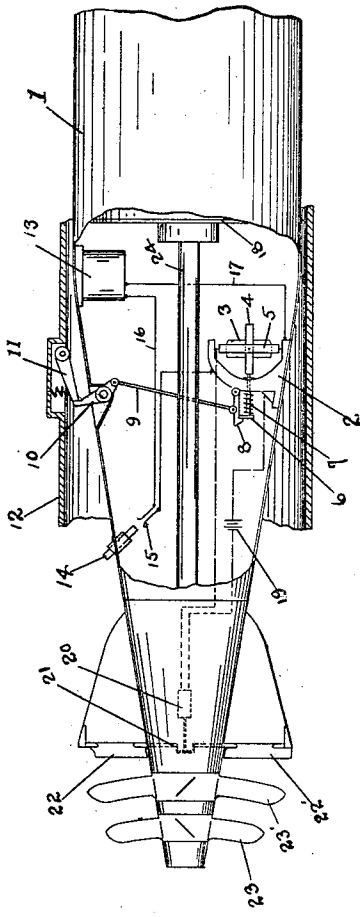
E. F. CHANDLER.

GYROSCOPICALLY CONTROLLED TORPEDO.

APPLICATION FILED NOV. 21, 1912.

1,127,403. Patented Feb. 9, 1915.

Fig. 1



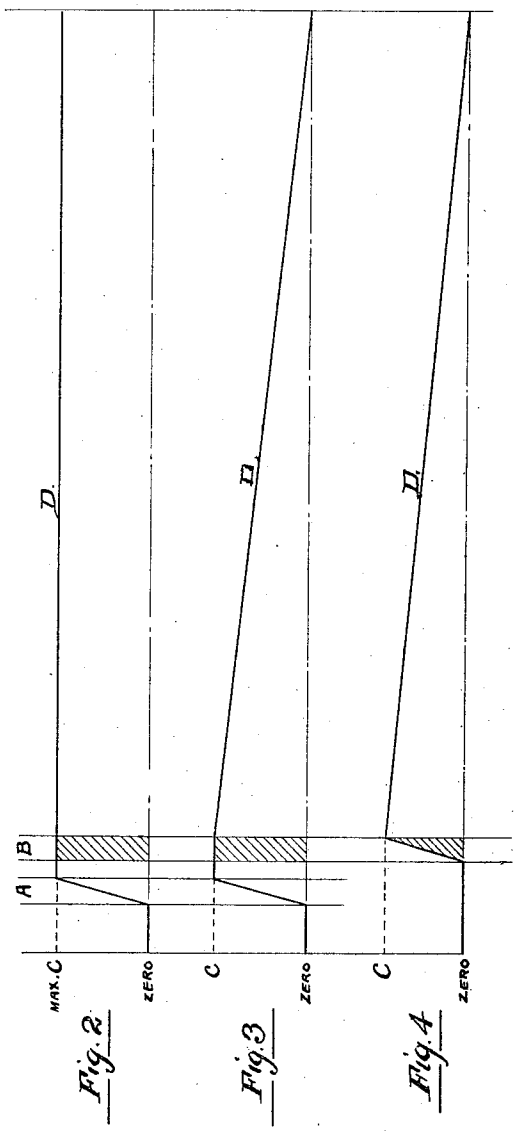


Fig. 2 Fig. 3 Fig. 4

WITNESSES:

H. L. Sloan

D. W. Chandler Jr.

INVENTOR

Edw. F. Chandler

BY Chas. E. Brock

ATTORNEY

UNITED STATES PATENT OFFICE.

EDWARD F. CHANDLER, OF BROOKLYN, NEW YORK, ASSIGNOR TO CHANDLER DEVELOPMENT CORPORATION, A CORPORATION OF NEW YORK.

GYROSCOPICALLY-CONTROLLED TORPEDO.

1,127,403. Specification of Letters Patent. Patented Feb. 9, 1915.

Application filed November 21, 1912. Serial No. 732,738.

To all whom it may concern:

Be it known that I, EDWARD F. CHANDLER, a citizen of the United States, residing in Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Gyroscopically-Controlled Torpedoes, of which the following is a specification.

The present invention relates to a method and means applicable to any form of automobile device such as a torpedo, submarine boat, aircraft or in fact any self propelling, self steering vessel or vehicle intended to be despatched over a horizontal course, in a predetermined direction and in which the gyroscopic effect of a fly-wheel supported on a horizontal axis in gimbal rings is used to control the rectilinear course of the device.

Owing to the extensive use of the gyroscopic steering means in torpedoes and as the basic application is the same irrespective of the nature of the device to which it is applied I have for convenience shown my invention as applied to a torpedo of the well known automobile variety. As is well known the direction in the horizontal plane, taken by the torpedo (or other device having a gyroscopically governed helm) will be that direction to which the axis of said fly-wheel relates at the moment the fly-wheel is set free to exercise its gyroscopic influence upon the steering mechanism of the torpedo and the course, in the horizontal plane will be in said direction so long as the gyroscopic influence of the fly-wheel maintains said fly-wheel in its original plane of rotation with respect to the longitudinal axis of the torpedo.

Heretofore the gyroscopes used in torpedoes and other devices for controlling the steering mechanism have been of the impulse type. That is to say, the gyroscope fly-wheel is spun and the spinning energy is discontinued, before the weapon is launched. This is objectionable as the duration of the spin, and the consequent gyroscopic influence gradually decreases as the weapon nears its mark, very often resulting in the torpedo deviating from its directed course. This is overcome to some extent, in moderately long range weapons, by providing a larger fly-wheel, and spinning same by powerful external means, nevertheless aside from the mechanical disadvantages of this system, it is still necessary to discontinue the spinning energy before the weapon is launched, with the result that in extreme long range work, the gyroscopic influence decreases as the distance traveled increases.

Now to overcome these faults and to provide a means whereby an automobile device may be steered over courses of extreme length is one of the important objects of this invention and I accomplish my purpose by employing the well known electric-motor-gyroscope, to control my steering mechanism. By this means, it is possible to start my spinning operation at will and as the source of energy for spinning the gyroscope fly-wheel is carried within the torpedo, I do not discontinue the spinning energy but continue to supply same, so that the velocity of the fly-wheel remains practically constant, throughout the run of the weapon. The operation of automatically unlocking the gyroscope, does not interrupt the supply of energy, as in other types of gyroscopically controlled steering devices. Another feature of my invention is in the fact, that my torpedo is entirely independent of the launching tube, this makes it possible to shoot the torpedo from alongside of a boat when it is only necessary to start the gyroscope spinning, while the torpedo is at rest in the water, and at the instant that the weapon is properly pointed, to release the gyroscope and start the propelling motor. Modifications of this method of despatching torpedoes; self-propelling mines and other devices intended to be despatched over a predetermined horizontal course will be apparent to those versed in the art of warfare, etc.

Other advantages of my invention will be brought out in conjunction with the description of my present invention following.

My invention is illustrated diagrammatically in the accompanying drawings, wherein—

Figure 1 is a side view, partly in section, of a torpedo afterbody shown in its relative position in a section of a launching tube. Fig. 2 is a chart showing the constant speed, spinning curve as is made by my gyroscope. Fig. 3 is a chart showing the decreasing speed, spinning curve as is made by impulse spun gyroscopes, in which the spin is initiated before the launching and unlocking impulse is applied. Fig. 4 is a chart showing the decreasing speed spinning curve as is

made by impulse gyroscopes of the Whitehead variety, in which the gyroscope is at rest, until the launching impulse is initiated.

The afterbody is at 1. Within the afterbody is the torpedo propelling means 18, which may be any type or form of motive means best adapted to the purpose. Power is transmitted from said motor by the shaft 24, to the two oppositely rotating propellers 23 and 23^1. This propelling means is entirely independent of, and apart from my steering means, as will appear later.

At 2 is a frame, supporting the gyroscope fly-wheel 3, which is suspended in gimbal rings 4 and 5. Passing through the frame 2, is a latch 6 opposed by a spring 7, which is shown as being compressed between the latch head and the frame 2. Said latch 6, is shown in engagement with the gyroscope gimbal ring 4, and is held in said engagement by the latch pawl 8. The pawl 8, is operatively connected with the tripping lever 10, so that when the torpedo is ejected from the launching tube 12, the pawl 11, which is in the path of 10, will engage same causing the gyroscope latch 6 to be released, thus allowing said gyroscope to balance freely in its gimbals. This latch 10, is common to all torpedoes and is ordinarily connected with the throttle valve and, when opened by engagement with 11, during the launching period, starts the propelling motor, but as this phase of the torpedo mechanism is foreign to my present invention, I have not shown its functions in detail. Between latch 10 and latch pawl 8 I have provided a connecting rod 9, but it is understood that I may use any well known means of communication between these points, such as electrical means, or fluid pressure means, etc., without departing from the spirit of my invention.

In my invention I employ a gyroscope, which is in fact an electric motor, suspended in gimbal rings. The fly-wheel forming one of the elements of an electro-motor and the gimbal ring 4, the other. Electrical energy is transmitted to said motor elements, over insulated leads carried by the frame 2 and fed to said motor-gyroscope through the medium of the gimbal pivots, in any approved manner and according to the specific design of the apparatus employed. At 13, is the source of electrical energy, for running the gyroscope motor and may be of any suitable nature. At 14 is shown a circuit closing means which may be of any suitable design, said circuit closing means being adapted to complete the flow of energy from and between the source 13, and the gyroscope, so that by completing said circuit, the gyroscope will be caused to "spin" and will continue to spin so long as energy is supplied by 13, without said circuit is again opened manually, at 14.

As is well known, and as above explained, the gyroscope having been brought up to speed, and then released, will retain the direction to which the axis of said fly-wheel relates at the moment the fly-wheel is set free to exercise its gyroscopic influence. This being the fact, it is possible to communicate this influence to a suitable motor means, which is connected operatively with the horizontal course steering rudders, whereby any movement about the horizontal axis of the said gyroscope, will set up a counteracting effect at the rudder, the result being that the automobile device, is steered over a horizontal course closely approximating the direction impressed upon the gyroscope at the said time of unlocking. In my drawing 22 and 22^1 show the usual horizontal course steering rudders, same being rigidly connected together by a common crank shaft 21. 20 represents any convenient form of prime mover, for actuating the same, the function of which is governed by the gyroscope. 19 represents a source of power for operating the said motor means 20, though the source of power need not be independent but can be drawn from 13, or from the source supplying the propelling motor of the torpedo, itself.

In my drawing I have indicated two wires (in dotted lines) connecting the rudder motor 20 with the gyroscope, though it is my purpose to employ any suitable means whereby rotation of my gyroscope, about a vertical axis, will be communicated to said rudder motor, thus causing it to shift said rudders from one side of the longitudinal axis of the torpedo, to the other, as said torpedo deviates from the direction retained by said gyroscope.

It will be seen that I provide an automatic steering means, whereby automobile devices may be despatched over a course the length of which is only limited by the energy carrying capacity of the device as a whole, and which will by means of the gyroscopic device employed, and the method of employing same greatly increase the accuracy in extreme long range work.

It is of course understood by those versed in the art, that where the range is extended over extreme distances, certain adjustments and allowances must be made to compensate for natural and outside influence tending to cause a device of this nature to deviate from its intended course as for instance, the tides, currents, the earth's rotation, etc.

To better illustrate the advantage of my method over that of the other so called long distance torpedoes, and gyroscopically controlled automobile devices, in general, I refer to the charts Figs. 2, 3 and 4, in which A represents a period of time previous to launching the torpedo, B, represents the period between the time that the ejecting impulse is initiated and the gyroscope is un-

locked, and D, in each case represents the duration of the resulting spin.

In Fig. 2 which shows the results obtained with my invention, the advance spin may be initiated before the torpedo is placed in the launching tube. The action of unlocking, as shown has no effect on the spin, which continues at maximum, to the end of the course, or in fact until the supply of energy is exhausted.

Fig. 3 shows the result obtained with mechanically or otherwise spun impulse type gyroscopes, which though spun up, at any time previous to receiving the launching impulse, must nevertheless, require a specifically equipped launching tube, and as the energy is discontinued at the time of unlocking, the spin naturally decreases as the distance increases, as shown.

Fig. 4 shows the result obtained with the Whitehead type equipment, in which the gyroscope is idle until the discharging impulse is initiated, whereupon the maximum spin must be reached and the gyroscope released, within the period marked B, with the result that the speed decreases as the weapon nears its mark.

A serious objection to devices attached to the torpedo tube, for spinning the gyroscope from without the torpedo body, is in the possibility of same becoming fouled from contact with salt water, etc. Another objection being that in order to gain sufficiently over the older type of gyroscopes, the parts must be greatly enlarged, which consequently adds unnecessary weight. With my invention it is possible to decrease the size of the gyroscope, if desired even below that of the Whitehead, and as it is possible to inclose my entire mechanism within a sealed case, it is impossible for same to become fouled from oil, or grit, and drafts of air or temperature may be prevented from influencing my gyroscope by thus incasing same. The nature of my invention is such that the gyroscope may be placed in the head of the torpedo, which is not possible with any other known type of gyroscopic steering gear, owing to their construction. Also the extreme long range made possible by my invention makes it invaluable for use in connection with shore controlled devices of the wireless class, where the gyroscope steers the automobile device, and the operator at a convenient station, corrects the run of the weapon, or causes certain functions of the same, at the desired time, as for instance, causing same to discharge a torpedo, etc.

What I claim is:

1. In a gyroscopically controlled torpedo, the combination of a torpedo body, a gyroscope therein contained, and electric means for spinning said gyroscope to the proper speed, said means being also used to subsequently maintain said speed.

2. In a gyroscopically controlled torpedo, the combination of a torpedo body, a gyroscope therein contained, propelling means for said body, and electric means independent from said propelling means, for spinning said gyroscope to the proper speed, said means being also used to subsequently maintain said speed.

3. In a gyroscopically controlled torpedo, the combination of a torpedo body, a gyroscope therein contained, and electric means, also contained within said body, for spinning said gyroscope to the proper speed, said means being also used to subsequently maintain said speed.

4. In a gyroscopically controlled torpedo, the combination of a torpedo body, a gyroscope therein contained, means for spinning said gyroscope to the proper speed previous to the launching of the torpedo.

5. In a gyroscopically controlled torpedo, the combination of a torpedo body, a gyroscope therein contained, and means for spinning said gyroscope to the proper speed previous to the launching of the torpedo, said means being also used to subsequently maintain said speed.

6. In a gyroscopically controlled torpedo, the combination of a torpedo body, a gyroscope therein contained, means for spinning said gyroscope to the proper speed, said means being also adapted to subsequently maintain said speed, and means for starting said spinning means previous to the launching of the torpedo.

7. In a gyroscopically controlled torpedo, the combination of a torpedo body, a gyroscope therein contained, means for spinning the gyroscope to the proper speed previous to launching, and means for freeing the gyroscope from its fixed relation before the torpedo leaves the directing influence of the launching tube, said spinning means being also used for subsequently maintaining the speed of said gyroscope.

8. In a gyroscopically controlled torpedo, the combination of a torpedo body, a gyroscope therein contained, means for spinning the gyroscope to the proper speed previous to launching, means for freeing the gyroscope from its fixed relation before the torpedo leaves the directing influence of the launching tube, said spinning means being also used for subsequently maintaining the speed of said gyroscope, and steering means for said torpedo body controlled by said gyroscope.

9. In a gyroscopically controlled torpedo, the combination of a torpedo body, propelling means for the same, a gyroscope therein contained, electric means for spinning said gyroscope independently of said propelling means, means for freeing the gyroscope from its fixed relation before the torpedo leaves the directing influence of the

launching tube, said spinning means being also used for maintaining the speed of said gyroscope, and gyroscope controlled means for steering said body.

10. In a gyroscopically controlled torpedo, the combination of a torpedo body, a gyroscope therein contained, locking means for maintaining the same in a fixed relation, electric means for spinning said gyroscope previous to launching independently of said locking means, means for freeing the gyroscope from said locking means before the torpedo leaves the directing influence of the launching tube, said spinning means being also used for maintaining the speed of said gyroscope after launching.

11. In a gyroscopically controlled torpedo, the combination of a torpedo body, a gyroscope therein contained, locking means for maintaining the same in a fixed relation, means for spinning said gyroscope previous to launching independently of said locking means, said means being adapted to subsequently maintain the speed of said gyroscope after launching, and means for freeing the gyroscope from said locking means before the torpedo leaves the directing influence of the launching tube.

12. The combination of a torpedo body, a gyroscope therein contained, locking means for maintaining the same in a fixed relation, electric means for spinning said gyroscope to the proper speed previous to launching and for subsequently maintaining said speed, and means for freeing the gyroscope from said locking means before the torpedo leaves the directing influence of the launching tube.

13. The combination of a torpedo body, a gyroscope therein contained, locking means for maintaining the same in a fixed relation, electric means for spinning said gyroscope to the proper speed previous to launching and for subsequently maintaining said speed, means independent from said locking means for setting said electric means in the operative condition, and means for freeing the gyroscope from said locking means before the torpedo leaves the directing influence of the launching tube.

14. The combination of a torpedo body, propelling means for the same, a gyroscope therein contained, locking means for maintaining said gyroscope in a fixed relation, electric means for spinning said gyroscope previous to launching and for subsequently maintaining its speed, means for freeing said gyroscope from the locking means before the torpedo leaves the directing influence of the launching tube, means independent of said locking and propelling means for setting said spinning means in the operative condition, and gyroscope controlled means for steering said body; substantially as set forth.

15. In a gyroscopically controlled torpedo, and in combination with a torpedo body and a gyroscope controlling the same, spinning means for said gyroscope adapted to be operated independently from the launching of said torpedo, said spinning means being subsequently used to maintain the speed of said gyroscope.

EDWARD F. CHANDLER.

Witnesses:
DIGBY W. CHANDLER,
E. FLORENCE CHANDLER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."