(No Model.)

C. W. AYTON.

ELECTRICAL STEERING GEAR.

No. 507,522. Patented Oct. 31, 1893.

Fig. 1.

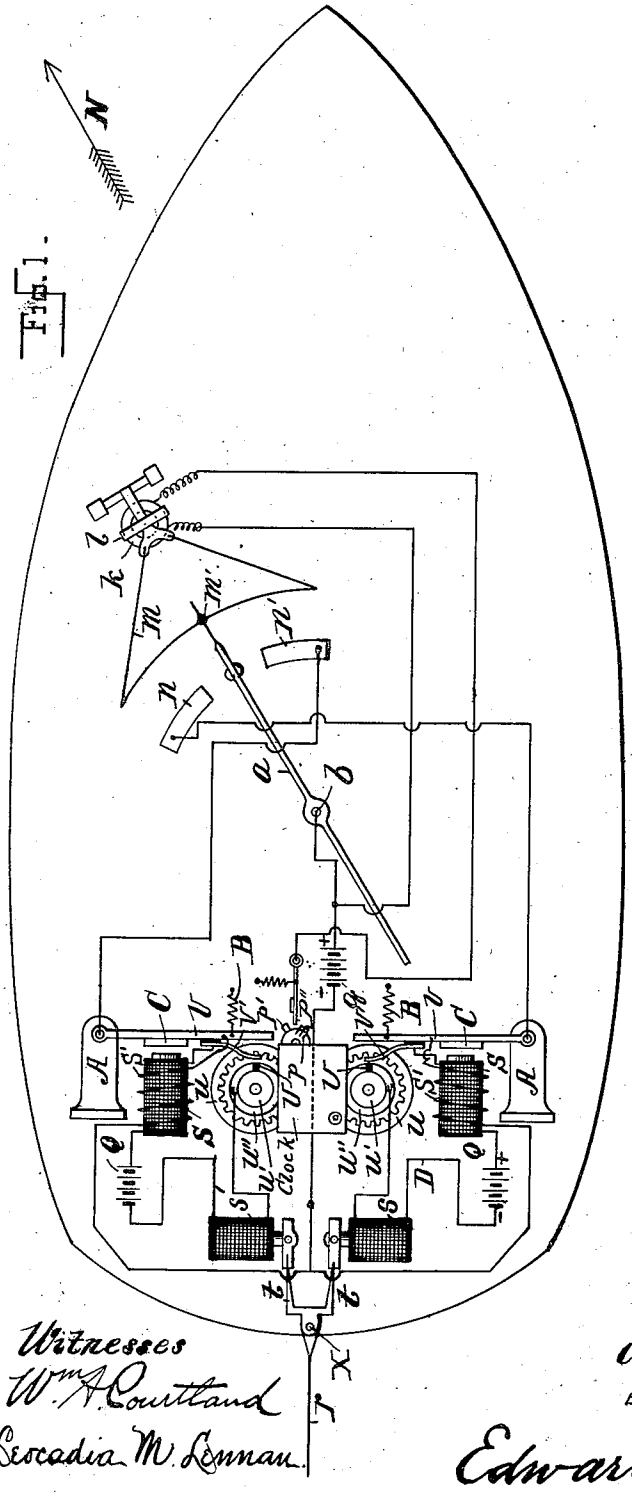
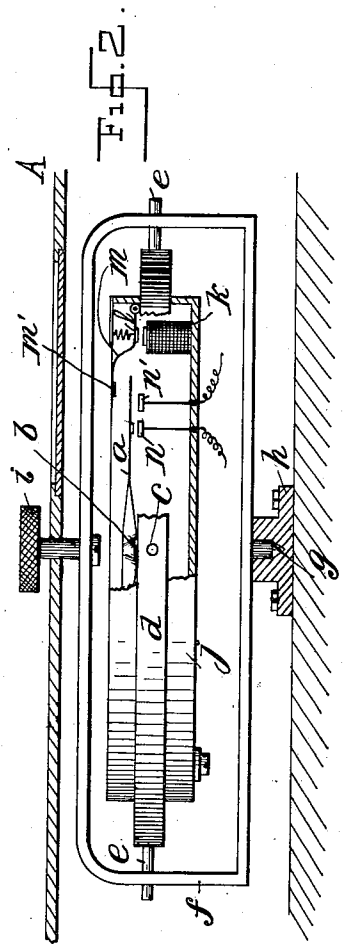


Fig. 2.



Witnesses
Wm. A. Courtland
Leocadia M. Lennan

Inventor
Charles W. Ayton
By his Attorney
Edward P. Thompson

UNITED STATES PATENT OFFICE.

CHARLES WILLIAM AYTON, OF NEW YORK, N. Y.

ELECTRICAL STEERING-GEAR.

SPECIFICATION forming part of Letters Patent No. 507,522, dated October 31, 1893.

Application filed July 13, 1892. Serial No. 439,864. (No model.)

To all whom it may concern:

Be it known that I, CHARLES WILLIAM AYTON, a citizen of the United States, and a resident of New York city, in the county and State of New York, have invented certain new and useful Improvements in Steering Apparatus for Torpedo-Boats, (Case No. 7,) of which the following is a specification.

The object of my invention is to provide a torpedo boat which will start from a given point in the water and travel therefrom to a distant ship or similar object without any one on board and without any connection with the point of starting.

To this end the invention relates to a torpedo boat equipped with a mariner's compass which controls an electric current which in turn operates a rudder whenever the boat steers either to the right or left from the course in which it has been adjusted.

In order that the exact nature of the construction may be easily understood, the following drawings are annexed.

Figure 1, is a plan of the boat, in which the elements of the invention are shown mostly in diagram. Fig. 2, is an elevation partly in cross section. In order that all the parts may be shown in Fig. 2, as far as practicable, the relative positions of the elements are slightly changed.

The principle of operation is based upon the scientific principle that a compass needle always points to the magnetic north pole of the earth. This needle is represented at the letter *a*, and is pivoted at the center and is perfectly free to move in either direction horizontally, and to a limited extent in vertical planes. The pivot is lettered *b*. The compass box is swung upon pivots *c*, which are carried by a pivoted ring *d*, all in the ordinary manner of supporting a compass box at sea, so that the needle will lie in horizontal planes normally, independently of the rocking of the ship. The pivots of the ring *d*, are *e*, and are carried upon the frame *f*, which is rotary in consequence of the central pivot *g*, supported in the bearing *h*. The frame *f*, when turned, carries with it all the above named elements which turn with it, but the needle *a*, remains pointing to the north.

The device for turning the compass box and its adjuncts is the thumb screw *i*, which projects above the deck A of the boat. This screw is preferably detachable in the manner of a key of a clock.

Mounted within the compass box *j*, is a small magnet *k*, whose armature is *l*, mounted upon the spring guide *m*, which extends to a point above the needle *a*, and is in the form of a bent aluminium wire for the sake of lightness in weight. When pulled down by the magnet, the said guide or wire directs the needle against one of the electric terminals *n*, *n'*, according to which the needle is over. If over neither, the needle comes in contact with neither. The said terminals are separated only a small distance, about an inch or so, or perhaps less.

It will be noticed that the magnet is as small as possible and that it is located as far as possible or practicable from the needle *a*, so that it will have no direct magnetic influence thereon. The ordinary means applied, in marine practice for neutralizing magnetic influences upon the needles may also be applied here, but need not be described as they have nothing to do with my invention.

o, is a clock provided with a periodical circuit interrupter *p*, which is in circuit with the magnet *k*, and the generator *q*. It is now evident that inasmuch as the wire *m* will tilt every few seconds or in fact at any desired intervals of time, the needle will also be made to tilt, and will close a circuit through one of the terminals *n*, *n'* under certain conditions as hereinafter set forth. During the remaining intervals, the needle *a* is free to obey the attraction of the earth's magnetism.

r, is a rudder pivoted at *x* and controlled in different directions respectively by the magnets *s*, *s'*, which are so disposed that one magnet when energized, will steer the boat in one direction while the other will steer it in the other direction. To this end, the armatures of the magnets are attached to arms *t*, and are in the form of armatures called cores, while the magnets are in that form known as solenoids for the purpose of getting a long pull and one dependent upon the strength of the magnet. A periodic circuit closer is provided for each of the magnets *s*, *s'* and each consists of the wheel *u'* propelled by the clock *o*, while brushes *v'* rest above said wheels.

In order that the rudder may be held to one side for a longer period of time than the instant during which the needle *a*, is in contact with one of the terminals *n*, *n'*, which period would not be long enough to produce more than a very slight change in the course of the boat, means are provided for prolonging the action of the magnets *s*, *s'*, on the rudder during one complete rotation of the wheels *u''*. This is accomplished by the instrumentality of two local circuits which are normally open. One of these is composed of the magnets *s*, S, the generator of electricity Q, the conductor D, the wheel *u''* and the brush *v'*; the other is composed of the magnets *s'*, S, the generator Q, the conductor D, the wheel *u''* and the brush *v'*. These are all in circuit with each other. The brushes *v'* are mounted on the levers *v*, but are insulated from them. Besides these local circuits, there are three independent circuits, as follows: one from the positive pole of the generator *q*, to the periodical circuit interrupter *p*, to and through the magnet *k*, and thus to the negative pole. The second circuit is from the positive pole of the generator *q*, to the coil S', which is located over the magnet S, to the terminal *n'*, to the needle *a*, to the pivot *b*, and then to the negative pole. The third circuit is from the positive pole of the generator *q*, to the coil S', which is located over the magnet S, to the terminal *n*, to the needle *a*, to the pivot *b*, and finally to the negative pole. It should be explained that the coils S', are not connected with the other coils on the electromagnets S. There are thus two independent coils on each magnet and which are, furthermore, located in separate circuits, as explained above.

If the boat should sail in a straight line, with the needle *a*, located between the terminals *n*, *n'*, the periodical magnetizations of the magnet *k*, will simply tilt the needle periodically and the latter will escape contact with the terminals *n*, *n'*. When the boat deviates from its course, the tilting of the needle will close the circuit through one of the coils S', thereby energizing one of the magnets S. The action of this magnet upon its armature C, which is attached to the lever *v*, will move the lever and bring the brush *v'*, into contact with the wheel *u''*. The wheels *u''*, being continuously rotated by the clock, the small piece of insulation U, moves from under the brush, thereby closing one of the local circuits. The magnet S, in this circuit causes the brush to bear against the wheel *u''* and keep the circuit closed till the rotation of the wheel brings the piece of insulation in contact with the brush and thus interrupts the circuit. Then one of the springs B, returns the lever *v*, together with the brush *v'*, to their normal position out of contact with the wheel *u''*.

In the complete manipulation of the device, the operation is as follows:—Suppose, for example, that the boat is to sail by itself in a northeasterly direction, as represented in the drawings, where the arrow N is pointing northerly. The boat is pointed north east and the frame *f*, is turned until the terminals *n*, *n'*, lie respectively on opposite sides of the needle *a*. This position is shown in Fig. 1. If the needle tilts either by the motion of the waves of the water, or by the magnet *k*, the circuit will not be closed through one of the magnets *s*, *s'*. But, suppose the boat turns from its course, in view of the wind, tide or want of symmetry of construction or from any ordinary cause which is likely to exist in practice; then will the whole boat rotate on its axis, and one of the terminals *n*, *n'*, will come under the needle, so that the next time it tilts, the circuit will be closed through one of the magnets *s*, *s'*. Therefore, the rudder will be adjusted into a different position and consequently cause the boat to steer more or less. Although the needle will be in contact with one of the terminals *n*, *n'*, only an instant on account of the circuit closer *p*, consisting simply of a projection *p'*, on a wheel coming in contact with the spring terminal *p''*, yet the rudder will be held to one side for several seconds, because the insulation U, occupies only a small portion of the periphery of the wheel upon which it is located. The circuit through one of the magnets *s*, *s'*, remains closed until the insulation comes under the brush again, when the circuit is opened. It may be that the boat is now pointing again north east, but if not, the tilting of the needle will bring it about at last within a few seconds of the original direction.

It is admitted that in the case of the presence of a strong tide, the boat would simultaneously float down or up stream and that allowance would have to be made for the tide in the same manner that pilots must aim originally to one side of the point they wish to reach in order to allow for the tide. This matter is settled by practice and computation as in the firing of cannon balls whereby they may be directed with great accuracy in spite of gravitation, resistance of the air, variable explosive powers of different powders, &c.

By this invention no heavy connecting wires are needed, but it is evident that if desired, a delicate string may be allowed to be pulled along by the boat so that, should it not strike the vessel to be destroyed, it may be pulled back and adjusted and thereby made useful. For purposes of practice, such a string could be used with advantage.

No means of propulsion are shown, but it is evident that my invention has nothing to do with that. Either electric, steam, or even wind power may be employed.

It is well known that the magnetic compass needle moves with the greatest delicacy, and that the least force will stop its progress, but by the organization shown, the needle can move to any position without hinderance and may obey the earth's magnetism with as

much freedom as if it were not employed indirectly to steer a sizable boat.

I claim as my invention—

1. The combination with the rudder of a boat, of electric motors engaged therewith, a mariner's compass, means for periodically tilting the needle of said compass, electric terminals in the path of said needle, when in predetermined positions, and an electric generator in circuit with the said motors.

2. The combination with the rudder of a boat, of magnets adapted to move the rudder in different directions, a compass needle arranged for swinging horizontally and vertically, electric terminals lying in the path of the said needle, when tilting in predetermined positions, and located in independent circuits, whose common terminal is said needle, a magnet *k*, located in a third circuit, its armature carrying a projection lying in the path of the tilting needle, for the purpose, as described of causing the needle to tilt at intervals, periodical circuit interrupters in said independent circuits, and an electric generator included in all of said circuits.

3. The combination with the rudder or similar steering device of a boat, of a compass needle horizontally and vertically movable about a point, means for periodically tilting the needle, electric motors engaged with said rudder, and circuit closers, consisting of the terminals *n*, *n'* and the needle, in circuit with said motors.

4. The combination with the rudder or similar device of a boat, of electric motors engaged therewith, and a compass needle controlling the currents passing through said motors, the respective terminals of the said needle, lying in the path of the tilting needle when at predetermined positions.

5. The combination with the rudder of a boat, of arms *t*, extending therefrom, magnets engaged with the said arms in such a manner that the energizing of one of the magnets moves the rudder in one direction and the energizing of the other magnet moves it in the opposite direction, means for tilting a compass needle carried by the boat, said means consisting of a magnet and its armature included in a circuit which also includes an intermittent circuit closer, electric terminals respectively in circuit with the said magnets, and located on each side of but at a different level from the end of said needle which forms the common terminal of the circuits of the last named magnets, and means for maintaining the last named circuits closed for a predetermined length of time consisting each of a rotating wheel having insulation on a part of its periphery and a brush resting upon said periphery.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 17th day of March, 1892.

CHARLES WILLIAM AYTON.

Witnesses:
EDWARD P. THOMPSON,
E. W. L. BLATZ.