O. FLAMM.

SUBMARINE BOAT.

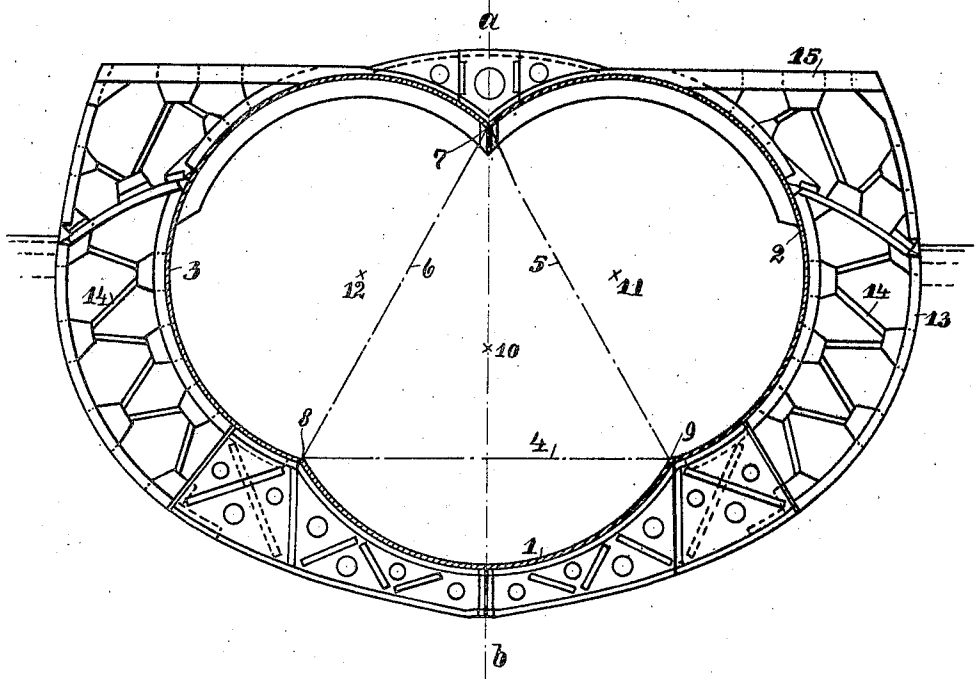
APPLICATION FILED MAY 6, 1921.

1,429,941.

Patented Sept. 26, 1922.

2 SHEETS—SHEET 1.

Fig. 1



Inventor:

Oswald Flamm

By Lawrence Langner

Atty

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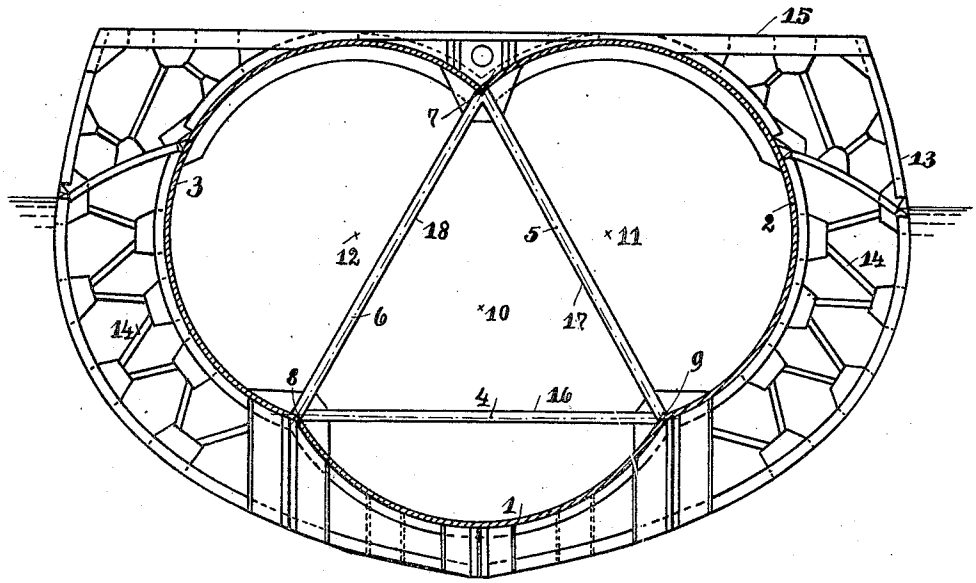
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2 SHEETS—SHEET 2.

Fig. 2



Inventor:

Oswald Flamm

By Lawrence Langner Atty.

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UNITED STATES PATENT OFFICE.

OSWALD FLAMM, OF NICOLASSEE, NEAR BERLIN, GERMANY.

SUBMARINE BOAT.

Application filed May 6, 1921. Serial No. 467,439.

To all whom it may concern:

Be it known that I, OSWALD FLAMM, a citizen of the German Republic, and resident of Nicolassee, near Berlin, German Republic, have invented certain new and useful Improvements in Submarine Boats (for which I have filed application in Germany April 22, 1918), of which the following is a full, clear, and exact description.

It is known that with the increasing dimensions of submarine boats difficulties arise in two respects: on the one hand the diameter of the pressure body grows so that the water, in which the submarine is still able to travel and to immerse, must be rather deep: further with the increasing diameter of the circle of the pressure body at a given depth of immersion the thickness of the wall of the pressure body and the strength of the ribs and other stiffenings built in the body increase, and lastly it is very desirable in regard to the stability under water to arrange the centre of displacement of the pressure body as high as possible in the ship. The attempts to reduce the draught have frequently been made by the provision of an elliptical cross section of the pressure receiving body with the major axis in the horizontal plane. But as is known this has the disadvantage of considerably enlarging the constructional parts of the pressure body, moreover nothing is gained with regard to the position of height of the centre of displacement of the pressure body, which remains at half the height of the vertical axis of the ellipse.

It has previously been proposed to construct the hull of a submarine or other boat with a series of cylindrical or partly cylindrical closed compartments which are filled with air or gas at a pressure greater than atmospheric pressure to assist in resisting the external pressure on the hull. Two or more of such compartments may be arranged symmetrically side by side or four of such compartments formed of tubes each of which is a little more than a half tube that is slightly more than a semicircle, may be arranged symmetrically in superimposed parts on each side of the keel, the edges of the tubes at the ends of the chords of the arcs being connected by horizontal and vertical ties, in the form of a cross, the compartments being thus arranged around a rectangle formed by the chords of said arcs. These compartments are intended to be used as cargo holds.

The object of my invention is to provide a construction of the hull of a submarine which will be of a greater strength for a given weight and displacement than the single circular or elliptical shell and by the utilization of a small radius of curvature of the pressure body for the scantlings, to obtain the advantage of stability and shallow draught for submarines of any desired dimensions. According to the present invention this is attained by forming the pressure body of single circular arches or the like, set one upon each of the sides of a triangle or a polygon in section which may form the corresponding girders.

In forming the cross section of the pressure body in such a way it is possible, according to the number, distribution, and the extent of the radius of the arches of the cross section, to influence according to choice the position of height of the centre of displacement and gravity for the stability, to reduce the draught, and to decrease the strength of the constructional parts.

In order to render my invention more easily understandable reference is had to the accompanying drawings, in which Fig. 1 illustrates a cross section of a two shell submarine boat according to this invention and Fig. 2 a cross section of a modification.

In such a construction each part of the pressure body consists in its cross section of a circle with small radius of curvature described over the side of the triangle or polygon. In this case the sides of the polygon, formed as a triangle, may be chosen at will according to the dimensions and the other conditions to be fulfilled by the boat. Accordingly an isosceles triangle with a narrow base line and with the apex uppermost may be chosen and semicircles or the like for the parts of the pressure body described over and above the sides, or a broad base line may be selected and the semicircles or the like described over the sides. In this case the centres of the circles lie on the sides of the triangle. But it is also possible for influencing the centre of displacement as regards height and the draught to locate, for instance, the centres of the circles or the like to be described over the sides outside of the triangle or polygon so that the side of the triangle or polygon forms a chord in the circle. Further one may locate the centre of the circle within the triangle or polygon, so that the side of the triangle or polygon, re-

spectively also forms a chord, but in the outer semicircle, and finally both arrangements may be combined in one and the same boat as, for instance, is shown in the figures.

If the cross section is formed of more than three arcs the construction is based upon a four, five, or more cornered polygon. The centres of the arcs may be disposed on the sides of the polygon, outside or inside the polygon.

Referring to Fig. 1 the cross section of the pressure body is composed of three circles, 1, 2 and 3, which are symmetrically displayed on either side of the vertical axis *a*—*b* of the submarine.

The construction of the circles is based upon a geometrical triangle, 4, 5 and 6, with its apex 7 uppermost and its corners, 8, 9, on the bottom. The centre of the lower circle 1 is located at 10 within the triangle, and the centres of the upper circles, 2 and 3, are located at 11 and 12 respectively outside of the triangle.

By such a shape it would be possible, for example, at a given volume of the pressure body to raise the centre of displacement, to lower the centre of gravity owing to the greater scantlings of the lower circle, and thus to improve the stability of the submarine body and at the same time diminish the draught. In spite of this the thickness of the walls required for the shell plating of such a pressure receiving body would be smaller than that required for a pressure body of a simple circular form. When armouring the over-water parts of the submarine boats, and employing heavy guns positioned on deck, the higher position of the centre of displacement of the pressure receiving body is most important. At the same time the lowering of the centre of gravity of the pressure receiving body shell by the light construction of the upper part (small radius of curvature) and the somewhat greater width of the wall of the under part may be simultaneously obtained if for the purpose of diminishing the draught the centre of the circle forming the under side is placed within the triangle or the polygon (greater radius of curvature).

Fig. 1 represents a cross section of a double shell submarine boat, the pressure body of which is surrounded by a second shell 13 connected up with the pressure receiving body by means of stiffeners, 14, 15, in the deck of the boat. The shell 13 is not necessary at all and may be omitted if, for instance, single shell boats are to be built. The shell 13 forms no part of the invention. On the junction points of the arcs channels are formed.

In order that the water in the upper channel between the circular arches may rapidly escape when the boat rises over and above the water level it is advisable to provide properly arranged draining pipes, which may be fitted with controlling valves.

According to the modification shown in Fig. 2 the junctions of the arc members are connected up by stiffeners, 16, 17, 18, which, as may easily be seen, follow the lines of the supposed triangle forming the basis of construction for the arcs of the pressure receiving body.

These girders advantageously support the construction of the pressure receiving body as they form stiffenings between the junction points of the arcs. The girders 17 and 18 may be advantageously embodied as draining pipes by being made hollow.

I claim as my invention:—

1. In a submarine boat the arrangement of the shell plating which forms the pressure body of the submarine and consists of a number of single circular arcs disposed one over each of the sides of a triangle, the provision of a girder construction, the girders following the sides of the triangle and forming draining appliances for leading off the water collected in the upper channel of the rising submarine boat, substantially as described.

2. In a submarine boat the arrangement of the shell plating which forms the pressure body of the submarine comprising a number of single circular arcs disposed one over each side of a triangle, substantially as described.

3. A submarine boat comprising a pressure chamber having a cross section made up of a plurality of circular arcs the chords of which form the sides of a triangle.

In testimony whereof I affixed my signature in the presence of two witnesses.

OSWALD FLAMM.

Witnesses:

VIFU M. LUBIN,

D. RICHARD GUINTER.