No. 871,453. PATENTED NOV. 19, 1907.

L. Y. SPEAR.

TANDEM TORPEDO TUBE.

APPLICATION FILED JAN. 15, 1907.

4 SHEETS—SHEET 1.

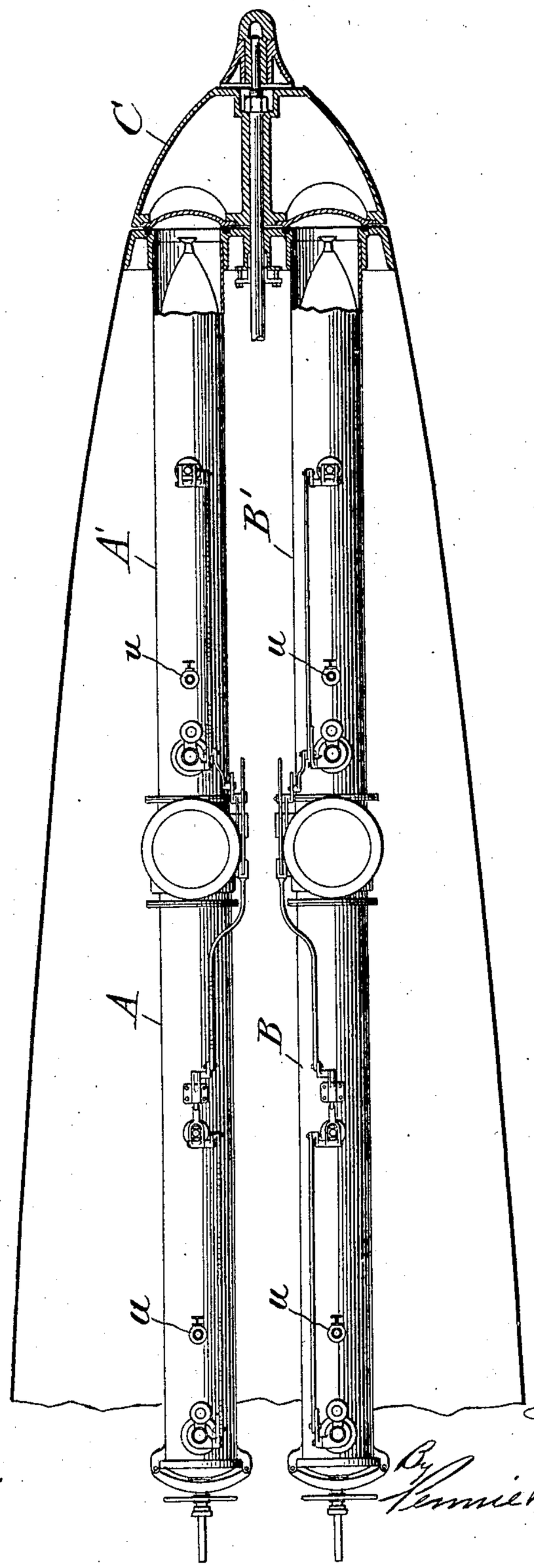

Fig. 1.

Witnesses
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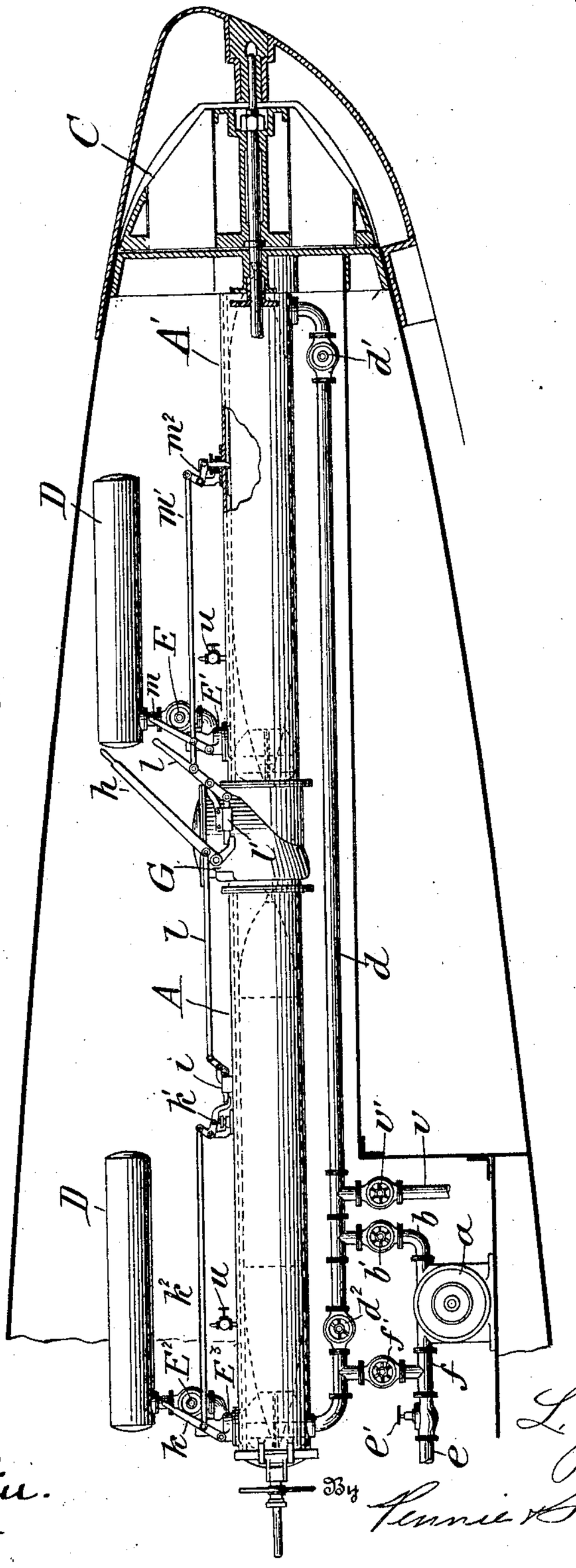
4 SHEETS—SHEET 2.

Fig. 2.



Witnesses

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4 SHEETS—SHEET 3.

Fig. 3

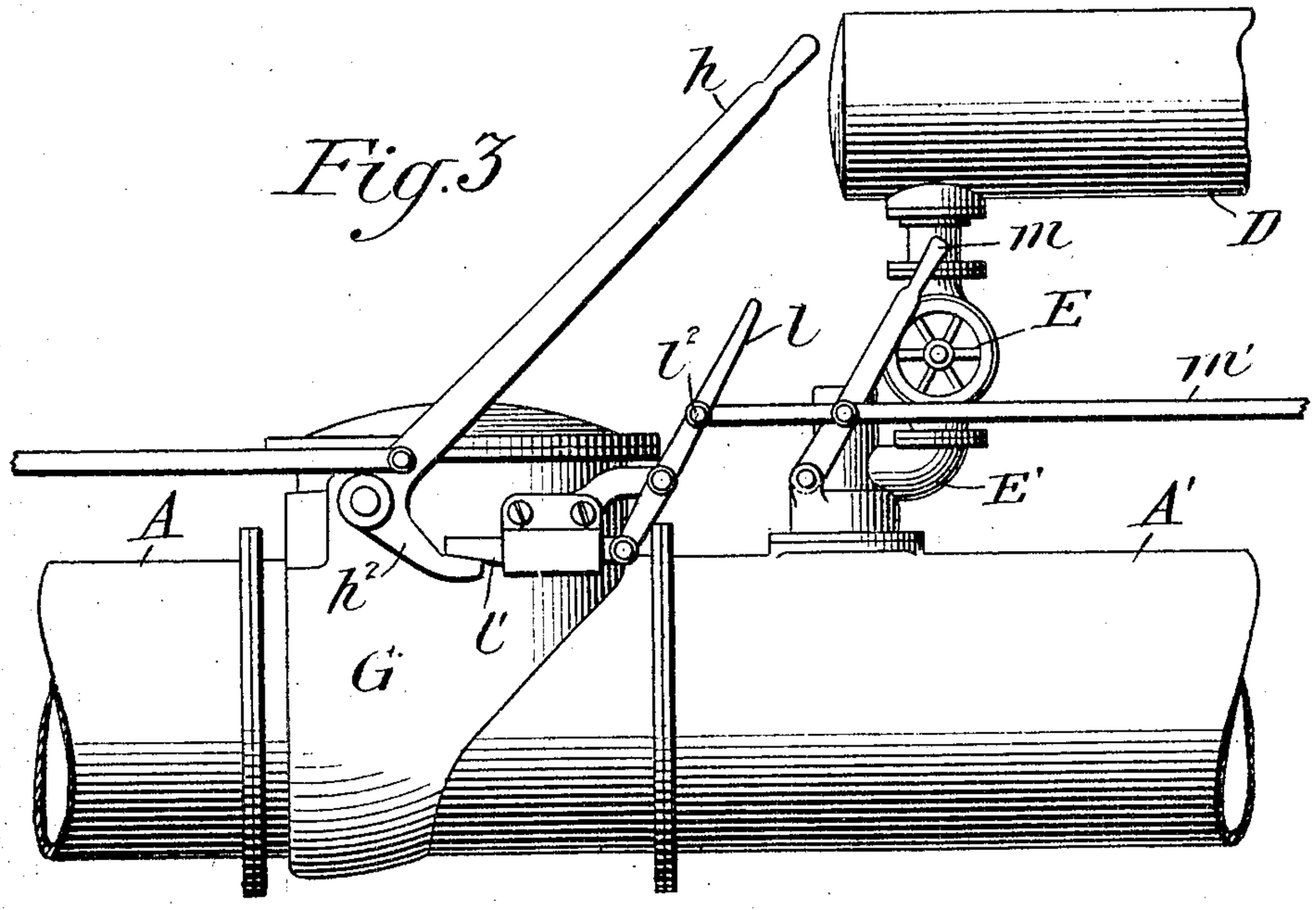
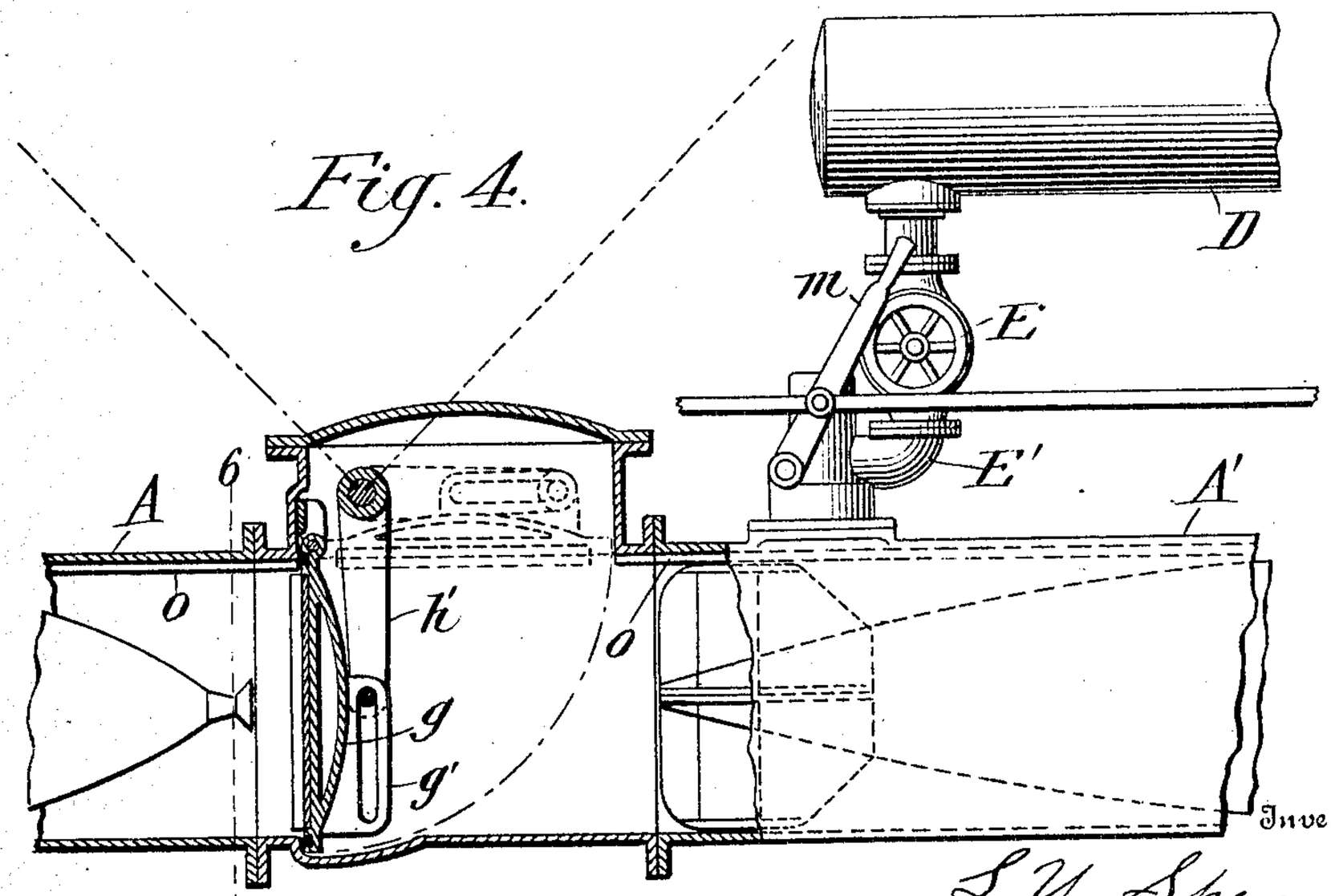


Fig. 4.



Witnesses
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4 SHEETS—SHEET 4.

Fig. 5.

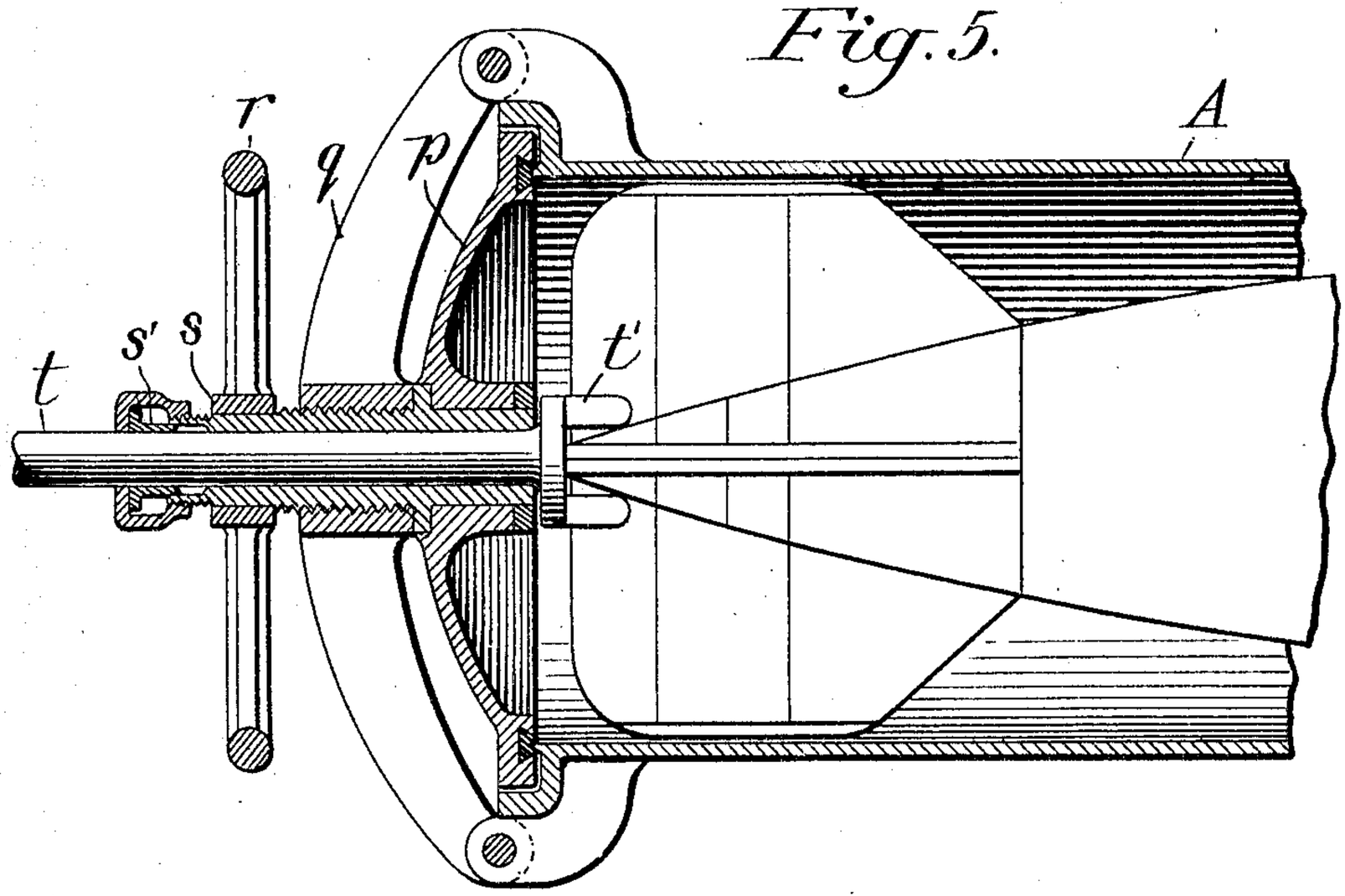


Fig. 6.

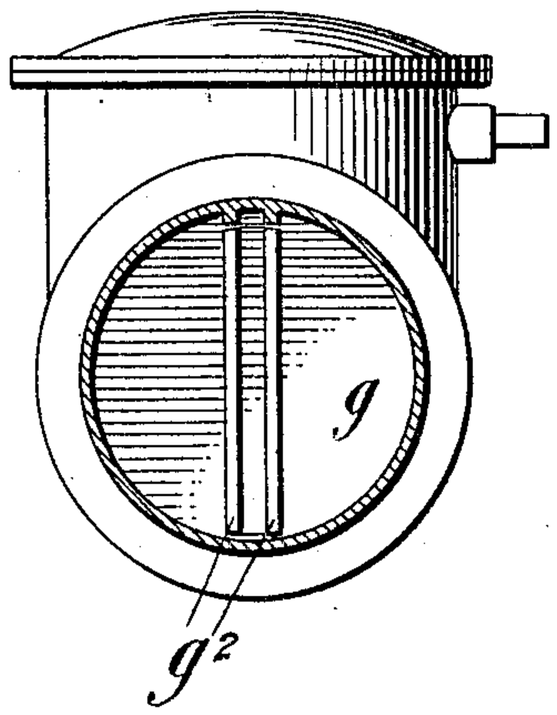
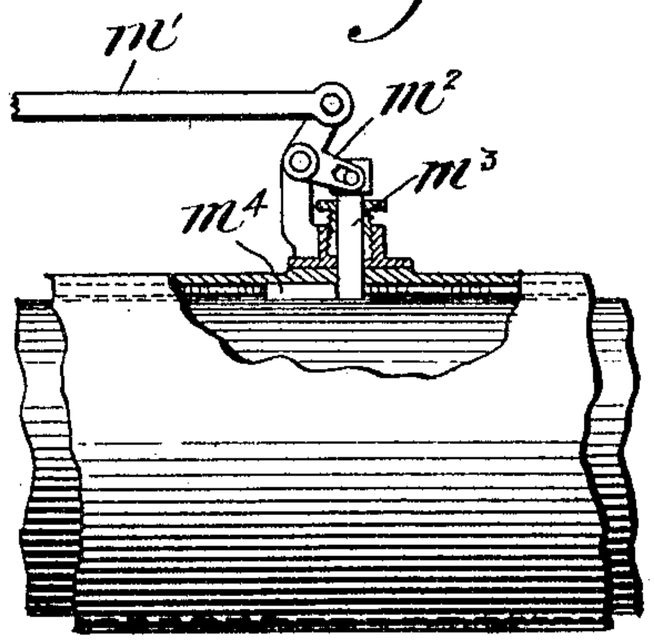


Fig. 7.



Witnesses
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UNITED STATES PATENT OFFICE.

LAWRENCE YORK SPEAR, OF MILTON, MASSACHUSETTS, ASSIGNOR TO ELECTRIC BOAT COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

TANDEM TORPEDO-TUBE.

No. 871,453. Specification of Letters Patent. Patented Nov. 19, 1907.

Application filed January 15, 1907. Serial No. 352,353.

To all whom it may concern:

Be it known that I, LAWRENCE Y. SPEAR, a citizen of the United States, residing at Milton, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Tandem Torpedo-Tubes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention provides a plurality of torpedo-tubes arranged in tandem relation and so equipped that a torpedo may be discharged directly outboard from the forward tube, and also from the after tube through the forward tube of the tandem, whereby the two torpedoes in the forward and after tubes may be discharged in quick succession if desired. The tandem tubes are also equipped with means for moving the torpedo from the after to the forward tube without discharging it, and also with a system of interlocking operating levers and stops, whereby the premature or undesired discharge or movement of the torpedoes is prevented.

The construction and operation of the parts will be understood from a reading of the following description in connection with the accompanying drawings, in which

Figure 1 is a top plan view of two sets of tandem torpedo-tubes arranged in the bow of a vessel, these tubes being equipped with my improved apparatus. Fig. 2 is a longitudinal central section of the forward part of the vessel showing one set of tandem tubes in side elevation. Fig. 3 is a side elevation on an enlarged scale of the gate valve between the two tubes of the tandem and showing the operating levers and rods. Fig. 4 is a central longitudinal section of the same. Fig. 5 is a central longitudinal section on an enlarged scale of the rear end of the after tube of a tandem. Fig. 6 is a section on line 6—6 of Fig. 4, and Fig. 7 is a detail view showing the stop mechanism and a portion of a torpedo engaging the same.

The illustration shows two sets of tandem tubes A and A′ and B and B′, which are mounted in position to discharge outboard through the rotatable cap C of a type which is now well known and which is illustrated and described in Letters Patent to Hugo O. Grieshaber, No. 820,925, granted May 15, 1906.

The construction and equipment of each set of tandem tubes is identical with that of the other and a description of one will serve for both.

The mechanism for moving the torpedoes from the after to the forward tube is of the same character as that disclosed in my Patent No. 739,735, granted September 22, 1903, and is constructed as follows:—

A pump a is connected on its eduction side with a pipe b controlled by a hand valve b' and this pipe b communicates with the pipe d extending from the forward to the rear end of the tandem tubes and provided with the hand valves d' and d^2. This pipe d may be put into communication with the water of flotation through the pipe v controlled by the hand valve v'. The pump a is connected on its induction side by the pipe f, controlled by a hand valve f', with the pipe d. The pipe e controlled by the hand valve e', leads outboard from the pipe f.

The mechanism for imparting to the torpedoes the firing impulse comprises for each tube a tank D containing air or other fluid under pressure and communicating with its respective torpedo tube through the hand valve E and the firing valve E′, the control of which will be more fully described hereafter.

The means for establishing a firing passage from the after tube through the forward tube is constructed as follows: Between the two tubes of each tandem is a casing G containing a swinging gate-valve g (see Figs. 3 and 4), having a slotted projection g' in the slot of which plays a pin on the arm h' rigidly secured to the rock-shaft of the operating lever h. Connected to the lever h is a rod l running back along the top of the after tube and connected to a pivoted dog i, which is adapted to restrain the movement of the firing lever k by taking over the toe of the pivoted lever k' connected with the lever k through the rod k^2. This lever k controls the firing valve E^3 of the after torpedo tube, and also controls the stop-pin in the torpedo guide slot of the after tube of the tandem through the pivoted lever k'. The character of this stop-pin, which is the same as the stop pin on the forward tube, will be understood by referring to Fig. 7, in which the pivoted lever m^2 operated by the rod m' controls the position of the stop-pin m^3 which pin projects through a stuffing box in the upper side of the torpedo tube into the torpedo guide slot where it is in

the path of the torpedo guide block m^4 on the torpedo itself, thus stopping the torpedo in the proper position within the tube in a manner which is now well known in the art. The main lever h of the gate valve is itself restrained by a dog l', which takes over the toe on the arm h^2 of the lever h and which is operated by the pivoted lever l. Connected to this lever l by a removable toggle-pin l^2 is the rod m' to which is connected the firing lever m, which controls the firing valve of the forward torpedo tube. This rod m' extends forward above the forward tube and is attached to the lever m^2, operating the stop-pin in a manner which has already been described. The gate valve g (see Fig. 6) is provided on its under surface with guide strips g^2, which are adapted, when the gate valve is open, as shown in dotted lines in Fig. 4, to aline with the guide strips o on the forward and rear torpedo tubes, thus forming a continuous guide for the guide-block m^4 on the torpedo and preventing the rotation thereof.

In addition to the fluid means for moving a torpedo from the after to the forward tube I have provided a mechanical mechanism for this purpose of a character which is illustrated in Fig. 5. Mounted in the breech door p, of the after tube, and passing through the yoke q and the hand wheel r, is a tubular casing s provided at its outer end with a stuffing box s', and extending through this casing is a push rod t provided within the cover with a head having fingers t' to engage the propeller of the torpedo. By means of this push rod the torpedo may be moved from the rear to the forward tube. The operation of the mechanism is as follows:—

The torpedo-tubes being empty and the bow-cap C turned so that the ends of the tubes are closed, the breech-door p is opened and a torpedo pushed into the tube A. In order to move this torpedo into the forward tube A′, two methods are indicated:—

(1) The breech-door is closed and the gate valve g is opened by throwing the lever h in the proper direction. Before this is done, it is necessary to unlock the lever h from the dog l' and this should be accomplished without withdrawing the stop-pin m^3 in the forward tube. To accomplish this, the removable toggle-pin l^2 is removed before the lever l is operated to move the dog l' from the toe of the arm h^2. The lever h being thus unlocked, can be thrown to open the valve g and this movement at the same time withdraws the latch i from the toe of lever k'. It is now possible to move lever k to the left, withdrawing the stop-pin from the torpedo guide slot, thereby releasing the torpedo guide-block so that the torpedo may be moved forward, the guide block being guided through the gate valve by the guide strips g^2 and so into the forward tube A^2. The vent valves u are now opened and valve v' in the pipe v which leads to the water of flotation is also opened. The valves d' and d^2 are then opened, allowing the water of flotation to fill the torpedo tubes, and when they are full the vent valves u are closed. The valves v', and d^2 are then closed and the pump a is started drawing the water from the forward tube A′ by a pipe d and discharging it through pipe f, the valve f' of which has been opened, into the after tube. This transfer of water moves the torpedo from the after to the forward tube and when it has reached the proper position within the forward tube the guide-block m^4 contacts with the stop-pin m^3 and stops the movement of the torpedo. The gate valve g may now be closed by reversing the operation for opening, the stop-pin in the after tube having fallen of its own weight into the guide slot and being again locked in this position by the latch i. The lever l is then reconnected to the rod m' by replacing the removable toggle-pin l^2 and then a torpedo may be placed in the after tube in the ordinary manner and the breech door secured in place.

(2) The second method for moving the torpedo from the after to the forward tube comprises the opening of the gate valve g in the same manner and the moving forward of the torpedo from the after to the forward tube by means of the push rod t.

The torpedoes being in the tubes, the operation for firing them is as follows: Cap C is revolved until the discharge openings therein are in line with the tubes whereupon the water of flotation enters and fills the forward tube, if it is not already filled. The valve E is then opened, admitting air from the tank D to the firing valve E′, then by movement of the firing lever m to the left the firing valve E′ is opened and the air of expulsion is admitted to the forward tube and at the same time the stop pin m^3 is lifted and the torpedo is impelled outward. The valve E is then closed. By this firing operation the dog l' is withdrawn from the toe of arm h^2 of the lever h, and the gate valve g may now be opened by a movement of the lever h to the left, which movement also withdraws the dog i from the toe of lever k'. The valve E^2 may now be opened, admitting air under pressure from the tank D, to the firing valve E^3, whereupon a movement of the lever k, to the left will open the firing valve and expel the torpedo through the forward tube and since the stop-pin m^3 in the forward tube is already lifted, the torpedo is discharged outboard, being guided throughout by the guide slot.

It will be observed that starting with the torpedoes in the tube surrounded by water, the whole operation of firing both torpedoes does not involve any permanent change of weight or center of gravity of the system,

since, as the torpedoes move out of the tube, they are replaced by a corresponding quantity of water. This makes the arrangement of particular value for submarine or submergible boats, but it is, of course, applicable to any form of submerged torpedo-firing tube and may be applied in any kind of a vessel. By this arrangement of parts, it is possible to fire the two torpedoes in the tandem tubes one immediately after the other, without the interposition of the operation of moving the second torpedo from the after to the forward tube, as has heretofore been necessary.

So far as I am aware, this is the first construction by which it is possible to fire two or more torpedoes from tandem tubes one after the other, and I desire that the claims covering the mechanism by which this object is attained should have a correspondingly broad interpretation, it being understood that the arrangement may be applied to any practicable number of tubes arranged in tandem or series, relation by a mere duplication of parts.

A further valuable feature of my improvements, to which I desire to call particular attention, is the arrangement of interlocking levers, above described, whereby the inopportune movement of the torpedoes is prevented. Thus the firing of the torpedo from the forward tube automatically releases the operating lever of the gate valve and the operation of this lever to open the valve automatically releases the firing lever for the torpedo in the after tube. It is thus rendered impossible to open the gate valve until after the torpedo is discharged from the forward tube, except by deliberately removing the toggle-pin l^2 connecting the lever l to the rod m', and it is impossible to fire the torpedo from the after tube until the torpedo has been fired from the forward tube and the gate valve has been opened.

It will be observed furthermore, that by the combination of parts described, I retain all the advantages of tandem torpedo-tubes which reside in the fact that after firing from the forward tubes the torpedoes may be quickly moved forward from the after tube and the valve g closed leaving the torpedoes in the forward tubes ready for instant firing while the after tubes are being refilled.

What I claim is:—

1. The combination with a plurality of torpedo tubes arranged in tandem relation, of firing mechanism associated with the forward tube, means for establishing a firing passage from an after tube through the forward tube, and firing mechanism associated with that after tube, whereby a plurality of torpedoes may be discharged in rapid succession, substantially as described.

2. The combination with two torpedo tubes arranged in tandem relation, of firing mechanism associated with both of said tubes, and means for establishing a firing passage from the after tube through the forward tube, whereby torpedoes may be discharged from both of said tubes in rapid succession, substantially as described.

3. The combination with two torpedo tubes arranged in tandem relation, of firing mechanism associated with the after tube, and means for establishing a firing passage from the after tube through the forward tube, whereby the torpedo may be fired directly from the after tube, substantially as described.

4. The combination with two torpedo tubes arranged in tandem relation, of firing mechanism associated with both of said tubes, means for establishing a firing passage from the after tube through the forward tube and a torpedo guide extending through said tubes and passage, substantially as described.

5. The combination with two torpedo tubes arranged in tandem relation, of a valve chamber between said tubes, a valve in said chamber provided with valve operating mechanism, firing mechanism associated with both of said tubes and interlocks between the firing mechanisms and the valve operating mechanism, whereby the firing of the forward torpedo unlocks the valve and the opening of the valve unlocks the firing mechanism of the after torpedo.

6. The combination with two torpedo tubes arranged in tandem relation, of a valve chamber between said tubes, a swinging gate valve in said chamber, means for swinging said valve to establish a firing passage from the after tube through the forward tube, torpedo guides in the forward and after tubes, and a torpedo guide on the swinging gate valve so constructed and arranged as to register with the guides in said tubes when the gate valve is open, substantially as described.

7. The combination with two torpedo tubes arranged in tandem relation, of a valve chamber between said tubes, a valve in said chamber, means for operating said valve, torpedo guide slots in the forward and after tubes and a guide slot in the valve chamber so constructed and arranged as to register with the guide slots in the tubes when the valve is open, substantially as described.

8. The combination with two torpedo tubes arranged in tandem relation, of a valve chamber between said tubes, a valve in said chamber, means for operating said valve, firing mechanism associated with the after tube, and an interlock between the valve operating mechanism and the said firing mechanism, whereby the said firing mechanism is locked until the valve is opened, substantially as described.

9. The combination with two torpedo tubes arranged in tandem relation, of firing

mechanism associated with both of said tubes, a valve between the said tubes, means for operating said valve, a torpedo guide slot in each tube, a stop pin in each guide slot, connections between the stop pin and its associated firing mechanism, whereby the stop-pin is withdrawn when the firing mechanism is operated, and interlocks between the firing mechanisms and the valve operating mechanism, whereby when the forward firing mechanism is operated and the stop-pin withdrawn, the valve operating mechanism is unlocked and when the valve operating mechanism is actuated to open the valve the firing mechanism of the after tube is unlocked, and when the firing mechanism, of the after tube is actuated its associated stop-pin is withdrawn, substantially as described.

10. The combination with a plurality of torpedo tubes arranged in tandem relation, of firing mechanism associated with the forward tube, means for establishing a firing passage from an after tube through the forward tube, firing mechanism associated with the after tube and means independent of the firing mechanism for moving a torpedo from the after to the forward tube, substantially as described.

11. A tubular container for discharging torpedoes having a removable breech-door or gate dividing it into tandem torpedo carrying sections, and firing mechanism for each section, substantially as described.

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

LAWRENCE YORK SPEAR.

Witnesses:
F. L. Brake,
W. D. Fesler.