No. 670,041. Patented Mar. 19, 1901.

A. J. VAN STOCKUM.

SUBMERSION REGULATING GEAR FOR TORPEDOES.

(Application filed June 23, 1900.)

(No Model.)

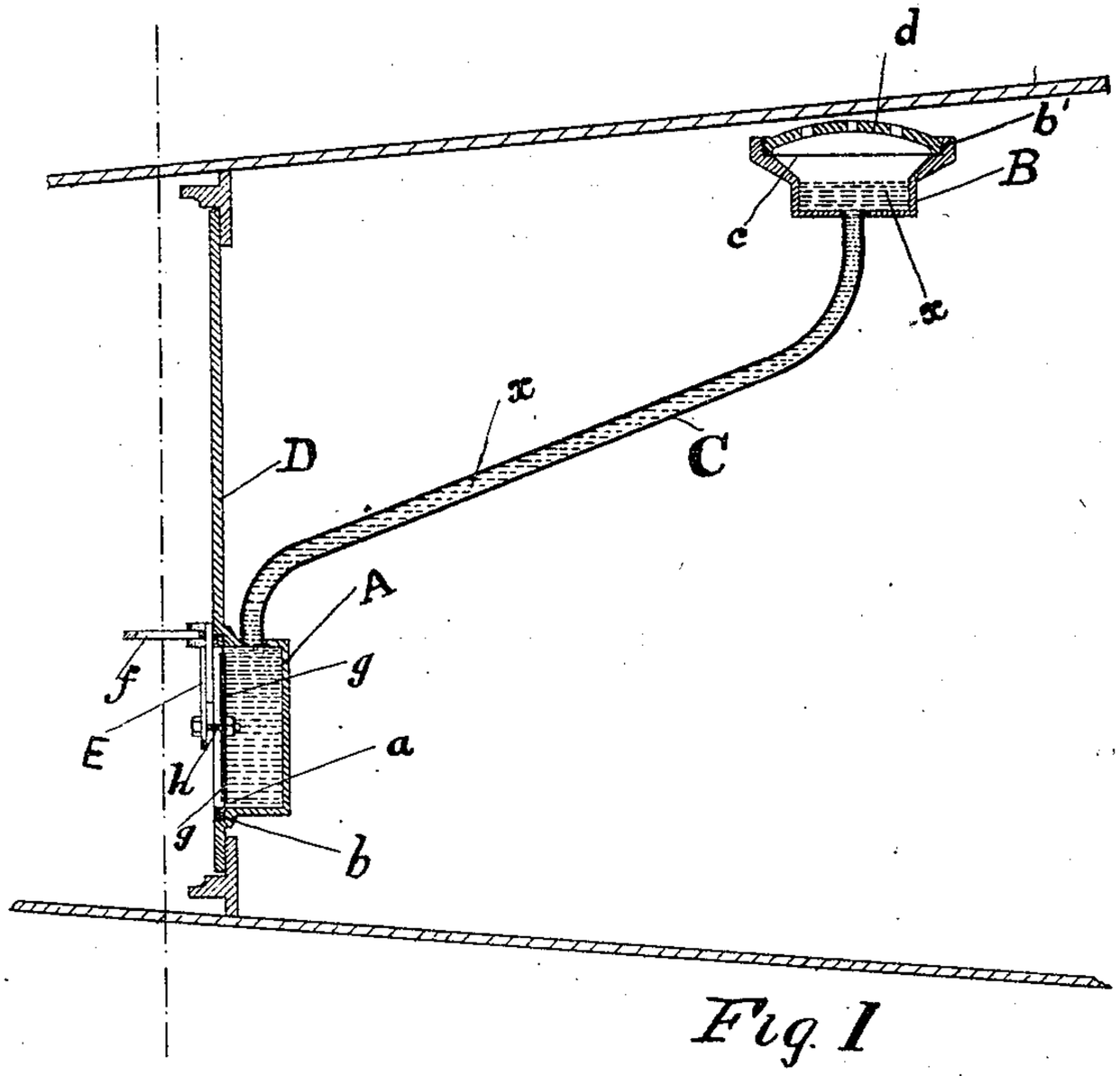

Fig. 1

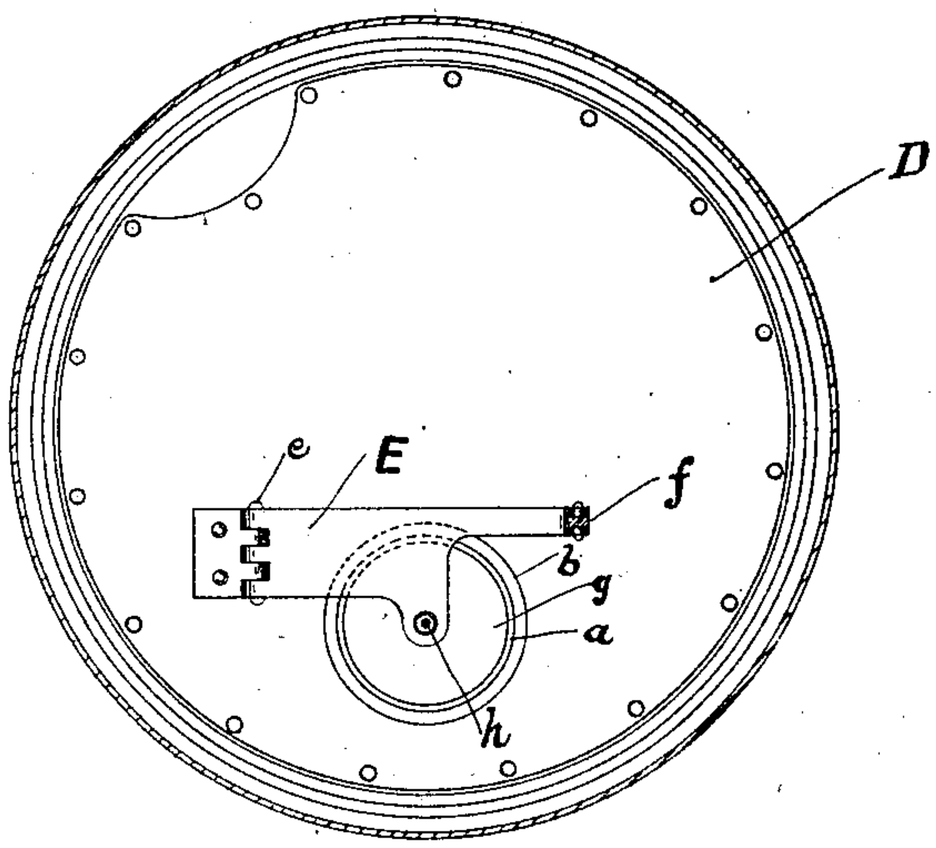

Fig 2.

Witnesses:
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UNITED STATES PATENT OFFICE.

ABRAHAM JOHANNES VAN STOCKUM, OF LISSE, NETHERLANDS.

SUBMERSION-REGULATING GEAR FOR TORPEDOES.

SPECIFICATION forming part of Letters Patent No. 670,041, dated March 19, 1901.

Application filed June 23, 1900. Serial No. 21,371. (No model.)

To all whom it may concern:

Be it known that I, ABRAHAM JOHANNES VAN STOCKUM, a subject of the Queen of the Netherlands, residing at Lisse, Netherlands, have invented certain new and useful Improvements in Submersion-Regulating Gear for Torpedoes, of which the following is a specification.

The object of this invention is to compel torpedoes to travel on an even keel at any required submersion by means of the apparatus now to be described.

Now according to this invention I secure in the body of the torpedo two hollow cylinders or other suitable receptacles open at one end and closed at the other end, the interior of the said receptacles communicating with each other by means of a pipe or tube, one of the said receptacles being vertical and the other horizontal. The horizontal receptacle is fixed in the bulkhead separating the compartment containing the apparatus from the engine-room or other chamber which is open to the water. The vertical receptacle may be secured to a suitable bracket or stanchion; but if the apparatus is made strong enough the one connection to the bulkhead is sufficient to support the whole. The receptacles and connecting-tube are filled or partly filled with mercury and their open ends closed with flexible waterproof diaphragms, the diaphragm of the horizontal receptacle being connected by suitable linkwork to the Servo motor or other mechanism operating the horizontal rudders. The depth at which the torpedo floats is determined by the height of the column of mercury contained in the receptacles and connecting-tube, and the sensitiveness of the apparatus and its ability to quickly correct errors of inclination and to compel the torpedo to travel on an even keel depend upon the horizontal distance between the receptacles.

In order that my said invention may be fully understood, I will proceed to explain the same with reference to the accompanying drawings, in which—

Figure 1 represents a section of an apparatus for regulating the submersion of torpedoes constructed according to this invention. Fig. 2 shows bulkhead and lever which is connected to Servo motor.

The same letters denote the same parts in both figures.

A and B are two cylindrical or other suitably-shaped receptacles of steel, iron, gun-metal, or other suitable material containing mercury, the interior of the receptacle A communicating with the interior of the receptacle B by means of the pipe C. The mouths of the receptacles A and B are closed by flexible diaphragms *a c*, made of india-rubber, leather, or any other suitable material, preferably waterproof, the said diaphragms being held in place by one or more metal locking-rings *b b'*, screwed into the said receptacles, which latter are formed with shoulders, as shown, to form seatings for the diaphragms *a c*. The diaphragm *a* serves the double purpose of preventing water from entering the apparatus and also retaining the mercury in the receptacles A B and tube C.

The receptacle B is closed with a perforated cover *d*, forming part of the locking-ring *b'*, so as to allow the atmospheric air to have free access to the upper side of the diaphragm *c*.

D is the bulkhead separating the chamber which is open to the water from the compartment containing the submersion-regulating gear, to which bulkhead is secured the receptacle A, or the said receptacle may be cast in one piece with the said bulkhead, as shown by Fig. 1.

E is a lever hinged at *e* to the said bulkhead and connected at its free end by one or more links *f* to the Servo motor or other apparatus actuating the horizontal rudders. The lever E is secured to the plates or disks *g g* on each side of the diaphragm *a*, the said plates or disks being of a smaller diameter than the inside of the receptacle A, as shown by Fig. 1, a bolt or stud *h* passing through the lever E, plates *g g*, and diaphragm *a*, nuts at each end of the said bolt or stud securing the whole together.

The action of the apparatus is as follows: When the apparatus is in the normal position shown by Fig. 1, the Servo motor or other apparatus holds the horizontal rudders level and the torpedo floats on an even keel at a depth below the surface of the water, dependent upon the height of the column of mercury *x*, it being understood that the said col-

umn balances the hydrostatic pressure when the torpedo floats at the required depth, and so long as the pressures on both sides of the diaphragm *a* are equal the horizontal rudders are held stationary in their normal (level) position. When the torpedo is discharged from the torpedo-tube, the torpedo being at a slight angle with the water, the mercury column is unbalanced and the diaphragm *a* is forced backward, causing the Servo motor or other apparatus to incline the horizontal rudders downward and to submerge the torpedo. As the torpedo becomes more and more submerged the hydrostatic pressure on the diaphragm *a* is increased and the inclination of the horizontal rudders diminished until when the torpedo floats on an even keel at the required depth the pressures on each side of the diaphragm are equal and the torpedo travels as required.

Should the torpedo attempt to rise by reason of the head of the same becoming inclined upward or otherwise, the diaphragm is again forced backward by the pressure of the mercury column, and the horizontal rudders are again inclined until the torpedo once more floats on an even keel at the required depth.

The horizontal distance between the receptacles A B should be as great as possible, as the greater the distance the more sensitive the apparatus.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a submersion-regulating gear for torpedoes the combination of two cylindrical or other suitably-shaped receptacles containing mercury and communicating with each other by means of a pipe or tube; diaphragms of leather india-rubber or other suitable material closing the mouths of the said receptacles and a means for transmitting the motion of one of the diaphragms caused by variations in the height of the mercury column to the Servo motor or other apparatus operating the horizontal rudders substantially as hereinbefore specified.

2. In a submersion-regulating gear for torpedoes the combination of receptacles A B containing mercury whereof the receptacle A is fixed to or made integral with the bulkhead D separating the compartment containing the apparatus from the chamber which is open to the water, a pipe or tube C forming a communication between the interior of the receptacle A and the interior of the receptacle B; diaphragms *a c* closing the mouths of the receptacles A B; plates or disks *g g* secured by a bolt or other suitable means *e* to the diaphragm *a;* a lever E hinged at one end to the bulkhead D and at the other end to a link or links *f* connected to the Servo motor the said lever being also connected to the bolt *h* so as to move therewith and one or more locking-rings *b b'* to secure the diaphragms in the receptacles all substantiallyas specified and for the purposes stated.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ABRAHAM JOHANNES VAN STOCKUM.

Witnesses:
ANTONIE MARTINUS VAN DER JAGT,
JOHANNES VAN DE REEP.