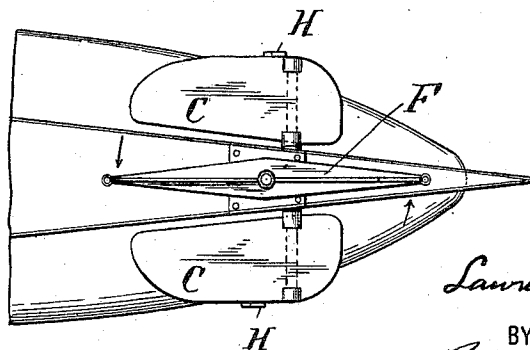
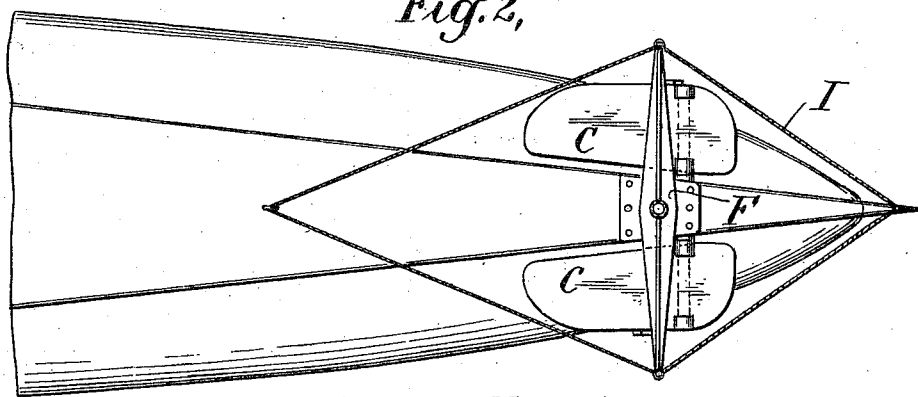
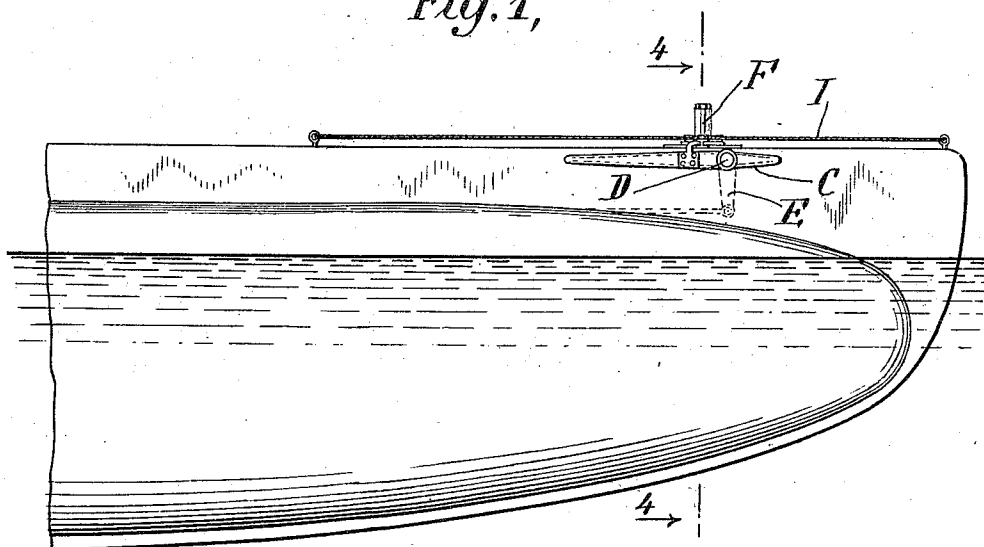


973,227.

2 SHEETS--SHEET 1.



M. L. Owen.
B. T. O'Keefe

Lawrence G. Spear

BY
Rennie Goldsborough
 her ATTORNEYS

L. Y. SPEAR.
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 APPLICATION FILED MAY 10, 1910.

973,227.

Patented Oct. 18, 1910

2 SHEETS-SHEET 2.

Fig. 4.

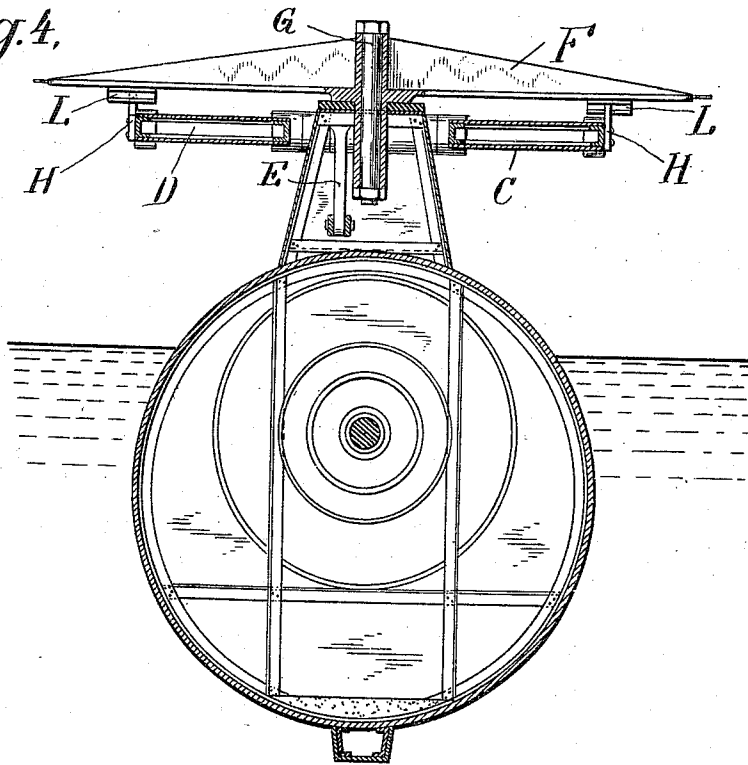
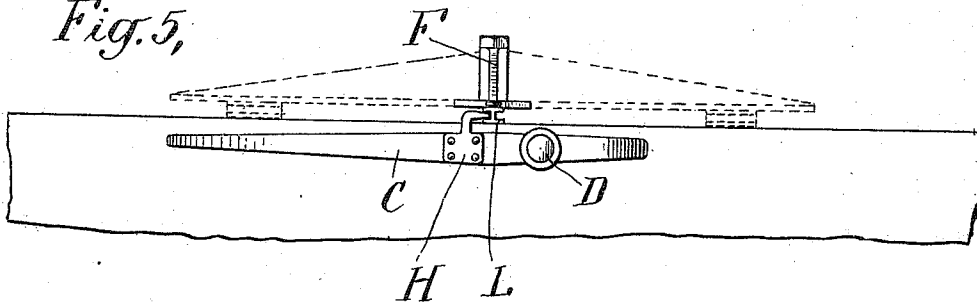


Fig. 5.



WITNESSES:
 M. L. Owen.
 C. T. O'Keeffe

INVENTOR
 Lawrence Y. Spear
 BY
 Percival H. Hildborough
 his ATTORNEYS

UNITED STATES PATENT OFFICE.

LAWRENCE Y. SPEAR, OF QUINCY, MASSACHUSETTS, ASSIGNOR TO ELECTRIC BOAT COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

SUBMARINE BOAT EQUIPPED WITH SUBMERGING-PLANES.

973,227.

Specification of Letters Patent.

Patented Oct. 18, 1910.

Application filed May 10, 1910. Serial No. 560,442.

To all whom it may concern:

Be it known that I, LAWRENCE Y. SPEAR, a citizen of the United States, residing at Quincy, county of Norfolk, State of Massachusetts, have invented certain new and useful Improvements in Submarine Boats Equipped with Submerging-Planes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to the mounting and protection of submerging planes on submarine boats.

It is usual and customary to fit upon submarine and submersible vessels, projecting planes variously designated as horizontal rudders, inclining planes, stability planes, hydro-planes, submerging planes, etc., and which I shall hereafter refer to as submerging planes. These are usually mounted upon a horizontal axis, at right angles, or nearly so, to the vertical medial fore and aft plane of the vessel, and are usually arranged so that the inclination of the planes to the horizontal, can be suitably controlled. In exceptional cases, such planes are set at a fixed angle, no provision being made for changing their angle to the horizontal. Ordinarily these planes perform no functions when the vessel is operating on the surface with considerable buoyancy, their usefulness being limited to those periods when the vessel is operating with small buoyancy either at the surface, or submerged. Obviously, these fittings, when under water, increase the resistance of a vessel and hence decrease her speed. Because of this, and for the purpose of making them readily accessible, it is of advantage to fit them at such a level that they are entirely out of water when the vessel is operating on the surface with considerable buoyancy. It is a fact, moreover, that the stresses on the planes, when they are performing their normal functions in connection with the vertical control of the vessel and its fore and aft inclination, are not necessarily great, but if the planes are located as just indicated, they become subject to considerable stresses, due to the force of the waves striking them, and also to shocks received by collision with other vessels, docks and so forth.

The object of the present invention is to provide a suitable and convenient guard for the submerging planes, generally applicable whatever may be the position in which they are mounted with respect to the hull, and adapted to protect the planes from injury in striking against outside objects; and more specifically to provide an arrangement in which the planes are so mounted with respect to the hull as to be out of water when the vessel is operating on the surface with considerable buoyancy, additional provision being made in that case from the stresses arising from the beating of waves against the planes. To this end, I provide a guarding mechanism for the planes, of a movable or collapsible character, so that it may be shipped, that is, set or fitted in a prepared place on the vessel when the planes are under water, and may be fixed transversely of the vessel to guard the planes when they are out of water; whereby a suitable guarded mounting of the planes is attained while at the same time avoiding, as far as possible, any increase in the resistance of the vessel when submerged, and any interference with the efficiency of the planes.

In order to elucidate the nature of the invention, as stated above, reference is made to the accompanying drawings which illustrate in detail a preferred embodiment, and one in which the planes are out of water at such times as the vessel is operating with reserve buoyancy on the surface.

Figure 1 shows in elevation one end of a submarine or submersible boat equipped with submerging planes and a protecting guard in accordance with the invention, and Fig. 2 is a plan of the same parts. In these figures the guard is shown in position to protect the planes. Fig. 3 is a plan on a smaller scale, showing the guard boom in its shipped position. Fig. 4 is a section on the line 4-4 of Fig. 1 on a somewhat larger scale, and Fig. 5 is a detail view. In these Figs. 4 and 5, the guard boom is shown in position to protect the planes, and in Fig. 5 the shipped position is indicated in dotted lines.

In the various views the submerging planes are designated by C. Those illustrated are of the movable type, that is, they are mounted on an axis D, journaled in the superstructure of the bow near the upper

edge and transversely thereof, and the inclination of the planes may be altered at will, as for example, by a lever-arm E, connected to an actuating rod extending within the hull of the vessel. For the purpose of protecting the planes, I pivot a stiff boom or guard F on a pivot G, supported vertically in the superstructure. The guard F is of such length that when in use it projects beyond the outer edges of the planes C as a protection to the same. This protection may conveniently be increased, and the boom F stayed, by running heavy guy lines or rods from the outer ends of the boom to suitable anchorages on the vessel. Where maximum protection is desired, such guys may be run from each end of the boom, both forward and aft, as indicated in Figs. 1 and 2, but the two sets are not essential to the invention, and one or both sets may be dispensed with if desired. These guys, which are preferably of heavy wire rope, serve the double purpose of holding the guard F in position (to which end they may be assisted by suitable stops fitted at the pivot) and as a fender to prevent striking the edges of the planes against other vessels, docks, and so forth.

The boom or guard is preferably mounted immediately above and in close proximity to the planes, so that when the under surfaces of the planes are subjected to blows, as from waves striking against them when the planes are out of water, the stresses thus brought upon the planes and their supporting axis, will be taken up by contact between the lower face of the boom, or projections thereon, and the upper surfaces of the planes. Mechanism for in like manner supporting the planes against the force of blows striking on their upper surfaces, may conveniently be associated with the boom. One suitable arrangement of such means is indicated in the drawings, see particularly Fig. 5, where each of the planes has attached to its outer edge, a hook-plate H. At a point on the under surface of each limb of the boom, in position to be engaged by the nose of the hook on plate H, is secured a section L of I-beam. These sections receive the noses of the two hook-plates H, and thereby support the planes and enable them to resist the force due to waves striking on their upper surfaces, and at the same time the sections L conveniently serve as rests for the boom on the superstructure of the vessel when it is shipped. By thus affording strengthening means for the planes against the force of the waves, it becomes possible to design the planes primarily to withstand the stresses which they are subjected to in performing their normal functions in connection with the vertical control of the vessel and its fore and aft inclination, relying upon the additional sup-

port of the boom to enable them to withstand the extraordinary stresses to which they may be subjected when out of water. When the boat is to be submerged, and the planes are to be used, the guys are unhooked as necessary, and the boom F is swung about its pivot G into its fore and aft position, and is shipped on the superstructure of the vessel, as indicated in Fig. 3, and by the dotted lines in Fig. 5. As that position coincides with the line of advance of the vessel, the resistance due to the presence of the guard is reduced to a minimum, and the planes are free to work in the water.

I have thus stated generally, the nature of the invention and its advantages, and further exemplified it by a detailed description of a preferred embodiment, but it will be understood that the invention is of such character that it may be embodied in very many equivalent forms.

It is not essential that the boom be made in a single piece pivoted on the top of the superstructure. It might obviously be made in two pieces hinged to the superstructure or other portion of the vessel, this depending upon the position in which the planes are mounted; but the preferable arrangement is that in which the planes are fitted high up on the superstructure, for the reasons set forth above.

What I claim is:

1. A submarine or submersible boat having submerging planes, in combination with mechanism for supporting the planes against the blows of waves on their under surfaces when they are out of water, said mechanism comprising a transversely extending structure lying closely above the planes so that it will receive the thrust of blows directed against their under surfaces.

2. A submarine or submersible boat having submerging planes, in combination with mechanism for guarding said planes and for supporting them against the blows of waves on their under surfaces when they are out of water, said mechanism comprising a transversely extending structure which projects beyond the outer edges of the planes to guard them from collision and which lies closely above the planes so that it will receive the thrust of blows directed against their under surfaces.

3. A submarine or submersible boat having submerging planes, in combination with mechanism for guarding said planes and for supporting them against the blows of waves when they are out of water, said mechanism comprising a transversely extending structure which projects beyond the outer edges of the planes to guard them from collision and which lies closely above the planes so that it will receive the thrust of blows directed against their under surfaces and additional supporting means associated

with the said structure to receive the thrust of blows directed against the upper surfaces of the planes.

5 4. A guard for submerging planes of submarine or submersible boats comprising a boom pivoted on the superstructure so that it may be swung into a transverse position to guard the planes, or shipped in position along the superstructure where it offers little resistance to the water.

10 5. A guard for submerging planes of submarine or submersible boats comprising a boom pivoted on the superstructure so that it may be swung into a transverse position to guard the planes or shipped in position along the superstructure where it offers little resistance to the water, and guy-wires extending from the vessel to the boom to stay the boom and serve as fenders for the planes.

20 6. A submarine or submersible boat having a narrow superstructure along the end portion of the hull, submerging planes mounted on the superstructure near its upper edge, and a boom pivoted on the upper

surface of the superstructure above the planes so that it may be swung into a transverse position to guard the planes or shipped in position along the top of the superstructure where it offers little resistance to the water.

30 7. A submarine or submersible boat having submerging planes so fitted as to be well out of water when the boat is running on the surface with considerable buoyancy, in combination with a guard for the planes movably attached to the boat and being capable of being brought into position to guard the planes when they are out of water, or of being shipped in position to offer little resistance to the water when the planes are under water and in use.

40 In testimony whereof I affix my signature, in presence of two witnesses.

LAWRENCE Y. SPEAR.

Witnesses:

W. D. FESLER,
F. L. BRAKE.