No. 814,969. PATENTED MAR. 13, 1906.

F. M. LEAVITT.

GYROSCOPE SPINNING DEVICE.

APPLICATION FILED JUNE 17, 1905.

FIG. 1.

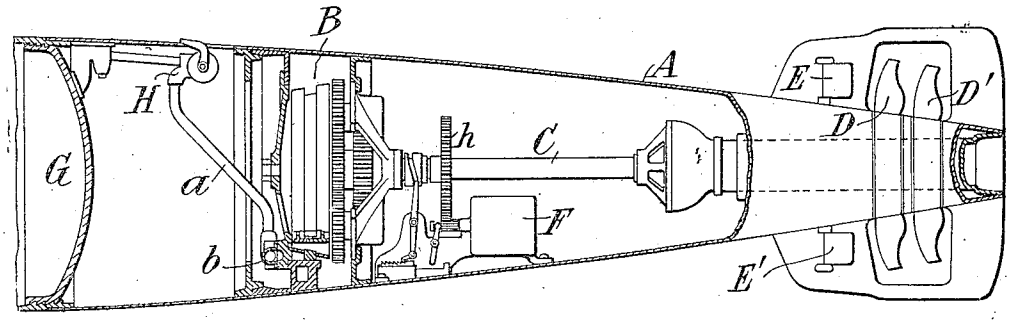


FIG. 2.

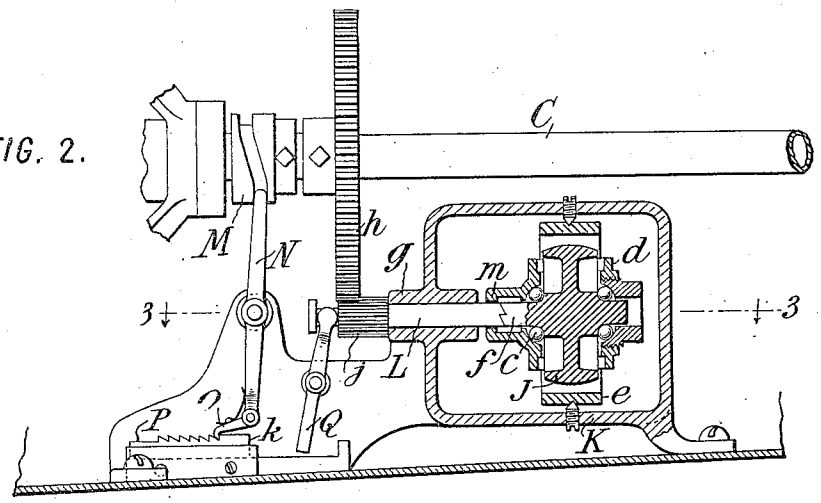
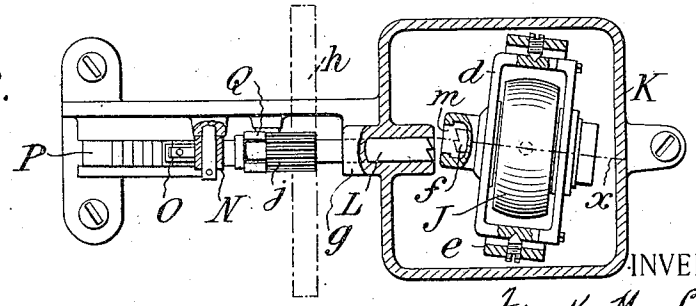


FIG. 3.



WITNESSES:

Fred Whitz

Rene' Muine

INVENTOR:

Frank M. Leavitt,

By Attorneys,

Arthur C. Fraser & Co.

UNITED STATES PATENT OFFICE.

FRANK M. LEAVITT, OF NEW YORK, N. Y., ASSIGNOR TO E. W. BLISS COMPANY, OF BROOKLYN, NEW YORK, A CORPORATION OF WEST VIRGINIA.

GYROSCOPE SPINNING DEVICE.

No. 814,969. Specification of Letters Patent. Patented March 13, 1906.

Application filed June 17, 1905. Serial No. 265,756.

To all whom it may concern:

Be it known that I, FRANK M. LEAVITT, a citizen of the United States, residing in the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Gyroscope Spinning Devices, of which the following is a specification.

In an automobile torpedo having a gyroscopic steering apparatus it is necessary to spin up the gyroscope during the launching of the torpedo while the latter is moving in the launching-tube and to release the spun gyroscope before the torpedo shall have moved far enough to depart from the original direction given it by the launching-tube. This spinning up has heretofore been accomplished in two ways: first, by a spring-motor previously wound, which is tripped automatically during the launching movement, whereupon it exerts its stress to first spin up and then unlock the gyroscope; second, by a turbine or reaction motor to which compressed air is admitted upon the opening of the air-valve to start the engine during launching, whereby the air-jet quickly spins up the gyroscope, whereupon a compressed-air-actuated device acts to unlock the gyroscope. The latter system is set forth in my United States Patents Nos. 741,683 and 768,291.

The present invention instead of providing a special motor for momentary use in spinning up the gyroscope utilizes for this purpose the main motor or propelling-engine of the torpedo, which is primarily connected to the gyroscope, means being provided for disconnecting them after a sufficient interval to insure that the gyroscope shall have been spun up to the requisite velocity, whereupon the gyroscope is simultaneously set free.

Figure 1 of the accompanying drawings is a sectional view of the after portion of an automobile torpedo. Fig. 2 is a vertical section, on a larger scale, of a portion of Fig. 1. Fig. 3 is a horizontal section on the line 3 3 in Fig. 2.

Referring to the drawings, A designates the shell or hull of the torpedo, of which B is the propelling-engine or motor. C is the propeller-shaft. D and D′ are propeller-screws. E E′ are the steering-rudders, and F is the gyroscope or gyroscopic steering apparatus which through any suitable intermediate steering-engine controls these rudders.

In the construction shown the propelling-engine B is a turbine driven by compressed air from the usual compressed-air reservoir G, which during the launching movement is admitted by the opening of the starting-valve H through a pipe *a* to the nozzle *b*, from which the jets of air impinge upon the blades of the turbine, the spent air escaping within the torpedo-shell and discharging through the hollow tail portion of the propeller-shaft. While this turbine-engine is preferable, yet for the purposes of the present invention the usual cylinder-engine or any other suitable motor may be used.

The gyroscopic device F comprises the usual fly-wheel J, hung in gimbal-rings, whereby it is capable of universal movement, so that its axis of rotation may be deflected in any direction. It is shown as turning in ball-bearings *c* within a frame *d*, constituting the inner gimbal-ring, and which is pivoted on an axis at right angles to that of the fly-wheel (shown as a horizontal axis) in a frame *e*, constituting the outer gimbal-ring, which in turn is pivoted on an axis normally at right angles to both the preceding axes (shown as a vertical axis) to a fixed frame or outer support K, which is shown as an inclosing case or box. While this construction of gyroscope is preferred, any other suitable construction thereof may be used. The gyroscope may be connected in any suitable manner to control a steering-engine or other mechanism for operating the rudders.

For connecting the gyroscope to the propelling-engine in order to spin up the gyroscope a shaft L is geared to the propeller-shaft C and arranged to be detachably coupled to the fly-wheel, preferably by engaging an axial shaft or spindle *f* thereof. The shaft L turns in a bearing *g*, which may conveniently be carried by the frame K. It is rotated by a gear-wheel *h*, fixed on the shaft C, meshing with a pinion *j* on the shaft L. The shaft L is movable endwise in its bearing, and to accommodate this movement the pinion *j* is elongated. This longitudinal movement of the shaft L is for disconnecting it from the fly-wheel after spinning up the latter. This movement is imparted by any mechanism which will act only after a certain time has elapsed to enable the propelling-engine to have attained such speed as to spin up the gyroscope to the requisite velocity. A suit-

able velocity for a gyroscope of the usual dimensions is ten thousand revolutions per minute.

A suitable mechanism for accomplishing this result is that shown, comprising a cam M, fixed on the shaft C and acting to vibrate a lever N, which carries a pawl O, which engages teeth in a slide P, so that the latter is advanced step by step, and after a predetermined movement its shoulder *k* strikes a lever Q, the opposite arm of which is forked and engages a groove in the shaft L, whereby this shaft is quickly moved endwise, so as to uncouple it from the fly-wheel.

It is requisite that the inner frame or ring *d* of the gyroscope be locked fast during the spinning-up operation and thereupon unlocked or released, so as to leave the gyroscope free to turn in any direction. This locking and unlocking may be variously accomplished. A simple and effective way is to utilize the shaft L as the locking means, so that its endwise movement shall release the gyroscope. For this purpose the ring *d* has a prolongation or neck *m*, which embraces the shaft L during the spinning-up operation, whereby the correct alinement of the fly-wheel axis is assured. On the endwise movement of the shaft L it first disengages itself from the fly-wheel, so as to set the latter free, and immediately thereafter withdraws from the bearing portion *m* of the ring *d*, whereby the gyroscope is released. Fig. 3 shows this released condition, whereby the gyroscope is free to turn, and shows that a relative movement in a horizontal plane has occurred between the torpedo and gyroscope, whereby the gyroscope-axis *x* is deflected out of line with the shaft L, as occurs during the run of the torpedo. After this unlocking movement and during the remaining run of the torpedo the shaft L turns idly.

In order to prepare the mechanism for a new operation, it is necessary to lift the pawl O and move the slide P to its starting-point, then to bring the gyroscope-ring *d*, with its bearing *m*, in line with the shaft L and push this shaft endwise into this bearing until its end engages with the spindle *f*.

During the spinning up the motion is a gradual acceleration due to the inertia of the moving parts of the engine or motor, so that the gyroscope is protected from injury which might occur from a too sudden movement.

The mechanical construction may be greatly varied without departing from the essentials of this invention.

What I claim is—

1. The combination of a propelling-engine, a gyroscope, means for connecting them whereby to spin up the gyroscope upon the starting of the engine, and means for disconnecting them after a predetermined interval.

2. In an automobile torpedo, a propelling-engine and shaft, a gyroscope, a geared connection between said shaft and the gyroscope for spinning up the gyroscope upon the starting of the engine, and means for disconnecting them after a predetermined interval.

3. In an automobile torpedo, a gyroscope, and a connection between it and the propelling-engine, whereby to spin up the gyroscope upon the starting of the engine, and means for disconnecting them and for releasing the gyroscope after a predetermined interval.

4. The combination of a propelling-engine, a gyroscope, a longitudinally-movable shaft geared to the engine and adapted to engage the gyroscope fly-wheel, and means for displacing this shaft after a predetermined number of revolutions to disconnect it from said fly-wheel.

5. The combination of a propelling-engine, a gyroscope, a longitudinally-movable shaft geared to the engine and adapted to engage the gyroscope fly-wheel, the inner ring of the gyroscope adapted to be engaged by said shaft, whereby it holds this ring immovable during spinning, and means for displacing said shaft to disconnect it from said inner ring to set the gyroscope free.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

FRANK M. LEAVITT.

Witnesses:

ARTHUR C. FRASER,

THEODORE T. SNELL.