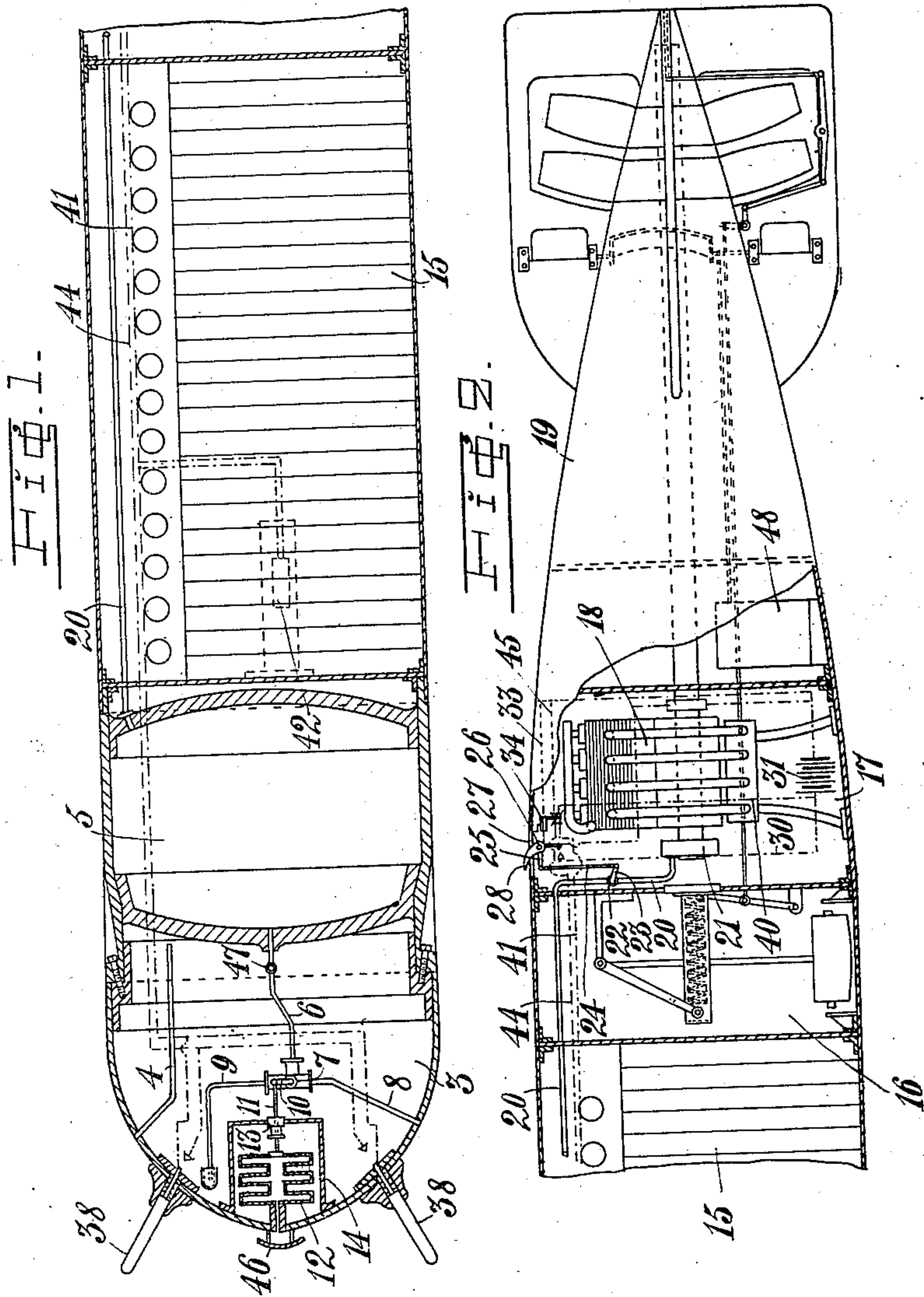


K. O. LEON.  
TORPEDO AND THE LIKE.  
APPLICATION FILED NOV. 1, 1907.

952,451.

Patented Mar. 22, 1910.

3 SHEETS—SHEET 1.



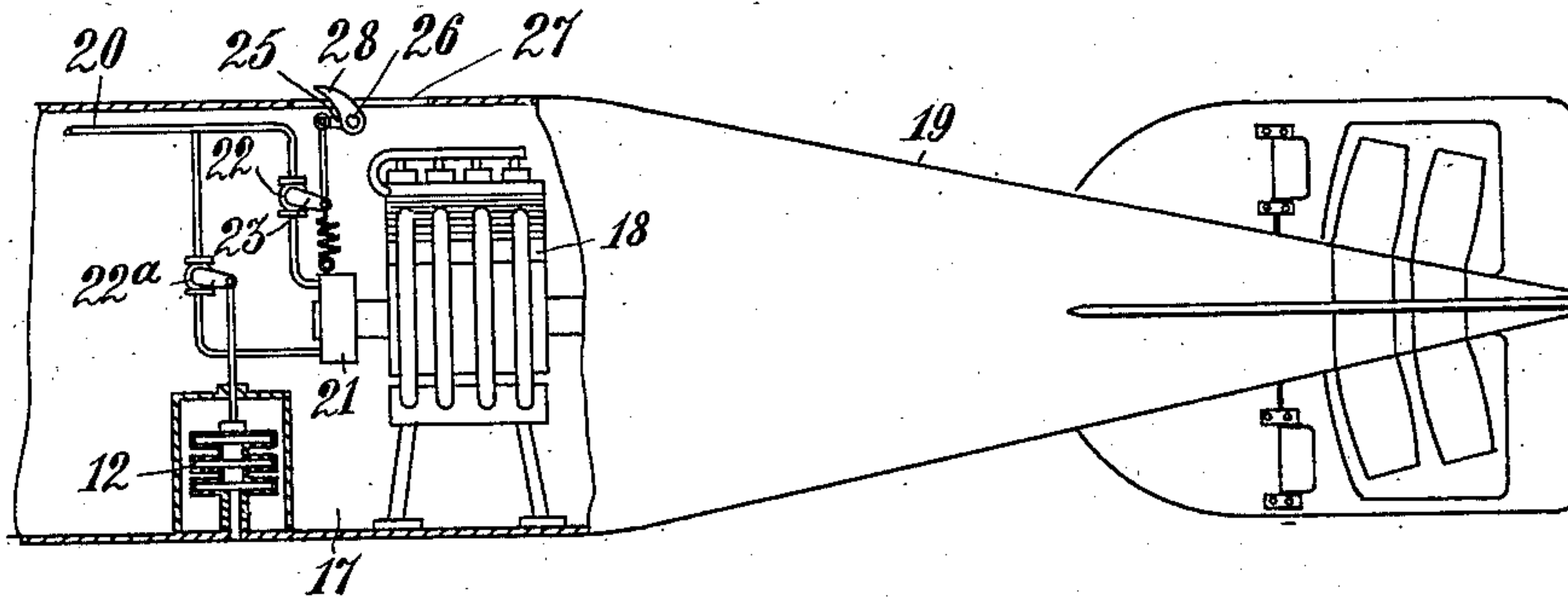
Witnesses

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by *Arvidson*  
his att'y

**952,451.**

3 SHEETS—SHEET 2.



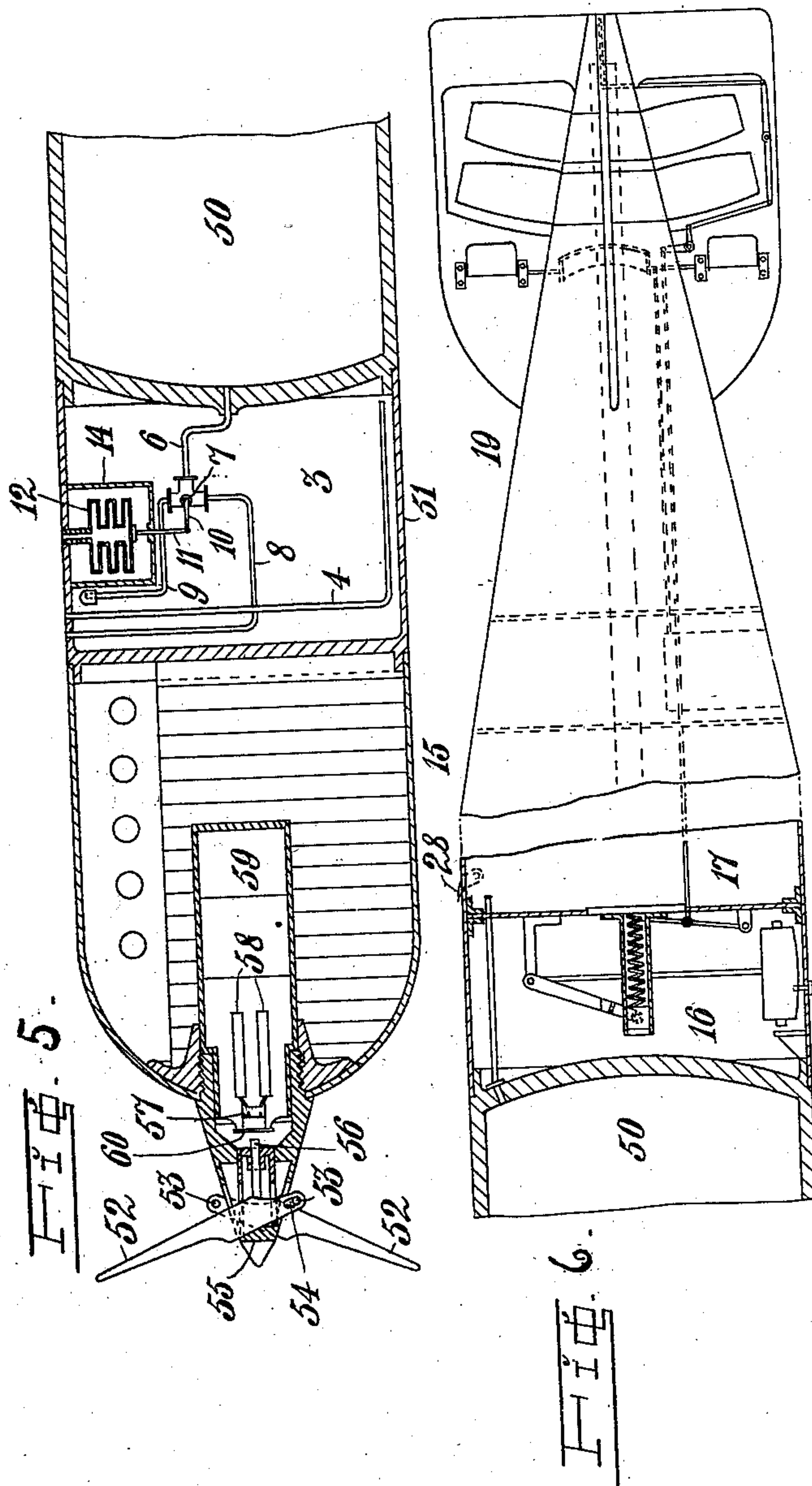
Aug. 18. 1848  
Karl, Rønne og.

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3 SHEETS—SHEET 3.

952,451.



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# UNITED STATES PATENT OFFICE.

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## TORPEDO AND THE LIKE.

952,451.

Specification of Letters Patent. Patented Mar. 22, 1910.

Application filed November 1, 1907. Serial No. 400,215.

*To all whom it may concern:*

Be it known that I, KARL OSKAR LEON, a subject of the King of Sweden, and resident of Stockholm, in the Kingdom of Sweden, have invented new and useful Improvements in Torpedoes and the Like, of which the following is a specification, reference being had to the drawings accompanying and forming a part hereof.

This invention relates to improvements in torpedoes and the like.

The object of the invention is to increase the probability of hitting at greater distances by causing the torpedoes launched in the usual way to stop at a predetermined distance from the launching place, in case they have not already been exploded by shock against any object, and to thereupon adjust themselves at a predetermined depth of submersion, in order to act for some time as mines of the sub-floating or unanchored type and to enable a mine field to be easily formed at any desired distance from the launching place.

In the specification of my earlier application for patent Serial Number 368498, filed April 16, 1907, I have described a subfloating mine adapted to be launched in the same manner as a torpedo and to adjust itself, after stopping, at a predetermined depth of submersion, but the said apparatus is not provided with any propelling device and, therefore, stops at a comparatively short distance (a few yards) from the launching place. The present invention, on the contrary, provides a new weapon making it possible to establish an effective field of subfloating mines at any desired distance from the launching place, said weapon thus affording a quite novel tactical effect. A fleet provided with such weapons is thus able to establish a mine field in front of a moving hostile fleet, for instance at the ordinary fighting distance or at any distance between the fleets, by which the blocked up fleet is prevented from moving farther in the same direction. The new weapon is therefore to a certain extent independent of the decreased security of hitting at greater distances.

With this and other objects in view the invention consists, chiefly, in the combination of an engine adapted to rotate a propeller shaft for driving the apparatus, means for starting the engine, when the ap-

paratus is launched, means for automatically stopping the apparatus, when it has traveled a predetermined distance, and means for causing the apparatus, after stopping, to oscillate vertically about a predetermined normal depth of submersion and to act for some time as a sub-floating mine.

The invention further comprises the constructions and combinations of parts hereinafter particularly described.

In the drawings I have illustrated, by way of example, three embodiments of a torpedo constructed according to this invention.

Figure 1 is a vertical section of the fore part of one embodiment. Fig. 2 is a partial vertical section and partial elevation of the rear part of the same embodiment. Fig. 3 is a diagram of the electric circuits. Fig. 4 is a partial vertical section and partial elevation of the rear part of a second form of the torpedo. Figs. 5 and 6 are two views similar to Figs. 1 and 2, respectively, of a third embodiment which may be obtained by a small change of a common torpedo.

Referring to Fig. 1 of the drawings, the depth regulating chamber 3 set forth in my earlier application above referred to is located in the foremost part of the torpedo. The said chamber 3 communicates through a tube 4 or otherwise with the water outside the torpedo. The tube 4 suitably extends from the fore part of the depth-regulating chamber toward the rearward bottom of the said chamber. Located behind the depth-regulating chamber is a high-pressure chamber 5 filled with highly compressed air or gas, such as carbonic acid. This high-pressure chamber has for its chief object to provide the pressure fluid required for the depth-regulation, after the torpedo has stopped. The propelling of the torpedo is, suitably, performed by an internal combustion engine, such as an oil-engine. If the high-pressure chamber contains compressed air, the air required for combustion during the travel of the torpedo through the water can be taken from the said chamber. In other cases the oxygen for combustion can be taken from a separate air or oxygen receptacle. A tube 6 extends from the high-pressure chamber 5 to a three-way-cock 7 situated within the depth-regulating chamber. The said tube is shown to be screwed into the rear nozzle of the three-way-cock. Lead-



ing from the two other nozzles are pipes or tubes 8, 9, the tube 8 extending through the shell or casing of the torpedo and communicating with the space outside the torpedo, whereas the other 9 opens into the fore part of the depth-regulating chamber. The openings provided in the plug of the cock are arranged in such a manner that the said plug in one position forms a passage between the tubes 6 and 9 and in another position forms a passage between the tubes 8 and 9. The plug is provided, at one end, with a crank 10 operated by a rod or link 11 connected, at its fore end, to a kind of bellows 12 or any suitable device adapted to be operated by water pressure. The rod 11 is shown to pass through a stuffing-box 13 situated in the bottom of a drum or cylinder 14 inclosing the bellows 12. When the torpedo has stopped and taken up a vertical position with the depth-regulating chamber at the top, the bellows 12 acts in such a manner that, when the water-pressure increases, the bellows 12 extend and cause the rod 11 to move downward, whereas, when the water pressure decreases, the bellows contract and move the rod 11 upward.

Located behind the high-pressure chamber 5 is the explosive charge or detonator 15, and located behind the latter is a chamber 16 (Fig. 2) inclosing the well known devices for regulating the direction of movement of the torpedo. Situated behind the latter chamber is the so-called engine chamber 17, inclosing an engine for propelling the torpedo, preferably an internal combustion engine 18. The parts inclosed within the stern-cone 19 are well known and, therefore, need not be described.

In the embodiment of the torpedo shown in Figs. 1 and 2 a tube 20 extends from the high-pressure chamber 5 to a starting motor 21 situated within the engine chamber, said starting motor suitably consisting of an air or gas turbine. Situated in the part of the air tube 20 within the engine chamber 17 is a cock or valve 22 whose handle 23 is connected, by means of a link 24, to a lever 25 adapted to be operated by a hook 28, or the like, attached to a shaft 26 and projecting through an opening 27 in the shell of the torpedo, said hook being caught by a lug and turned backwardly, when the torpedo is ejected. When the hook 28 is turned backwardly, the lever 25 is lifted and opens the valve 22 so that compressed air or gas can stream from the high-pressure chamber 5 into the turbine or starting motor 21 and cause the propeller to rotate. At the same time a contact 29 (Fig. 3) is closed by which a circuit 30 is completed, said circuit including a battery 31 and means for controlling the engine, said means being herein-after more particularly described. When the torpedo is ejected, the engine is immedi-

ately started, whereupon the valve 22 is automatically closed by a spring 32 or other suitable means.

In the embodiment of the torpedo illustrated in Figs. 1 and 2 the engine is, thus, supposed to be arranged in such a manner as to be automatically started, when the torpedo is ejected. Obviously, the engine might be started by hand, before the torpedo is placed within the tube, in which case the engine should, preferably, be connected to the propeller shaft by means of a clutch which is automatically thrown into action, when the torpedo is ejected, so that the propeller shaft does not commence to rotate before the torpedo is ejected. Finally, the engine might be started, after the torpedo has been ejected, by the propeller shaft being caused to rotate by the water pressure against the propeller blades and thereby to start the engine. The invention is, therefore, not limited to the specific starting means described and illustrated, though these means are, at present, considered to be the most practical.

In the arrangement illustrated in Figs. 2 and 3 a conductor 33 is connected in shunt to the circuit 30, and included in the said conductor is a device for closing contacts in the exploding circuit of the torpedo a predetermined short time after the torpedo has been ejected. The said device 34 is shown constructed as a time fuse and, suitably, consists of two disks adapted to be turned relatively to each other. Situated between the two disks is a passage filled with a combustible substance. By turning one disk relatively to the other, the length of the passage can be increased or decreased and thus the length of time of the progress of combustion from one end of the passage to the other can be regulated. The time fuse 34 is ignited, as soon as the torpedo is ejected and the shunt conductor 33 is supplied with current, whereupon the combustion proceeds through the whole passage to a combustible insulating material 37 situated between two pairs of springy contacts 35, 36. When the combustion has proceeded to the end of the passage within the time fuse the insulating material 37 is ignited and burned, so that the two pairs of contacts 35 and 36 are closed. The object of this arrangement is to prevent unintentional completing of the exploding circuit which, on account of the described arrangement, can be completed, only when the two pairs of contacts have been closed. Obviously, any means might be employed by which one or more pairs of contacts included in the exploding circuit are closed, after the torpedo has been ejected, and it is, therefore, not necessary to use a time fuse, but such a device is one of the simplest of those well known by persons skilled in the art. After the two pairs of contacts 35, 36 have been closed, the exploded-



ing circuit can be closed, for instance by the closing of an electric contact, when the torpedo strikes an object. In the diagram, Fig. 3, I have shown a device consisting of a horn 38 adapted to close a contact 39, when the torpedo strikes a vessel, and thereby to complete a circuit for the battery 31 through conductor 40, contacts 36, conductor 41, fuse 42, conductor 43, contact 39, conductor 44, contacts 35, conductor 45, and conductors 33 and 30 back to the battery 31. The fuse then ignites the explosive charge, so that the torpedo is exploded.

If the torpedo should miss its object, which, at greater distances, is most frequently the case, its activity does not thereby cease. In forming a mine field, it may be of advantage to cause the torpedoes to stop in front of the vessels to be blocked up. This can be performed in several ways, for instance by shutting off the supply of fuel to the internal combustion engine a predetermined length of time after the starting of the engine, or by shutting off the air required for the combustion, or disconnecting the propeller shaft etc. In the diagram, Fig. 3, I have shown certain apparatus included in the circuit 30 for controlling the engine in the case of an internal combustion engine being used, said apparatus suitably consisting of a clock-work 61 and electro-magnets 62, 63 and 64 for controlling the supply of air and fuel to the engine as well as the ignition of the explosive gas mixture, respectively. The clock-work 61 comprises two contact rods 65, 66, each connected to one pole of the battery 31, and a contact spring 67 normally forming a bridge between the two contact rods. The contact spring is driven by the clock-work, for instance in the clockwise direction indicated by the arrow. When the contact spring reaches the position indicated by dotted lines, in which it does not connect the contact rods 65, 66, the circuit 30 is broken. Until this takes place the electro-magnets 62, 63, 64 are supplied with current and the engine is kept working. Each of the two electro-magnets 62 and 63 controls an armature 68, 69, respectively, each connected to the plug of a cock 70, 71, respectively, for supplying air or fuel, respectively, to the engine. When the electro-magnets are energized and attract their armatures, the supply cocks are opened and supply the engine with air and fuel. When the electro-magnets are deprived of current, the armatures are retracted by springs in such positions as to keep the supply cocks closed. The electro-magnet 64, when energized, attracts an armature 72 and, thereby, closes an auxiliary circuit including a battery 73, a self-interrupter 74, and a contact 75 adapted to be closed by the engine in a certain position of the piston thereof. The self-interrupter

forms the primary winding of an induction coil whose secondary winding 76 is connected to a spark gap 77 serving to ignite the gas mixture compressed within the explosion chamber.

By suitably adjusting the clock-work 61, the engine may be caused to propel the torpedo through any desired distance. When the clock-work breaks the circuit 30, the torpedo ceases to move horizontally and, on account of the displacement of weight, takes up a vertical position with the fore end upwardly. The action of the torpedo as a floating mine now commences. If the torpedo sinks beneath a predetermined depth of submersion, the water pressure within the bellows 12 is increased, whereby the bellows extends and presses the rod 11 and, thereby, the crank 10 downwardly so that the cock 7 shuts off the connection between the tubes 8 and 9 and, instead thereof, opens the connection between the tubes 6 and 9. A part of the compressed air or gas inclosed within the high-pressure chamber 5 thus rushes into the upper part of the depth-regulating chamber and presses out a greater or less quantity of the water which is in the lower part of the said chamber, said water being caused to rise through the tube 4 and escape. On account thereof the torpedo again becomes lighter and rises, whereby the bellows 12 contracts and moves the rod 11 upward, so that the communication between the tubes 6 and 9 is shut off and the communication between the tubes 8 and 9 is reestablished. If the torpedo should ascend too near the water surface, water is admitted from without through tube 4 into the depth-regulating chamber so as to fill a part thereof, by which the torpedo grows heavier and sinks. The torpedo is thus caused to keep itself at a certain depth of submersion or to ascend a short distance above and descend a short distance below a certain normal position. In order to prevent water from entering the tube 9 the mouth of said tube is shown covered by a bell or the like.

It is obvious that, when the pressure within the high-pressure chamber has decreased to a value equal to the sum of the atmospheric pressure and the water pressure, no further depth-regulation will take place, but the torpedo will slowly sink. The sinking of the torpedo is facilitated, if the gas confined within the high-pressure chamber is of such a nature as to be easily absorbed in water. The time the torpedo keeps itself floating is, to a great extent, dependent of the size of the high-pressure chamber and of the initial pressure therein, but it is also dependent of other factors, such as the cross-sectional area of the exhaust pipe for the gas and of the presence or absence of means for moderating the violence of the vertical movements of the torpedo. The cap 46 at



the front end of the torpedo serves to prevent the water pressure in the bellows 12, during the propelling of the torpedo, to rise to such a height that the bellows will open the connection between the high-pressure chamber 5 and the depth-regulating chamber 3. Obviously, to this end, a valve 47 interposed in the tube 6 might be employed, said valve being adapted to be kept closed during the travel of the torpedo through the water, whereas it is automatically opened, when the engine ceases working. It may, however, be of advantage not to make use of any closing device, because the bellows 12 and the cock 7 will then coöperate with the means within the chamber 16 for retaining the torpedo at a predetermined depth during the travel of the torpedo through the water.

In order to prevent excessive shaking, the internal combustion engine can, suitably, be elastically supported. Preferably, a so-called explosion turbine may be used, since the shaking is thereby essentially diminished. Situated within the chamber behind the engine chamber is the gyroscope 48 serving to prevent the torpedo from departing, during the propulsion, from the vertical plane in which it was ejected. In the usual torpedoes the gyroscope is driven by the energy imparted thereto, when the torpedo is ejected, but in far-going torpedoes it may be necessary to drive the gyroscope by any suitable means. Such driving means are well known and therefore, need not be particularly described. The automatic depth regulation which takes place, when the torpedo has stopped, need not be performed in the manner hereinbefore described. The engine 18 might be started, or connected to the propeller shaft, when the torpedo descends, and stopped or disconnected from the propeller shaft, when the torpedo ascends beyond predetermined limits. The controlling of the engine, or the connecting and disconnecting of same, may in such a case be performed by the bellows 12 which in this instance may be placed in the engine chamber 17. If preferred, the bellows 12 (Fig. 4) may be used to control an air supplying valve 22<sup>a</sup> of the turbine or starting motor 21 in such a manner that the said valve is opened and the turbine is caused to rotate, when the water pressure in the bellows 12 is increased above a predetermined value, whereas, when the water pressure in the bellows is decreased, the valve 22<sup>a</sup> is closed and the turbine is caused to stop.

Figs. 5 and 6 show in what manner a torpedo of usual construction can be changed into a mine torpedo. This can be performed by interposing, between the detonator 15 situated at the front end of the torpedo and the air-vessel 50, a tubular part

51 inclosing the hereinbefore described appliances for regulating the depth of submersion of the torpedo, when it has stopped and taken up a vertical position with the contact devices at the top.

In the torpedo shown in Figs. 5 and 6 the detonator is ignited by a percussion device arranged in such a manner that the torpedo is reliably exploded, when exposed to a shock in any direction. Instead of the horns 38 shown in Fig. 1, levers 52 may be employed, said levers being adapted to turn about pivots 53 entering oblong slots 54 in the levers 52, so as to allow the latter not only to be turned but also to be moved somewhat longitudinally. The levers 52, suitably three in number (only two visible) bear with their forward sides, which have a somewhat oblique direction, on a shoulder 55 and with their rear edges on a firing pin 56. This pin is moved backwardly, as soon as one or the other of levers 52 is turned backwardly or moved in its longitudinal direction along the shoulder 55. When the pin is moved backwardly, the primer 57 is ignited, by which the fuses 58, the explosive charge 59 and, thereby, the main detonator 15 are caused to explode. Placed in front of the primer 57 is a thin metal sheet 60 serving to prevent the entrance of water to the explosive charge. In order to prevent unintentional exploding, the pin 56 is kept locked by any suitable locking device which is released, when the torpedo is inserted into the torpedo tube.

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

1. The combination with a submarine apparatus, of a propeller shaft, an engine placed within the apparatus and adapted to rotate the said shaft, means for starting the engine, means for automatically stopping the apparatus, when it has traveled a predetermined distance, and means for causing the apparatus, after stopping, to oscillate vertically about a predetermined normal depth of submersion.

2. The combination with a torpedo, of a propeller shaft, an engine placed within the torpedo and adapted to rotate the said shaft, means for starting the engine, means for automatically stopping the torpedo, when it has traveled a predetermined distance, and means for causing the torpedo, after stopping, to oscillate vertically about a predetermined normal depth of submersion, acting for some time as a subfloating mine.

3. The combination with a torpedo, of a propeller shaft, an engine placed within the torpedo and adapted to rotate the said shaft, means for automatically starting the engine when the torpedo is launched, means for automatically stopping the engine, when the torpedo has traveled through a predeter-

mined distance, and means for causing the torpedo, after stopping, to oscillate vertically about a predetermined normal depth of submersion, acting for some time as a sub-  
5 floating mine.

4. The combination with a torpedo, of a propeller shaft, an engine placed within the torpedo and adapted to rotate the said shaft, means for starting the engine, means for  
10 automatically stopping the torpedo, when it has traveled through a predetermined distance, and means for causing the propeller shaft to rotate, after the torpedo has stopped, when the torpedo sinks below a predeter-  
15 mined depth of submersion.

5. The combination with a torpedo, of a

propeller shaft, an engine placed within the torpedo and adapted to rotate the said shaft, means for starting the engine, means for  
20 automatically stopping the torpedo, when it has traveled through a predetermined distance, and a pressure fluid turbine adapted to rotate the propeller shaft, after the tor-  
25 pedo has stopped, when the torpedo sinks below a predetermined depth of submersion.

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

KARL OSKAR LEON.

Witnesses:

AUGUST SÖRANSEN,  
EMIL WAHLBERG.