

W. DIETER.
DIVING GEAR FOR TORPEDOES.
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Fig. 1.

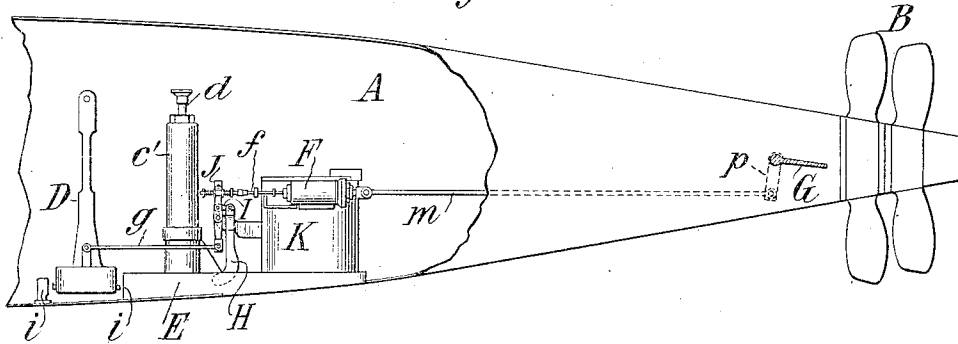
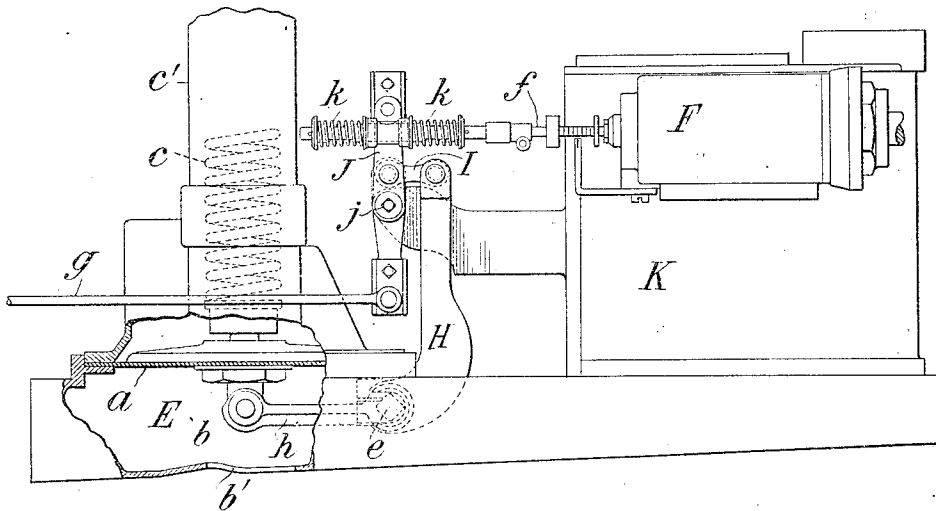


Fig. 2.



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UNITED STATES PATENT OFFICE.

WILLIAM DIETER, OF NEW YORK, N. Y., ASSIGNOR TO E. W. BLISS COMPANY, OF
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DIVING-GEAR FOR TORPEDOES.

1,145,355.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM DIETER, 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 Diving-Gear for Torpedoes, of which the following is a specification.

This invention relates to the so-called diving gear or immersion mechanism for controlling the path of an automobile torpedo or other submarine boat in a vertical plane, in order to impart to it a tendency to run at a given or set depth below the surface. This vertical steering is best accomplished by a so-called horizontal rudder or rudders operated by a depth engine or servomotor, the valve of which is controlled by the conjoint action of a hydrostat and a pendulum. The hydrostat comprises a diaphragm receiving on one side the pressure of the water and on the other side the pressure of a spring, so that by adjusting the stress of the spring the depth at which the torpedo is to travel may be varied at will. The pendulum is adapted to swing in a longitudinal plane, and therefore responds to any acceleration or retardation of speed, and also to any diving or broaching tendency.

The present invention provides an improved mechanism for this purpose. This mechanism is especially applicable to the Bliss-Leavitt torpedo, although with obvious modifications it may be made applicable to other types of torpedoes.

According to this invention the hydrostat acts through an elbow-lever or other suitable connection upon a transmission lever, and the pendulum acts upon the same transmission lever so that the lever takes a position which is the resultant of the unbalanced pressure on the hydrostat and the gravitating or other tendency of the pendulum; and this lever is connected to operate the valve of the depth engine.

Referring to the drawings,—Figure 1 is a side elevation of the after-portion of a torpedo shell which is partly broken away to show the immersion mechanism in elevation. Fig. 2 is an elevation of this mechanism

partly in section showing it upon a larger scale.

In the drawings the propelling mechanism by which the propellers B are driven is omitted, such mechanism being well understood.

A is the torpedo shell or hull, B the propellers, D the pendulum, E the hydrostat, F the depth engine and G the horizontal rudder. All of these parts are of the usual construction as applied in the well-known Bliss-Leavitt torpedo, and require no special description.

The hydrostat E has as usual a diaphragm *a* which receives the pressure of water in a chamber *b* entering through an opening *b'*. The opposite side of the diaphragm receives the pressure of a spring *c* which is inclosed in a casing *c'* and is adjusted by a screw *d*. The diaphragm is connected to a lever H pivoted at *e* and which is in the form of an elbow-lever, its lower arm *h* entering the diaphragm chamber while its other arm extends upwardly, and at its upper end connects by a link I with a transmission lever J, which latter is fulcrumed at *j* to a fixed point in a suitable bracket or support.

The pendulum D is suitably hung within the torpedo shell so that its heavy body may have a restricted swing or movement between stops *i i*, the body carrying as usual spring buffers to diminish the impact. The pendulum is connected by a rod *g* to the lower end of the lever J. The upper end of the lever beyond the point where the link I engages it, is connected to the valve stem *f* of the depth engine F. To make this connection elastic or yielding the valve stem passes through an eye in the lever J and springs *k k* are provided confined between shoulders on the lever and collars on the stem respectively, so that the thrust of the levers in either direction is transmitted through one of these springs to the stem.

The depth engine F is of the usual construction having a plunger driven by compressed air and connected through a rod *m* to the tiller *p* of the rudder G; inside the plunger is the usual floating valve operated from the valve stem *f*. The operation is the same as is usual with floating valves, that is,

every movement of the valve is followed by a movement of the plunger, so that each movement imparted to the valve stem *f* is followed by a corresponding movement of the rudder G.

K is the casing containing the gyroscope for steering the torpedo in the horizontal plane, but this forms no part of the present invention.

10 In operation, when the torpedo is above the prescribed depth for which the hydrostat is set, the spring *c* presses down the diaphragm, thereby moving the arm H and link I forward. This movement, acting
15 through the lever K and link *g* pulls the pendulum aft. The inertia of the pendulum thus prevents a sudden or violent movement. The lever J is thus displaced somewhat slowly, and eventually assumes a position
20 which is the resultant of the unbalanced pressure upon the diaphragm and the gravitating tendency of the pendulum. The movement of the lever J to this position acting through one of the springs *k* moves the
25 valve stem *f* forward, this being followed by a corresponding movement of the plunger and by a downward movement of the rudder G which causes the torpedo to dive, and this continues until the torpedo has
30 traveled obliquely downward so that its prescribed depth is reached. Upon approaching this depth the hydrostatic pressure gradually increases so that the unbalanced pressure of the spring correspond-
35 ingly relaxes, and the gravitating tendency of the pendulum becomes effective to partially restore the lever J in advance of the hydrostat reaching equilibrium, so that, as the torpedo approaches its set depth the
40 rudder G gradually moves toward its mid-position. In case the torpedo dives below its prescribed depth the hydrostatic pressure preponderates and the lever H pulls aft-
45 through the link I, exerting a forward pressure upon the pendulum so that the lever J moves to a resultant position in the contrary direction, thereby through the depth engine throwing the rudder upward. When the torpedo is diving or rising its in-
50 clination from the horizontal gives the pendulum a tendency to swing forward or aft, and this, transmitted through the rod *g* and lever J, tends to move the valve of the depth engine in such direction as to cause the
55 rudder to compensate for the inclination and exert a tendency to restore the torpedo to a level. So also, if the torpedo is accelerating or retarding its speed, the consequent lag or advance of the pendulum im-
60 parts a tendency for a corresponding movement of the rudder.

60 The new depth mechanism or diving gear thus provided has the practical effect of diminishing the vertical oscillations of the
65 torpedo, keeping it nearer to its prescribed

depth than formerly, and causing its trajectory to follow curves of such large radius as to more nearly approximate than heretofore a straight line at the prescribed depth.

70 My invention is to be distinguished from a depth mechanism in which the hydrostatic pressure on the diaphragm is resisted by the gravitating tendency of the pendulum instead of by a spring. In such mechanism
75 the counter stress on the diaphragm varies with the inclination of the torpedo, being increased when it is rising and diminished when it is diving. This I consider undesirable, and use a spring which when ad-
80 justed gives a uniform stress upon the diaphragm for determining the normal depth of immersion. The pendulum is used as in the best practice heretofore solely to intro-
85 duce a source of control due to acceleration, and to departures of the torpedo from a level keel.

I claim as my invention:—

1. A diving gear comprising a hydrostat, a pendulum, and a depth engine, the hydro-
90 stat having a diaphragm and a spring therefor affording a uniform stress against the diaphragm, a positive connection between the hydrostat and pendulum adapted to
95 transmit movement from either to the other, and transmission means adapted to communicate the resultant movement therefrom to the valve of said engine.

2. A diving gear comprising a hydrostat, a pendulum, and a depth engine, the hydro-
100 stat having a diaphragm and a spring therefor, and a transmission lever having a fixed fulcrum and connected to both said hydrostat and pendulum for transmitting resultant movement therefrom to the valve
105 of said engine.

3. A diving gear comprising a hydrostat, a pendulum, a depth engine and a trans-
mission lever, the latter having a fixed ful-
110 crum and connections from the hydrostat diaphragm and from the pendulum to said lever, the connection from the hydrostat being nearer the fulcrum than the connection from the pendulum, and said lever con-
115 nected to the valve of said engine.

4. A diving gear comprising a hydrostat, a pendulum, a depth engine and a trans-
mission lever, the latter having a fixed ful-
120 crum, an elbow-lever connecting from the hydrostat diaphragm to the transmission lever, a link connecting said transmission lever to the pendulum, said connections be-
125 ing in such manner that a displacement of the hydrostat displaces the pendulum, and said transmission lever connected to the valve stem of said engine.

5. A diving gear comprising a hydrostat, a pendulum, and a depth engine, a positive
130 connection between the hydrostat and pendulum adapted to transmit movement from

either to the other, a transmission lever adapted to communicate the resultant movement therefrom to the valve of said engine, and interposed springs adapted to cushion the movement transmitted to such valve.

signed my name in the presence of two subscribing witnesses,

WILLIAM DIETER.

Witnesses:

JOHN D. McTAFE,
STEPHEN B. TALLMAN.

In witness whereof, I have hereunto

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