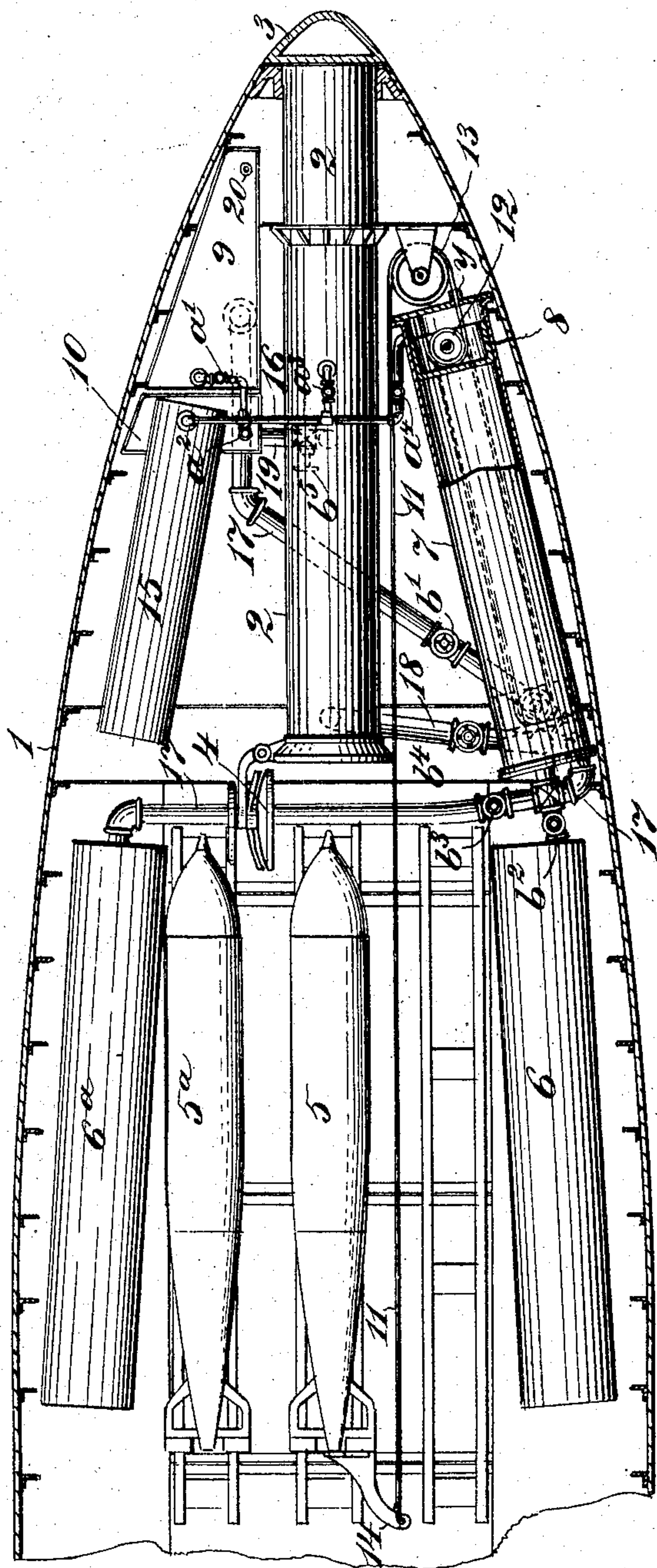


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F. T. CABLE.  
COMPENSATING DEVICE FOR SUBMARINE BOATS.  
APPLICATION FILED AUG. 1, 1903. RENEWED MAY 24, 1904.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## COMPENSATING DEVICE FOR SUBMARINE BOATS.

SPECIFICATION forming part of Letters Patent No. 778,350, dated December 27, 1904.

Application filed August 1, 1903. Renewed May 24, 1904. Serial No. 209,593.

*To all whom it may concern:*

Be it known that I, FRANK T. CABLE, of New Suffolk, in the county of Suffolk and State of New York, have invented certain new and useful Improvements in Compensating Devices for Submergible and Submarine Boats, of which the following is a specification.

This invention relates specifically to the class of submarine or submergible boats or vessels which carry and expel torpedoes, and has for its object means for compensating the weight of torpedoes discharged or moved in a fore-and-aft direction in the boat in order that the fore-and-aft center of gravity of the system may be maintained substantially constant.

In the accompanying drawing, which illustrates an embodiment of the invention, the figure is a horizontal section taken at the axis of the boat and showing only those features at the forward end of the latter in which the present invention resides.

1 designates the hull of the boat; 2, an expulsion-tube mounted therein; 3, a hinged water-tight cap which closes the outer end of the expulsion-tube, and 4 a hinged water-tight door for closing the inboard end of said tube. This door is shown as open in the drawing.

5 and 5<sup>a</sup> designate torpedoes, the former being shown in position alined with the expulsion-tube and ready for entering the latter.

6 and 6<sup>a</sup> are compensating tanks for the respective torpedoes.

7 is a water-receptacle in the form of a cylinder situated adjacent to the expulsion-tube and provided with a piston 8. This piston is shown in full lines where the forward end of the cylinder is broken away and in dotted lines at the inboard end of the cylinder.

9 is a tank or water-receptacle of such capacity and so situated that its volume, combined with that of the cylinder 7, is equal to the displacement of the water by one torpedo and so that their center of gravity, the two being taken together, will be at substantially the fore-and-aft center of gravity of the expulsion-tube. 10 is a smaller tank or water-receptacle which may contain a quantity of water equal to that which surrounds the tor-

pedo in the expulsion-tube or which has a capacity equal to that of the expulsion-tube less the displacement of the torpedo.

A rope or like flexible connector 11 is secured to the forward head of the cylinder 7, passes about a sheave 12, attached to the piston 8, thence out through an aperture or packed passage  $\gamma$  in the cylinder-head and about a guide-sheave 13, and thence inboard, its inboard end being attached to a portable bracket 14, adapted to be secured to the torpedo 5.

15 is a tank to contain compressed air, and 16 is a pipe leading therefrom and having connections with the tanks 9 and 10, the expulsion-tube 2, and the cylinder 7, the admission of air to these receptacles being controlled, respectively, by stop-valves or cocks  $a'$ ,  $a''$ ,  $a'''$ , and  $a^4$  in said pipe.

17 is a water-pipe below the level of the several parts described and having connections with the receptacles 7, 9, 6, and 6<sup>a</sup>. This pipe has in it controlling stop valves or cocks  $b'$ ,  $b''$ , and  $b^3$ . Another water-pipe, 18, connects the inboard ends of the expulsion-tube 2 and cylinder 7, and this pipe is controlled by a stop-valve  $b^4$ . Another water-pipe, 19, connects the small tank 10 with the expulsion-tube and is controlled by a stop-valve  $b^5$ . This last-named valve, being below the expulsion-tube, is indicated in dotted lines.

The operation of the device is as follows: Assume the expulsion-tube 2 to be full of water, with the cap 3 and door 4 closed and the tanks 6, 6<sup>a</sup>, 9, and 10 and the cylinder 7 empty. The piston 8 is at the inboard end of the cylinder. All the stop-valves may be assumed as closed except at a small air-vent pipe 20 on the tank 9. The valve  $b^4$  in pipe 18, the valve  $b'$  in pipe 17, and the valve  $b^5$  in pipe 19 are opened, so that water may flow from the expulsion-tube 2 to the cylinder 7 and tanks 9 and 10. Air is now admitted to the expulsion-tube at valve  $a^3$  and the water blown out therefrom into the said cylinder and tanks, forcing the piston 8 to the forward end of the cylinder. Thus the tube 2 is left empty and these receptacles are filled, but without disturbing the center of gravity fore and



aft of the system. The cocks are now again closed, the door 4 opened, and the torpedo 5 shifted laterally into the position seen in the drawings. The rope 11 is now drawn aft and the bracket 14 secured to the inboard end or stern of the torpedo, as seen in the drawing. The valve  $b^2$  is now opened to establish communication between the tank 6 and the cylinder 7. The valve  $b'$  is opened to establish communication between said cylinder and the tank 9 and the air-valves  $a'$  and  $a^4$  opened to admit air to the tank 9 and cylinder 7. The effect of this is to force the piston 8 back and drive the water from the cylinder into the compensation-tank 6 and from the tank 9 to the said tank 6, while the bracket 14 draws the torpedo 5 into the expulsion-tube 2. The tank 6 has the same capacity as the combined tank 9 and cylinder 7. After the torpedo 5 is placed the bracket 14 is detached, the door 4 closed, and the water from the smaller tank 10 is forced into the expulsion-tube by the compressed air. Thus the cylinder 7 and tanks 9 and 10 are empty, and the expulsion-tube 2 and compensation-tank 6 are full. By regulation with the valve  $b'$  the flow of water to the tank 6 from the tank 9 may be made to correspond very nearly with the gradual displacement forward of the torpedo by the rope 11, and this aids in preserving constant the fore-and-aft specific gravity of the system.

Obviously the invention is not restricted to the specific arrangement of the parts and the shapes of the same herein shown, as these may be varied without departing from my invention.

It will be noted that the water-receptacle 7 is in the form of a cylinder only to adapt it to the piston and also that the receptacles 7 and 9 constitute means for holding water equivalent to the volume displaced by a single torpedo regardless of the number of such receptacles or their form, whether one or more.

The sheave 12 is employed only in order that a shorter cylinder may be employed in getting the desired travel of the torpedo in charging the tube 2.

The aperture  $y$ , from which the rope 11 emerges, may be packed in any known way to prevent excessive leakage of air.

Having thus described my invention, I claim—

1. A submarine or submergible boat having an expulsion-tube to receive a torpedo, means for holding water comprising receptacles disposed respectively at opposite sides of the said tube, the center of gravity of the combined

receptacles being substantially coincident with that of the expulsion-tube, and the capacity of the combined receptacles being substantially equal to the volume of water displaced by the torpedo when submerged, and means for shifting the water from the expulsion-tube to said water-holding receptacles.

2. A submarine or submergible boat having an expulsion-tube to receive a torpedo, water-receptacles adjacent to said tube having a combined capacity substantially equal to the volume of water displaced by the submerged torpedo, a water-receptacle adjacent to the expulsion-tube and having a capacity equal to that of the expulsion-tube less the volume displaced by the torpedo therein, and means for expelling the water from the expulsion-tube into said receptacles.

3. A submarine or submergible boat, having an expulsion-tube, a plurality of water-receptacles adjacent to the said tube and having a combined capacity substantially equal to the capacity of the expulsion-tube, one of said receptacles, 10, having a capacity substantially equal to that of the expulsion-tube less the displacement of the torpedo when submerged in the tube, means for driving the water from the expulsion-tubes into said receptacles, and means independently operatable, for forcing the water from the receptacle 10 back into the expulsion-tube when the torpedo is in place therein,

4. A submarine or submergible boat having an expulsion-tube, a cylinder adjacent thereto, a piston in said cylinder, a rope coupled to said piston and provided with means for securing it to a torpedo for driving the latter into the expulsion-tube, and means for moving said piston in the cylinder.

5. A submarine or submergible boat having an expulsion-tube, a compensating tank, a cylinder adjacent to the expulsion-tube, said cylinder being connected by cock-controlled passages with said tank and tube, a compressed-air tank, connected by cock-controlled passages with both the expulsion-tube and said cylinder, a piston in said cylinder situated between the air and water inlets thereto, a rope connected with said piston for operating a torpedo, and a guide-sheave for said rope.

In witness whereof I have hereunto signed my name, this 27th day of July, 1903, in the presence of two subscribing witnesses.

FRANK T. CABLE.

Witnesses:

HOWARD G. TUTHILL,  
WILLIAM R. SANDS.