(No Model.)

T. NORDENFELT.

TORPEDO.

No. 312,579. Patented Feb. 17, 1885.

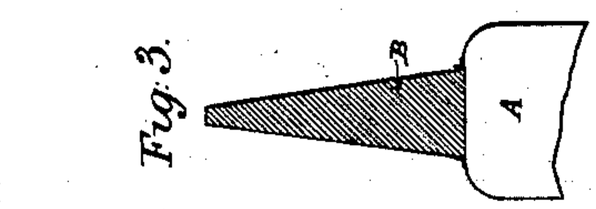

Fig. 3.

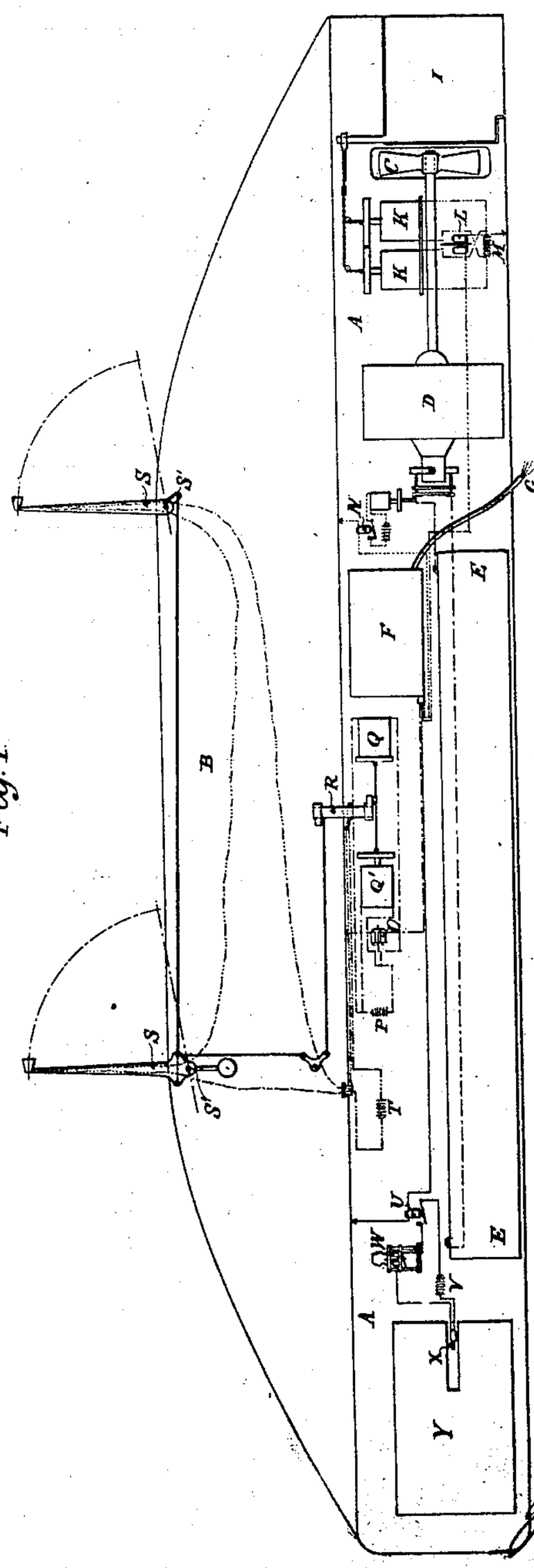

Fig. 1.

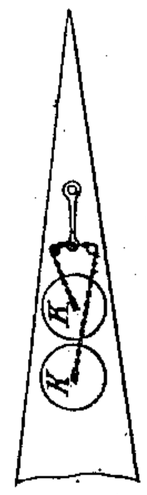

Fig. 2.

Witnesses.
Eugene V. Brown,
James Young.

T. Nordenfelt
Inventor.
By Attys
Baldwin, Hopkins & Peyton.

UNITED STATES PATENT OFFICE.

THORSTEN NORDENFELT, OF WESTMINSTER, ENGLAND.

TORPEDO.

SPECIFICATION forming part of Letters Patent No. 312,579, dated February 17, 1885.

Application filed April 19, 1884. (No model.) Patented in England September 20, 1883, No. 4,494, and October 13, 1883, No. 4,887; in France March 17, 1884, No. 160,987, and in Germany March 21, 1884, No. 29,139.

To all whom it may concern:

Be it known that I, THORSTEN NORDENFELT, a subject of the King of Sweden, residing at 53 Parliament Street, in the city of Westminster, England, have invented certain new and useful Improvements in Torpedoes, (for which I have received Letters Patent in Great Britain, No. 4,494, dated September 20, 1883, and No. 4,887, dated October 13, 1883; in France, No. 160,987, dated March 17, 1884, and in Germany, No. 29,139, dated March 21, 1884,) of which the following is a specification.

This invention has for its object the construction of a locomotive torpedo (controllable or otherwise) in such a manner as to be practically indestructible by artillery, and to bring the center of the explosive effect of the charge in the torpedo some distance below the surface of the water.

Also, the invention has for its object the propulsion and control of locomotive torpedoes.

The torpedo, as I prefer to construct it, consists, generally, of a body and a fin. The fin is such that it can with facility be disconnected from the body. The object of this is that the torpedo may be more commodiously packed for transport. The body has the center of gravity as far below the metacenter as possible and a very small reserve buoyancy. If this proportion is, for instance, one three-hundredth, the body of the torpedo will then float with one three-hundredth of its volume above the surface of the water as long as the fin is not attached to it. The fin, which is easily attached to the top of the body, is constructed of wood, cork, or other light material, and can be covered with iron or steel plate. From the middle of its base the fin slopes to nothing, both vertically and horizontally, so as to present as little surface friction as possible. The fin should be so constructed as to float when in the water, but its reserve buoyancy should be considerably less than the reserve buoyancy of the body. Care must be taken in constructing the fin that its center of gravity is well below its metacenter, so that it may float with its base down. The fin being placed on the top of the body its extra weight will cause the body to be entirely submerged, and the torpedo—*i. e.*, the body and fin combined—will float with only a small portion of the fin above the surface of the water, the displacement of which portion will be equal to the sum of the reserve buoyancy of the body and the fin. If shots be fired against the torpedo, no injury can possibly be done to the body, as it is submerged some feet under the water, and should any of the shots strike the fin, penetrating it or even knocking pieces off it, this would not cause the torpedo to sink, but, on the contrary, would tend to raise it, because, as the body is in itself buoyant, the fin being by these causes lightened, the torpedo would have less weight bearing it down. These torpedoes are consequently of such a construction as to be practically indestructible by artillery. They are provided with propelling-screws, rudders by which they can be directed, and sight or guide rods capable, if required, of being elevated at the pleasure of the operator to indicate the position and course. The power for driving the motor which actuates the screw or screws and for operating the guide-rods—that is, raising and lowering them—and for operating the rudder, is an electric current derived from a storage or other battery carried in the torpedo itself. The whole of the electric current from the battery contained in the torpedo is utilized to drive the motor, except when a small portion is diverted for the performance of either of the other functions, such as lighting the electric lamps, or operating the guide-rods or the rudder. Guide-lights are provided for night runs. They are incandescent electric lights, the electric current for which is derived from the battery contained in the torpedo. The incandescent lamps will only be lighted when the guide-rods are raised, as the lamps are put in and out of circuit by the movement of the guide-rods. The controlling arrangements of the torpedo consist of one or more electric cables and a small battery at the directing-point. The electric current from the battery at the directing-point controls circuit-closers in the torpedo and brings the electric power contained in the torpedo into play, exciting solenoids or other electro-magnetic arrangements for performing all the functions of starting and stopping the motor, raising and lowering the guide-rods, lighting the incandescent

lamps, moving the rudder to one side or the other, and for firing the fuse in the charge. The electric cable is so placed in the torpedo that during the run it will pay out without any appreciable drag, and may be stopped from running out when the torpedo ceases to travel. The charge may be arranged to be fired electrically or mechanically.

In order that my said invention may be most fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

The annexed drawings, Figure 1, shows a longitudinal section of an electric locomotive-torpedo constructed according to my invention. Its dimensions are such as to give a displacement of about three tons; but these dimensions may be varied. Fig. 2 is a horizontal section of the after end of this torpedo, and indicates the tapering form at the extremity. The fore end is of a similar form. Fig. 3 is a transverse vertical section.

The torpedo consists of a sheet-iron ship-like case, A, having a longitudinal fin, B, running along it from end to end upon the upper side.

In place of using a fin, other means may be resorted to for maintaining the torpedo in the desired position in the water.

C is a screw-propeller which drives the torpedo.

D is an electric motor giving motion to the propeller.

E are the secondary or other battery cells from which the electric energy to put in motion the electric motor and the propeller is obtained.

F is a tank containing an electric cable with four, or it might be other number of conductors.

G is a tube through which the electric cable passes out from the tank as the torpedo advances through the water. The arrangements in respect to the paying out of this cable are such as have been made in other torpedoes, which throughout their run remain electrically connected with the controlling-station.

I is the rudder. The tiller is connected by chains with the armatures of the electro-magnets or solenoids K. These are so constructed as to give a long stroke and powerful action.

L is a polarized relay of ordinary construction.

M is a local battery which supplies the power requisite for steering the torpedo. There are several such batteries represented in the drawings, each to perform a separate function, as hereinafter described. In practice it would usually be preferable to employ one battery to perform all the internal work of the torpedo, with the exception of driving the screw-propeller. One of the conducting-wires of the electric cable is connected with the coils of the relay L, and through these coils with the skin of the torpedo, which is equivalent to an earth-connection. Hence, when at the station from which the torpedo is directed an electric current is sent through this wire of the cable, the polarized relay L being rendered active, the circuit of the local battery M is closed by it through one or other of the magnets or solenoids K. The corresponding armature is then attracted and drawn down, and the rudder is thus put over to port or starboard, as the case may be. Whether one or other solenoid is excited and the helm put to port or starboard is dependent upon the direction of the current transmitted to the polarized relay L.

In place of steering by electro-magnets or solenoids an electric motor may be employed. The motor may rotate a screw on which is a nut, and the nut, which is thus caused to traverse on the screw, is connected with the tiller by links. By means of the polarized relay the current can be sent through this steering-motor in either direction, and the steering-nut traversed either way on the screw. Another of the conductors in the cable is in like manner connected with an electro-magnet, N, and through the coils of this magnet with the skin of the torpedo. When a current of either polarity is transmitted through this wire, the magnet attracts its armature, and in so doing either directly closes the circuit of the main battery through the electric motor, or it may perform this function through the intervention of another electro-magnet in a local circuit, as the drawing indicates. When the current in the cable-wire ceases, the circuit of the battery E is opened and the torpedo ceases to be propelled. A third wire in the electric cable is connected with the coils of the polarized relay O, and so to earth, and this relay serves to close the circuit of the local battery P either through the coils of the electro-magnet Q or through those of another similar magnet, Q′, according to the direction of the current transmitted through the cable to the relay O. The magnets Q or Q′, when thus excited, give partial rotary motion to the axis R, which is linked with their armatures, as the drawings indicate, and by levers and links (indicated in the drawings) the movement of the axis R is transmitted to the sight-rods S S. When the magnet Q is excited, it raises the sight-rods to the position in which they are represented in full lines in the drawings, causing them to rotate about the pins or studs S′, upon which they are mounted. On the other hand, when the magnet Q′ is excited, it causes the sight-rods to be drawn down to the position indicated in the drawings by dotted lines. The sight-rods are thus raised when it is desired to observe accurately from the controlling-station the direction the torpedo is taking. At other times the sight-rods are folded down to conceal them from the enemy.

In order that the torpedo may be employed at night each of the sight-rods is provided at its upper end with an incandescent lamp, and these lamps are supplied with current from the battery T so long as the sight-rods re-

main raised, the movement of the vertical axis R at this time closing the battery-circuit through the lamps in the manner indicated by the drawings. A fourth conductor (shown within the electric cable) is connected with the skin of the torpedo through the coils of the electro-magnet, and when a current is transmitted through this wire from the controlling station the armature of the magnet is attracted. This closes a gap previously open in the circuit of the firing-battery V, but it does not complete the circuit because there is a second gap under the control of the circuit-closer W. This circuit-closer is of a well-known construction, such as is commonly employed in torpedoes which are intended to be fired on collision with a passing ship or vessel. A weight in the circuit-closer is overturned on the collision taking place, and in its movement the weight closes the gap in the circuit of the firing-battery, which is under the control of the circuit-closer W.

X is an electric fuse in the circuit of the firing-battery V. This fuse is fired on collision, provided that an electric current is at the same time being transmitted to the torpedo by the wire connected with the magnet U.

Y is the chamber containing the bursting-charge, which is fired by the ignition of the fuse. The propelling-battery should, for a torpedo of these dimensions, be capable of delivering a current equivalent to about thirty horse-power, and of maintaining the same during the run. The auxiliary or steering battery should be capable of delivering a current of about thirty volts.

It is not essential that the cable connecting the torpedo with the controlling-station should contain more than a single wire. By well-known mechanism, which it is now unnecessary for me to describe, the one wire may be made to perform all the duties of the several wires, to which reference has already been made. This, however, would involve the use of comparatively complicated mechanism both at the controlling-station and within the torpedo itself, which can be avoided if there be several insulated conductors in the connecting-cable.

I am aware that it is not new with me to propel a torpedo-boat by means of electricity derived from a battery carried by the boat.

I am also aware that it is old to control the motion of a torpedo-boat by opening and closing the valves of the steam-engine that propels the boat by means of electric circuits connecting said valves with the shore, and also that boats have been steered from shore by means of electro-magnetic devices. I do not, therefore, broadly claim such subjects-matter.

Having thus described the nature of my said invention and the manner of performing the same, I would have it understood that I claim—

1. The herein-described torpedo-boat, consisting of the combination of the buoyant body, and a buoyant fin arranged lengthwise of the body and connected therewith at more than one point, so as to be permanently prevented from turning horizontally.

2. The herein-described torpedo-boat, consisting of the combination of the buoyant body, and a buoyant elongated vertical blade or fin arranged lengthwise over the body and connected therewith.

3. The combination, in a locomotive torpedo, of an electric motor, motor-controlling devices, and a source of electric energy for driving said motor, all carried by the torpedo itself, and an electric conductor connecting the motor-controlling devices of the torpedo with a controlling-station, whereby the electric motor may be stopped and started at will from the shore.

4. In a locomotive torpedo, the combination, substantially as set forth, of a local battery carried by the torpedo, the rudder, electro-magnetic steering devices in the circuit of said local battery for directly actuating the rudder, a relay which controls said local circuit to effect the steering of the torpedo, and an electric circuit connecting said relay with the controlling-station.

5. In a locomotive torpedo, the combination, substantially as set forth, of the sight-rods, electro-magnetic devices for raising and lowering the sight-rods, a battery within the torpedo for operating said devices, and an electric circuit connecting the electro-magnetic devices with a controlling-station.

6. In a locomotive torpedo, the combination, substantially as set forth, of a sight-rod, electro-magnetic devices for raising and lowering the sight-rod, a circuit-closer, and an electric circuit connecting the circuit-closer with a directing-station.

7. In a locomotive torpedo, the combination, substantially as set forth, of the sight-rods, the electro-magnetic devices for raising and lowering the sight-rods, the electric lamps carried by the sight-rods, and devices for closing the electric current through the lamps while the rods are elevated.

8. The combination, in a locomotive torpedo, of rising and falling sight-rods, electric lamps on the sight-rods, their circuit and source of energy, and circuit-completing devices, which complete the lamp-circuit when the rods are raised.

9. In a locomotive torpedo, the combination, substantially as set forth, of the electric lamps, the battery carried by the torpedo, the circuit-closer controlling the lamp-circuit, and an electric circuit connecting said circuit-closer with a directing-station.

THORSTEN NORDENFELT.

Witnesses:
J. WATT,
THOMAS LAKE,
Both of 17 *Gracechurch Street, London.*