

M. F. HAY.
 DEVICE FOR REGULATING THE SUBMERSION OF SUBMARINE BOATS AND THE LIKE.
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977,951.

Patented Dec. 6, 1910.

Fig. 1

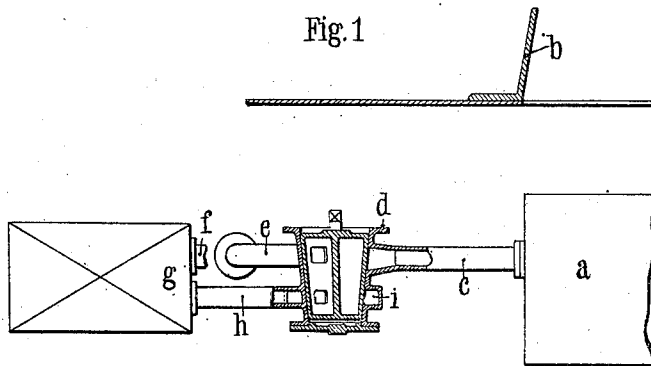


Fig. 2

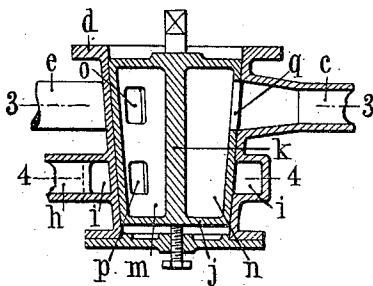


Fig. 3

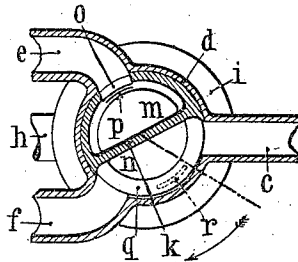


Fig. 4

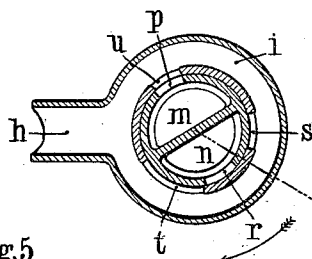


Fig. 5

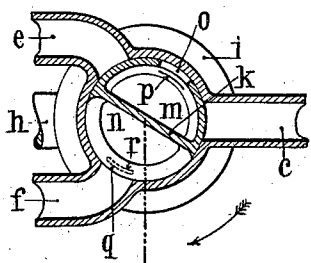
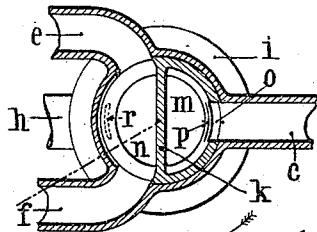


Fig. 6



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UNITED STATES PATENT OFFICE.

MARLEY FOTHERINGHAM HAY, OF FIUME, AUSTRIA-HUNGARY, ASSIGNOR TO WHITE-HEAD & COMPANY, OF FIUME, AUSTRIA-HUNGARY, A CORPORATION OF HUNGARY.

DEVICE FOR REGULATING THE SUBMERSION OF SUBMARINE BOATS AND THE LIKE

977,951.

Specification of Letters Patent.

Patented Dec. 6, 1910.

Application filed June 22, 1910. Serial No. 568,396.

To all whom it may concern:

Be it known that I, MARLEY FOTHERINGHAM HAY, a citizen of Great Britain, resident at Fiume, Austria-Hungary, have invented certain new and useful Improvements in and Relating to Devices for Regulating the Submersion of Submarine Boats and the Like, of which the following is a specification.

The object of this invention is a device for regulating the submersion of submarine boats and the like by means of a pump connected to a tank.

It has more particularly in view to allow the application of a rotary pump turning in one direction only, with the object of subjecting the control of the device to a single distributing cock, thus simplifying the working, and obviating errors.

In the annexed drawings: Figure 1 is a diagrammatic side view partially in section of the invention applied to a submarine boat. Fig. 2 is a vertical section of the distributing cock. Figs. 3 and 4 are horizontal sections along the lines 3—3 and 4—4 respectively of Fig. 2. Figs. 5 and 6 are sections along the line 3—3 of Fig. 2, showing the various positions of the controlling member.

In the interior of the submarine, a ballast tank *a* (Fig. 1) is placed in such a way that its center of gravity lies in the vertical line passing through the center of volume of the conning tower *b*. This tank is connected by a pipe *c* to the casing *d* of a reverser having two outlets, one *e* leading to the sea, and the other *f* being connected to the delivery of the pump *g* of any suitable construction. These pipes are distributed about the periphery of the casing symmetrically. The suction pipe *h* of the said pump terminates in an annular chamber *i* (Fig. 4), at the lower part of the casing *d*, and communicating with the interior of said casing by means of openings *s*, *t*, *u*, of varying suitable size, distributed over its periphery. Within this casing *d* is a plug *j*, divided by means of a vertical partition *k* into two independent compartments *m*, *n*. The compartment *m* has two openings *o*, *p*, superposed, and arranged to be capable of communicating with the pipes *c*, *e*, *f*, and the annular chamber *i*. In the compartment *n*, in the plane of the upper piping, is an opening *q* having a

width equal to that of the compartment, and in the plane of the annular chamber *i*, is an opening *r*, beneath the central portion of and co-axial with the opening *q*, and corresponding in dimension to an opening *s* through the wall of the casing and communicating with annular chamber *i*.

The working is as follows: When it is desired to fill the ballast tank for diving, the pump is set going, and the controlling member is brought into the position of Figs. 3 and 4. The piping *e*, leading to the sea, is by means of the opening *o*, put into communication with the compartment *m*, itself connected by opposite openings *p* and *u* with the annular chamber *i*, and consequently with the suction *h* of the pump. The delivery *f* of this pump is directly connected, by means of the opening *q* of the compartment *n*, with the pipe *c* leading to the tank. When the ballast tank is sufficiently filled and the submarine begins to dive, the cock of the controlling member is turned in the direction indicated by the arrow, so as to bring it into the position of Fig. 5. During this rotation the suction opening connected with the sea, is progressively closed, as also is the delivery pipe leading to the tank by means of the edge of opening *q*. As soon as the plug begins to turn, the opening *r* (Fig. 4) comes into position opposite the opening *t*, and the water arriving from the delivery of the pump through the pipe *f* is divided into two parts, one of which flows to the ballast tank, while the other returns through the annular chamber *i* and the pipe *h* to the suction of the pump. When the controlling member arrives in the position of Fig. 5, the opposite openings *t* and *r* (Fig. 4), place the suction *h* of the pump in communication with the compartment *m*, which is connected by the opening *q* with delivery *f*. The pump is thus short-circuited, its delivery corresponding with its suction, and it can continue to work at the same speed without any increase of resistance in the delivery and consequent increase of load being produced, during its passage from the position of Fig. 3 to that of Fig. 5. When it is desired to raise the boat to the surface, the regulator is turned continually in the direction of the arrow until the position of Fig. 6 is reached. In the position of Fig. 6, the suction of the pump communicates, by oppo-

site openings p and s , with the compartment m of the regulator, which is connected by the opening o to the pipe c communicating with the tank. Again, the delivery f of the pump is directly connected by the opening q of the compartment n , with the pipe e leading to the sea, so that the pump sucks from the ballast tank and expels into the sea, causing the boat to rise.

10 The advantages are as follows: The invention allows the quantity of water contained in the ballast tanks of a submarine boat to be varied without affecting the speed of the pump, which can thus work constantly at full speed. By this means maneuvering errors are avoided, as well as damage resulting from failure by the pump to pick up the suction when stopped and set going again at each change in direction of suction. The arrangement of the regulator makes it possible, by means of an incomplete opening of orifices o , p , q , r , to vary with precision the quantity of water sucked up by the pump without varying its speed and without increasing the pressure of its delivery. The degree of immersion of a submarine may thus be regulated without the help of diving rudders.

The pump may be of any suitable construction, actuated for example by an electric motor, or otherwise. The plug j may be connected to a single ballast tank, or to a group of tanks arranged in series or in steps.

35 What I claim is:

1. Mechanism for controlling the diving mechanism of submarine boats comprising a ballast tank, a pump, and conduits communicating with the ballast tank, the external water, and the inlet and outlet of the pump, in combination with a distributing-cock interposed in said conduits and having passages so arranged that in one position it connects the suction side of the pump to the external water and the discharge side of the pump to the tank, whereby the tank may be filled; in another position it connects the suction side of the pump to the tank and the discharge side to the external water, whereby the tank may be emptied; and in a third position it connects the suction side of the pump to the discharge side thereof; whereby the pump may be driven constantly in the same direction, and by manipulating

the distribution cock, may be short-circuited or employed to fill or empty the ballast tank.

2. In mechanism for controlling the diving of submarine boats, a distributing cock having a casing, three conduits disposed symmetrically about the periphery of the casing and communicating respectively with the outside water, with a ballast tank, and with a discharge of a pump, a fourth conduit extending from the casing to the intake of the pump, and a hollow plug within the casing and adapted in one position to connect the suction side of the pump to the external water and the discharge side of the pump to the tank, whereby the tank may be filled; in another position to connect the suction side of the pump to the tank and the discharge side to the external water, whereby the tank may be emptied; and in a third position to connect the suction side of the pump to the discharge side thereof; whereby the pump may be driven constantly in the same direction, and by manipulating the distribution cock, may be short-circuited or employed to fill or empty the ballast tank.

3. In mechanism for controlling the diving of submarine boats, a distributing cock having a casing, three conduits disposed symmetrically about the periphery of the casing and communicating respectively with the outside water, with a ballast tank, and with the discharge of a pump, said casing having also an annular peripheral chamber on a different plane, a fourth conduit connecting said chamber with the intake of the pump, a hollow plug j within the casing, a partition k dividing the interior of such plug into two compartments of which one m has an orifice p communicating with the annular chamber i and an orifice o arranged to register with the three symmetrically disposed conduits, and of which the other compartment n has an orifice q situated on the plane of the first conduits, and of sufficient extent to connect any two of said conduits, and also an orifice r situated on the plane of the annular chamber i .

In testimony whereof I have hereunto set my hand this seventh day of April, 1910.

MARLEY FOTHERINGHAM HAY.

In the presence of two witnesses:

WERNER F. GENER,
ANDOR STEINACKER.