S. LAKE & E. L. PEACOCK.

SUBMARINE OR SUBMERGIBLE BOAT.

APPLICATION FILED OCT. 31, 1908.

926,007.

Patented June 22, 1909.

4 SHEETS—SHEET 1.

Fig. 1.

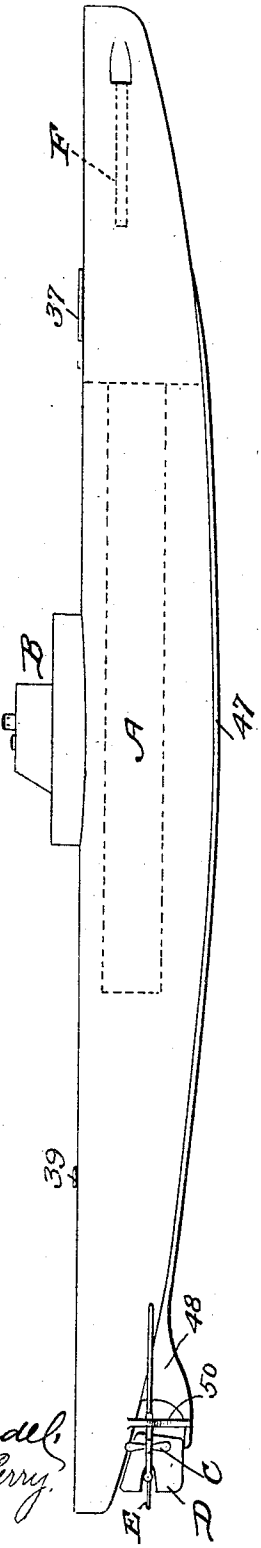
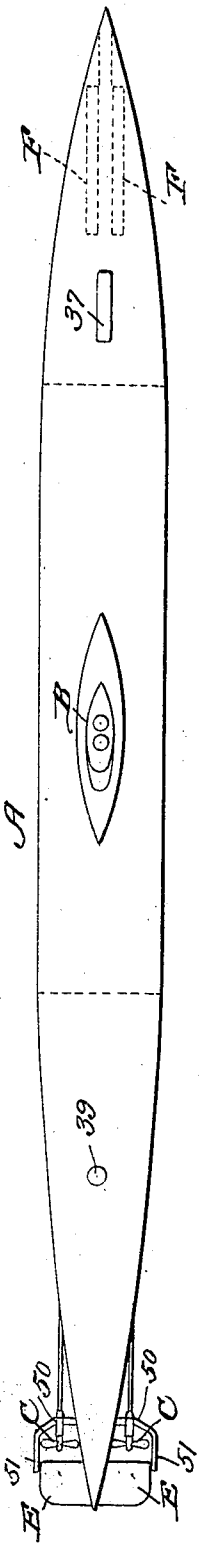


Fig. 2.



Witnesses

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4 SHEETS—SHEET 2.

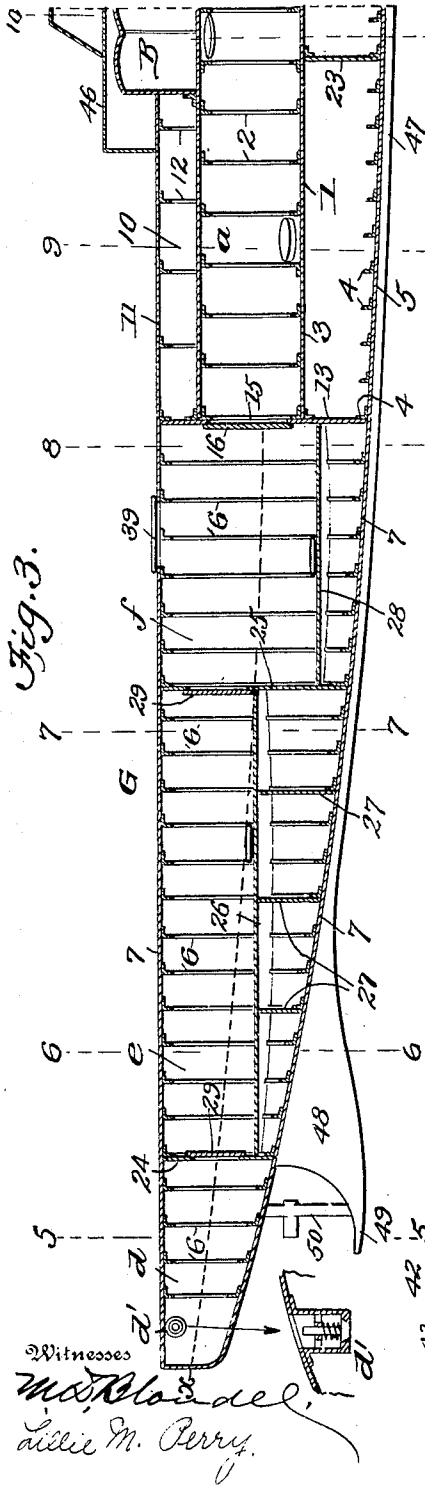


Fig. 3.

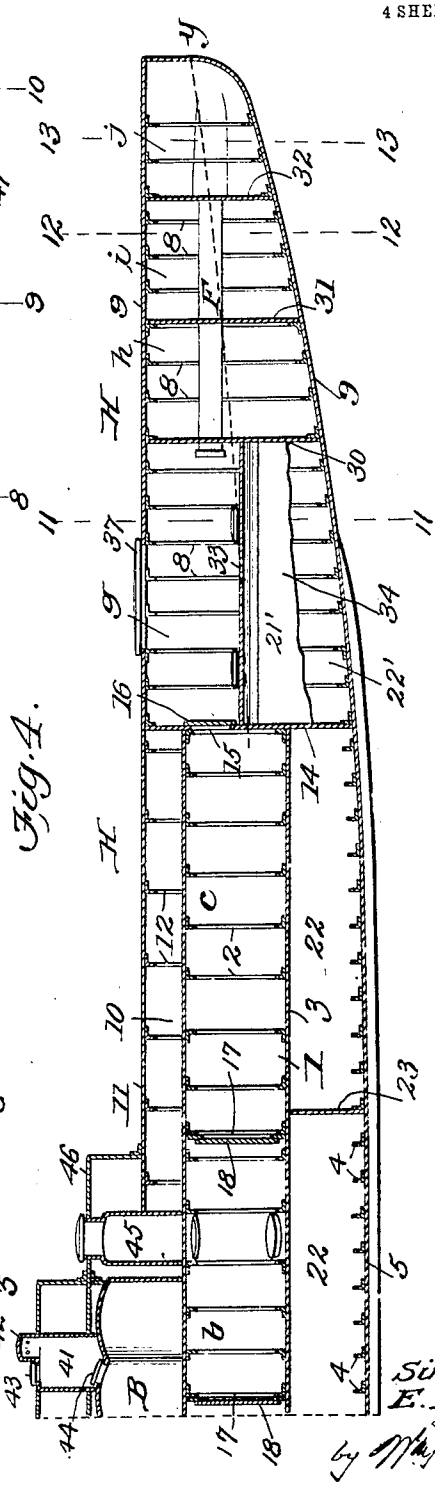


Fig. 4.

Witnesses

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4 SHEETS—SHEET 3.

Fig. 7.

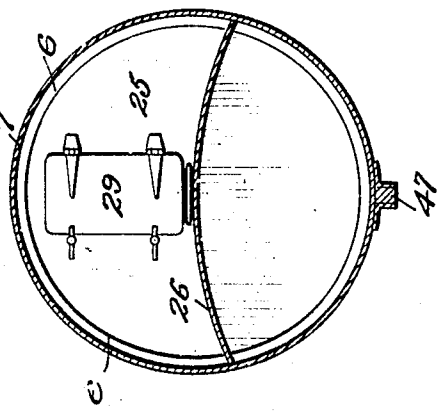


Fig. 6.

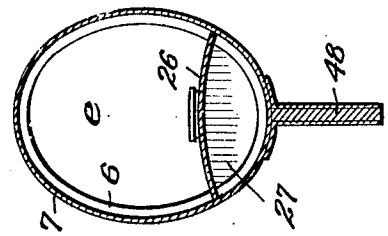


Fig. 9.

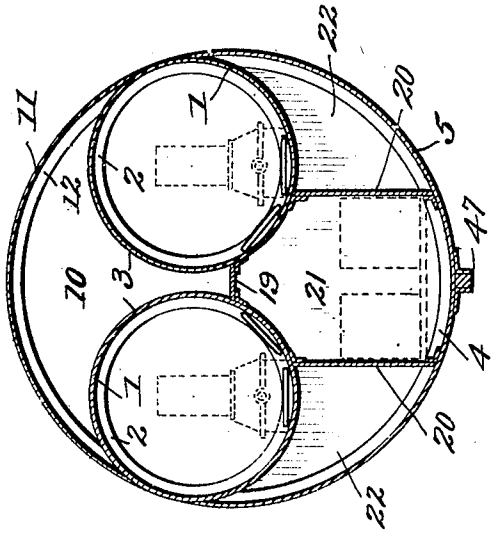


Fig. 5.

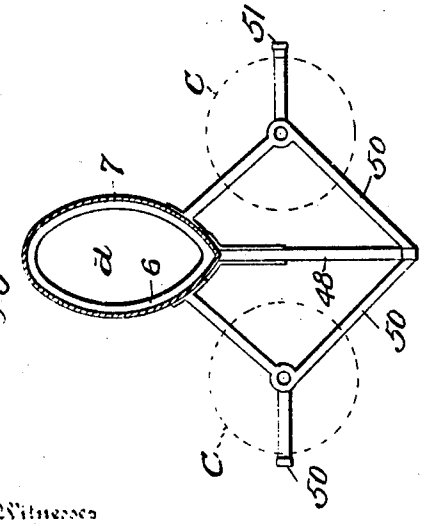
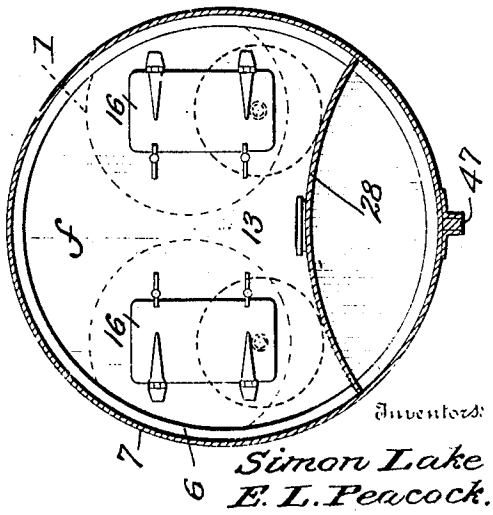


Fig. 8.



Witnesses

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4 SHEETS—SHEET 4.

Fig. 13.

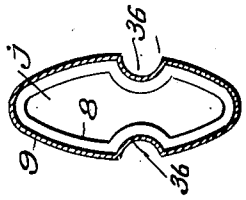


Fig. 12

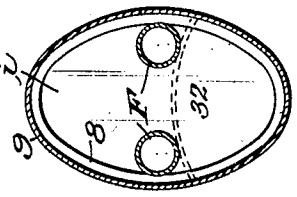


Fig. 14.

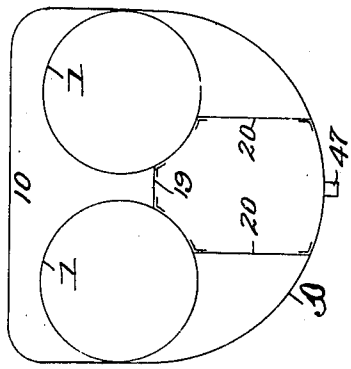


Fig. 11.

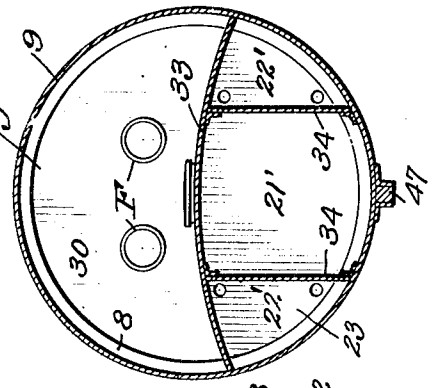
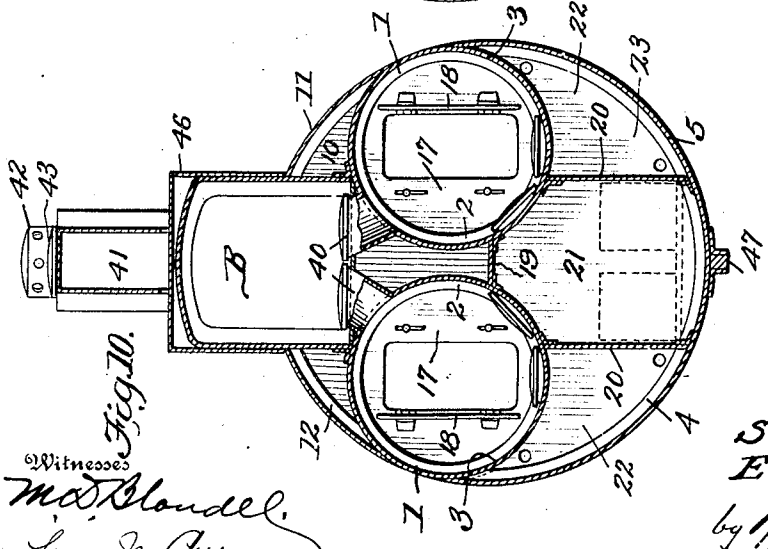


Fig. 10.



Witnesses

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UNITED STATES PATENT OFFICE.

SIMON LAKE, OF BRIDGEPORT, CONNECTICUT, AND EDWARD LASIUS PEACOCK, OF WEST MOUNT, MONTREAL, QUEBEC, CANADA, ASSIGNORS TO THE LAKE TORPEDO BOAT COMPANY, A CORPORATION OF NEW JERSEY.

SUBMARINE OR SUBMERGIBLE BOAT.

No. 926,007. Specification of Letters Patent. Patented June 22, 1909.

Application filed October 31, 1908. Serial No. 460,506.

To all whom it may concern:

Be it known that we, SIMON LAKE, a citizen of the United States, and a resident of Bridgeport, in the county of Fairfield and State of Connecticut, and EDWARD LASIUS PEACOCK, a subject of the King of Great Britain, and a resident of West Mount, Montreal, Province of Quebec, Canada, have invented a certain new and useful Improvement in Submarine or Submergible Boats, of which the following is a full, clear, and exact description.

In the construction of submarines or submergible boats adapted particularly for long distance cruising, it is essential that the boat be capable of maintaining a large reserve of buoyancy for surface navigation so as to withstand the weather, and that it possess the necessary strength to withstand the pressure of water at the maximum depth of submergence for which the boat is designed.

The object of the invention is to provide a novel construction of the hull which, without reducing its capacity to resist high external water pressure when submerged, has a high center of buoyancy and a low center of gravity when in submerged condition, and a very high reserve of buoyancy for surface navigation on the least draft and which is of a form that preserves the substantially circular cross-section that is essential for easy submergence and emergence, and which has such lines as will insure a very high surface speed under ordinary motive power.

The invention consists of a submarine or submergible boat, having amidships a double-compartment section of tubular form, below which the hull is given a substantially semi-circular cross-section, and the bow and stern sections are continued out from this amidships construction on lines that will meet the objects of the invention. These several portions of the boat may be partitioned off so as to provide water-ballast tanks, quarters, storage rooms and machinery rooms, all and severally as will be fully described in the following specification and pointed out in the claims.

In the accompanying drawings illustrating the invention in the several figures of which like parts are similarly designated, Figure 1 is a side elevation of the entire vessel, Fig. 2 is a plan view of the same, Fig. 3 is a longitudinal section of the rear half of the boat drawn on a larger scale, Fig. 4 is a similar view of the forward end of the boat, Fig. 5 is a vertical cross section on an enlarged scale drawn on the line 5—5 of Fig 3, Figs. 6, 7, 8, 9 and 10 are similar views drawn respectively on the lines 6—6, 7—7, 8—8, 9—9 and 10—10 of Fig. 3, Figs. 11, 12 and 13 are similar views drawn respectively on the lines 11—11, 12—12 and 13—13 of Fig. 4, Fig. 14 is a diagrammatic cross sectional view drawn through the amidship portion of the boat illustrating a slightly modified form of the deck or superstructure of the boat.

A designates the entire hull of the boat, B the conning-tower, C the propellers, D the vertical rudder, E the horizontal rudders and F the torpedo firing tubes, of which two are shown in the present construction.

The intermediate section of the boat (Figs. 3, 4, 8, 9 and 10) is constructed of two tubular sections 1 which are arranged in parallel relation and extend upon opposite sides of the center of gravity of the boat as a whole. Each section is constructed of a series of substantially circular frames or ribs 2 which are covered by suitable platings 3 that form the shells of the sections. The sections are of sufficient strength to withstand the external pressure due to the depth of submergence. These tubular sections 1 are each of less diameter than half the beam of the boat. Arranged below and connected to the outer sides of the sections are semi-circular ribs 4 which are located at certain intervals throughout the length of the said sections 1 and are of a radius corresponding to the shape of the boat at the particular points at which they are arranged.

The ribs 4 are covered by a plating 5 which forms the outer, lower hull portion of the boat. This portion is also made of sufficient strength to resist collapse due to the pressure of water at the maximum depth for which the boat is designed.

G designates the stern section of the boat which is constructed of a series of frames or ribs 6 which are substantially circular at that portion of the boat adjoining the tubular sections 1, but which are of gradually diminishing size and of oval shape toward the extreme rear end. The tops of the frames 6 are arranged substantially upon the same level, while the centers of their maximum radius are arranged in a center or axial line

that is upwardly inclined and preferably curved from the rearmost frame 4 to the extreme end as indicated by the dotted line *x* in Fig. 3. The frames 6 are covered by a plating 7 which forms the skin of the stern section and is a continuation of the skin or plating 5 of the lower hull portion.

H designates the bow section of the boat which is also constructed of a series of frames 8, those next to the intermediate section being substantially circular and those next following being oval and of diminishing cross-section forward. The tops of these frames are arranged upon substantially the same level, with their maximum centers also arranged in a center or axial line that is upwardly inclined and preferably curved from the forward rib 4 of the intermediate section toward the forward end of the boat, as indicated by the dotted line *y* in Fig. 4. The frames 8 are covered by a plating 9 that forms the skin of the bow of the boat and is also a continuation of the plating 5 of the lower hull or intermediate portion.

By reference to the cross sectional views of the said stern and bow sections, it will be seen that the ends are gradually diminished in width as well as depth with their upper ends arranged in substantially the same horizontal plane, thereby giving a tapering form to the lower surfaces of the stern and bow portions and the fine lines to the boat which conduce to speed. The shape of the ends may be changed to meet the special conditions for which the boat is designed without departing from the broad principle of the invention.

By reference to Figs. 3, 4, 8, 9 and 10 it will be seen that throughout the length of the tubular sections 1, the beam of the boat, which is subject to heavy external pressure on submergence, is greater than the vertical axis, so that it is necessary to extend the tops of the stern and bow sections above the tops of the said tubular sections in order to retain the even surfaces of the sides. This arrangement leaves a recess in the intermediate section of the boat along the entire length of the tubular sections 1 and the space 10 thus formed, is covered by a light weight skin or plating 11 which forms a superstructure at the said intermediate section. The skin or plating 11 is practically a continuation of the skin or plating 5 of the lower section and of the skins 7 and 9 of the stern and bow sections and is supported by light weight frames 12 that are secured to the sides of the tubular sections in any suitable manner. The space formed by the superstructure is designed to be filled with water when the boat is submerged and is therefore not made of sufficient strength to withstand the external pressure to which the boat is subjected when operating below the surface. This arrangement further increases the stability of the vessel when submerged and also increases the reserve of buoyancy when operating upon the surface as the space is emptied of the water and converted into an air-tight compartment.

13 and 14 designate partitions or bulkheads which are arranged at the ends of the tubular sections 1 and separate the intermediate portion of the boat from the end sections. Each partition or bulkhead is provided with a door opening through which communication may be had with either end of the boat from the tubular sections 1 and these openings are controlled by doors 16, as shown. The tubular sections 1 are divided by bulkheads 17 into three compartments *a*, *b*, and *c* that are intended, respectively, for the engines, the auxiliary machinery and the living quarters of the personnel. The bulkheads 17 are provided with door openings that are controlled by doors 18.

A horizontal division plate 19 is arranged between the tubular sections 1 below the horizontal plane of their centers and the space formed by the said sections and the lower semi-circular hull portion, is divided by longitudinal vertical partitions 20, into a central compartment 21, and two lateral compartments 22. The central compartment 21 is intended for the location of the storage-battery-cells and the compartments 22 are divided by transverse partitions 23 into a system of water-ballast-tanks, which tanks are filled with water preparatory to submergence to reduce the reserve buoyancy of the boat.

The stern section of the boat is divided by transverse partitions or bulkheads 24 and 25 into three compartments *d*, *e* and *f*, and the space between the partitions is divided by a horizontal partition 26, and the space below the partition 26 is divided by transverse partitions 27 into a system of after water-ballast-tanks. The compartment *e* is intended for the living quarters of the personnel and the space *d* at the extreme rear end of the boat is preferably employed as an exhaust-tank into which the exhaust gases from the explosive engines are conducted and allowed to expand before being finally discharged from the boat, thereby greatly reducing the noise incidental to the discharge of the products of combustion from such engines. An outwardly opening check-valve *d'* (see enlarged detail to left of Fig. 3) is arranged in the side of the boat to permit the gases to escape when the pressure in the space *d* exceeds that of the surrounding water. The space *d* may, however, be used as an air chamber or as a storage-compartment.

The compartment *f* is divided by a horizontal partition 28 to provide below a lower water-ballast compartment, and a space above for the location of the motors used for re-charging the batteries. The partitions 24

and 25 are provided with door openings that are controlled by doors 29.

The bow section of the boat is divided by transverse partitions or bulkheads 30, 31 and 32 into a series of compartments *g*, *h*, *i* and *j*. The space between the bulkhead 14 and the partition 30 is divided by a horizontally arranged partition 33, the upper space thus formed providing a torpedo storage-compartment and the space below being divided by longitudinal vertical partitions 34, arranged in alinement with the partitions 20 to provide a central battery-cell compartment 21′ and lateral water-ballast tanks 22′. The spaces *h*, *i* and *j* may also be employed for water-ballast compartments, air chambers, or storage tanks, as desired.

The torpedo firing tubes F are arranged in the bow section of the boat and have their forward ends extending through the sides of the boat and their inner ends projecting into the compartment *g*.

The sides of the extreme forward end of the boat are curved inwardly as shown at 36 Figs. 1 and 13 to conform to the shape of the torpedo tubes to provide an unobstructed passage for the torpedoes when discharged from the tubes.

37 designates a hatch leading into the said torpedo storage-compartment, and 39 designates a hatch leading into the stern section of the boat.

Any suitable apparatus for controlling the contents of the system of water-ballast-tanks may be employed and in practice we prefer to employ that shown in Letters Patent No. 803,175 granted to Simon Lake, Oct. 31st., 1905.

The navigating-turret B rises from the tubular sections 1 at the center of the boat and is surmounted by a conning-tower 41, having a sighting-hood 42, as shown. Access to the turret from the tubular sections 1 may be had through hatches 40. The turret is also accessible through a hatch 43 in the top of the conning-tower, and a hatch 44 in the top of the turret, as shown in Fig. 4.

45 designates a hatch extending upwardly from each tubular section in front of the turret, by which access to, or exit from the forward part of the boat may be made should entrance to or exit from the boat be cut off through the other hatches.

In practice the navigating-turret and conning-tower and the upper end of the hatch 45 are inclosed in a suitable light weight casing 46 that is of double-conoidal shape in horizontal longitudinal section for the purpose of presenting an even surface to the water to offer the least possible resistance to the vessel when running submerged.

47 designates the keel of the boat which terminates at its rear end in a skeg 48 having a rearwardly projecting arm 49 that forms a support for the vertical rudder.

50 designates tail shaft brackets from which extend arms 51 that form supports for the horizontal rudders.

From the foregoing it will be seen that the parallel tubes provide a double-compartment construction throughout the intermediate section of the boat and, with the lower semi-circular portion, complete the said intermediate section, and permit the arrangement of a series of compartments below and co-extensively with the length of the tubes.

It will be seen by reference to the cross-sectional figures of the drawings, that by the arrangement of the tubular sections the center of buoyancy of the vessel as a whole is considerably higher than that of the so-called cigar-shaped boats for the reason that the centers of the tubular sections are arranged considerably above the longitudinal center of the intermediate portion of the boat and of the upwardly rising centers of the sections forming the ends.

The semi-circular section provides a chamber at the extreme lowest part of the boat which is divided into a central battery-cell compartment and large lateral water-ballast-tanks which extend throughout the full length of the said section. As is well known the battery-cells are the heaviest details in submarine boats, and by their location the center of gravity of the boat is considerably lowered and the stability of the boat greatly increased both when operating upon and below the surface of the water.

It will be further noted that the semi-circular intermediate section provides for the arrangement of exceptionally large water-ballast-tanks which, with the water contained in the chamber 10, formed by the superstructure, forms a large percentage of the whole cross sectional area of the entire intermediate section of the boat and therefore increases the reserve of buoyancy.

The engines for operating the boat when running on the surface are located in the tubular sections in longitudinal alinement with the propeller shafts to which they are connected. The present construction shows an arrangement for the installation of machinery for twin propellers, but if it is desired to construct a boat to be operated with three propellers the hull would be constructed with three tubular sections instead of two, in which case the third section would be arranged between and slightly below the two sections shown in the drawings.

The main figures of the drawings show the superstructure semi-circular at the center of the boat, and of a radius corresponding to that of the lower hull portion, but we do not wish to be limited to this shape as the top may be constructed with vertical sides Fig. 14 extending tangentially from the tubular sections and with a flat or substantially flat upper surface which increases the area formed

by this section and the tubular sections and consequently increases the surface stability of the vessel. Such a construction also provides a deck for the convenience of the crew when the boat is lying upon or operating on the surface of the water.

In the drawings we have indicated the position of the engines, battery-cells, motors and so forth in dotted lines only, and while we have shown the tubular sections 1 circular in cross section, it is obvious that they may be made oval and of various other forms in order to accommodate the styles of engines employed, and for arranging the weights as low as possible, and we therefore do not wish to be limited to the exact construction shown, as these changes may be made without departing from the spirit of the invention.

What we claim is:—

1. A submarine or submergible boat, constructed with an intermediate double-compartment section, a substantially semi-circular hull portion below the said section, and bow and stern sections extending from the ends of the said double-compartment section and from the said hull portion.

2. A submarine or submergible boat, constructed with an intermediate double-compartment section, a substantially semi-circular hull portion arranged below the section, bow and stern sections extending from the ends of the said double-compartment section and from the said hull portion, the axes of which are upwardly inclined toward the extreme ends of the boat.

3. A submarine or submergible boat, comprising substantially circular parallel tubular sections, a substantially semi-circular hull portion arranged below the said sections, and bow and stern sections extending from the ends of the said tubular sections and from the said hull portion.

4. A submarine or submergible boat, comprising substantially circular intermediate tubular sections arranged in parallel relation, each of which is of less diameter than half the beam of the boat, a substantially semi-circular hull portion of the full beam of the boat arranged below the said parallel sections, bow and stern sections extending from the ends of the said parallel sections and from the said hull portion, the tops of the said bow and stern sections being arranged in the same horizontal plane and above the said tubular sections and whose axes are upwardly inclined from the said tubular sections toward the extreme ends of the boat, and a superstructure arranged over the said tubular sections.

5. A submarine or submergible boat, comprising intermediate, substantially circular tubular sections, a substantially semi-circular hull portion arranged below the said tubular sections, and bow and stern sections extending from the ends of the said tubular sections and from the said hull portion, the major axes of the said bow and stern sections being arranged in upwardly inclined axial lines toward the extreme ends of the boat.

6. A submarine or submergible boat, comprising intermediate, substantially circular tubular sections arranged in parallel relation, each of which is of less diameter than half the beam of the boat, a substantially semi-circular hull portion arranged below the said tubular sections, bow and stern sections extending from the said tubular sections and from the said hull portion and which are of gradually diminishing size toward their extreme outer ends with their upper surfaces arranged in the same horizontal plane and above the said tubular sections, and a superstructure arranged over the said tubular sections and forming a continuation of the upper surfaces of the said bow and stern sections.

7. A submarine or submergible boat, comprising parallel tubular sections of less diameter than half the beam of the boat, a substantially semi-circular hull portion of the full beam of the boat arranged below the said tubular sections, bow and stern sections and of diminishing size toward their extreme ends extending from the said tubular sections and the said semi-circular hull portion, the tops of the said bow and stern sections being arranged in the same horizontal plane and above the tops of the said tubular sections, and a superstructure arranged over the said tubular sections in the same horizontal plane as the bow and stern sections.

8. A submarine or submergible boat, constructed with intermediate double-compartment sections, a hull portion arranged below the said sections, bow and stern sections extending from the ends of the said double-compartment sections and from the said hull portion and which have their axes rising toward the extreme ends of the boat and their upper surfaces arranged in the same horizontal plane and above the double-compartment sections, a superstructure arranged over the said double-compartment sections forming a continuation of the upper surfaces of the said bow and stern sections, a storage-battery compartment arranged centrally within the space formed by the double-compartment sections and the said hull portion, water-ballast-tanks upon each side of the said battery-compartment, and water-ballast-tanks arranged in the said bow and stern sections.

9. A submarine or submergible boat, comprising substantially circular tubular sections arranged in parallel relation throughout the intermediate portion of the boat, a substantially semi-circular hull portion arranged below and connected to the said tubular sections, bow and stern sections extending from the said tubular sections and

from the said hull portion, bulkheads arranged within the boat at the ends of the tubular sections, longitudinal vertical partitions arranged in the space formed by the said tubular sections and the said semi-circular hull portion which divide the said space into a central battery-compartment and lateral water ballast-tanks, transverse partitions arranged in the said stern and bow sections, and horizontal division plates arranged between the said transverse partitions for the purpose specified.

10. A submarine or submergible boat, comprising intermediate parallel tubular sections, a substantially semi-circular hull portion arranged below the said tubular sections, bow and stern sections of diminishing size toward their outer ends and extending from the said tubular sections and the said hull portion, the major axes of the said bow and stern sections being arranged upon upwardly inclined lines toward the extreme ends of the boat, partitions arranged in the space between the said tubular sections and the said hull portion which divide said space into a central battery-cell-compartment and lateral water-ballast-tanks, bulkheads arranged in the bow and stern sections at the ends of the tubular sections, a horizontal partition arranged between the bulkhead at the forward end of the tubular sections and the adjacent partition, a partition arranged in the lower compartment formed by the said horizontal partition, transverse partitions arranged in the stern section, horizontal partitions arranged between the transverse partitions for the purpose specified, bulkheads arranged in the said tubular sections, a conning-tower extended from the said tubular sections, and hatches controlling admission to the bow and stern sections.

11. A submarine or submergible boat, comprising intermediate tubular sections arranged in parallel relation and in the same horizontal plane, each tubular section being of a diameter less than one-half the beam of the boat, a substantially semi-circular hull-portion arranged below the said tubular sections which is of the full beam of the boat, bow and stern sections extending from the ends of the tubular sections and the said hull portion, said sections being of diminishing size toward their extreme ends and having their upper surfaces arranged in the same horizontal plane, bulkheads arranged at the ends of the tubular sections, partitions arranged throughout the length of the space between said tubular sections and said hull portion and dividing it into a central storage-battery-compartment and lateral water-ballast-tanks, a superstructure of light weight construction arranged over the tubular sections between the bow and stern sections providing a space that is adapted to be filled with water when the vessel is submerged, transverse partitions arranged in the bow and stern sections, horizontal partitions arranged between the said transverse partitions for the purpose specified, a navigating-turret extending from the said tubular sections and projecting through the superstructure, hatches controlling communication between the said tubular sections and the said turret, a conning-tower projecting from the said turret, a sighting-hood projecting therefrom, a hatch in the top of the turret, and means for controlling communication between the said turret and said conning-tower.

12. A hull construction for submarine or submergible boats, comprising intermediate tubular sections substantially circular in cross section and arranged in parallel relation, a semi-circular hull portion arranged below the said sections and connected thereto, and bow and stern sections forming continuations of the said intermediate sections and the said semi-circular hull portion.

13. A hull construction for submarine or submergible boats, comprising parallel tubular sections substantially circular in cross section, a substantially semi-circular hull portion arranged below the said tubular sections and connected to the outer sides thereof, bow and stern sections of diminishing size toward their outer ends extending from the said tubular sections and from the said hull portion, the major axes of the said bow and stern sections being arranged in upwardly inclined lines toward the extreme ends of the boat, whereby the tops of the said sections are arranged in the same horizontal plane, and a superstructure arranged above the said tubular sections.

14. A hull construction for submarine or submergible boats, comprising intermediate parallel tubular sections substantially circular in cross section, a substantially semi-circular hull portion arranged below the said sections and connected thereto, bow and stern sections forming continuations of the said tubular sections and the said semi-circular hull portion, and of diminishing size toward their extreme outer ends with their upper surfaces arranged in the same horizontal plane and above the tops of the said tubular sections, and a superstructure arranged over the tubular sections.

15. A hull construction for submarine or submergible boats comprising intermediate tubular sections, substantially circular in cross section arranged in parallel relation and in the same horizontal plane, each of said tubular sections being of less diameter than one-half the beam of the boat, a semi-circular hull portion of the full beam of the boat arranged below and connected to the said tubular sections, bow and stern sections extend-

ing from the ends of the said tubular sections and from the said hull portion, said bow and stern sections being of substantially circular cross-section adjacent to the ends of the tubular sections and thence of oval cross-section diminishing toward the ends of the boat with their major axes arranged upon upwardly inclined lines, whereby their upper surfaces are arranged in the same horizontal plane and above the upper edges of the said tubular sections and their lower surfaces are upwardly inclined, and a superstructure ar ranged over the tubular sections.

In testimony whereof we have hereunt set our hands this 15th day of October A. I 1908.

SIMON LAKE.
EDWARD LASIUS PEACOCK.

Witnesses:
H. A. LOVIAGHINE,
H. CUSTIS VEZEY.