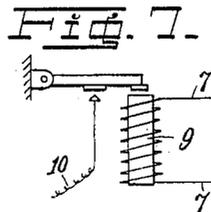
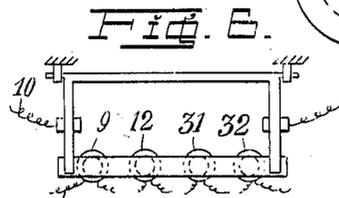
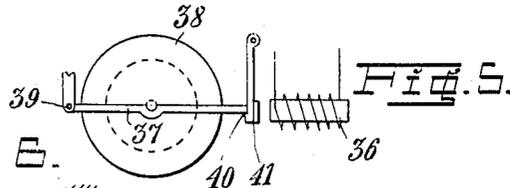
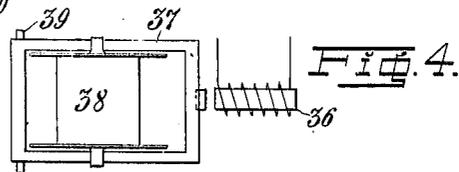
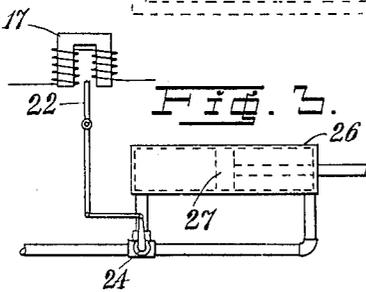
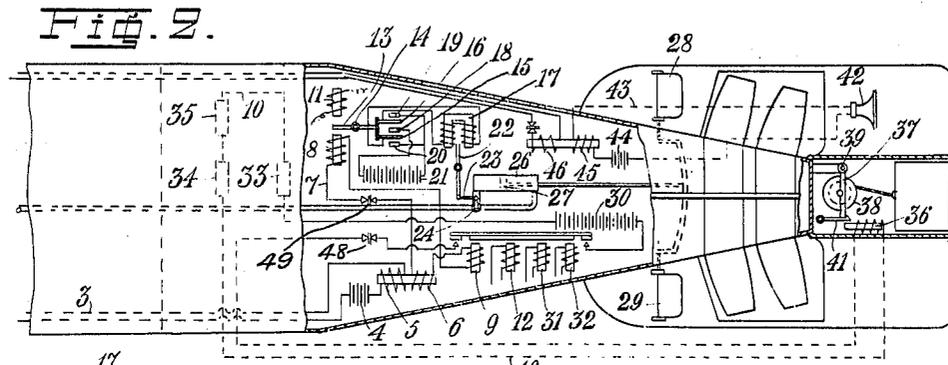
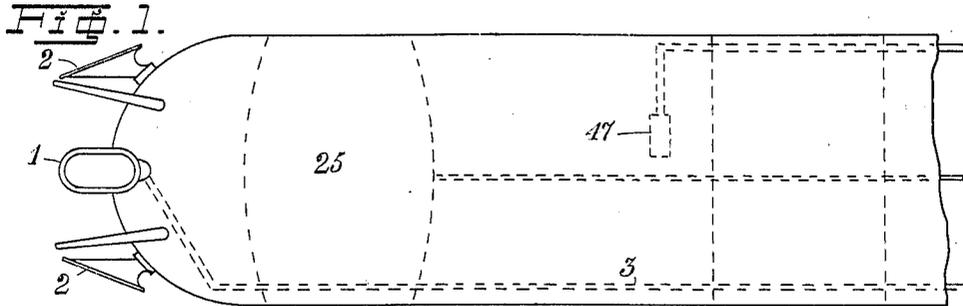


K. O. LEON.
 TORPEDO AND OTHER SUBMARINE APPARATUS.
 APPLICATION FILED FEB. 11, 1908.

1,137,222.

Patented Apr. 27, 1915.

2 SHEETS—SHEET 1.



Witnesses

August Sorenson
Emil Wahlberg

Inventor

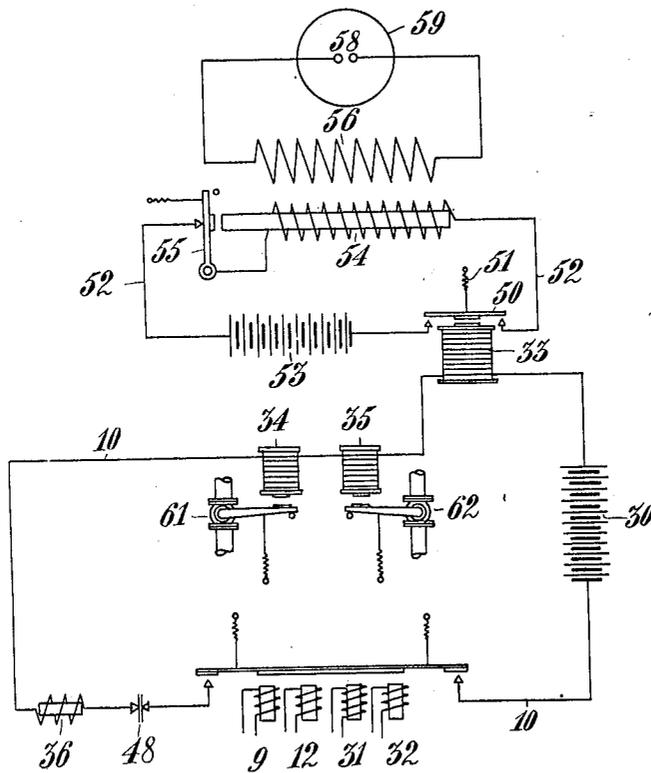
Karl O. Leon
 by *Boydell*
Att'y

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 2 SHEETS—SHEET 2.

Fig. 8.



Witnesses

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UNITED STATES PATENT OFFICE.

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TORPEDO AND OTHER SUBMARINE APPARATUS.

1,137,222.

Specification of Letters Patent.

Patented Apr. 27, 1915.

Application filed February 11, 1908. Serial No. 415,309.

To all whom it may concern:

Be it known that I, KARL OSKAR LEON, a subject of the King of Sweden, and resident of Gottenborg, in the Kingdom of Sweden, have invented new and useful Improvements in Torpedoes and other Submarine Apparatus, of which the following is a specification.

This invention relates to improvements in torpedoes and similar submarine apparatus, such as mines, mining torpedoes, submarine boats, and the like.

The main object of the invention is to provide a torpedo adapted to automatically steer, without any control, toward the object to be destroyed, and to change its course according to the movement of the said object.

A torpedo constructed according to this invention is especially adapted to detect submarine boats or other hostile vessels and to automatically steer toward the same, whatever be the original course of the torpedo. In torpedoes of the kind described in my earlier patent application Serial No. 400215, filed November 1, 1907, (patented March 22, 1910, No. 952,451,) special arrangements may be provided for causing the torpedo, after the propulsion of the same has ceased and it has taken up a vertical position, at a predetermined depth of submersion, to again start, as soon as a vessel enters its sphere of action, and steer for the vessel to destroy it. In mining torpedoes having a mooring device, special arrangements may be provided for automatically disengaging the moored torpedo, as soon as a vessel enters its sphere of action, so as to enable the torpedo to start and steer for the vessel. Finally, a torpedo having devices according to this invention may be provided with special devices for automatically exploding it, in case it should pass the vessel without hitting it, the action being thereby essentially the same as if the exploding was performed by percussion.

In the following all the destroying means hereinbefore referred to are comprised under the common name torpedoes. Certain kinds of torpedoes are provided with means for maintaining them at a certain predetermined depth of submersion after they have ceased moving, in order that they may act for some time as submarine mines, either of the sub-floating (unanchored) type, or as anchored mines, if the torpedo is provided with a mooring device adapted to be thrown into action, when the torpedo ceases moving.

Torpedoes of these kinds are hereinafter called mining torpedoes.

The invention consists, chiefly, in so placing, on the torpedo, suitably at its fore end, a number of microphones, telephone receivers, or other receivers sensible to vibrations of the water, such as vibration of sound, or the like, that the said receivers are adapted to be actuated by vibrations issuing from the object to be destroyed, each receiver being connected, by suitable apparatus, to one or more of the devices (steering, propulsion, exploding or other devices) of the torpedo in such a manner that the said device or devices will be actuated, as soon as the receiver is made active.

It has been proposed to steer torpedoes at a distance by means of the generation and transmission of sound waves, but these waves were generated at and transmitted from a controlling station at the launching place. Such method suffers from the disadvantage that the torpedo cannot be seen from the controlling station when it has traveled over a certain distance therefrom, which makes it impossible to steer the torpedo at longer distances toward the object to be destroyed. The nearer the torpedo approaches the object to be destroyed, the more difficult is the steering, and beyond a certain range from the controlling station the steering becomes quite impossible. According to the present invention, on the contrary, the steering will become more and more infallible, the nearer the torpedo approaches its mark.

For automatically steering the torpedo, each receiver may, suitably, be included in an electric circuit or electric circuits, connected, by suitable apparatus, to one or more rudders or other steering devices in such a manner that the said device or devices will be actuated in a certain direction, as soon as the circuit is made active by variations in the resistance produced by the receiver. To this end the one winding of a transformer may, suitably, be included in the said circuit or circuits, the other winding of said transformer being included in a circuit containing one or more electromagnets serving to operate the controlling means, such as the distributing cock of a servomotor, or an air pressure cylinder whose piston is connected, in any suitable manner, to the said rudder, but, obviously, other arrangements may be employed, and

the invention is, therefore, not limited to any particular arrangement for actuating the rudder or rudders. For steering the torpedo suitably four receivers may be employed, said receivers being arranged about the geometrical axis of the torpedo, at an interdistance of about 90°. The receivers situated in a central longitudinal plane diametrically opposite each other form together one pair of receivers operating the same rudder or rudders for turning same in one or the other direction, according as one or the other receiver is more actively actuated than the other by waves of sound, or the like. One of the two pairs of receivers operates the horizontal rudder or rudders of the torpedo, and the other pair of receivers operates the vertical rudder or rudders, so that the torpedo is automatically steered horizontally as well as vertically toward the object emitting the waves of sound. The number and arrangement of the receivers may, obviously, be varied, but in the ordinary torpedo type having one or more rudders for steering horizontally and one or more rudders for steering vertically the aforesaid arrangement of the receivers is preferred. The receivers operating a certain rudder should, obviously, be situated in a plane extending at right angles to the center of motion of the said rudder.

Although I prefer the described arrangement, the number of receivers might, obviously, be diminished inasmuch as two receivers situated in a horizontal plane for steering the torpedo horizontally may suffice, if the torpedo is caused, by known arrangements, to move at a predetermined depth beneath the water surface, but in such case the torpedo can only be used as an offensive means against ordinary war vessels and thus loses its important feature as an offensive means against submarine boats, which are able to move at different depths. In torpedoes of the kind described in my earlier patent application (Patent 952,451) hereinbefore referred to the receivers may be employed not only for steering but also for starting the engine, when a vessel enters the sphere of action of any of the receivers (supposing the torpedo to be at rest). This can be performed in several ways, for instance by relays serving to close one or more circuits through the starting arrangement of the engine (in the case of an internal combustion engine through the igniting device and, suitably, through one or more electromagnets operating valves for supplying air and fuel). In mining torpedoes provided with a mooring device the receivers may, further, be employed for disengaging the torpedo from the mooring, as soon as any of the receivers is actuated by sufficiently strong waves of sound, or the like. Also this is, suitably, performed by an elec-

tromagnet, which, when supplied with current, attracts an armature serving as a releasing device. For starting the engine and disengaging the torpedo from the mooring special receivers for waves of sound, or the like, may be employed, if desired. The exploding of the torpedo, in case it should pass the vessel toward which it moves, may, suitably, be performed by a rearwardly directed receiver placed in the rear part of the torpedo, said receiver being connected, in any suitable way, to an igniting device for the explosive charge, or detonator.

In order to make the invention more easily understood I will now proceed to describe a suitable embodiment thereof illustrated in the drawings.

Figure 1 shows diagrammatically the fore part, and Fig. 2 shows diagrammatically the rear part of a torpedo provided with an internal combustion engine and with a mooring device, said torpedo being actuated by a number of receivers for performing the functions above mentioned. Figs. 3 to 7 show details. Fig. 8 is a diagram showing the circuits and apparatus for controlling the engine.

In the embodiment illustrated four receivers are placed at the anterior end of the torpedo, two of said receivers marked 1 (only one visible in the drawing) serving to steer the torpedo horizontally, while the two other receivers 2 serve to steer the torpedo vertically. The one receiver 1 is shown included in an electric circuit 3 comprising a battery 4 and the one winding 5 of a transformer whose other winding 6 is inserted in a circuit 7 including two electromagnets 8, 9 both serving as relay magnets, the one 8 for operating the rudder and the other 9 for closing an electric circuit 10 including the devices for starting the engine and disengaging the torpedo from the mooring. The non-visible receiver diametrically opposite the receiver 1 is supposed to be included, in a similar manner, in an electric circuit comprising a battery and the one winding of a transformer in whose secondary circuit the electromagnets 11 and 12 are included. Projecting between the ends of the electromagnets 8 and 11 facing each other is an armature 13 pivoted at 14 and carrying, at its opposite end, two contacts 15, 16 insulated from each other, each of said contacts being connected to the one winding of a horse-shoe electromagnet 17. The contacts 15, 16 cooperate with three contacts of which the middle one 18 is connected to one pole and the two outer 19, 20 are connected to the other pole of a battery 21. Inserted between the poles of the horse-shoe magnet 17 is a polarized armature 22 connected, by a link 23, or the like, to a valve 24 serving to put the high-pressure chamber 25, or other pressure receptacle, in communication with

one or the other end of a cylinder 26 whose piston 27 is connected to the rudders 28, 29 in such a manner as to turn the latter in one or the other direction, according as the piston 27 is moved from its middle position toward the one or the other end of the cylinder. The receivers 2 are supposed to be connected, in a similar manner, to the depth-regulating rudders of the torpedo. Normally, a constant continuous current flows through each receiver, which current is transformed into an undulating continuous current, when the receiver is actuated by waves of sound, or the like. When the receiver 1 shown in the drawing is actuated, an alternating current is generated in the circuit 7 whereby the electromagnet 8 attracts its armature 13 and closes a continuous current from the battery 21 through the contact 18, contact 15, electromagnet 17, contact 16, and contact 19, back to the battery 21. According as one or the other of the receivers 1 is actuated by waves of sound, or the like, or as one is more intensely actuated than the other, one or the other of the electromagnets 8 and 11 is excited, or the excitation of the one preponderates over the other, whereby the armature 13, which normally takes up the middle position shown in the drawing, is attracted toward the one or the other of the said electromagnets and closes a circuit for the battery 21 through the electromagnet 17, so that the latter is supplied with current in one or the other direction. On account thereof, the polarized armature 22, which normally takes up a middle position (see also Fig. 3), is caused to turn in one or the other direction, whereby the valve 24 is opened for admitting compressed air to one or the other side of the piston 27. The rudders 28, 29 will thus be turned in one or the other direction, according as one or the other of the receivers 1 is actuated. The depth-regulation by means of the receivers 2 is supposed to take place in a similar manner, and the arrangements, therefore, need not be described.

The circuit 10 (Fig. 1), which is common to all the receivers, is supplied with current from the battery 30, as soon as the circuit is closed by any of the relay electromagnets 9, 12, 31, 32 (see also Figs. 6 and 7), the electromagnets 12, 31 and 32 being supposed to be connected each to one receiver in the same manner as the electromagnet 9 is connected to the receiver 1 (Fig. 1). The circuit 10 will, thus, be supplied with current, as soon as any receiver is actuated by waves of sound. Included in the circuit 10 is an electromagnet 33 serving to control the ignitions of the engine as well as electromagnets 34, 35 for opening the valves for the supply of air and fuel to the engine (all the arrangements schematically indicated).

Referring to Fig. 8, the electromagnets 34,

35 serve to control the supply of air and fuel to the engine. When the said electromagnets are energized and attract their armatures, the supply cocks 61 and 62 are opened and supply the engine with air and fuel. When the electromagnets 34, 35 are deprived of current, their armatures are retracted by springs in such positions as to keep the supply cocks closed. The electromagnet 33, when supplied with current, attracts its armature 50 against the action of a spring 51 and thereby closes a circuit 52 including a battery 53 and a self-interrupter 54, 55. When the circuit 52 is closed by the armature 50, the winding 54 of the self-interrupter causes the armature 55 to rapidly swing, so as to break and make the circuit 52. The winding 54 forms the primary winding of a transformer whose secondary winding 56 is connected to a spark-gap 58 forming the igniting device for the engine 59. As soon as the circuit of the battery 30 is closed, the electromagnets 34 and 35 attract their armatures opening the valves 61, 62 for the supply of air and fuel to the engine, and at the same time the electromagnet 33 attracts its armature 50 closing the circuit for the battery 53, whereby the explosive gas mixture in the explosion chamber of the cylinder is ignited, and the engine is started. If the torpedo is moored after stopping, means are provided for disengaging the torpedo, when a vessel enters into its sphere of action, said means suitably consisting of an electromagnet 36 included in the circuit 10. The arrangement for disconnection is shown on a larger scale in Figs. 4 and 5. The lower bearings 37 for the roller 38 carrying the mooring line are shown pivoted at 39 and are supported, at the other end thereof, by a hook 40 projecting from the armature 41 of the electromagnet 36. When the latter is supplied with current, the armature 41 is attracted, whereby the hook 40 is moved away from the bearings 37, so that the latter are allowed to turn about their pivots and let the roller 38 go. The torpedo can then freely move, under the influence of the receivers, toward the object emitting the waves of sound, or the like.

Placed behind the propeller is a rearwardly directed receiver 42 included in a circuit 43 comprising, furthermore, a battery 44 and the one winding 45 of a transformer whose other winding 46 is electrically connected to a device 47 for igniting the detonator. The torpedo is, thereby, caused to explode, even if it does not hit the object emitting the waves of sound but passes the said object so that the receiver 42 is actuated by waves of sound from behind.

All the receivers should be arranged in such a manner as to dominate only a certain angle, which is easy to afford, inasmuch as the waves of sound, or the like, conveyed

through the water cannot enter the funnels of the receivers without meeting their open ends.

The circuit 43, or the igniting circuit controlled thereby, is, obviously, not closed, when the torpedo is ejected, but is to be closed, after the ejection of the torpedo, by means of a clockwork, a time-fuse, or any other suitable device. As such arrangements are before known, they need not be particularly described. Also the circuit 3, or the circuit 7, and the corresponding circuits of the other receivers should be closed first some time after the ejection of the torpedo. The circuit 10 should, obviously, not be made ready for closing before the torpedo has stopped and taken up a vertical position. The starting of the clockwork for closing the circuits, or the ignition of the corresponding time-fuse, can, suitably, be effected, when the torpedo is ejected. For the sake of simplicity the time-fuses 48, 49 are indicated in the drawing as contacts separated by insulating material. Each time fuse in the usual manner closes a break in the circuit controlled thereby a predetermined length of time after it has been ignited. The construction of such time fuses is well known in the art and, therefore, need not be particularly described.

A special advantage of the described torpedo is that it moves toward the propeller of the vessel to be destroyed and thus strikes the most vulnerable part of the vessel thereby making the latter unable to maneuver.

Arrangements similar to those described may, obviously, be used in submarine boats and the like.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A submarine vessel combined with a receiver adapted to be actuated by vibrations of the water, and a controlling means actuated by said receiver.

2. In a submarine vessel, the combination with a propelling engine and a steering device, of controlling means therefor, and a receiver operating said controlling means and adapted to be actuated by the vibrations of the water.

3. The combination with a submarine vessel of a receiver adapted to be actuated by vibrations of the water, a steering device for the said vessel, and controlling means therefor operated by said receiver for causing the vessel to approach the source of vibrations.

4. The combination with a submarine vessel of opposite receivers adapted to be actuated by sound vibrations, a steering device for the said vessel, and controlling means therefor actuated by either of said receivers for directing the vessel toward the source of sound.

5. The combination with a submarine ves-

sel of two receivers adapted to be actuated by sound vibrations, a steering device for the said vessel and controlling means adapted to operate the steering device in one or the other direction, when actuated by one or the other receiver, for steering the vessel toward the source of sound.

6. The combination with a submarine vessel of two receivers placed at the front end of the said vessel and adapted to be actuated by vibrations of the water, a steering device for the said vessel, and controlling means for operating the said steering device, adapted to steer in one or the other direction when actuated by one or the other receiver, for steering the vessel toward the source of vibrations impressing said receiver.

7. The combination with a submarine vessel of a pair of receivers adapted to be actuated by like vibrations of the water, a steering device for the said vessel, controlling means for said steering device, electric circuits each including one of the said receivers, and means in said circuits for actuating the controlling device to steer in one or the other direction toward the source of such vibrations according as one or the other receiver is exposed to the stronger vibrations.

8. The combination with a submarine vessel of a pair of receivers adapted to be actuated by like vibrations of the water, a steering device for the said vessel, controlling means for the said steering device, electric circuits each including one of the said receivers, transformers each having a primary winding included in one of the said circuits, electromagnets each connected in circuit with the secondary winding of one transformer, and means operated by the said electromagnets for actuating the controlling means to steer in one or the other direction toward the source of such vibrations, according as one or the other electromagnet is energized.

9. A submarine vessel combined with two pairs of receivers adapted to be actuated by like vibrations of the water, two of said receivers being in the horizontal and two in the vertical plane, means for steering the vessel laterally, means for regulating the depth of submersion of the vessel, connections between the horizontally disposed receivers and the lateral steering means for steering in one or the other direction, according as one or the other of the said receivers predominates, and connections between the vertically disposed receivers and the depth-regulating means for increasing or decreasing the depth of submersion according as the lower or the upper receiver predominates.

10. In a mining torpedo, the combination of an engine for propelling the torpedo, means for starting the said engine, a re-

ceiver sensible to vibrations of the water, an apparatus adapted to operate the said starting means, and a connection between the said receiver and the operating apparatus for actuating the latter, when the said receiver is actuated.

11. In a mining torpedo, the combination of an internal combustion engine, an igniting device for the said engine, valves for regulating the supply of air and fuel to the said engine, a receiver sensible to vibrations of the water, an electric circuit including the said receiver, a relay included in the said electric circuit, a second electric circuit controlled by the said relay, and means included in the said latter circuit for actuating the igniting device and the valves of the engine.

12. In a mining torpedo, the combination of a receiver adapted to be actuated by vibrations of the water, a mooring device for retaining the torpedo in position, means for disconnecting the torpedo from its mooring, and means connected to the receiver for actuating the said disconnecting means, when the receiver is actuated.

13. In a mining torpedo, the combination

of a receiver adapted to be actuated by vibrations of the water, a mooring line for retaining the torpedo in position, a drum carrying the mooring line, a supporting device for the said drum, an electromagnet adapted to release the said supporting device, when the electromagnet is energized, and electric connections between the receiver and the said electromagnet for energizing the latter, when the receiver is actuated.

14. In a torpedo, the combination of a receiver adapted to be actuated by vibrations of the water, said receiver being placed at the rear end of the torpedo and directed rearwardly, means for exploding the torpedo, and connections between the receiver and the said exploding means for actuating the latter, when the receiver is actuated.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

KARL OSKAR LEON.

Witnesses:

AUGUST SÖRENSEN,
HJALMAR ZETTERSTRÖM.