E. SCHNEIDER.

CONSTRUCTION OF WATER BALLAST TANKS FOR SUBMARINE AND OTHER SUBMERGIBLE FLOATING STRUCTURES.

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1,310,877.

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Fig. 1.

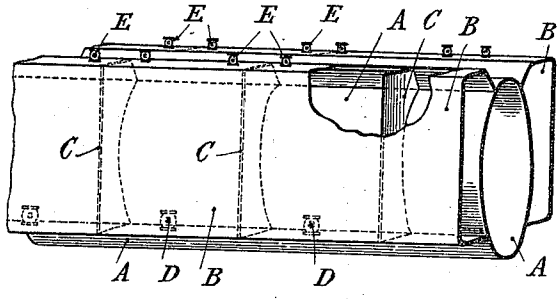


Fig. 2.

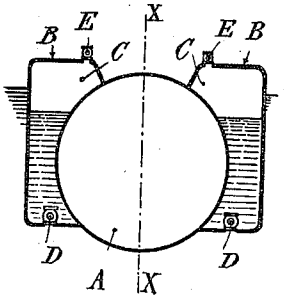


Fig. 3.

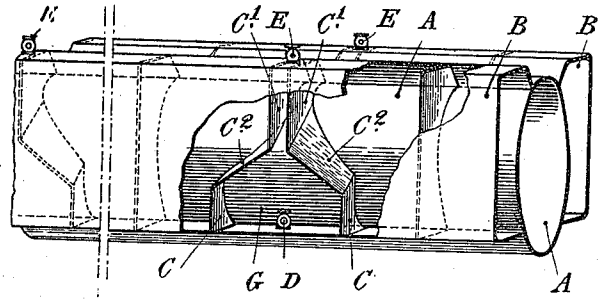


Fig. 4.

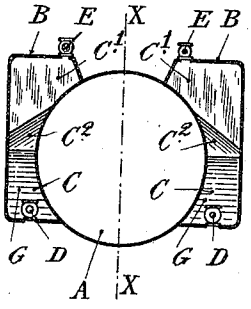


Fig. 5.

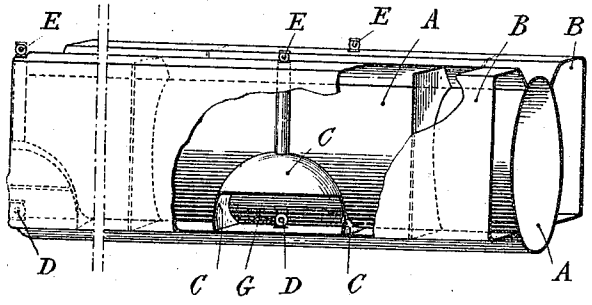
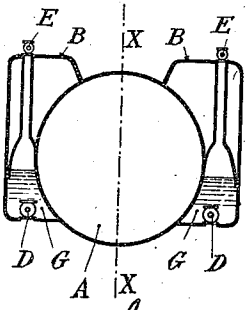


Fig. 6.



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UNITED STATES PATENT OFFICE.

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CONSTRUCTION OF WATER-BALLAST TANKS FOR SUBMARINE AND OTHER SUBMERGIBLE FLOATING STRUCTURES.

1,310,877. Specification of Letters Patent. Patented July 22, 1919.

Application filed February 11, 1916. Serial No. 77,713.

To all whom it may concern:

Be it known that I, EUGÈNE SCHNEIDER, a citizen of the Republic of France, residing at Le Creuzot, France, have invented a new and useful Improved Construction of Water-Ballast Tanks for Submarines and other Submergible Floating Structures, which is fully set forth in the following specification.

This invention has for its object to provide an improved construction of submarines which will allow of reducing the length of time required to cause such vessels to sink from the half-submerged position of navigation on the surface (with reduced buoyancy) into the position of complete immersion.

The manner in which this invention is to be performed is illustrated in the accompanying diagrammatic drawings in which:

Figures 1 and 2 are respectively a perspective side elevation partly in section and a vertical cross-section of the ordinary construction of the ballast tanks of a submarine.

Figs. 3 and 4 are similar respective views of one constructional example of the present invention, and

Figs. 5 and 6 are similar respective views of another constructional example of the present invention.

In a submarine the ballast tanks, by filling which the submarine is enabled to be sunk from the position of surface navigation into the position of submersion, are provided in the space comprised between the inner and outer shells A and B of the hull of the submarine. As shown in Figs. 1 and 2 this space is sub-divided by vertical bulkheads C extending at right angles to the longitudinal plane X—X of the submarine. The ceiling or upper wall of the tanks thus formed is constituted by the outer shell B the sections of which taken in planes parallel to the plane X—X are approximately horizontal, rendering it difficult to discharge the air therefrom and necessitating the provision of air discharge ducts at both ends of each tank.

Each tank or compartment of the total ballast space has generally a water inlet cock D at its lower portion, and preferably a number of air outlet cocks E at its upper portion. In the filling operation the water enters through the inlet D with a velocity that varies at the same rate as the difference between the level of the water outside the ballast tank, *i. e.* the level of surface navigation of the submarine and the level of the water inside the ballast tank. This difference of levels diminishes as the tanks gradually fill so that the velocity of the inflow of the water into the tank is much less toward the end of the filling of the tank than it was at the beginning.

This diminution of velocity of inflow is a great risk for the submarine, especially in cases where it is required to sink the submarine from a position of surface navigation at half immersion into a position of navigation with complete immersion.

It often happens that in order to take advantage of navigation at the surface while keeping in reserve the power of rapid descent into the position of complete immersion, the submarine is navigated in a position of semi-immersion with reduced buoyancy by having all its ballast tanks partly full. Now the portion of the ballast tanks that remains to be filled up is just the upper portion which fills up most slowly. Besides, the complete discharge of the air which is necessary to allow the water to enter takes place slowly and with difficulty because the upper portion of the ballast space is approximately horizontal.

Now according to that modification of the present invention which is exemplified in Figs. 3 and 4, a suitable number of special ballast tanks that are intended to be used for the purpose of sinking the submarine from its semi-submerged position of surface navigation into the position of navigation with complete immersion, are provided at suitably selected points in the submarine and so constructed that they may be partially filled to allow of semi-submerged navigation, while the other ballast tanks are kept quite full; the rapid filling of the partly filled special ballast tanks for the purpose of complete immersion of the submarine being obtained owing to the contraction of their upper portions through the use of con-

tinuous or interrupted stretches of sloping partitions.

In Figs. 3 and 4, G is one of these special ballast tanks. It is separated from the adjacent tanks by two bulkheads each composed of two vertical partitions C and C′ connected by a partition C^2 which is steeply inclined to both the longitudinal and transverse planes of the submarine; the upper partitions C′ being also arranged much closer together than are the partitions C. The consequence of this construction is that the upper space of the ballast tank G has a very small capacity compared with that of its lower space which has a large filling head. Further, since the air contained in the said tank encounters in escaping only surfaces that are vertical or at least have a steep upward slope, the said escaping air will be readily discharged through a single aperture E.

It will therefore be readily understood that if one or more such ballast tanks G, suitably situated, are kept only partly filled for navigation with semi-immersion, while the other ballast tanks are quite full, then the complete filling of the tanks G, and consequently the sinking of the submarine into the position of complete immersion, will be effected very quickly.

The invention may also be performed by constructing the bulkhead at one side of each ballast tank G of a single straight vertical partition C and constructing only the bulkhead at the other side of the same tank G in the improved manner hereinbefore set forth. In other words, this would be equivalent to providing a ballast tank for semi-immersion similar to the one or the other of the semi-immersion half tanks that would be produced by sub-dividing the special ballast tank G of Figs. 3 and 4 into two by a central vertical partition.

According to the modification illustrated in Figs. 5 and 6, a special semi-immersion tank may be constructed by separating out from the lower portion of the ordinary ballast tank of a submarine a chamber G of suitable capacity by means of a partition C of any suitable shape steeply convex toward its top; an air outlet pipe E being provided at the top of the chamber. Such a chamber G can be used in the same way as hereinbefore described as a special ballast tank for semi-immersion.

As a matter of fact water ballast tanks for semi-immersion may be constructed according to this invention in various ways provided that all the constructions adopted shall comprise, as regards each such ballast tank, a chamber the lower portion of which is of great capacity and is connected to an upper portion of small capacity. This said upper portion may, if desired, consist simply of a discharge pipe of suitable diameter.

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

1. In a submarine, a ballast tank subdivided to provide a plurality of tanks coextensive in depth, one of said subdivisions having a lower portion of large capacity and an upper air-outlet portion of small capacity.

2. In a submarine, a ballast tank subdivided to provide a plurality of tanks coextensive in depth, one of said subdivisions having approaching walls leading to an upper air-outlet of small cross-section.

3. In a submarine, a ballast tank subdivided to provide a plurality of tanks coextensive in depth, one of said subdivisions having walls which approach both longitudinally and transversely and lead to an upper-air-outlet of small cross-section.

4. In a submarine, a ballast tank subdivided to provide a plurality of tanks coextensive in depth, one of said subdivisions having a lower portion of large capacity connected by approaching walls to an upper air-outlet portion of small capacity.

5. In a submarine, a ballast tank subdivided to provide a plurality of tanks coextensive in depth, one of said subdivisions having approaching walls to facilitate the rapid filling thereof.

6. In a submarine, in combination with a main ballast tank to obtain semi-submersion, a tank to be filled for complete submersion and comprising a portion of large capacity approximately at the level of the lower portion of said main ballast tank, said second tank having approaching walls leading to an air-outlet of small cross-section.

7. In a submarine, in combination with a main ballast tank to obtain semi-submersion, a tank to be filled for complete submersion and comprising a lower portion of large capacity positioned relatively low in the vessel whereby the same may be completely filled under a large filling head, said lower portion being connected to an upper air outlet portion of small capacity.

8. In a submarine, in combination with a main ballast tank to obtain semi-submersion, a tank to be filled for complete submersion and comprising a lower portion of large capacity positioned relatively low in the vessel whereby the same may be completely filled under a large filling head, said lower portion being connected by approaching walls to an upper air-outlet portion of small capacity.

9. In a submarine, in combination with a main ballast tank to obtain semi-submersion, a tank to be filled for complete submersion and having the major portion of its capacity approximately at the level of the lower portion of said main ballast tank.

10. In a submarine, in combination with a main ballast tank to obtain semi-submersion,

a tank to be filled for complete submersion contracted intermediate its length so as to provide a lower portion of large capacity and an upper air-outlet portion of small capacity.

11. In a submarine, in combination with a main ballast tank to obtain semi-submersion, a tank to be filled for complete submersion contracted by approaching walls intermediate its length so as to provide a lower portion of large capacity and an upper air-outlet portion of small capacity.

In testimony wherof I have signed this specification in the presence of two subscribing witnesses.

EUGÈNE SCHNEIDER.

Witnesses:
CHAS. P. PRESSLY,
EMILE BERTRAND.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents. Washington, D. C."