

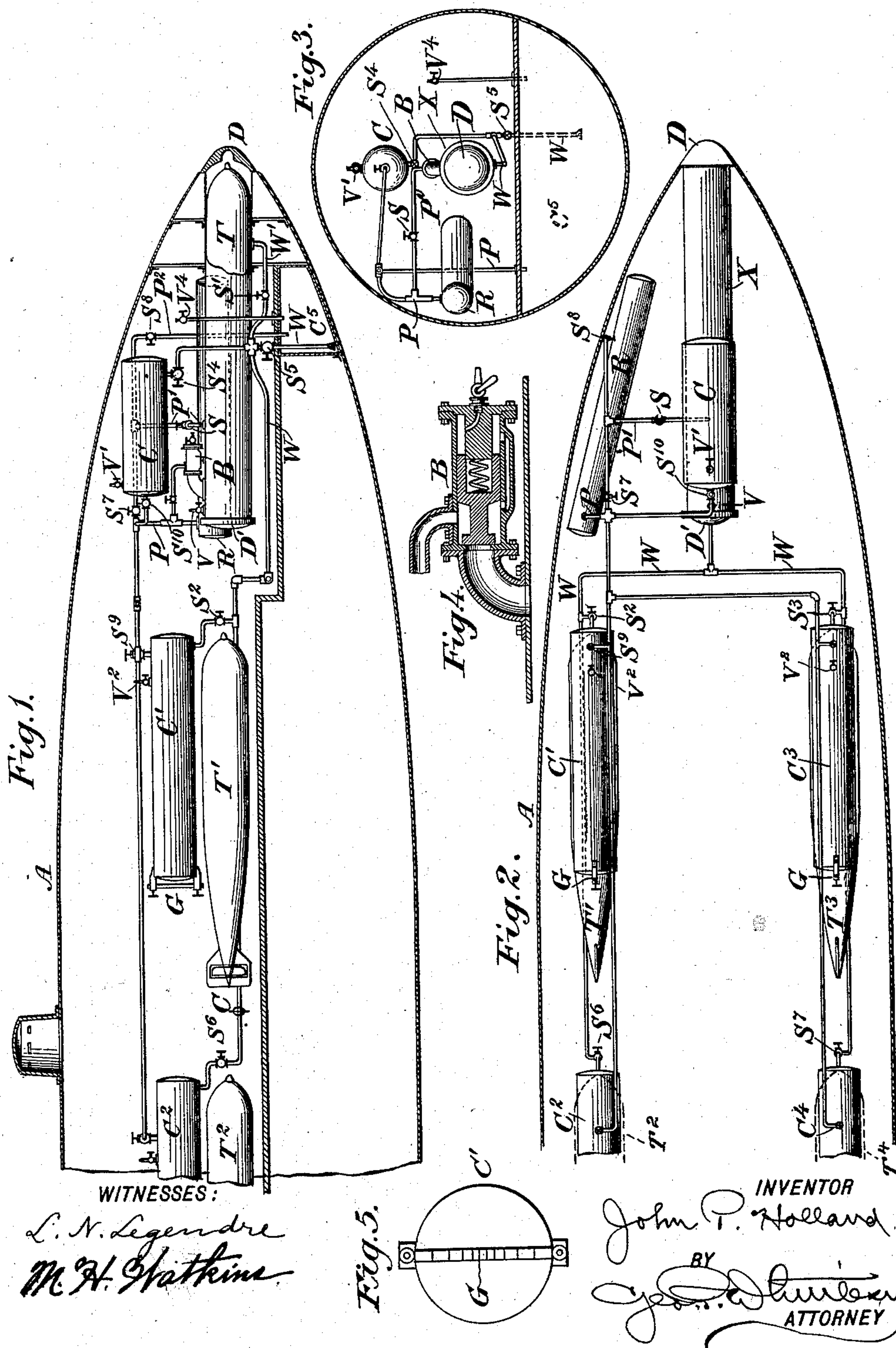
No. 683,400.

Patented Sept. 24, 1901.

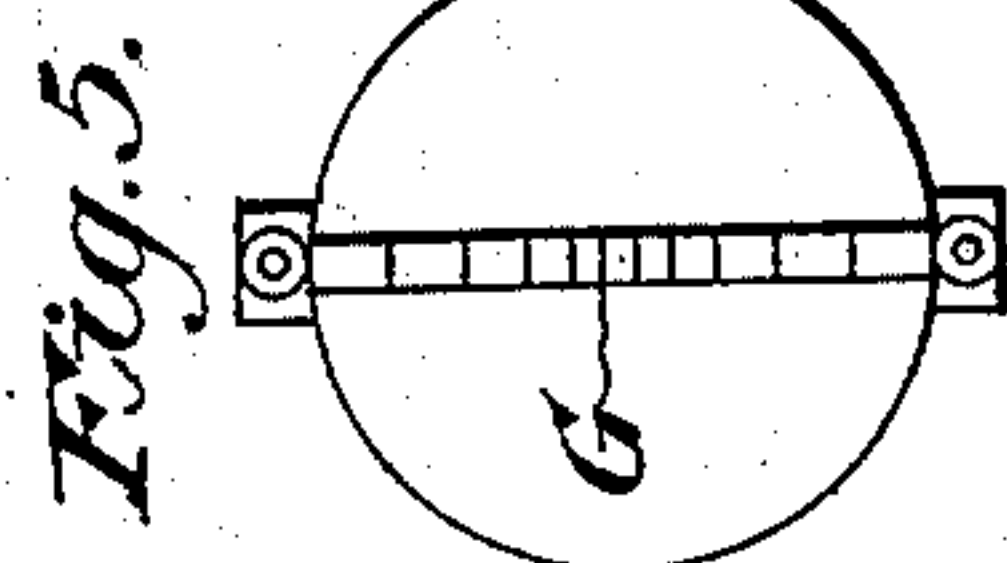
J. P. HOLLAND.  
SUBMARINE BOAT.

(Application filed Apr. 26, 1900.)

(No Model.)



WITNESSES:  
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# UNITED STATES PATENT OFFICE.

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## SUBMARINE BOAT.

SPECIFICATION forming part of Letters Patent No. 683,400, dated September 24, 1901.

Application filed April 26, 1900. Serial No. 14,482. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN P. HOLLAND, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Submarine Torpedo-Boats, of which the following is a specification.

This invention relates to the class of submarine or submergeable boats or vessels which carry torpedoes; and the object of the invention is to provide means for compensating the weight of torpedoes discharged from the boat and for preventing alteration in trim that would be caused by the change of position of each torpedo in the interior of the vessel while loading it into the expulsion-tube when making ready to fire it and also to maintain the total weight and trim of the vessel unaltered by the process of loading, firing, and reloading the expulsion-tube.

In the accompanying drawings, which illustrate an embodiment of the invention, Figure 1 is a vertical axial section of the front half or portion of the boat or vessel, and Fig. 2 is a horizontal axial section of the same. Fig. 3 is a cross-section of the boat at the inner end of the expulsion-tube. Fig. 4 is an enlarged sectional view of the valve B. Fig. 5 is an enlarged end view of the compensation-tank for the torpedo, showing the graduated water-gage.

A designates the hull or shell of the boat, and X the expulsion-tube, fitted therein in the usual way. A torpedo T is carried normally in the expulsion-tube ready for firing, and spare torpedoes T', T<sup>2</sup>, T<sup>3</sup>, and T<sup>4</sup> are carried in the boat at the sides. Over the expulsion-tube is situated a compensation-tank C, and over each of the spare torpedoes is also a compensation-tank, (designated, respectively, C', C<sup>2</sup>, C<sup>3</sup>, and C<sup>4</sup>.) Each of these tanks has on it a water-gage G. Below the expulsion-tube is a tank C<sup>5</sup>.

R is a compressed-air tank or holder.

P P', &c., designate the compressed-air pipes, and W W' designate the connected water-pipes and branches.

V V' V<sup>2</sup>, &c., designate the air-vents, and S S', &c., designate the various controlling-valves in the pipes.

D and D' designate, respectively, the outer and inner doors of the expulsion-tube X.

To prepare for firing the torpedo in the expulsion-tube, the exterior and interior doors D D' of the tube are closed and the water allowed to flow by gravity from the compensation-tank C into the expulsion-tube, or it may be forced from said tank by compressed air from the holder R through the air-pipes P, controlled by the cock S<sup>10</sup>. The internal volume of the compensation-tank C is equal to the volume of the space in the expulsion-tube left unfilled by the torpedo. The center of gravity of the volume of water held in the compensation-tank C is at the same distance from the center of buoyancy of the boat as is the center of gravity of the same water when it has passed into the expulsion-tube around the torpedo. The transfer of this body of water from the compensation-tank C to the expulsion-tube around the torpedo, or vice versa, will therefore produce no tendency to change of trim. During the transfer of water from the compensation-tank C into the expulsion-tube, the air-vent V at the breech of the expulsion-tube is left open; but this vent is closed after the expulsion-tube is filled. When the order to prepare to fire the torpedo is given, the exterior door D is opened. It can be opened without difficulty or hindrance from the external hydrostatic pressure, because the expulsion-tube is already filled with water around its torpedo, and the pressure on this inclosed water is greater than that due to the external hydrostatic pressure under which water was forced into the tube. When the order to fire is given, a charge of compressed air is by the opening of the balanced valve B, Figs. 1 and 4, caused to enter the expulsion-tube at its breech or after end, and this charge of compressed air forces outward the contents of the tube—that is, the torpedo and the water contained in the tube. When the contents of the expulsion-tube are shot outward, the impelling compressed air follows them. Water from the outside enters immediately, fills the tube, and restores the original total weight of the boat without injuriously affecting the conditions of trim. After the discharge of the torpedo the outer door D of the expulsion-tube is immediately closed, and



the tube holds water equal to the volume of the torpedo, which is approximately equal to its actual weight plus a quantity of water equal to the contents of the tank C. In order to reload the expulsion-tube with another torpedo, the contents of the tank C, previously transferred to the expulsion-tube, must be returned. This may be accomplished by admitting compressed air to the expulsion-tube through the pipe P', controlled by the valve S, and at the same time opening the valves S' and S<sup>4</sup> to allow water to flow from the tube X to the tank C by way of the pipe W'. The air-vent V' of the tank C will be opened while charging the latter with water, and the other valves in the water-pipes connected with the pipe W' will be closed. Water connection is now made between the expulsion-tube and the tank C<sup>5</sup> in the boat under the expulsion-tube, which tank will contain a weight of sea-water equal to the weight of the torpedo. This water connection is made by opening the valves S' and S<sup>5</sup> in the pipes W W' and closing the valves S<sup>2</sup>, S<sup>3</sup>, and S<sup>4</sup>. The air-vent V<sup>4</sup> on the tank C<sup>5</sup> being opened at the same time is left open until the water remaining in the expulsion-tube, which is equal to the weight of the torpedo, shall have been transferred to said tank by air-pressure or by gravity. When the expulsion-tube has been emptied of water, the compressed air is cut off by means of the valve S, and the air-vent V on the breech of the expulsion-tube is opened to permit the compressed air it contains to escape. Then the breech-door D' on the expulsion-tube is opened to permit of the entrance of another torpedo. Any one of the spare torpedoes (suppose it to be the forward torpedo T' on the port side) is then moved into the center of the boat in line with the axis of the expulsion-tube. The last-named valves being now closed, water connection is made between the compensation-tanks C' and C<sup>5</sup> by means of branch pipes W and valves S<sup>2</sup> and S<sup>5</sup>, the valves S', S<sup>4</sup>, S<sup>3</sup>, S<sup>7</sup>, and S<sup>6</sup> being closed. Compressed-air connection is also established between the air-tank R and the compensation-tank C<sup>5</sup> by means of the pipes P, P', and P<sup>2</sup> and the valves S<sup>8</sup> and S<sup>7</sup>, the valves S, S<sup>9</sup>, and S<sup>10</sup> on the air-pipes being now closed and the air-vent V<sup>4</sup> on the tank C' opened. Air from the tank R will now enter the tank C<sup>5</sup>, forcing water therefrom through the pipes W and valves S<sup>5</sup> and S<sup>2</sup>, the valves S', S<sup>4</sup>, S<sup>3</sup>, S<sup>6</sup>, and S<sup>7</sup> being closed and the vent V<sup>2</sup> on the tank C' being open. When all the water in the tank C<sup>5</sup> has been thus transferred to the tank C', the vent V<sup>2</sup> and the last-named air-valves will be closed. As the water contents of the tank C<sup>5</sup> pass into the tank C' the torpedo T' is gradually moved by hand into the expulsion-tube. The distance to be moved is indicated and made to correspond with the proportion of the graduated gage G, Fig. 5, filled.

For example, if the total distance that the torpedo is to be moved forward is twelve times greater than the length of the gage, then the latter may have twelve graduation-marks, so spaced as to indicate each a weight of water added to that in the tank equal to one-twelfth the length of the torpedo. If the compensation-tank be cylindrical, as shown in the drawings, the graduations on the gage will of course be proportionately varied in spacing; but the tank may be of other shapes. The torpedo will be driven home by the time all the water shall have passed from the tank C<sup>5</sup> to the tank C'. The breech-door D' of the expulsion-tube is then closed, and the second torpedo T' is ready to be discharged. The speed of the movement forward of torpedo T' is regulated to correspond with the quantity of water indicated on the glass gage G on compensation-tank C' to be present in it. The same method is adopted in discharging, moving, compensating for, and loading each torpedo in succession until all the torpedoes are discharged and all the compensation-tanks are filled with water, the expulsion-tube being empty.

The balanced firing-valve B forms no essential part of the present invention, and indeed any form of valve suitable for the purpose may be employed. Fig. 4 illustrates the internal construction of the valve.

Having thus described my invention, I claim—

1. The combination with a submarine boat provided with an expulsion-tube, of a tank or receptacle connected with said tube, and capable of holding a volume of water sufficient to completely fill the expulsion-tube when the latter contains a torpedo.

2. The combination with a submarine boat provided with an expulsion-tube, of a tank or receptacle connected therewith, and capable of holding a volume of water sufficient to fill said tube when it contains a torpedo, the center of volume of said tank being at the same distance from the center of buoyancy of the boat as is the center of volume of the space in said tube around the torpedo.

3. The combination with a submarine boat provided with an expulsion-tube, of a tank or receptacle connected therewith, and capable of holding a volume of water sufficient to fill said tube when it contains a torpedo, and means for transferring the contents of said tank to the expulsion-tube and vice versa, without altering the total weight of the boat, or disturbing its longitudinal trim.

4. The combination with a submarine boat, provided with an expulsion-tube, of a tank or receptacle located adjacent to said tube with its center of volume at the same distance from the center of buoyancy of the boat as that of the space around a torpedo in the tube, the capacity of said tank being equal to said space, valved pipes connecting said tank and tube, a source of compressed air,



and valved pipes connecting said source with the tank and the tube.

5 The combination with a submarine boat provided with an expulsion-tube, of compensation-tanks each capable of holding a volume of water equal in weight to a torpedo  
10 and arranged with its center of volume at the same distance from the center of buoyancy of said boat as that of the corresponding torpedo, one of said tanks being situated above and over the expulsion-tube and the others at the sides of the boat over the respective spare torpedoes.

15 6. The combination with a submarine boat, provided with an expulsion-tube, of a compensation-tank capable of holding a volume of water equal to that displaced by a torpedo, said tank being connected with the expulsion-tube, exterior thereto, and lying with its  
20 center of volume at the same distance from the center of buoyancy as that of the torpedo when in the expulsion-tube.

25 7. The combination with a submarine boat provided with an expulsion-tube, of a compensation-tank adjacent to said tube, one or more spare torpedoes, a compensation-tank adjacent to each spare torpedo, and means for transferring water from said expulsion-

tube to the transfer-tank, and thence to a compensation-tank.

30 8. The combination with a submarine boat provided with an expulsion-tube, of two tanks adjacent to said tube, whose combined capacities equal that of the tube, one or more spare torpedoes, a compensation-tank adjacent to each spare torpedo, a source of compressed air, and valved pipes for transferring the water which fills the expulsion-tube after firing, to the two adjacent tanks, and from  
35 one of them to a compensation-tank when the corresponding torpedo is being loaded.

9. The combination with a submarine boat provided with an expulsion-tube, of one or more spare torpedoes, a compensation-tank adjacent to each torpedo, and a gage-tube on  
45 each tank to indicate to the gunner the rate at which the compensation-tank is filling and the corresponding speed with which the torpedo should be moved forward.

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

JOHN P. HOLLAND.

Witnesses:

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