(No Model.) 2 Sheets—Sheet 1.

G. R. MURPHY.

MECHANISM FOR CONTROLLING TORPEDOES, &c.

No. 442,327. Patented Dec. 9, 1890.

Fig. 1.

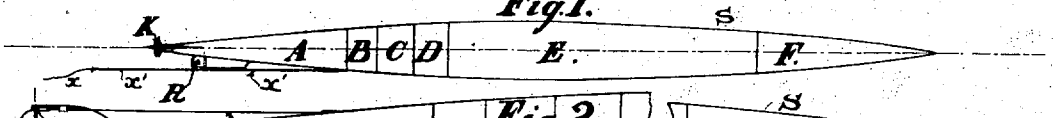


Fig. 2.

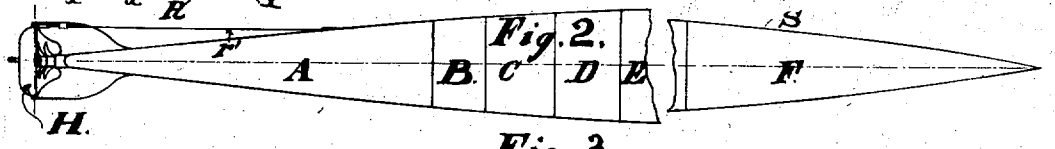


Fig. 3.

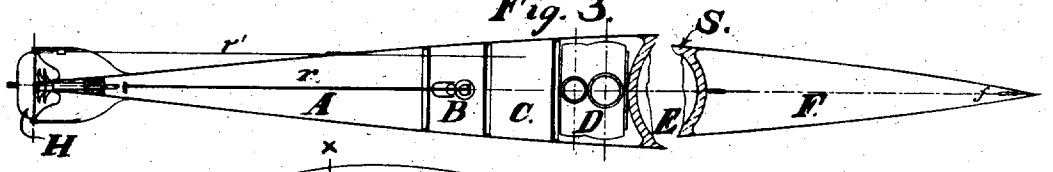


Fig. 11.



Fig. 12.

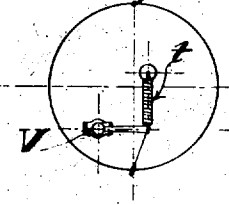


Fig. 13.

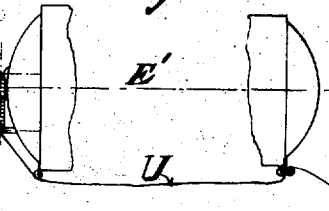


Fig. 6.

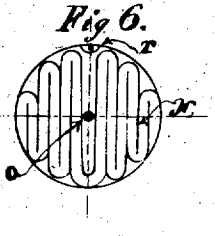


Fig. 5.

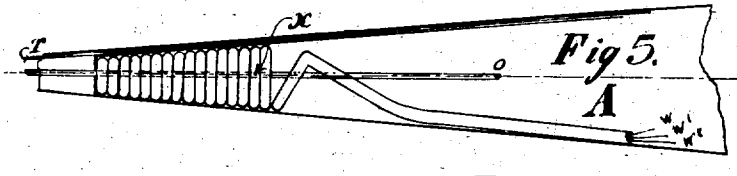


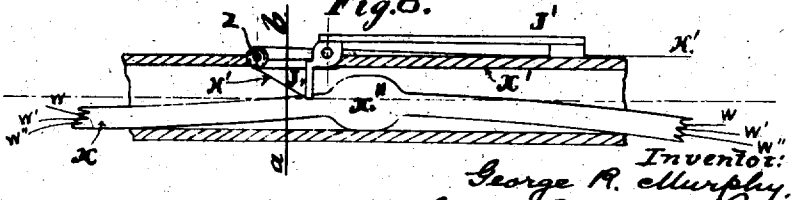
Fig 7



Fig. 9.



Fig. 8.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

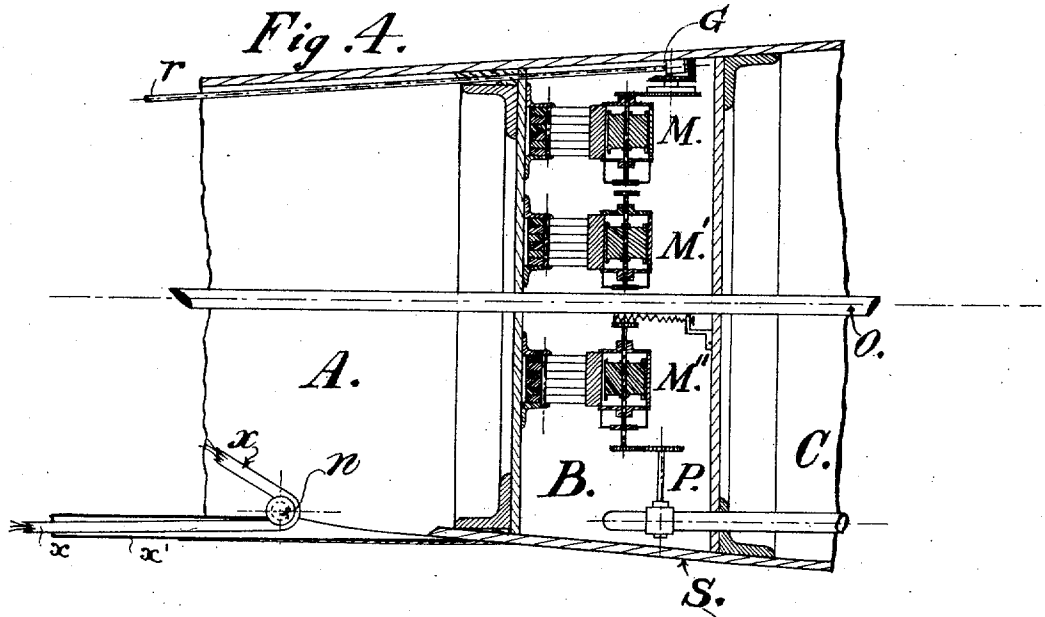
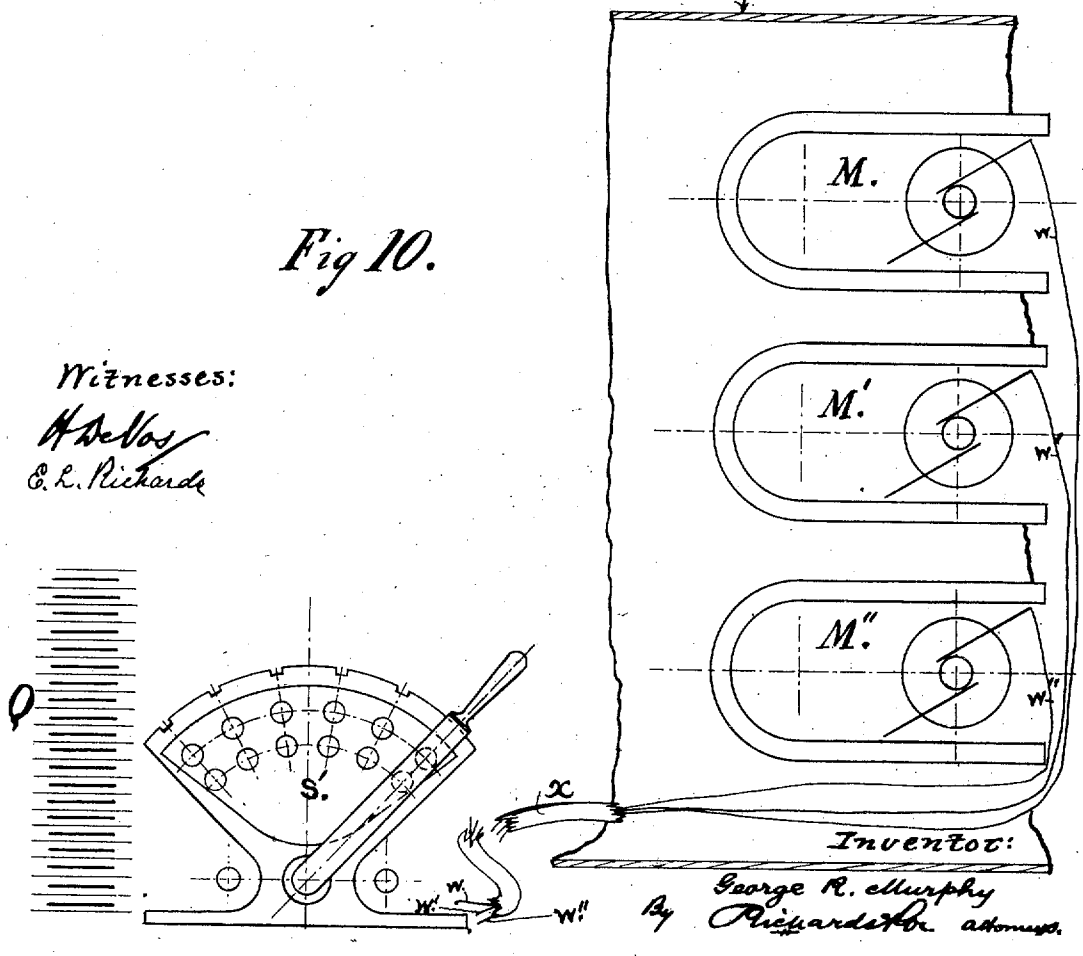


Fig 10.



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UNITED STATES PATENT OFFICE.

GEORGE READ MURPHY, OF LONDON, ENGLAND.

MECHANISM FOR CONTROLLING TORPEDOES, &c.

SPECIFICATION forming part of Letters Patent No. 442,327, dated December 9, 1890.

Application filed December 17, 1889. Serial No. 334,076. (No model.)

To all whom it may concern:

Be it known that I, GEORGE READ MURPHY, of 9 Fenchurch Avenue, London, England, have invented certain Improvements in Means and Mechanisms for Propelling, Controlling, Exploding, and Steering Torpedoes; and I do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement.

My invention relates to improvements in means and mechanisms for propelling, controlling, exploding, and steering torpedoes similar to those known as "Whitbread torpedoes;" and it consists in the application of certain novel features or mechanism hereinafter fully described, in combination with known means, devices, or appliances for more conveniently and readily propelling, steering, exploding, and controlling torpedoes than heretofore either from the shore for harbor defense or from a ship attacking or defensive purposes.

My improvements further comprise certain internal arrangements for the purpose of facilitating the carrying out of the above-mentioned objects.

The motive power used for propelling my improved torpedo is compressed air, and one of the important features of my improvements is the control of the admission of such compressed air to the engine by means of an electric motor.

The engine which I prefer to use for actuating the screw-propellers is Brotherhood's high-speed air-engine; but any other efficient air-engine may likewise answer for the purpose of my invention.

My improved means for controlling torpedoes consists of a flexible gutta-percha cable of a specific gravity equal to that of sea-water, or thereabout, part of which is coiled and stowed away in the aft part of the torpedo, while the other portion is stored on shore or on the ships and first paid out when the torpedo is started. That part of the cable which is contained in the latter is freely unwound, either when the valve controlling the admission of compressed air to the engine is fully opened by an electric motor and the torpedo is driven at full speed or when the tension exerted upon such cable exceeds a pressure of from five to seven pounds. This cable contains three separately-insulated copper wires, by means of which the power necessary for controlling, raising, steering, and exploding is transmitted from the shore for harbor defense, which will be the application hereinafter referred to for convenience of description. One of the objects of this cable is to enable the torpedo to be recovered when practicing or when the charge is not exploded. For steering and raising purposes I make use of two rudders, a vertical and a horizontal rudder, the former serving to steer the vessel in any desired direction, while the latter enables the same to be raised from any depth to the surface of the water. The torpedo is sunk to the bottom of the sea or a river by allowing the air stored below the admission-pipe to escape and water to take its place, and it is raised by opening the admission-pipe, when the compressed air admitted will force the water out, and thereby render the torpedo buoyant; or the latter may be caused to rise more or less rapidly by suitably maneuvering the horizontal rudder. The depth which the torpedo has to reach is fixed or set by a depth-registering apparatus of ordinary construction carried in the vessel. The rudders are actuated by means of rods set in motion by two electric motors and suitable bevel or other gear. The horizontal rudder is connected with a hydrostatic valve and balance actuated by one of the said electric motors.

My improved torpedo is controlled, steered, raised, and exploded by means of three magneto-electric motors driven from shore by the three copper wires of the above-mentioned cable. These magneto-electric motors may be of any suitable construction and form no separate part of my invention. One of these motors is used, as already stated, for regulating the admission of compressed air to the engine, and hence for controlling the speed of the torpedo. Another motor serves for actuating the rudder, and consequently for

steering the torpedo, in any desired direction, while the third motor operates the horizontal rudder, the wire transmitting the electric current thereto serving likewise to ignite the explosive charge. The electric currents actuating these three magneto-electric motors from the shore by means of the three copper wires inclosed in the cable aforesaid are produced by suitable batteries or by a dynamo-electric machine placed on shore and driven by any suitable motor, such as a water-wheel, windmill, or the like, actuated by water, wind, or any other source of power, which may be conveniently and inexpensively utilized. The electric currents are controlled and regulated by three switches—one for each wire—these switches effecting the transmission of the electric currents of various intensities. Suitable devices may be used for reversing some of the currents, so that if a current of varying intensity is used to open more or less according to its intensity the compressed-air admission-valve a reverse current of varying intensity will be needed for closing the said valve more or less.

According to a modification of my invention I dispense with the hydrostatic valve and the horizontal rudder before mentioned, and I use instead a vessel or float resembling in form and shape that of the torpedo and provided with a compressed-air reservoir and a high-speed air-engine similar to those of the torpedo. This floating vessel is furnished with a fin and attached by a cable to the torpedo in such a manner that the propulsion of the former will be started as a consequence of the forward motion of the torpedo by means of a suitable valve operated by the latter during such motion. The object of this arrangement is to enable the float to have a certain velocity of its own, so that it shall not be a drag upon the torpedo, there being, however, a difference of about five knots between the speeds of the two vessels.

Referring now more particularly to the constructive details of my improvements, my torpedo consists of a cigar shaped steel shell divided into six compartments or chambers, which, as arranged in successive order from fore to aft, contain the explosive charge, the compressed air, the high-speed air-engine, the depth-registering apparatus, the three electric motors, and the portion of the cable coiled or stowed away in the torpedo proper. It may be necessary to vary this order; but in the largest of my torpedoes it will be observed.

The fore part of the torpedo containing the explosive charge is furnished with a fuse and cap, by means of which it can be exploded when coming into contact with an obstacle, and this part is, moreover, detachable from the rest of the vessel, being only adjusted thereto at the time of starting in action.

In order that my invention may be more fully understood, I have shown the same in the two accompanying sheets of illustrative drawings, in which like letters of reference indicate corresponding parts throughout the figures.

Figure 1 is a side view of my improved torpedo, showing diagrammatically the general arrangement of the various compartments or chambers. Fig. 2 is a plan of the torpedo. Fig. 3 is a top view of the same, showing more particularly the mode of controlling the horizontal rudder by a hydrostatic valve. Fig. 4 is a sectional plan of a portion of the vessel, showing more particularly the electric motors and some of the contents of the adjoining compartments or chambers. Figs. 5 and 6 illustrate the manner in which the cable is coiled or stowed away in the aft compartment of the vessel. Figs. 7 and 8 show, respectively, in plan and longitudinal section the releasing-gear used for that part of the cable which is stowed in the vessel. Fig. 9 is a section on line *a b* of Fig. 8. Fig. 10 illustrates diagrammatically the electrical apparatus on shore, as well as the wire-connections between the land-battery switch and electric motors of the torpedo. Fig. 11 shows the float attached to the torpedo. Fig. 12 is a cross-section of the float on line *x x* of Fig. 11; and Fig. 13 is a portion of the side elevation of the float, showing the compressed-air chamber E′.

As shown in Figs. 1, 2, and 3, my improved torpedo consists of a cigar-shaped shell S, of steel or other suitable metal, divided internally in six compartments A B C D E F. The compartment A is designed to contain chiefly one end portion of the cable X, made of gutta-percha, india-rubber, or other suitable flexible material, which is coiled therein in the manner clearly shown in Figs. 5 and 6, and contains the three line-wires W W′ W², as shown in Figs. 7, 8, 9, and 10.

In Fig. 3 the compartment or chamber B contains the three magneto-electric motors M M′ M″, Fig. 4. The compartment C contains the apparatus for regulating the depth at which the torpedo has to be sunk or raised. This kind of apparatus is well known and need not be described or illustrated.

The compartment D contains a Brotherhood high-speed air-engine, and the adjoining compartment E contains the compressed air, the admission-pipe P, which passes through the compartment D and enters the compartment C, being therein fitted with a suitable valve, opened or closed by the motor M″, as shown in Fig. 4, and finally conveyed back to the compartment D, where it is connected to the inlet-opening of the engine. Lastly, the compartment or fore part F, which is detachable from the remaining parts of the torpedo, contains the explosive charge. This compartment chamber or casing F may be connected to the compartment E by any suitable spring-catch or screw-joint or in any other convenient manner, and has a fuse and cap *f*, by means of which the charge can be

exploded when the said fore part F comes into contact with an obstacle. It has also a detonating-charge, which the motor M′ will at any time, at the will of the operator, cause to explode. The engine in compartment D drives the main shaft O, which rotates the two screw-propellers K, mounted thereon.

The cable *x*, one end of which is, as above stated, coiled in compartment A, passes, Fig. 5, through the disengaging gear or device shown separately in Figs. 7, 8, and 9, and is finally led over a roller N, Fig. 4, in order to be paid out. This engaging gear consists of a tube *x′*, containing a catch J, pivoted thereto and held in a depressed position by a spring J′, fixed on the top of the same tube. In this position the catch J bars the passage of the bulb *x″*, formed in any suitable manner upon the cable *x*, and is so regulated as to be raised when a tensile strain equivalent to a pressure of five or seven pounds is applied thereto, the bulb being released and the cable consequently freed, ready for paying-out purposes. In order that the catch may be also raised when the admission-valve is fully opened and the torpedo is propelled at full speed, a wire K′ is attached to the end of the catch J, as shown, and passes over a pulley Z and through a suitable guard on the top of tube, conveying it to the said valve, to which it is attached, and which, when fully opened by the electric motor M″, pulls this wire and raises the catch, thus releasing the cable. This cable *x* contains, as above mentioned, three line-wires W W′ W″, connected at one end with the three motors M M′ M″ on board the torpedo and at the other with the shore battery or dynamos Q through three switches, one of which S′ is only shown in the drawings, Fig. 10. The motor M actuates by means of the rod *r*, operated by the bevel-gearing G, the vertical rudder of the torpedo, and according to the intensity of the current regulated by the switch S′ the said rudder is moved to a greater or less extent in one direction, being turned in an opposite direction by a reversal of the current effected by a suitable commutator. The explosive charge is ignited or exploded by a current in derivation from the main current sent along the line-wire W′ to the motor M′, which releases a spring, or in any other suitable manner, all such details being well-known by electricians and forming no distinct part of my invention.

The motor M′ actuates the horizontal rudder H, by means of which the torpedo can be raised to the surface. This rudder H is maneuvered by the rod *r′*, operated with the aid of suitable gearing by the motor M′, and is more or less turned in one or the other direction, according as a direct or reversed current of great or small intensity is sent through the second switch, the current being in the latter case reversed by a suitable commutator. The motor M″ serves to open and close the valve, regulating the admission of compressed air to the engine through the pipe P, and is actuated by a current sent along the line-wire W″ through the third switch, such current being reversed by a suitable commutator or spring when the valve has to be closed. This opening or closing of the valve by the motor may be obviously carried out by any suitable spring mechanism, which has no need to be shown on the drawings.

According to a modification of my invention I dispense with the depth-registering apparatus and with the horizontal rudder and use instead a float, as shown in Figs. 11, 12, and 13. This float is provided with an air-engine and a reservoir E′, containing compressed air similar to those contained in the torpedo, and is thus furnished with power, which is an important feature of my invention. This float is attached to the torpedo below by means of a cable in such manner that cock V, regulating the admission of the compressed air to the engine in the float, may be actuated thereby in any suitable manner as soon as the torpedo is propelled, so that the said float shall not be a heavy drag upon the torpedo, and shall have a speed inferior by about five knots an hour to that of the latter vessel.

My improved float is provided with a top fin T, which is intended to be always exposed above the water.

t is a spiral spring, one end of which is attached to a bracket fixed to the sides of the chamber E′, while the other end is secured to a lever fixed to the spindle of the cock V. A wire connection from this spring passes over one roller and under another, as shown at U in Fig. 13. This wire is preferably inclosed in a tube. As it leaves the rollers, this wire is attached to my torpedo proper.

Having now particularly described and ascertained the nature of my invention and the manner in which the same is to be performed, I declare that what I claim is—

1. In torpedoes and other similar submarine vessels, the cable transmitting the electro-motive force, combined with the hollow hull having a delivery-opening and laid therein in parallel transverse layers thereto, as shown, each layer consisting of straight parallel portions of the cable to entirely fill the chamber, the other end of the cable passing through said opening and being stored or coiled on the shore or in a ship, substantially as set forth.

2. In torpedoes and other similar submarine vessels, the means for automatically releasing under the application of a predetermined tension the cable stored or coiled therein, and likewise for releasing the same through the agency of the electric motor controlling the valve admitting the fluid power to the engine, consisting of the cable provided with a bulb, a tube for the same, a resisting-catch in the tube, a motor, and a connection between said catch and motor, whereby the latter may re-

lease the former, substantially as and for the purpose set forth.

3. The combination, with the torpedo, of a floating vessel carrying its own motive-power engine and valve regulating the admission of such power to the said engine, and a connection between the said valve and the torpedo, whereby the valve is opened by the tension exerted by the torpedo upon the said connection, substantially as set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

GEORGE READ MURPHY.

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