

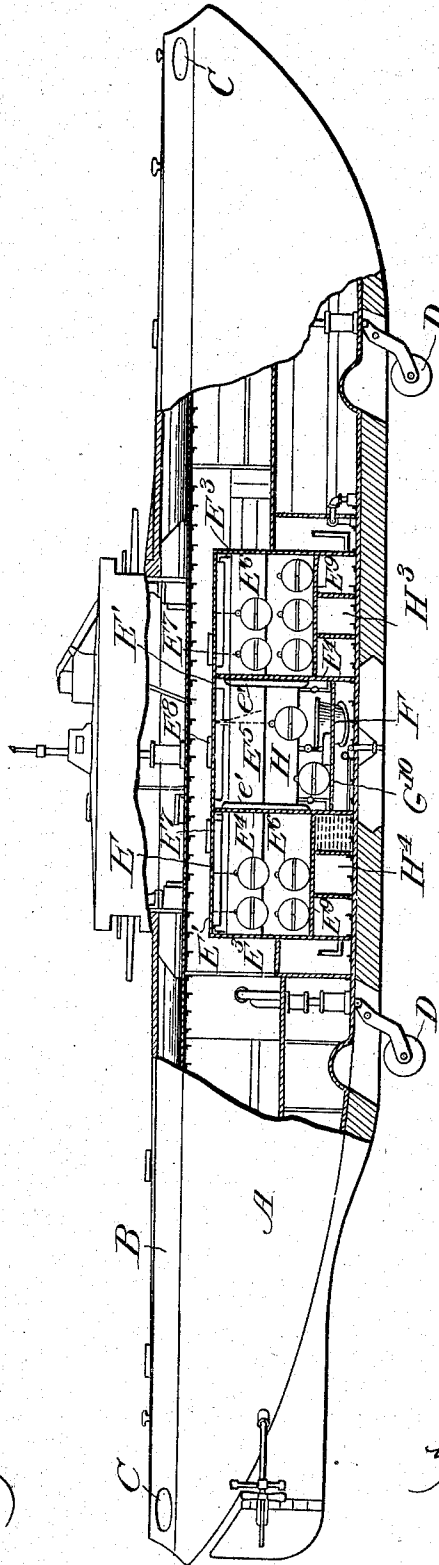
S. LAKE.
SUBMARINE VESSEL.
APPLICATION FILED JUNE 4, 1907.

947,921.

Patented Feb. 1, 1910.

4 SHEETS—SHEET 1.

Fig. 1.



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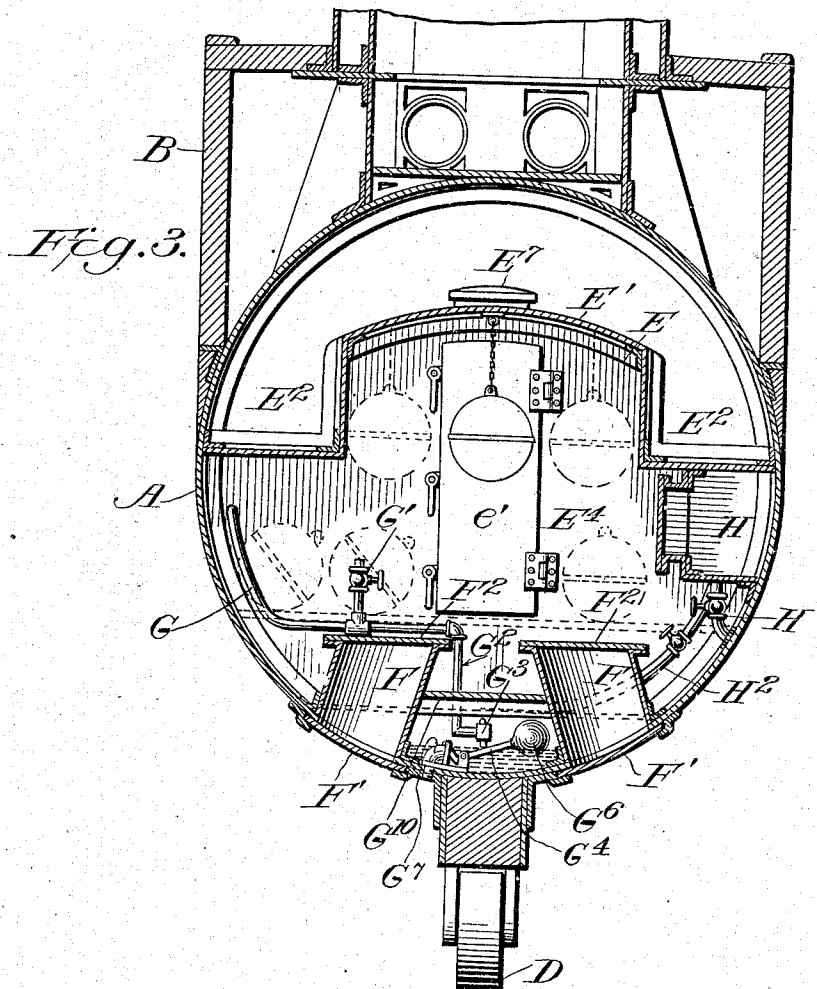
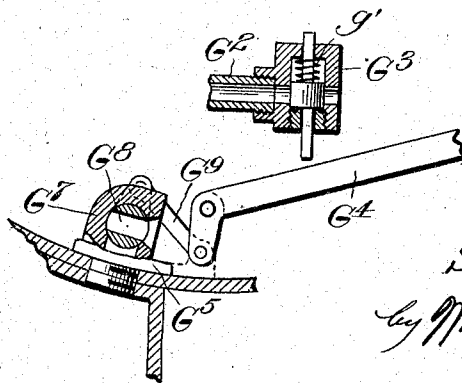


Fig. 4.



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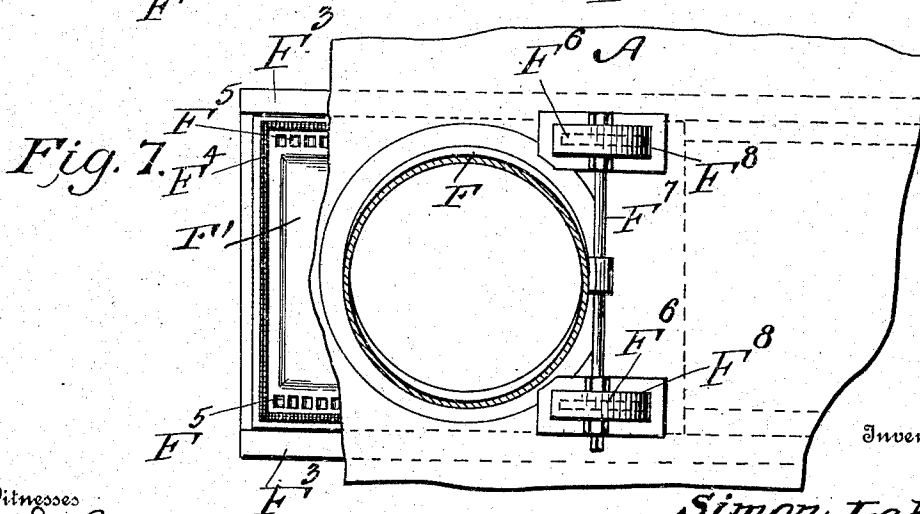
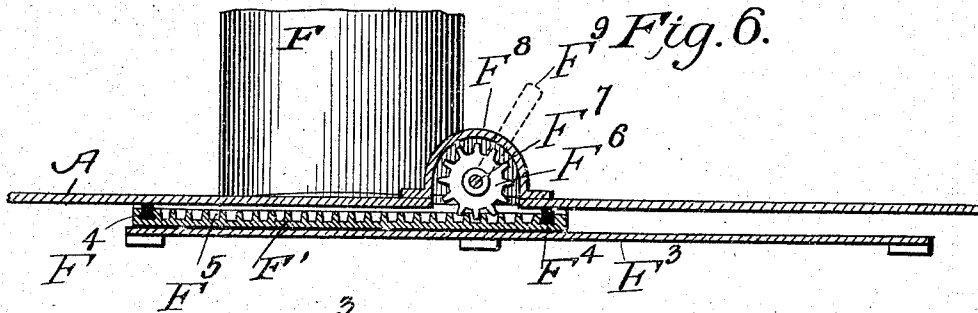
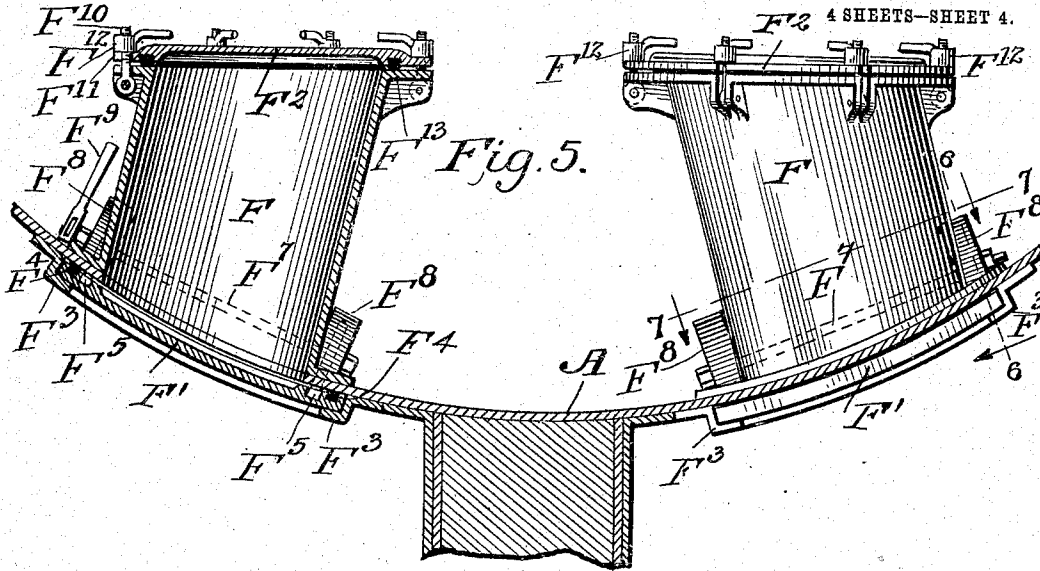
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

SIMON LAKE, OF BRIDGEPORT, CONNECTICUT.

SUBMARINE VESSEL.

947,921.

Specification of Letters Patent.

Patented Feb. 1, 1910.

Application filed June 4, 1907. Serial No. 377,135.

To all whom it may concern:

Be it known that I, SIMON LAKE, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented a certain new and useful Improvement in Submarine Vessels, of which the following is the specification.

The invention consists of a submarine vessel, having a central mine-planting or diving compartment, which opens to the sea through launching-tubes or hatchways arranged in the bottom of the hull of the vessel. The hatchways are arranged in the hull directly below the center of buoyancy when the vessel is submerged, and substantially at the center of gravity, and the center of the volume of the compartment is substantially at the centers of gravity and buoyancy of the vessel. By this arrangement, the mines are dropped at a point at which the even keel of the vessel is the least apt to be disturbed. Means are provided for admitting a quantity of water into the vessel equal to the launched mine or mines, the water being conducted to ballast-tanks located fore and aft of the center of gravity and occupying the same relative position as the mines before their removal. Means are also provided for automatically admitting compressed air to the compartment after the hatchways have been opened, for preventing an excess quantity of water entering the compartment, which might occur either through the shifting or rolling motion of the vessel or by changes of weight due to the launching of the mine and the sudden decrease of air pressure in the chamber by their removal.

In the accompanying drawings, illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 is a side elevation, partly in section, of the entire vessel. Fig. 2 is a vertical section, on a larger scale, drawn longitudinally amidships, the navigating turret and upper part of the superstructure being shown in elevation. Fig. 3 is a vertical cross-section drawn on the line 3—3 of Fig. 2. Fig. 4 shows in two sections certain details of the mechanism for supplying compressed air to counterbalance the water pressure. Fig. 5 is a cross-section of the vessel as in Fig. 3, but on a larger scale, and showing the left-hand launching tube in section and the right-hand launching tube in elevation, with means for operating the outboard and in-

board covers, and omitting the mechanism shown in Figs. 3 and 4 for supplying compressed air to counterbalance the water pressure. Fig. 6 is an elevation and partial section drawn on the line 6—6, Fig. 5. Fig. 7 is a horizontal section drawn on the line 7—7, Fig. 5, some parts broken away.

A designates the hull of the vessel, provided with a superstructure B, torpedo-firing tubes C, and bearing-wheels D, which last are adapted to be projected below the bottom of the vessel to prevent its contact with the water-bed.

E is an air-tight compartment, arranged centrally within the vessel and whose center of volume is equally disposed relatively to the centers of gravity and buoyancy of the vessel. The said compartment has a top E', highest in the center and connected to the sides and the hull in any suitable manner. On each side of said compartment is a passage-way E², to permit access to the fore and aft parts of the vessel. E³ are the ends which also are connected to the sides of the vessel.

The compartment E is divided by partitions E⁴, into a central diving or mine-planting compartment E⁵, and storage compartments E⁶ for mines. The compartments E⁶ communicate with the diving compartment through openings *e* in the partitions E⁴, which are closed air-tight by doors *e'*, opening into the diving compartment. Hatchways having covers E⁷, E⁷ and E⁸ are arranged in the top E' and communicate respectively with the storage compartments and the diving compartment.

The diving compartment E⁵ is provided with two launching-tubes or hatchways F, surrounding openings in the bottom of the hull upon each side of the keel, so that when the vessel is submerged they will be below the center of buoyancy of the vessel. The hatchways are closed by outboard and inboard covers F' and F², respectively. The tubes F are arranged in diverging directions from their upper to their lower ends, so as to give the mines an impulse away from the vessel when dropped through the said tubes, thereby decreasing the danger of contact with the hull of the vessel when first launched. In planting a number of mines, the launching tubes are preferably used alternately, except when the presence of a swift cross-current makes it desirable to launch from that side which would carry the

mines quickest from the vessel. One convenient means for operating these covers may be as shown in Figs. 5, 6 and 7. The outboard covers F' are mounted in fixed slide-ways F^3 on the bottom of the hull A and made water-tight, as by packing F^4 , and near their longitudinal edges they are provided with toothed-racks F^5 which are engaged by pinions F^6 on shafts F^7 arranged inside the hull. These pinions are mounted in water-tight boxes F^8 . One end of each shaft is adapted to be provided with some sort of operating device F^9 , such as a ratchet-wrench, in order to cause the pinions to rotate and so move the covers to open and close the tubes.

As shown in Fig. 5, the inboard covers F^2 are removably or detachably held to the tubes by bolts F^{10} hinged to the tubes and engaging notches F^{11} in the edges of the covers and themselves held by nuts F^{12} having handles and which clamp the parts together. These covers F^2 are also provided with packing F^{13} in order to fit water-tight on the tubes.

Obviously the invention is not limited to the described means for opening and closing the covers of the launching tubes.

The storage compartments E^6 are designed for carrying a number of mines besides those carried in the diving compartments. These mines preferably are in assembled condition, and are suspended from the top E' and also arranged on the horizontal divisional plates or floors E^9 in each compartment. Means, of course, are provided to prevent the displacement of the mines by the movement of the vessel.

In order to insure against the diving or mine-planting compartment E^5 being flooded, which might occur either from the changes of weight or the decrease of air pressure due to the successive launching of the mines, and also by the rolling movement of the vessel when operating upon or immediately adjacent to the surface of the water, in which latter position, the vessel would be susceptible to the wave motion, especially should there be a heavy sea, I employ an automatically operated air-supplying device independent of the air-supply pipe for conducting compressed air to the compartment before the mine-planting tubes or hatchways are opened. This device comprises a compressed-air supply-pipe G extending from a suitable supply-tank (not shown) and having a branch valve-controlled pipe G' through which enough compressed air is admitted into the compartment before the tubes are opened to counterbalance the external water pressure. From the union of the branch pipe G' extends a pipe G^2 , which has a valve G^3 at its end normally seated by a spring g' (see Fig. 4) and opened by an elbow-lever G^4 . This

lever G^4 is pivoted at one end to a casting G^5 , and has a float G^6 at its free end which will elevate the lever as water is admitted into the compartment, thereby opening the valve G^3 and admitting an additional supply of air to expel the water. The casting G^5 is connected to an elbow-pipe G^7 , which opens to the sea, and has a valve G^8 at its inner end which is connected by a link G^9 with the short arm of the lever G^4 . A floor G^{10} is constructed in the chamber to protect the float and lever and to provide a working platform for the operator.

Should water enter the compartment E^5 , the float would immediately rise and elevate the lever, thereby bringing it into contact with the stem of the valve G^3 and opening said valve and admitting an additional supply of compressed air. Simultaneously with this operation, the lever opens the valve G^8 to effect the expulsion of the water by the superior pressure of the compressed-air, thereby preventing the flooding of the compartment; and it will also be seen that the greater the quantity of water "shipped", the wider the valves will be opened to regulate the quantity of air admitted to meet the conditions.

Within the diving or mine-planting compartment E^5 , and to one side thereof, is arranged a compensating-tank H , connected to the seat through a valve-controlled pipe H' , and at each end the compensating-tank is connected by valve-controlled pipes H^2 , H^2 , with the first of a series of ballast-tanks H^3 and H^4 , respectively arranged or formed in the bottoms of the storage compartments. By this means a quantity of water may be discharged into the tanks of either series to compensate for the weight of the mine or mines removed from either compartment, and thereby it is possible to hold the vessel on an even keel. A gage H^5 is connected to the compensating-tank by which the quantity of water discharged into the ballast-tanks may be ascertained and regulated.

The mines used are preferably of spherical shape, and of the electro-chemical contact type, and of the size and type known in the United States as "Naval defense mines", but, of course, any pattern other than that specified may be used equally well.

Ordinarily a number of mines are carried in the diving compartment in addition to those carried in the storage compartments, and when it is desired to plant a number not exceeding the number carried in the said diving compartment, the operator enters said compartment through the hatchway E^8 , and the hatchway as well as the doors leading into the storage compartments are then securely fastened, and enough compressed-air is admitted to counterbalance the external water pressure, after which one or both of the launching-tubes are opened and the

mines dropped or launched. Should, however, it be desired to plant a greater number of mines than that carried in the diving compartment, the doors e' and e'' are left
 5 open and enough air is admitted to permit all three compartments to be put under air pressure at the same time.

In practice, I propose to construct the ballast-tanks and to employ a system of
 10 emptying them substantially as shown and described in Letters Patent granted to me October 31, 1905, No. 803,175, and, therefore, do not consider it essential to show the details of construction embodied in the said
 15 patent, and only show the communications between the tanks and the outlet pipes m , m' .

From the foregoing it will be seen that I combine the features of a mine-planting boat and a submarine torpedo boat; and while I
 20 have shown the invention embodied in a submarine torpedo boat, I desire it to be understood that the invention is not limited to use in such boats, but may be equally well used in other forms of submarine vessels.

25 What I claim, is:—

1. In a submarine vessel, a hull, and an air-tight compartment arranged centrally therein and having partitions to divide it into storage compartments and an intermediate diving or mine-planting compartment,
 30 the center of volume of which is arranged in vertical alinement with the center of gravity and center of buoyancy of the vessel, a launching tube arranged and opening within said diving or mine-planting compartment,
 35 and means to supply compressed air to said diving or mine-planting compartment to exclude the water therefrom during the time said tube is open.

40 2. In a submarine vessel, the combination with the hull, of a central air-tight compartment partitioned off into storage compartments and an intermediate diving compartment the center of volume of which is arranged in vertical alinement with the center
 45 of gravity and center of buoyancy of the vessel, launching-tubes in the said diving compartment, means for supplying air under pressure separately to said diving compartment when the launching-tubes are in use, and
 50 means for automatically operating said air-supplying means rendered operative in the event of water entering said compartment.

55 3. In a submarine vessel, the combination with the hull, of an air-tight compartment centrally arranged in the hull and partitioned off into storage compartments and an intermediate diving compartment the center of volume of which is arranged in vertical
 60 alinement with the center of gravity and center of buoyancy of the vessel, means to permit communication between the storage compartments and the diving compartment, means for supplying air under pressure to
 65 the several compartments, and automatically

operating means for independently supplying air to the diving compartment.

4. A submarine vessel, constructed with a central air-tight compartment, and having
 70 launching-openings in the hull communicating therewith, covers for the openings, and automatically operated means for admitting air under pressure to the compartment rendered active by water admitted when
 75 the covers of the openings are removed.

5. A submarine vessel, constructed with an air-tight compartment the center of volume of which is arranged in vertical alinement with the center of gravity and center
 80 of buoyancy of the vessel, partitions arranged in the compartment dividing the same into a central diving compartment and storage compartments, doors in said partitions, launching-tubes arranged in the central
 85 compartment, means for admitting air under pressure to the central compartment, and independent means for supplying an additional quantity of air operating by water admitted when the launching-tubes are
 90 open.

6. A submarine vessel, constructed with an air-tight compartment the center of volume of which is arranged in vertical alinement with the center of gravity and center
 95 of buoyancy of the vessel, launching-tubes in the compartment which open outwardly through the hull upon each side of the keel, and are arranged in diverging directions, covers for the tubes, means for supplying
 100 air under pressure to the compartment, and independent means automatically operated by rise of water in the compartment to admit additional quantities of air when the covers of the tubes are removed.

7. A submarine vessel, constructed with
 105 an air-tight compartment the center of volume of which is arranged in vertical alinement with the center of gravity and center of buoyancy of the vessel, partitions in the compartment dividing it into a central diving
 110 or mine-planting compartment and storage compartments, ballast-tanks arranged in the bottoms of the storage compartments, means for supplying water to the tanks, and means for supplying air under pressure to
 115 the said central compartment.

8. A submarine vessel, constructed with an air-tight diving or mine-planting compartment the center of volume of which is
 120 arranged in vertical alinement with the center of gravity and center of buoyancy of the vessel, launching-tubes in the compartment and means for closing the same, ballast-tanks arranged fore and aft of the center of the
 125 said compartment, means for supplying water to the tanks, for the purpose specified, and means for supplying air under pressure to the said compartment.

9. A submarine vessel, constructed with a
 130 diving or mine-planting compartment the

center of volume of which is arranged in vertical alinement with the center of gravity and center of buoyancy of the vessel, launching-tubes in the compartment arranged upon each side of the keel, means to close the tubes, means for supplying air under pressure to the compartment, ballast-tanks arranged in the vessel, and means for supplying water to the tanks.

10 10. A submarine vessel, constructed with a central air-tight compartment, launching-tubes arranged in the compartment, a pipe for supplying air under pressure to the compartment, a valve for controlling the admission of air, a second valve arranged in the pipe, an outlet pipe arranged in the bottom of the compartment and opening into the surrounding water, a valve in the outlet pipe, a lever connected to the valve in the outlet pipe and also adapted for engagement with the valve in the air inlet pipe, and a float connected to the lever to open the valves when water enters the compartment.

25 11. A submarine vessel, constructed with an air-tight compartment the center of volume of which is arranged in vertical alinement with the center of gravity and center of buoyancy of the vessel, launching-tubes in the compartment, outboard and inboard closures for the tubes, a compressed-air supply-pipe extending into the compartment, a valve in said pipe, a lever for engagement with the valve stem and having a float at one end, an outlet pipe in the bottom of the compartment, a valve in the outlet pipe connected to the opposite end of the said lever, ballast-tanks arranged in the vessel, and means for conducting water to the tanks.

12. A submarine vessel, constructed with

a central air-tight compartment, launching-tubes arranged in the compartment, closures for the tubes, an air inlet pipe extending into the compartment and having a valve at its inner end, a lever pivotally held in the compartment in position for engagement with the stem of the valve, a float carried at one end of the lever, an outlet pipe arranged in the bottom of the compartment, and a valve in the said pipe connected to the lever.

13. A submarine vessel, constructed with an air-tight compartment the center of volume of which is arranged in vertical alinement with the center of gravity and center of buoyancy of the vessel, launching-tubes in the compartment, ballast-tanks arranged in the vessel, means for supplying water from the surrounding body of water to the tanks, and means for supplying air under pressure to the said compartment.

14. A submarine vessel, constructed with a diving or mine-planting compartment the center of volume of which is arranged in vertical alinement with the center of gravity and center of buoyancy of the vessel, and having storage compartments in the fore and aft ends thereof, ballast-tanks arranged in the storage compartments, means for admitting water to the tanks, and means for supplying air under pressure to the said mine-planting compartment.

In testimony whereof I have hereunto set my hand this 27th day of May A. D. 1907.

SIMON LAKE.

Witnesses:

FREDERIC W. BAKER,
FRED B. WHITNEY.