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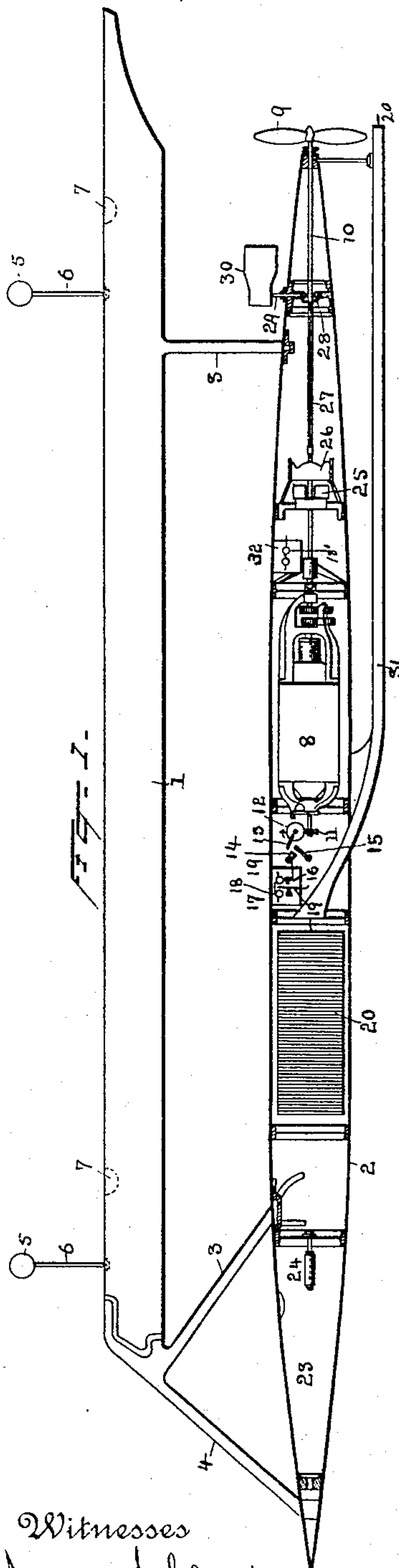
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W. S. SIMS.

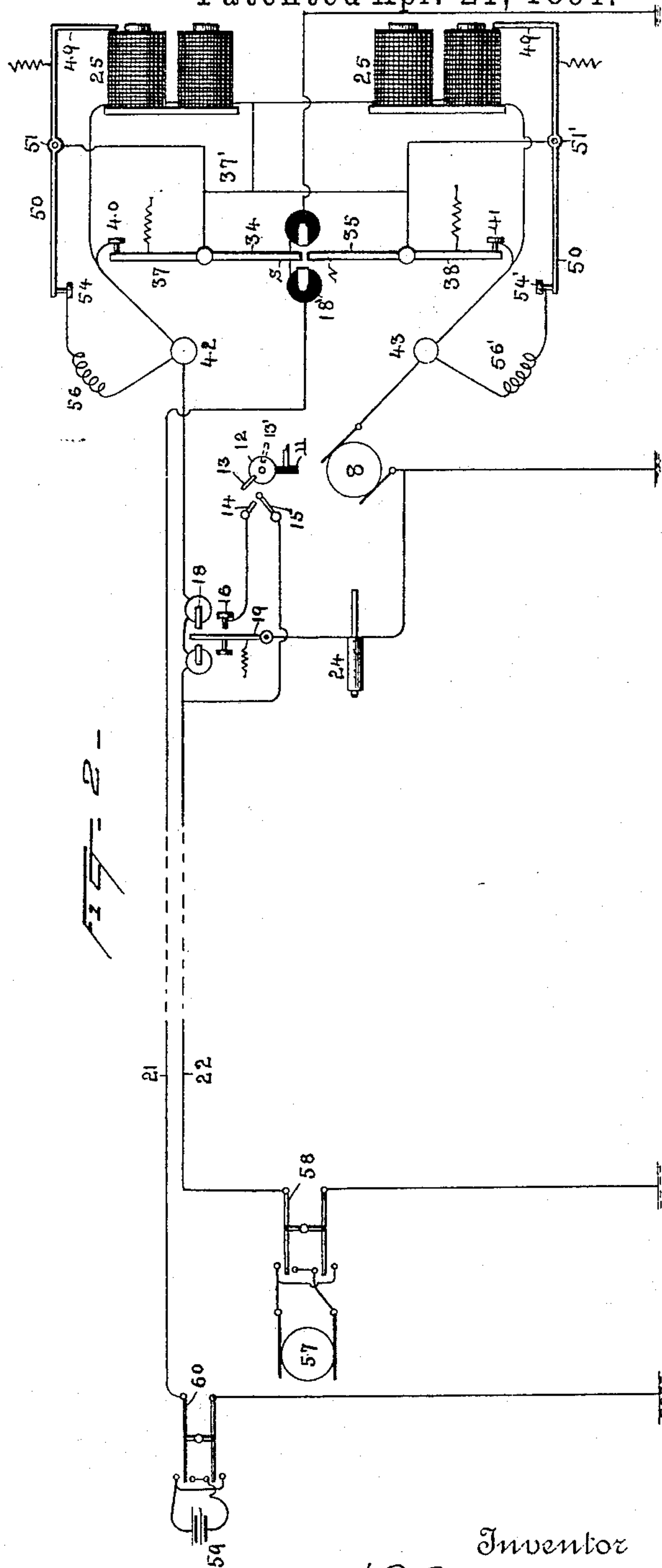
ELECTRICALLY PROPELLED AND STEERED TORPEDO.

No. 450,875.

Patented Apr. 21, 1891.



Witnesses
 Norris A. Clark,
 J. F. O'Leary.



Inventor
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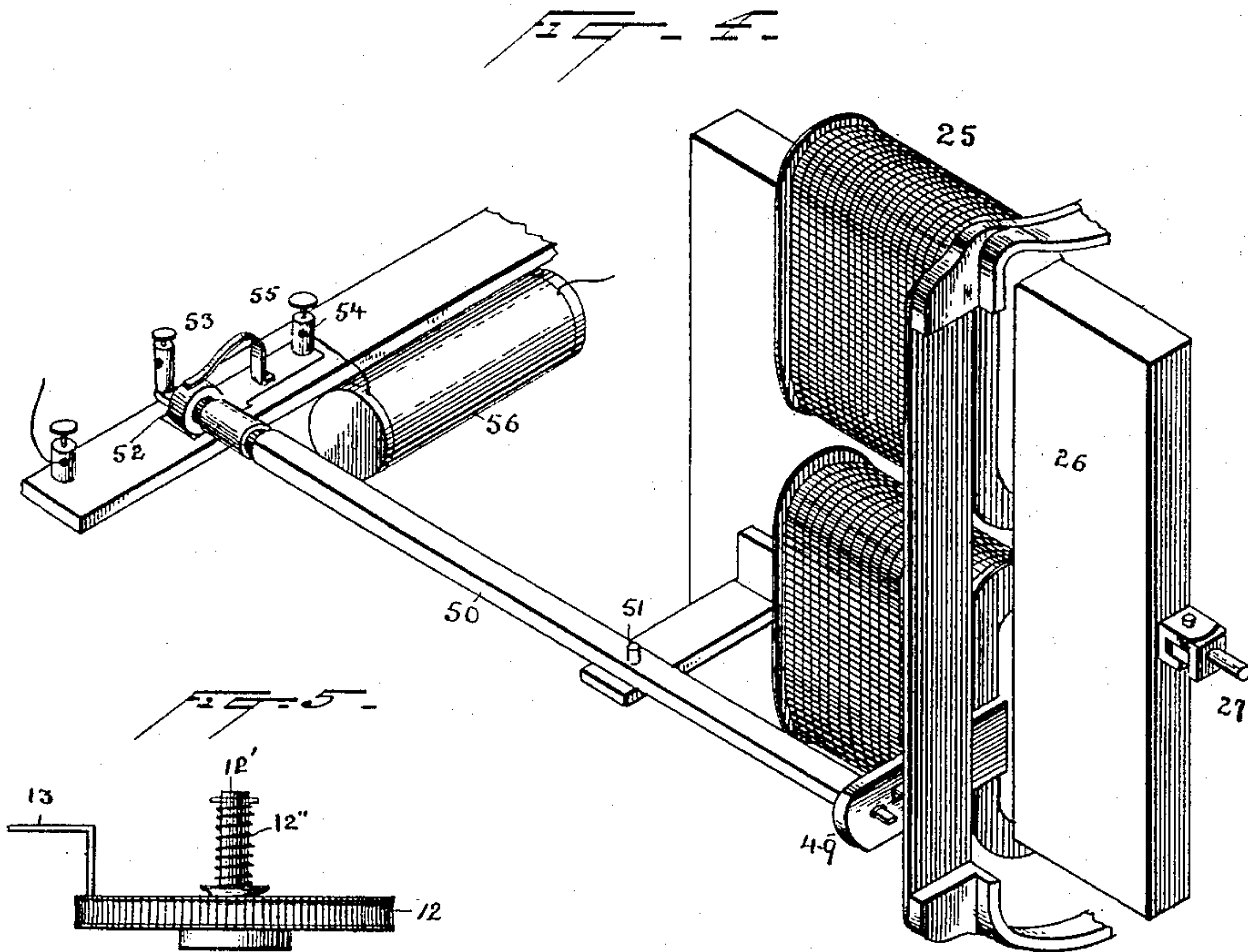
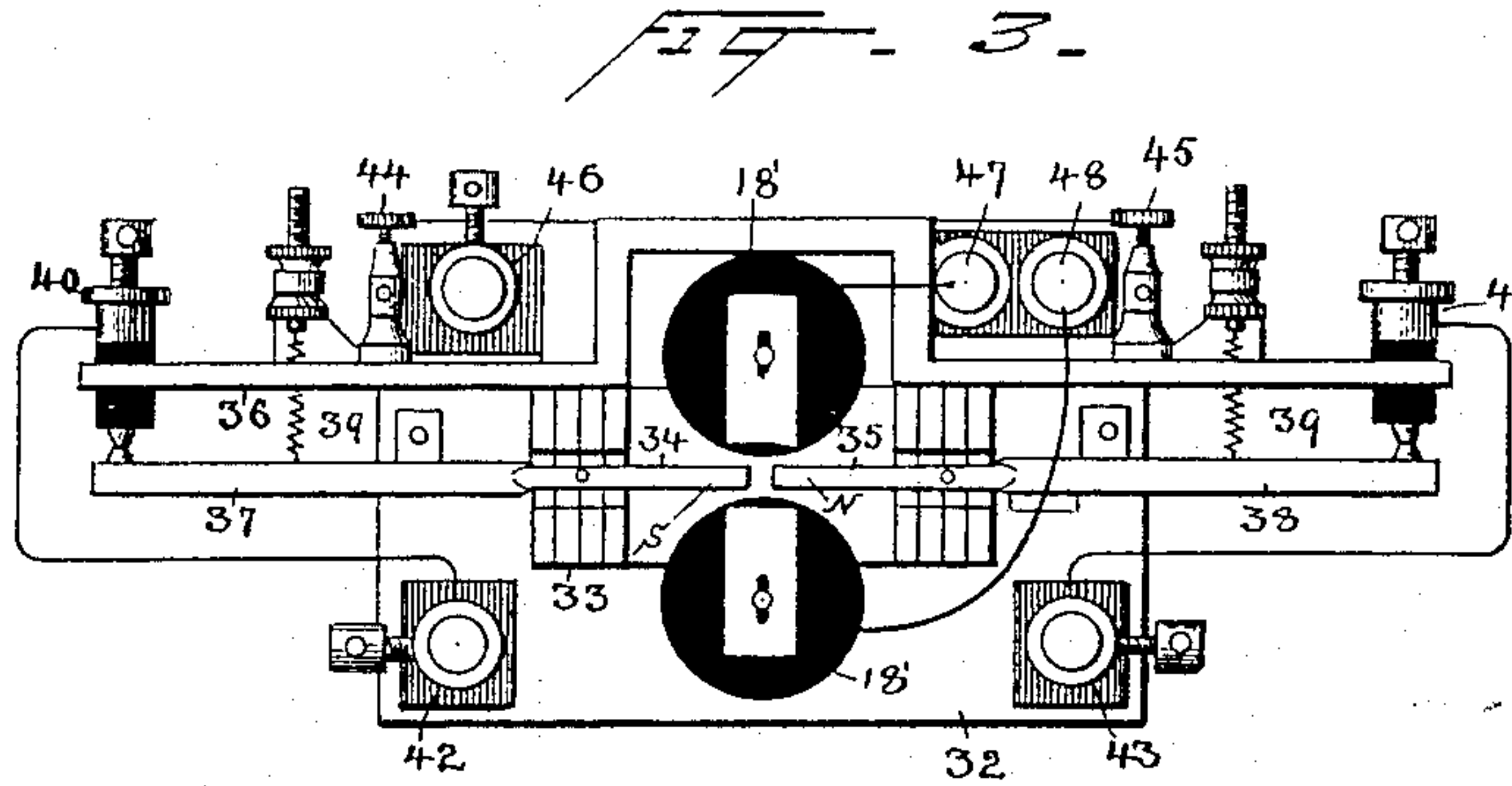
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UNITED STATES PATENT OFFICE.

WINFIELD S. SIMS, OF NEWARK, NEW JERSEY.

ELECTRICALLY PROPELLED AND STEERED TORPEDO.

SPECIFICATION forming part of Letters Patent No. 450,875, dated April 21, 1891.

Application filed December 22, 1890. Serial No. 375,417. (No model.)

To all whom it may concern:

Be it known that I, WINFIELD S. SIMS, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Torpedoes Propelled and Steered by Electricity, of which the following is a specification.

My invention relates to that class of torpedoes which are submerged or partially submerged in the water and which are propelled by an electric motor on the torpedo by means of a cable leading from said motor to a generator on the shore or on any suitable support external to the torpedo.

The present invention is an improvement on the devices described and claimed in my patent, No. 319,633, dated June 9, 1885; and the invention consists in improved devices for controlling the motor and steering-magnet circuits, in means for controlling the firing or exploding circuit, and in certain combinations and devices hereinafter described and claimed.

In the accompanying drawings, which illustrate the improvements, Figure 1 is a view of my torpedo, the shell being in section. Fig. 2 is a diagram showing the circuits and general arrangement of devices on the torpedo, the conductors extending from the torpedo to the shore, and the generators and switches at the generator-station. Fig. 3 is a plan view of the relay which I employ for controlling the circuits to the steering-magnets. Fig. 4 is a perspective view of one of the steering-magnets and a circuit-controller operated thereby. Fig. 5 shows a portion of a circuit-controller.

The main features of construction in the torpedo herein shown are substantially the same as in my patent above referred to.

1 is a float in the shape of a boat, below which the torpedo 2 is supported by the braces 3. This torpedo is made of a metal shell, preferably of copper and nearly cylindrical in cross-section, being made up in sections of convenient length secured together by suitable means. The forward brace 4 I preferably make in the form of a knife-edge, in order that it may cut ropes or other small obstructions against which it may strike. The

float carries two or any suitable number of signal balls, disks, or other devices 5, supported on pivoted rods 6. These serve to indicate the position of the torpedo when the rest is entirely submerged. Should the torpedo strike a log or other obstruction when under way, the inclined edge of the brace 4 would cause it to sink still farther into the water and the torpedo would pass under the obstruction, the arms 6 being at the same time turned on their pivots, moving the signal balls or disks so that they rest in the sockets 7 provided for them in the top of the float.

8 is the electric motor for driving the propeller 9 by means of the shaft 10. The armature-shaft is extended and carries a worm-gear 11, which engages with a corresponding gear 12. This latter gear is provided with a projecting pin 13. The wheel 12 is supported on a stud or shaft 12', Fig. 5, and can turn thereon.

12'' is a spring which presses a washer against the wheel. The position of arm 13 can be changed before the torpedo is launched by raising the wheel 12 against the force of the spring, turning the wheel on the stud, and then moving it back into engagement with gear 11. Adjacent to said wheel is a circuit-controller consisting of a stationary spring-terminal 14 and a movable terminal 15. The terminal 14 is connected to a normally-open contact 16 on the firing-relay 17. The magnet 18 of this relay is connected directly in the motor-circuit, and the armature 19 is connected to the fuse for exploding the charge of the torpedo.

20 is the cable connecting the motor and the generator. This is coiled in one section of the torpedo and uncoiled as the torpedo moves away from the shore. This cable carries two conductors, as indicated at 21 22 in the diagram, and the conductors are preferably arranged in the cable concentrically. One conductor is comparatively small, and consists of several fine wires twisted together and surrounded by insulating material. The other conductor, which is of greater capacity, consists of a larger number of fine wires wound in long spirals around said insulated conductor, and are in turn covered with insulat-

ing material. This construction not forming a part of the invention is not shown in detail.

23 is the chamber in which the dynamite or other explosive is placed, and 24 is an electrically-operated exploding device therefor of any suitable construction.

At the right of the motor are steering-magnets 25, only one pair of magnets being shown in Fig. 1; but it will appear from Fig. 2 that there are two magnets. These magnets are rigidly supported, one on one side and one on the other side of the shaft 10. In front of each magnet is a sliding armature 26, connected by means of a rod 27 to one end of a cross-rod 28, which is rigidly connected to a post 29, carrying the rudder 30. The connection between the armatures and the rudder-post is practically the same as in the patent above referred to.

31 is a tube through which the cable passes as it is uncoiled during progress of the torpedo. This tube is longer than heretofore described by me, being carried to the rear of the propeller. This is found advisable in order to prevent any possibility of the cable being caught by the propeller, thereby interfering with the progress of the torpedo.

Referring to Fig. 3, 32 is a suitable base on which the electro-magnets 18', the permanent magnet 33, its polarized armatures 34 35, and the bar 36 are mounted. The polarized armatures 34 35 have extensions 37 38, which are preferably of brass, and retracting-springs 39 normally hold said extensions against the insulated binding-posts 40 41, carried by the arm 36. 42 is an insulated binding-post connected with post 40, and 43 is a similar post connected with 41. 44 45 are binding-posts carried by the arm 36, and 46, 47, and 48 are insulated binding-posts on the base.

Referring now to Fig. 4, it will be seen that the steering-magnet 25, in addition to the armature 26, connected to the rudder, has a second armature 49. This armature is smaller and much more delicate than the steering-armature. It is carried on a rod or bar 50, pivoted at 51. At its outer end it carries an insulated sleeve 52, to which is connected a binding-post 53. 54 is a second binding-post connected with spring 55, which is adapted to bear on said sleeve, whereby posts 53 and 54 will be connected; but when said sleeve is moved to the left the circuit will be broken. 56 is a resistance-coil one end of which is connected to the post 42 and one end of which is connected to the post 54. This resistance I usually make about equal to that of one of the steering-magnets.

In Fig. 2, 57 is the dynamo supplying current to propel and steer the torpedo, and is provided with a current-reversing switch 58. 59 is a battery for controlling the relay-magnets 18', and is provided with a reversing-switch 60.

The operation and the several circuit-con-

nections will now be described with special reference to Fig. 2. When it is desired to propel the torpedo, the switch 58 is closed in such direction that the current proceeding over conductor 22 will hold the armature 19 against its back-stop—that is, in the position occupied by the armature in the drawings. The current proceeds to post 42, where it finds two paths, one to post 40, arm 37, and wire 37', or, in the apparatus actually used, through the base to arm 38, post 41, motor 8, and to earth. This ground is ordinarily the shell of the torpedo, which is immersed in the water. This branch divides near the post 40, one branch being as above indicated and the other extending to the steering-magnet 25 and to wire 37'. It will be seen that the steering-magnets are thus short-circuited. The second branch is from post 42 through resistance 56 and post 54 to wire 37'. It will be seen that this resistance is in a shunt cut-out or safety circuit around the contact between arm 37 and post 40 to protect the steering-circuit. Said resistance is for the purpose of protecting the contact at said point from the destructive effect of very heavy currents, such as used for propelling torpedoes.

In torpedoes heretofore made by me it has been found that the steering apparatus becomes somewhat unreliable after the torpedo has been in operation for a short time, owing to the fact that the contacts of the controlling-relay become roughened by arcing or fusion and stick together, so that it is impossible to properly direct the current to steer the torpedo.

When it is desired to energize the starboard steering-magnet 25, the switch 60 is turned onto the contacts in the proper position to energize magnet 18' to move the pole S toward the right, thereby breaking the contact between 37 40. This opens the short circuit around the starboard steering-magnet; but since the current from the dynamo still has two paths the said steering-magnet is not energized sufficiently to operate the rudder. It is, however, sufficiently energized to attract its armature 49, thereby tilting the lever 50 and breaking contact between it and the post 54, thus throwing the entire current through the starboard steering-magnet; but since the circuit through 37 40 was broken first the contacts were protected from injury. If it were desired to energize the port steering-magnet, the switch 60 would be moved in the opposite direction, whereby the pole N of magnet 18' would be moved to the right and the short circuit around the port steering-magnet would be open, as above described in connection with the starboard steering-magnet.

Heretofore there has been danger of premature explosions of the torpedo, owing to accidental closures of the circuit leading to the fuse. In order to prevent such explosion before the torpedo has proceeded to a safe distance from operators on shore, I provide

the circuit-controller 14-15. The gear between the motor-shaft and the wheel 12 is so proportioned that the motor-shaft makes a large number of revolutions—for example, 5 three hundred—before the wheel 12 moves far enough to bring arm 13 against the movable part 15 of the circuit controller, throwing the same onto contact 14. If it should be desired to close the circuit before the motor had made three hundred revolutions, the 10 wheel 12 could be turned so as to bring the pin 13 to the position indicated by 13' before the torpedo is started. After the circuit is closed between 14 15 the charge of the torpedo can be exploded by reversing the current of the dynamo by means of switch 38. 15 This throws the armature 19 against contact 16, closing the branch circuit from the conductor 22 to 15 14 16 19, to the fuse, and to 20 earth.

It will be seen that by the arrangement of circuits and devices above described all danger of losing control of the steering apparatus by reason of fusion between the contacts 25 37 40 is avoided, the normal resistance of the motor-circuit is reduced, and all danger of premature explosion is absolutely avoided.

Having thus described the invention, what I claim is—

30 1. The combination, with a torpedo, of a steering-magnet, an electrical generator, a relay for directing current through the steering-magnet, a resistance in a shunt around the relay-contacts, and means for opening 35 the shunt after the relay-contacts are separated, substantially as described.

2. The combination, with a torpedo, of a steering-magnet, an electrical generator, a relay for directing current through the steering-magnet, a resistance in a shunt around 40 the relay-contacts, and an auxiliary armature operated by the steering-magnet and acting to open the shunt after the relay-contacts are separated, substantially as described.

45 3. The combination, with a torpedo having a suitable propeller, an electric motor on the torpedo for driving the propeller, and a conductor connected to the motor and to an external generator, of steering-magnets connected to the motor-circuit, but normally 50 shunted or short-circuited, means for opening the short circuit, a resistance around the short-circuit contacts, and a circuit-breaker for opening the circuit through said resistance, substantially as described.

55 4. The combination, with a torpedo having a suitable propeller, an electric motor on the torpedo for driving the propeller, and a conductor connected to the motor and to an external generator, of steering-magnets connected to the motor-circuit, but normally 60 shunted or short-circuited, means for opening the short-circuit, a resistance around the short-circuit contacts, a circuit-breaker, and an armature adjacent to a steering-magnet 65 and connected to the circuit-breaker for mov-

ing the same, thereby opening the circuit through said resistance, substantially as described.

5. The combination of a steering-magnet, 70 an armature therefor connected with the rudder, an armature requiring less power to move it than the first armature, but controlled by a magnet in the same circuit as the magnet of the first armature, and a circuit-controller 75 in a cut-out or safety circuit and operated by the second armature, substantially as described.

6. The combination of a steering-magnet, an armature therefor connected with the rudder, a circuit-controlling armature requiring 80 less power to move it than the first armature, a shunt to the steering-magnet, and a circuit-controller in the shunt operated by said second armature, substantially as described. 85

7. The combination of a steering-magnet, an armature therefor connected with the rudder, and a circuit-controlling armature also 90 operated by the steering-magnet and requiring less power to move it than the first armature, substantially as described.

8. The combination, with a boat or torpedo, of a rudder for the boat, electro-magnets for moving the rudder, and two shunts or short 95 circuits for each electro-magnet, and circuit-controllers for said shunts, substantially as described.

9. The combination, with a boat or torpedo having a suitable propeller, an electric motor on the boat for driving the propeller, and a 100 conductor connected to the motor and to an external generator, of a rudder, electro-magnets therefor, and two shunts or short circuits for each electro-magnet, one shunt containing a circuit-controller operated by the steering-magnets, substantially as described. 105

10. The combination, with a torpedo having suitable propelling and controlling devices, of an electric exploding device for the torpedo charge, a normally-inoperative circuit 110 to the exploding device, a circuit-controller for said circuit, and means dependent on movement of the torpedo for operating said circuit-controller, substantially as described.

11. The combination, with a torpedo having 115 a suitable propelling motor and controlling devices, of an exploding device for the torpedo charge, and a normally-inoperative circuit to the exploding device open at a relay and open at a second circuit-controller, which 120 is operated when the torpedo has moved a predetermined distance, substantially as described.

12. The combination, with a torpedo having a propelling-motor, of a relay-magnet, an 125 armature for the relay-magnet connected to an exploding device on the torpedo, and a safety circuit-controller also in said exploding circuit, substantially as described.

13. The combination, in a torpedo, of an 130 exploding device, a safety circuit-controller in a circuit extending to the exploding de-

vice, and means moving in accordance with the torpedo for operating the circuit-controller at a predetermined time, substantially as described.

- 5 14. The combination of the steering-magnet, an armature therefor connected to the rudder, a second armature, a pivoted arm connected to said armature, and a circuit-breaker

in a safety-circuit carried by said arm, substantially as described. 10

This specification signed and witnessed this 17th day of December, 1890.

WINFIELD S. SIMS.

Witnesses:

CHARLES M. CATLIN,
J. A. YOUNG.