to the tip of the stern 33, as shown in Figure 12. It is to be noted that the line 36 joining the tip of the stern with the point at which the superstructure ends, is slightly concave, and that the circular cross-section in Figures 13 and 12 is attained by causing the bottom line 37 of the stern tail to rise to the tip of the stern. The following features are also to be noted. The lines outlining the bow 32 in Figure 1 are both slightly convex, so that the solid enclosed by the peripheral surface of the bow is not truly conical, yet approximates a cone. Further, the lowermost section of the concave line 36 is not concave, but rather slightly convex between the tip of the stern and a vertical line (not shown) drawn through the line 36 from the beginning of the line 37, the latter also being slightly convex. Also, that a horizontal line drawn through the axis of the nose of the bow would lie above a horizontal axis drawn through the tip of the stern.

The horizontal cross-sectional views in Figures 2–11, inclusive, further emphasize the outline of the body 31 as above described, and a detailed explanation of these figures is believed to be unnecessary. The cross-hatched area 38 in Figure 2 represents the entire flattened top of the body 31 and also the outline of the base of the superstructure 34. The area 38, as beforementioned, lies in the same plane as the water surface indicated by the line A—A, Figure 1. It is to be noted that the superstructure 34 is of substantially a fin-like shape with its front and rear upper corners well rounded. As a result of this structure, the superstructure presents a minimum of resistance to the air while traveling at high speed, and, in case waves should break against it, its substantially blade-like front edge will cut through the waves and plow through the surface water which may rise over the upper limit of the body 31, with a minimum of resistance.

It will be observed that the intermediate oval portion is at least through the major portion of its length of greater cross-sectional area below a horizontal plane equally spaced from the top and bottom of the hull than above such plane. Furthermore, the width of the oval portion decreases substantially continuously from the point of greatest width upwardly.

As the form and the shape of the ship are the only pertinent elements in the structure involving the present invention, no propelling or steering means have been shown or described. Suitable provision of such parts, as well as other requisite items of structure necessary for a ship, may be made as desired without affecting the spirit and scope of the invention.

The ship above set forth evolved out or repeated experiments conducted with scientific precision with many models of varying shapes. The model represented in the drawings attains the aims set forth at the beginning of this description; that is, it is capable of attaining high speed with a relatively minimum expenditure of power as a result of having a minimum resistance to both air and water, and at the same time makes possible the maintenance of a practically constant high speed even in rough seas which would considerably slow up ships of the common type having a similar displacement.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent, is as follows:

1. A high speed seagoing ship having a substantially spindle-shaped underwater body, a superstructure projecting upward from said body, the periphery of the plane of intersection between said body and said superstructure lying in a single plane, such plane being also the same plane as the operating water line, the upper edge of said superstructure in a side view of the ship presenting for a portion intermediate its length a straight line which at each end curves convexly toward and as far as the upper edge of said underwater body, the side walls of the end portions of said superstructure being slightly arched outward, said side walls meeting in a vertical plane through the longitudinal axis of the ship to form a roof.

2. A high speed seagoing ship having a completely submerged substantially spindle-shaped main body provided with a substantially conical bow and a substantially conical stern, a superstructure projecting upward from said body, the periphery of the plane of intersection between said body and said superstructure lying in a sin-

gle plane, such plane being also the same plane as the operating water line, the transverse cross-section of said body from bow to stern varying from a circle at the bow which increases in area and changes its form to an upright oval at the beginning of the superstructure, said oval having a flattened bottom, said oval throughout the length of the superstructure having also a flattened top, said oval cross-section varying to that of an inverted spinning top from the end of the superstructure to the stern, said last-named cross-section gradually diminishing in height to merge with the gradually diminishing circular cross-section of the stern.

3. A ship having a spindle-shaped under-water hull and an above-water superstructure placed directly thereon, said hull and superstructure being joined substantially at the operating water line, said hull being substantially circular in cross-section at the bow and stern and intermediate said bow and stern being in cross-section of greater height than width and having its greatest width below the water line, and substantially continuously decreasing in width from its point of greatest width upwardly.

4. A ship as claimed in claim 3 in which the horizontal axis of the bow is higher than that of the stern.

5. A ship as claimed in claim 3, in which said intermediate part at least through the greater portion of its length is in cross-section of greater area below a horizontal plane equally spaced from the top and bottom of the hull than above such plane.

6. A ship having a spindle-shaped under-water hull and an above-water superstructure placed directly thereon, said hull and superstructure being joined substantially at the operating water line, said hull being substantially circular in cross-section at the bow and stern and intermediate said bow and stern being substantially in the form of an oblong having a greater height than width with generally convex sides.

7. A vessel having a spindle-shaped hull and a superstructure placed directly thereon, said hull being substantially circular in cross-section at the bow and stern and intermediate said bow and stern being substantially in the form of an oblong having a greater height than width with generally convex sides.

8. A ship having a spindle-shaped under-water hull and an above-water superstructure placed directly thereon, said hull and superstructure being joined substantially at the operating water line, said hull being substantially circular in cross-section at the bow and stern and intermediate said bow and stern being in cross-section of greater height than width and having its greatest width below the water line, the hull being of greatest cross-section at a point in front of the center thereof.

9. A ship having a spindle-shaped under-water hull and an above-water superstructure placed directly thereon, said hull and superstructure being joined substantially at the operating water line, said hull being substantially circular in cross-section at the bow and stern and intermediate said bow and stern being in cross-section of greater height than width and having its greatest width below the water line, the hull being of greatest cross-section at a point in front of the center thereof, the front of said superstructure terminating substantially at the point of greatest cross-section of the hull.

10. A ship having a spindle-shaped under-water hull and an above-water superstructure placed directly thereon, said hull and superstructure being joined substantially at the operating water line, said hull being substantially circular in cross-section at the bow and stern and intermediate said bow and stern being in cross-section of greater height than width and having its greatest width below the water line, said superstructure being streamlined and having walls converging to points at the front and rear ends thereof.

11. A ship having a spindle-shaped under-water hull and an above-water superstructure placed directly thereon, said hull and superstructure being joined substantially at the operating water line, said hull being substantially circular in cross-section at the bow and stern and intermediate said bow and stern being in cross-section of greater height than width and having its greatest width below the water line, the bottom of a part of the intermediate portion of the hull being substantially flat transversely of the hull.

12. A ship having a spindle-shaped under-water hull and an above-water superstructure placed directly thereon, said hull and superstructure being joined substantially at the operating water line, said hull being substantially circular in cross-section at the bow and stern, and intermediate said bow and stern being in cross-section of greater height than width and having its greatest width below the water line, the cross sectional shape changing from circular adjacent the bow to an oblong of greater height than width with generally convex sides, and changing thence rearwardly to the shape of an inverted spinning top which gradually diminishes in height to merge with the circular stern portion.

13. A ship having a spindle-shaped under-water hull and an above-water superstructure placed directly thereon, said hull and superstructure being joined substantially at the operating water line, said hull being substantially circular in cross-section at the bow and stern, and intermediate said bow and stern being in cross-section of greater height than width and having its greatest width below the water line, the cross sectional shape changing from circular adjacent the bow to an oblong of greater height than width with generally convex sides adjacent the front of the superstructure, and changing adjacent the rear of the superstructure to the shape of an inverted spinning top which gradually diminishes in height to merge with the circular stern portion.

14. A ship having a spindle-shaped under-water hull and an above-water superstructure placed directly thereon, said hull and superstructure being joined substantially at the operating water line, said hull being substantially circular in cross-section at the bow and stern, and intermediate said bow and stern being in cross-section of greater height than width and having its greatest width below the water line, the cross-sectional shape changing from circular adjacent the bow to an oblong of greater height than width with generally convex sides adjacent the front of the superstructure, and changing adjacent the rear of the superstructure to the shape of an inverted spinning top which gradually diminishes in height to merge with the circular stern portion, said oval section being flattened on the bottom.

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