PATENT SPECIFICATION

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455,466

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COMPLETE SPECIFICATION

Improvements relating to the construction of Ships

I, RUDOLF ENGELMANN, a German Citizen, of 1, Bayerischer Platz, Berlin, W.30, Germany, formerly of Hubertus Strasse 17, Berlin-Schlachtensee, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to ships capable of being used on the high seas, and is based upon the following considerations. In order to attain high speeds, ships capable of use on the high seas require extraordinarily high output from the engines. Thus, for example, in order to increase the speed of a large liner from about 24 knots to about 27 knots, it is necessary to double the output of the engines. At present the speed of the fastest liners is about 30 knots, and for this such enormous output is required of the engines that the economic limits of such ships are reached or even exceeded. The maximum speed attained amounts to about 40 knots, and this speed is attainable only by a few destroyers. These destroyers, however, can maintain such speeds only when the sea is quite smooth, whereas even when the sea is slightly choppy it is necessary for them to reduce the speed considerably in order that the ships may not shiver unduly. Even when the sea is moderately rough it is necessary to reduce the speed of the destroyer to about a third of its maximum speed.

The object of the present invention is to produce a ship capable of cruising the high seas, which, as compared with ships of the usual type of construction can attain considerably higher speeds with the same output of the engine, or can maintain the same speed with a considerably lower output, and is capable of cruising at these high speeds even when the sea is rough.

According to this invention the ship which is of the kind having a fusiform hull and an above-water superstructure placed directly thereon is characterised in that the upper edge of the under-water hull when viewed from the side—apart from the portions leading to the point of the bow and to the point of the stern—is of rectilinear form and is disposed at the water-line when the ship at rest is in the normal trimmed position, the cross-section of the under-water hull being circular at the front part of the bow and at the rear part of the stern, whereas the cross-section of the under-water hull in the middle part has the form of an ellipse with a vertical major axis, whilst the above-water superstructure extending over the middle part of the under-water hull is designed as a stream-lined body.

The superstructure which protrudes above the level of the water, has, according to the invention, an area which in its middle part is limited by parallel side lines which, towards the bow and towards the stern, converge in a gentle curve, whereas the middle part of the superstructure, seen in side view, has a straight upper edge and towards the bow and towards the stern runs in a convex curve. The superstructure extends towards the bow not further than to the position of maximum cross-section of the under-water hull which is arranged in front of the middle of the ship.

The lateral surfaces of the front and back parts of the superstructure are curved outwards slightly and converge roof-wise in the symmetrical plane of the ship.

The invention is not applicable to submarines, as with the latter it is not important that very high speeds should be attained. The invention is based upon the new discovery that fusiform bodies of the above-mentioned trim and form have very good resistance characteristics at high speeds. Starting from this point, the under-water hull is produced in combination with the above-water superstructure fitted directly thereon, in order that it may be possible to reduce resistance to the minimum and to maintain a high speed even in a rough sea. At the same time, by the means specified the ship, while being of simple structure, possesses all the necessary stability and rudder properties.

One form of construction of the inven-

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tion is illustrated in the annexed drawings, in which:—

Fig. 1 is a side view of a ship according to the invention.

Fig. 2 is a horizontal longitudinal section on the level of the line K W L in Fig. 1.

Fig. 3 is a horizontal longitudinal section along the line 12—12 of Fig. 1.

Fig. 4 is a horizontal longitudinal section along the line 4—4 of Fig. 1.

Fig. 5 is a vertical cross-section along the line 0—10 in Fig. 1, the cross-section being shown in two halves, namely a cross-section along the line 0—7 in the left part of Fig. 5 and a cross-section from 7—10 in the right-hand part of Fig. 5.

The ship according to the invention, as may be seen from Figs. 1—5, is so designed that the upper edge of the under-water hull 1, when the ship is in the normal trim position in still water, is in exact alignment with the surface of the water, and the upper edge of the hull, being shown in side view, is designed as a straight line and the maximum cross-section of the under-water hull is located in front of the middle of the ship. The under-water hull is substantially fusiform, the longitudinal axis passing through the stern end 4 of circular cross-section, is arranged lower than the corresponding axis of the bow end 3. The apex of the bow end 3 is slightly rounded: the limiting edges 5, 6 of the bow end merge with slight curvature into the keel line 9 and the upper edge 10 of the under-water hull.

The apex of the stern 4 is connected by a slightly curved portion 7 with the end point of the above-water superstructure 2 and by a slightly curved portion 8, with the substantially straight keel line 9.

The above-water superstructure 2 does not extend, towards the bow, beyond the part of the cross-section (at 7); the middle of the upper edge of the superstructure is straight and towards the bow and the stern curves uniformly towards the under-water hull. When the ship is in normal trim in quiet water, no part of the superstructure is immersed in the water (Fig. 1).

The plan of the superstructure can be seen in Fig. 2. In the middle part the plan is bounded laterally by straight lines, whereas, towards the bow, it ends in a slender point, and towards the stern in a blunter point.

The sections shown in Figs. 3 and 4 along the line 12—12 and line 4—4 of Fig. 1 clearly show the form of the longitudinal section of the under-water hull, and needs no further explanation.

The cross-sectional form of the hull is shown in Fig. 5. In the vicinity of the point of the bow the under-water hull is of circular cross-section, as shown in the cross-sections along the lines $9\frac{3}{4}$, $9\frac{1}{2}$ and $9\frac{1}{4}$; at the same time the circumference of the hull increases. In the case of sectional line 9, the cross-sectional form is no longer exactly circular, but approximates to a vertical ellipse whose lower cross-sectional half is greater than the upper cross-sectional half. In the sectional lines $8\frac{1}{2}$ and 8 the elliptical or oval is still more strongly pronounced; in this case the lateral lines of the cross-section approximate to straight lines, whereas the bottom has a clear flattening. In the cross-sections $7\frac{1}{2}$ and 7 the straight course of the lateral edges and the flattening of the bottom is still more clearly pronounced (Fig. 5 right half). At the top the cross-section is no longer strongly rounded, but it has a flat end.

At the line 7 the position of maximum cross-section is reached, and then alters mainly in that the under-water hull is provided at the top with a flat surface corresponding to the plan surface of the superstructure, which surface first of all broadens laterally, then remains constant, and then decreases laterally. Accordingly, the cross-sectional form widens at the top from line 7 to line 4. From cross-section 6 substantial tapering of the upper cross-sectional halves takes place, so that here the cross-section assumes a pear shape. The tapering of the upper halves continues as far as the end of the stern, and from about cross-section $2\frac{1}{2}$ onwards there is a strong diminution of the cross-sectional height. At cross-section $\frac{3}{4}$ for instance, the form is again elliptical, and at the cross-sections $\frac{1}{2}$ and $\frac{1}{4}$ as far as the end of the stern the cross-section is again circular.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. An ocean-going ship having a fusiform under-water hull and an above-water superstructure placed directly thereon, characterised in that the upper edge of the under-water hull when viewed from the side—apart from portions leading to the point of the bow and to the point of the stern—is of rectilinear form and is disposed at the water-line when the ship at rest is in the normal trimmed position, the cross-section of the under-water hull being circular at the front part of the bow and at the rear part of the stern, whereas the cross-section of the under-water hull in the middle part has

the form of an ellipse with a vertical major axis, whilst the above-water superstructure extending over the middle part of the under-water hull is designed as a stream-lined body.

2. A ship according to Claim 1, characterised in that the horizontal axis passing through the point of the stern of the under-water hull is arranged lower than the horizontal axis passing through the point of the bow of the under-water hull.

3. A ship according to Claim 1 or 2, characterised in that the vertical cross-section of the under-water hull seen from bow to stern, at the beginning of the superstructure merges from an initially circular form, by progressive increase of the cross-sectional circumference, into the form of a vertical oval with flattened lower edge, the upper edge thereof likewise being flattened in the region of the superstructure, whilst the cross-sectional shape, seen from the end of the superstructure to the point of the stern, has the shape of a vertically disposed pear which by progressive decrease in height merges into the circular cross-sectional form of the gradually tapering stern.

4. A ship according to any one of the preceding claims, characterised in that the under edge of the under-water hull, seen in side view, apart from the bow which is conical in side view, and the conical stern, is straight.

5. A ship according to any one of the preceding claims, characterised in that the under-water hull is rounded off at the bow end, whereas it ends in a sharp point at the stern end.

6. A ship according to any one of the preceding claims, characterised in that the superstructure which protrudes above the level of the water has an area which is bounded in its middle part by parallel lateral lines which converge towards the bow and towards the stern in a gentle curve, while the middle part of the superstructure, seen from the side, has a straight upper edge and runs towards the bow and towards the stern in a convex curve to the under-water hull, the superstructure being carried at the utmost as far as the point of maximum cross-section of the under-water hull.

7. A ship according to any one of the preceding claims, characterised in that the lateral surfaces of the front and rear part of the superstructure are curved gently outwards and converged roof-wise in the symmetrical plane of the ship.

8. A ship according to any one of the preceding claims, characterised in that the superstructure fitted on the under-water hull extends towards the bow and towards the stern not further than the ends of the straight part of the upper edge of the under-water hull.

Dated this 20th day of January, 1936.

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W.C.2.

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Fig. 1

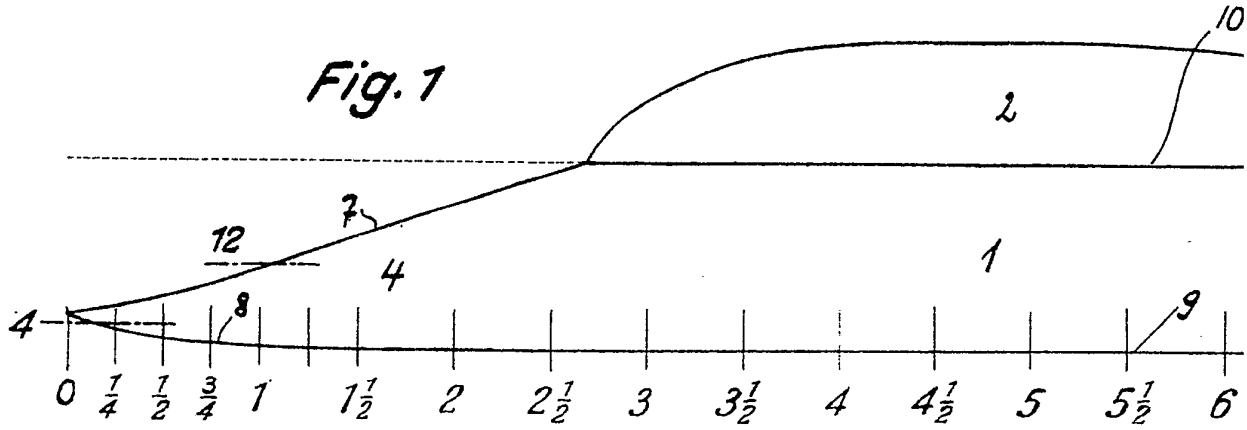


Fig. 2

Fig. 3

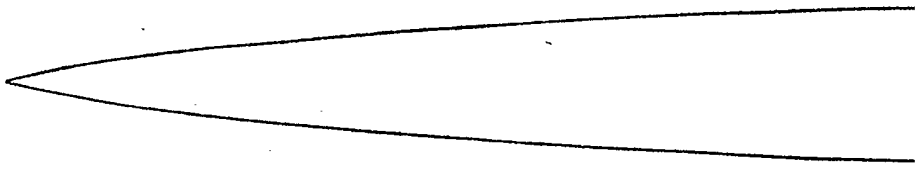
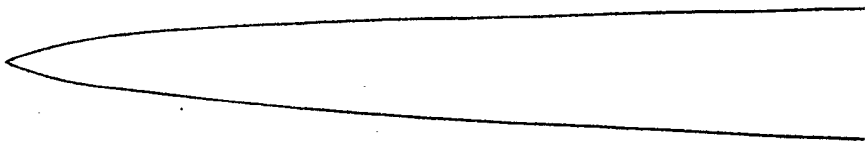
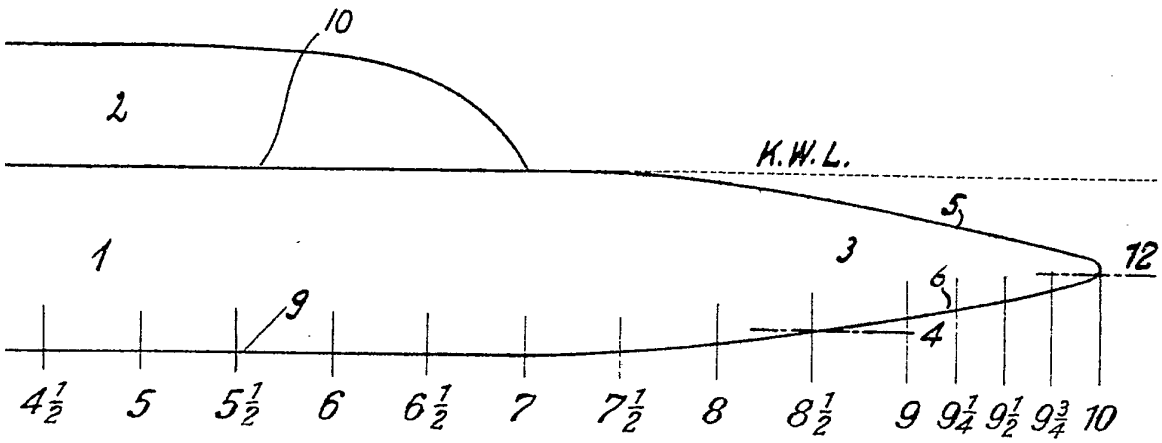
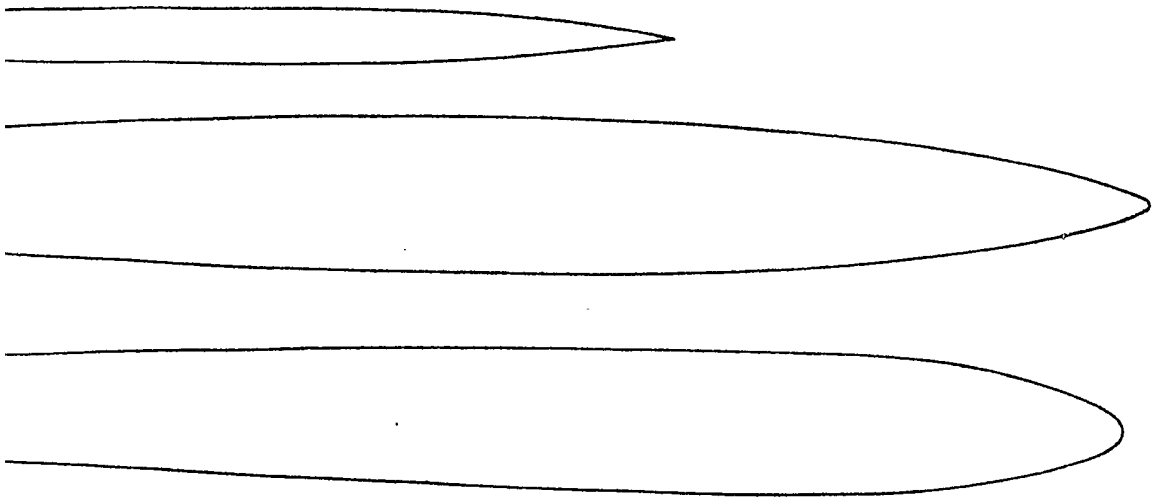


Fig. 4







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[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1

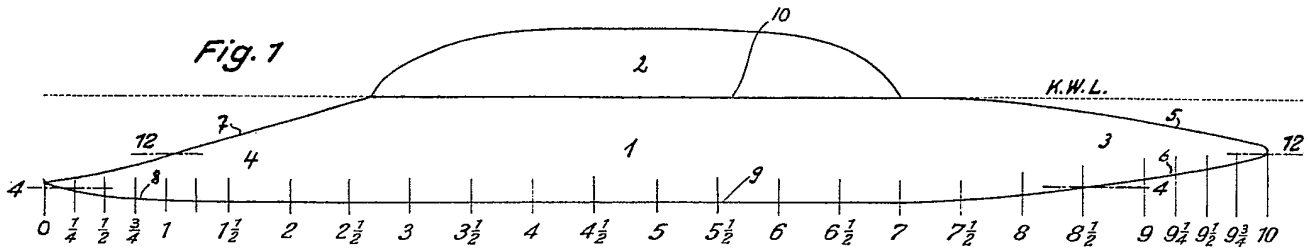


Fig. 2

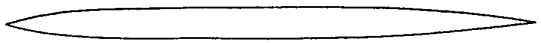
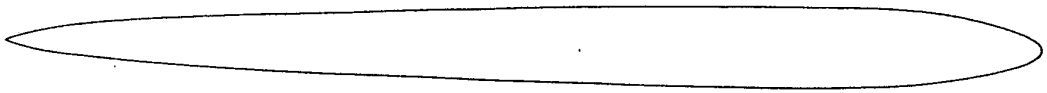


Fig. 3

Fig. 4



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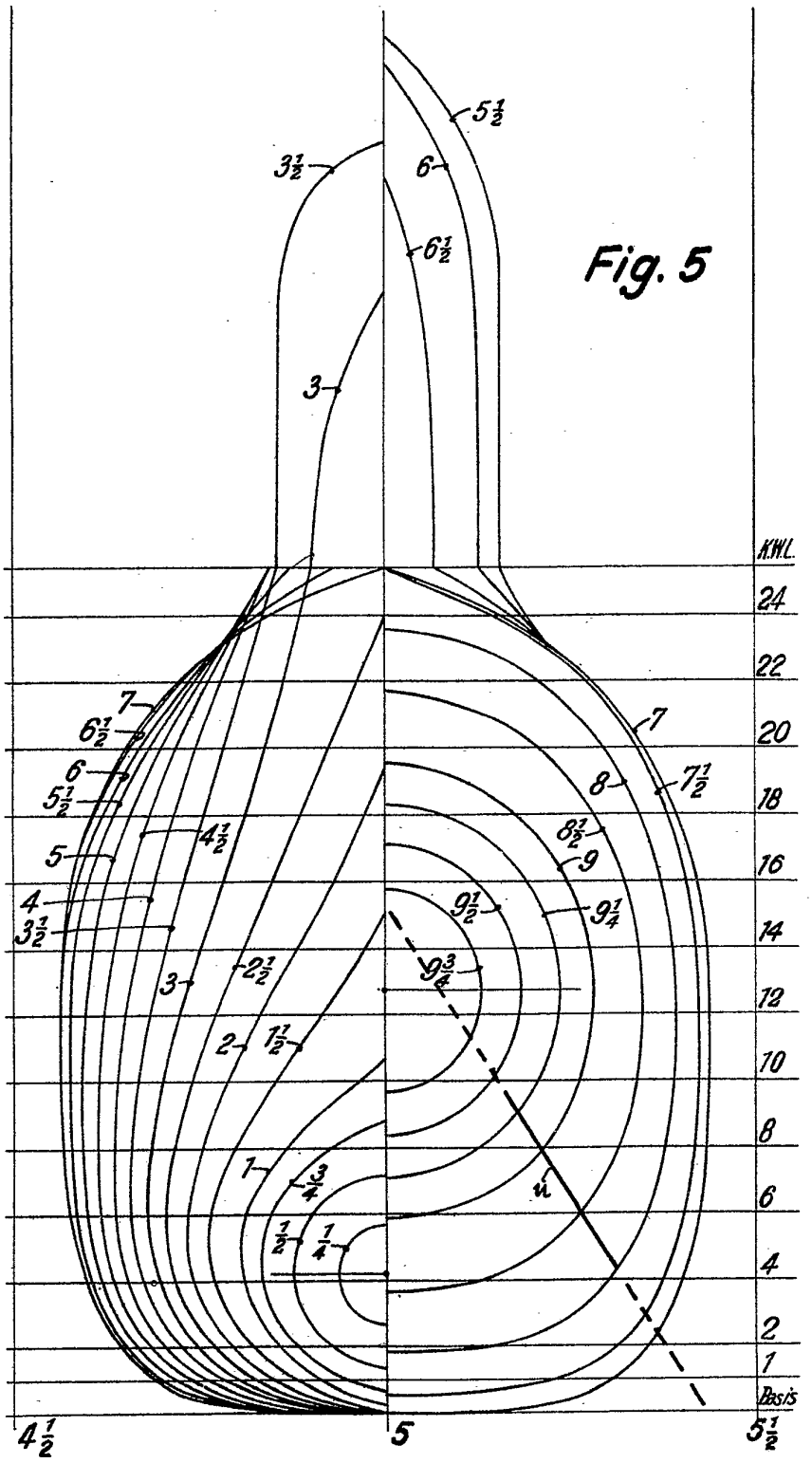

Fig. 5

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