This invention relates to mechanism for firing the warhead of a torpedo without actual contact between torpedo and target vessel through the effect of the vessel's magnetic field upon the mechanism hereinafter to be described.

Among the objects of this invention are:

To provide a torpedo firing device that will cause the explosion of a torpedo without the latter striking the target;

To provide a device of the type mentioned that will cause the explosion of the torpedo at the most vulnerable point of a target;

To provide a torpedo firing device that may be used with present types of torpedoes and that can be given periodic tests to determine its workable condition.

The present invention is in general similar to that disclosed in my co-pending application, Serial No. 610,239, filed May 9, 1932, but differs therefrom in the construction of the mechanism that is responsive to the magnetic field of a ship's hull.

In the drawings:

Fig. 1 is a general assembly view of my invention;

Fig. 2 is a side elevational view of the water driven impeller with the housing therefor in section;

Fig. 3 shows the solenoid used for moving the firing mechanism into operative position;

Fig. 4 is a circuit diagram of the invention;

Fig. 5 is an enlarged detail view of the magnetically controlled thermionic tube;

Figs. 6 and 7 illustrate the probable nature of the movements of the electrons in the tube of Fig. 5 when the magnetic field of the target vessel is not acting and when it is acting, respectively.

Housing 9 for impeller 8 is disposed within the stream-lines of a torpedo body to prevent excessive drag, but it permits ready access of the water through which the torpedo is passing to the blades of impeller 8 to cause rotation of the impeller. Shaft 19 transmits the rotatory movement of impeller 8 to an electric generator 40 which has a high voltage winding 11 and a low voltage winding 12. These windings normally mounted on the same shaft, are being separated in Fig. 4 for purposes of clarity of illustration and marked, respectively, H and L in that figure. Winding 11 supplies the potential for plate 18 of triode 14 and anode 15 of magnetically controlled tube 16. The winding 12 supplies the filament currents for both tubes and also the current for coil 17 which sets up a magnetic field within tube 16. With the elements of tube 16 suitably adjusted the flow of electrons from filament 34 to anode 15 would normally be along radial lines as indicated in Fig. 6; but when current flows in coil 17 a whirling motion is imparted to the electrons, as indicated in Fig. 7, which, with sufficient intensity of current in coil 17, will effectually prevent any electrons from reaching the anode 15.

Across field coil 16 of generator 40 is connected a gas tube 18 in series with a coil 20 wound to oppose coil 18 when energized. After the torpedo has been launched the speed of impeller 8 gradually increases and consequently drives generator 40 at increasingly higher speeds, but when the generated voltage exceeds a predetermined value current passes through gas tube 19 and coil 20 which reduces the magnetic field due to winding 16 and so limits the output of the generator to predetermined values.

A potential divider 21 is provided to adjustably determine the average potential of circuits supplied by generator 12 relative to circuits supplied by generator 11. By means of the potential divider 21, working in conjunction with the condenser 20, the grid 23 is maintained sufficiently negative to block the tube 16, when no current flows through the anode 16 of tube 16, thereby preventing a flow of current through the solenoid 24. Adjacent the solenoid 26 is mounted a bell crank lever 28 having one end disposed to be contacted by core 26 of the solenoid and its other arm disposed under one end of a lever 27 that is pivoted between its ends and has its other end lying upon a pawl bar 26. Upon a shaft 41 that is geared to shaft 16 is mounted a toothed wheel 28 adjacent the lug 30 on pawl bar 26, which bar is pivotally mounted on a lever 31 that is rockable about pivot 32 and has an arm 33 disposed to actuate the torpedo firing element (not shown). Normally the magnetic field set up by coil 17 prevents any of the electrons given off by filament 34 of tube 18 from reaching the anode 15 thereof, the anode being in the form of a cylinder coaxial with the filament 34. However, when a torpedo equipped with my present invention comes within the magnetic influence of a ship's hull, the magnetic field within the tube 16 is distorted from that normally produced by the coil 17, so that coil 17 is no longer effective in preventing the passage of electrons to anode 15, and current flows in the anode circuit of tube 16.

The readjustment of potential occasioned thereby, operating through condenser 38 and resistor 37 upon the grid 23, unlocks the tube 14 and energizes solenoid 24. When current flows through solenoid 24 core 26 is moved to the left, as viewed in Fig. 3, rocking lever 28 on its pivot which in turn rocks lever 27 and thereby moves downwardly the end of pawl lever 26 adjacent
thereto, thus causing lug 38 to engage the teeth of wheel 28. The thrust of wheel 28 against lever 28 rocks lever 31 on its pivot in the direction indicated by the arrow and moves arm 33 thereof against the firing element of the torpedo firing mechanism and thereby causes the explosion of the torpedo.

It is apparent that with this invention it is not necessary that a torpedo strike the target to cause the firing of the torpedo. Further, the small delays inherent in the system permit the torpedo to move to a position directly under the ship before the explosion occurs, thereby attacking the vessel in its most vulnerable part and utilizing to their fullest extent both the detonation and compression waves.

It will be understood that the above description and accompanying drawings comprehend only the general and preferred embodiment of my invention and that various changes in construction, proportion and arrangement of parts may be made within the scope of the appended claims without sacrificing any of the advantages of my invention.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. In mechanism to actuate the firing element of a torpedo, an impeller disposed to be driven by water through which the torpedo is passing, a source of current actuated thereby, a toothed wheel also driven by said impeller, a device to actuate said firing element and having a portion engageable by said wheel, means including a triode tube to cause such engagement, said tube being biased normally to prevent flow of plate current whereby said means would be operated and a magnetically controlled thermionic tube operatively connected to said source and having an anode connected to the grid of said triode, said magnetically controlled tube being adjusted to prevent flow of anode current therethrough but adapted to respond to the magnetic field of a ship's hull whereby the anode current of said magnetically controlled tube overcomes the bias of said triode and causes the actuation of said firing element.

2. In mechanism to actuate the firing element of a torpedo, a source of electric current actuated by water through which the torpedo passes, a triode tube operatively connected to said source and normally biased thereby to prevent the flow of plate current, means to operate the said firing element connected to be actuated by the plate current from said triode and a magnetically controlled thermionic device having an anode connected to the grid of said triode whereby when within the magnetic field of a ship's hull the negative bias of the grid of said triode will be overcome and current will be caused to flow through said means to operate said element.

3. In mechanism to actuate the firing element of a torpedo, a source of electric current actuated by water through which the torpedo passes, a triode tube operatively connected to said source and normally biased thereby to prevent flow to plate current, means to operate the said firing element connected to be actuated by the plate current from said triode and a magnetically controlled thermionic device having a cylindrical anode, a cathode disposed axially of said anode, said anode and cathode being suitably biased by said source and said anode being connected to the grid of said triode, and a current carrying coil connected to said source and disposed to control the electron flow from said anode to said cathode whereby when within the magnetic field of a ship's hull the negative bias of the grid of said triode will be overcome and current caused to flow through said means to operate said element.

4. In mechanism to actuate the firing element of a torpedo, a source of electric current actuated by water through which the torpedo passes, a triode tube operatively connected to said source and normally biased thereby to operate of plate current, means to operate the said firing element connected to be actuated by the plate current from said triode and magnetic means having a definite magnetic field controlling an electron stream responsive to deformation of said definite field by an exterior magnetic field to cause flow of current in the plate circuit of said triode when in the magnetic field of a ship's hull.

5. In a device of the class described, means to actuate the firing element of a torpedo, a solenoid disposed to cause said means to operate the firing element, a triode tube having its plate connected to said solenoid, said tube being normally biased to the blocking point, magnetically controlled means to overcome said biasing, said last mentioned means having a magnetic field controlling an electron stream and being operative to overcome said biasing under the magnetic field deforming influence of the magnetic field of a ship's hull, a source of current to operate said solenoid, and said magnetically controlled means and means operatively connected to said source and water through which the torpedo passes to render said source operative.

6. In mechanism to actuate the firing element of a torpedo, a source of current actuated by the water through which the torpedo passes, a triode, circuits operatively connecting said triode to said source, normally biased to block the flow of plate current, and an electron stream device responsive to an external magnetic field to unblock the triode and permit plate current to flow.

7. In mechanism to actuate the firing element of a torpedo, a source of current actuated by the water through which the torpedo passes, a triode, circuits operatively connecting said triode to said source normally to block the flow of plate current, an electron stream device responsive to an external magnetic field to unblock the triode and permit plate current to flow, and means to operate the firing element of said plate current.

8. In mechanism to actuate the firing element of a torpedo, a source of electric current actuated by water through which the torpedo passes, a triode operatively connected to said source and normally biased, a source of current from said triode, a magnetron tube including means to produce a magnetic field in said magnetron to prevent flow through the result and said magnetron being deformable by a magnetic field produced by the proximity of a ship's hull to permit current to pass through said magnetron, and means to apply current from said magnetron to said triode to unblock the triode and permit current to pass.

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