E. H. MEDÉN.

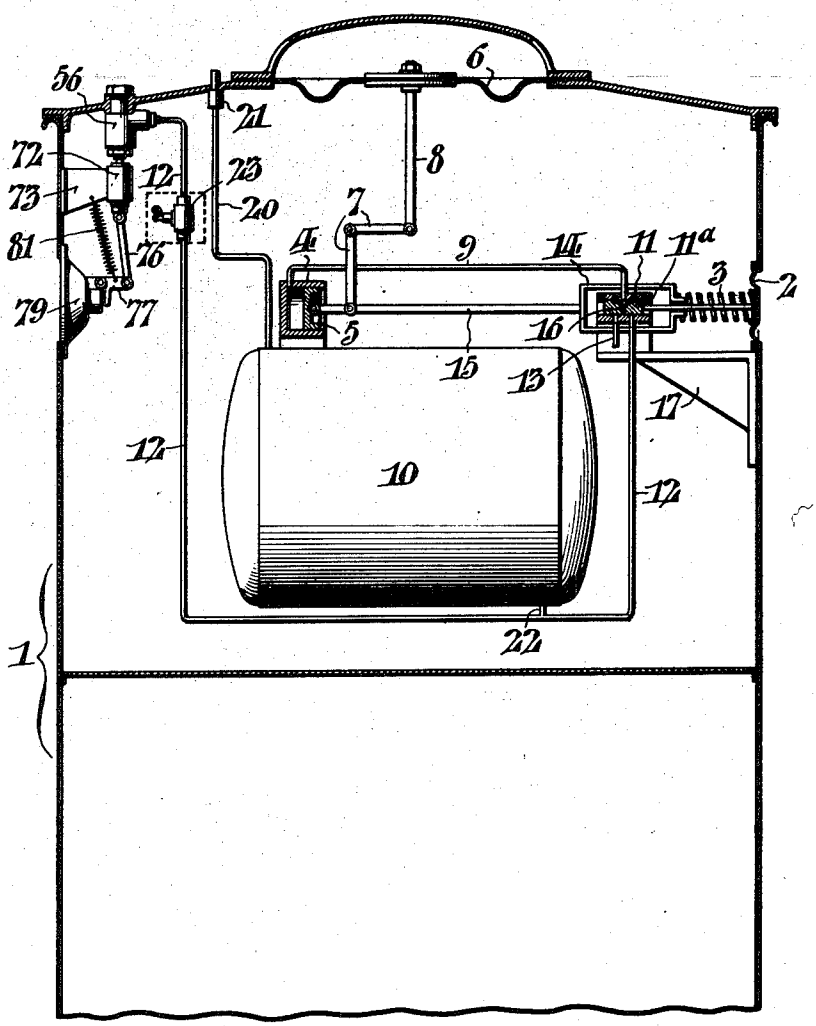
DEVICE FOR CAUSING SUBMERSIBLE BODIES TO RISE OR SINK.

APPLICATION FILED AUG. 17, 1917.

1,379,273. Patented May 24, 1921.

3 SHEETS—SHEET 1.

FIG. 1.



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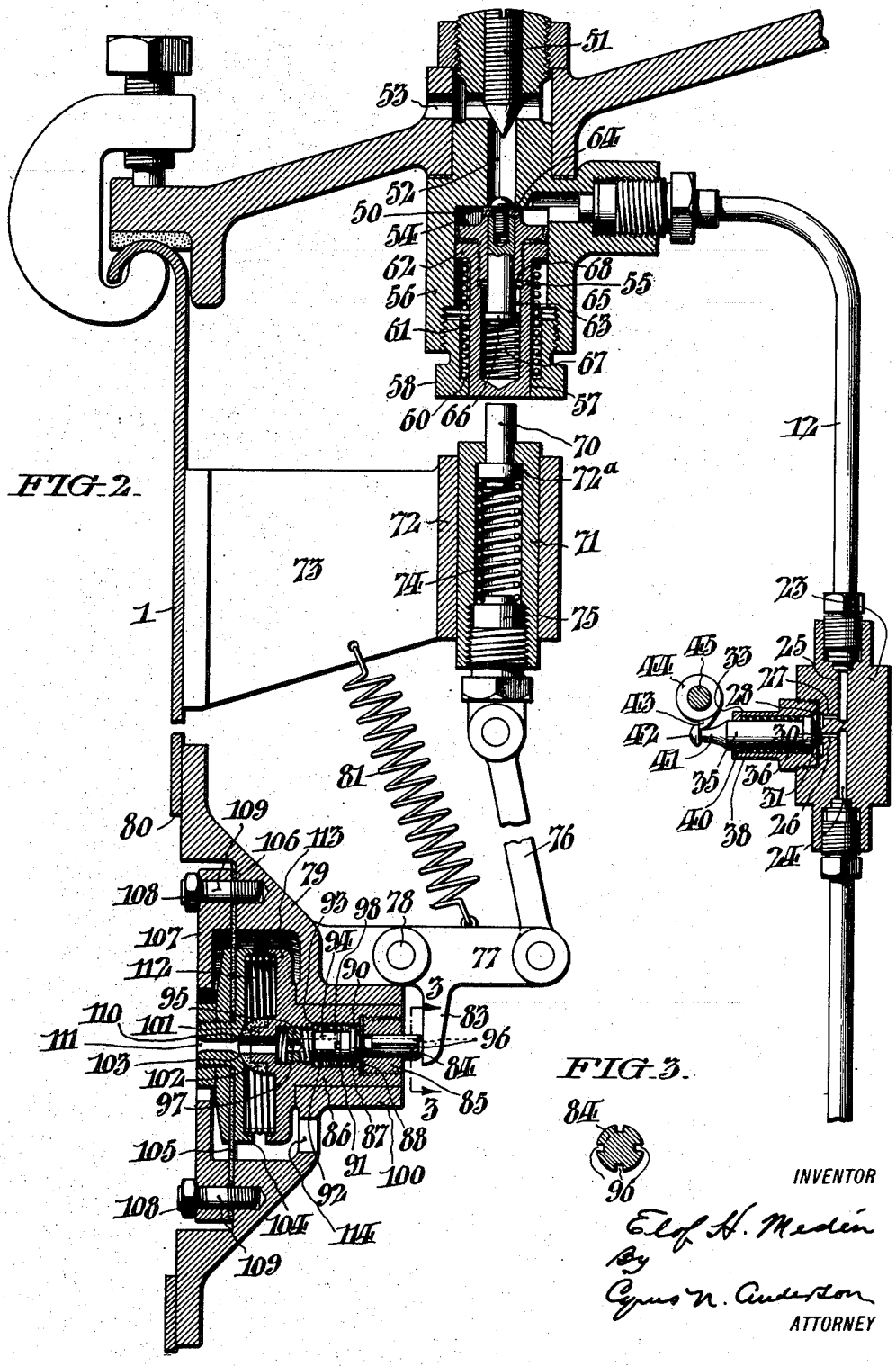

FIG. 2.

FIG. 3.

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FIG. 4.

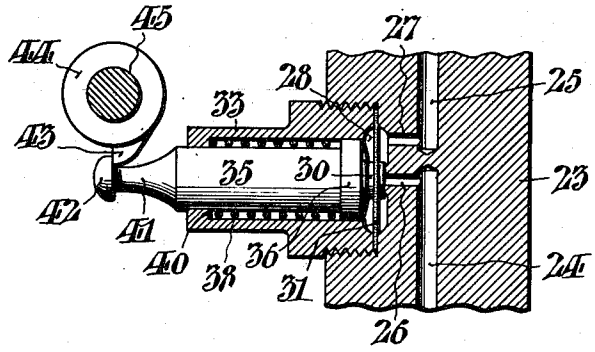


FIG. 5.

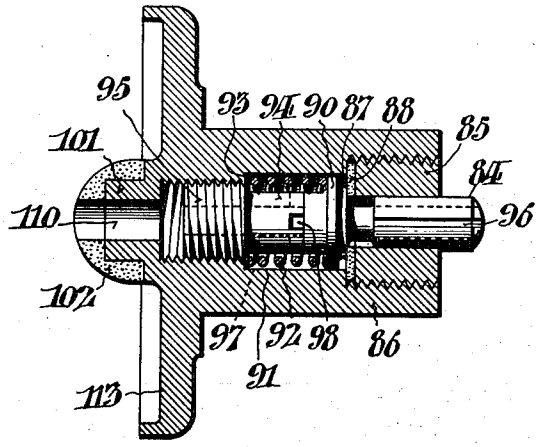


FIG. 6.

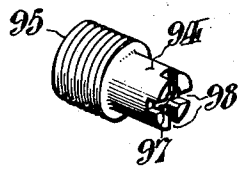
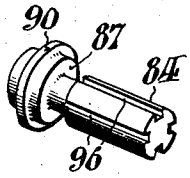


FIG. 7.



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UNITED STATES PATENT OFFICE.

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DEVICE FOR CAUSING SUBMERSIBLE BODIES TO RISE OR SINK.

1,379,273. Specification of Letters Patent. Patented May 24, 1921.

Application filed August 17, 1917. Serial No. 186,701.

To all whom it may concern:

Be it known that I, ELOF H. MEDÉN, a subject of the King of Sweden, residing in the city of Elizabeth, county of Hudson, State of New Jersey, have invented a certain new and useful Device for Causing Submersible Bodies to Rise or Sink, of which the following is a specification.

My invention relates to a device for use in connection with submersible bodies, such as submarine mines or similar bodies, to cause the said bodies either to rise or sink at the expiration of predetermined times.

As is well known, submarine mines, after having been discharged or thrown into the water, assume a position a certain distance below the surface depending upon the specific gravity of the water and the weight and construction of the mine itself.

These floating mines or bodies may be constructed so that, after having been thrown into the water, they oscillate up and down across a middle line or plane, or they may be so constructed as to occupy a nearly constant position at a certain depth below the surface of the water, depending upon the specific gravity of the water in which the mine may be located. A construction such as that last referred to is disclosed in the application of Gustaf Dalen for Letters Patent of the United States, filed August 14th, 1916, Serial No. 114,796.

It requires practice in order that these submarine mines may be properly launched. It is desirable, therefore, that some means be provided whereby a mine, after it has been launched or placed in the water and after having remained there for a certain predetermined period of time, will rise to the surface so that it may be picked up and again used either for practice purposes or for the purpose of mining a channel or a shore against hostile war vessels or enemy craft of any kind. On the other hand it may become desirable that such mines shall be caused to sink within a certain predetermined time.

It is the object of my invention, therefore, to provide means whereby a mine may be either caused to sink at the expiration of a certain time or may be caused to rise to the surface at such time as may be desirable. Usually the mines or floating bodies with which my device is associated would contain an explosive material with detonating means for exploding the same, but if the bodies are to be used merely for practice purposes the explosive and detonating means may be omitted.

It will also be understood that my invention may be used in connection with floating bodies which are not provided with means for maintaining them at a nearly constant depth below the surface of the water in which they may be situated, although in the construction as illustrated I have shown the mechanism employed for causing the body to rise or sink at the expiration of a predetermined time combined with means for maintaining the body in a nearly constant position below the surface of the water, such distance depending upon the specific gravity of the water in which the body may be situated.

Other objects and advantages of my invention will be referred to in the detailed description thereof which follows or will be apparent from such description.

In order that my invention may be more readily understood and its practical advantages fully comprehended and appreciated reference may be had to the accompanying drawings in which I have illustrated one convenient form of embodiment thereof. However, it will be understood that my invention is susceptible of embodiment in other forms of construction than that shown.

In the drawings:—

Figure 1 is a view in central longitudinal section of a floating body comprising a portion of a mine casing, the mechanism for causing the body to rise or sink at the expiration of a predetermined time being shown in elevation, while that for maintaining the body at a certain depth below the surface is shown partly in section and partly in elevation;

Fig. 2 is a vertical longitudinal sectional view through a portion of the casing and the mechanism for causing the submersible body to rise or sink at the expiration of a predetermined time;

Fig. 3 is a view taken on the line 3—3 of Fig. 2.

Figs. 4, 5, 6 and 7 are detail views on an enlarged scale of various portions of the mechanism illustrated in Fig. 2.

In the drawings, 1 designates a casing of

a body which is adapted to occupy either a submerged or a floating position.

In the construction as shown I have employed the means illustrated in Fig. 1 of the drawings of the application of Gustaf Dalen, Serial No. 114,796 for causing the body to assume and maintain a nearly constant position at a certain depth below the surface of the water.

2 designates a diaphragm, the outer side of which is subjected to the pressure of the external or surrounding water. It will be understood that a piston or any other equivalent device may be substituted for the diaphragm 2. The external water pressure against the diaphragm 2 is opposed by the pressure of a spring 3 or its equivalent. The said diaphragm, together with the spring 3, constitutes what may be termed a hydrostatic device by means of which the mechanism which will be described below for changing the specific weight of the said submersible body is controlled.

The said mechanism consists of a cylinder 4 containing a piston 5 which is connected with a diaphragm 6 by means of a bell crank lever 7 and a link 8. The outer surface of the said diaphragm is subjected to the pressure of the external or surrounding water.

Opening into the cylinder 4 behind the piston 5 is a pipe 9 for conducting or conveying a suitable pressure medium, such as liquid, from the receptacle 10, the said liquid being acted upon by the pressure of a gas adapted to be supplied from without by a pump or from a compressed gas receiver before the submersible body is launched. If preferred a compressed gas receiver may be located interiorly of the casing 1 of the submersible body so that the gas for forcing the liquid from the said receptacle may be supplied to the said receptacle from the said receiver after the said body has been submerged.

In order to control the supply of pressure medium to the cylinder 4 a slide valve 11 is provided which is movable in a valve chest 11^a. Instead of such valve and valve chest, a three-way cock or its equivalent controlled by the hydrostat may be employed.

12 designates a pipe leading from the receptacle 10 to the slide valve and 13 designates a discharge pipe which is adapted to discharge the liquid from the cylinder into the interior of the floating body or if desired into a separate container (not shown). The slide valve 11 is also controlled indirectly by the piston 5, which is connected with a frame 14, forming a support for the inner end of the spring 3. By reason of the fact that the inner end of the spring 3 is situated against an end of the frame 14, which is connected by means of the rod 15 with the piston 5, it will be understood that the tension of said spring is in a measure dependent upon the position of the piston 5 and that a change of the position of said piston with a corresponding change of the external water pressure will cause a movement of the slide valve 11 from operative to inoperative position. When in inoperative position the valve channel 16 occupies a middle position between the ports provided in the valve chest 11^a for the pipes 12 and 13.

The portion of the mechanism as thus far described is adapted to maintain the body in a nearly constant position at a certain depth of submersion.

The valve chest 11^a is supported upon a bracket 17 secured to the inner side of a portion of the side wall of the casing 1 of the submersible body. The receptacle 10 may be supported interiorly of the said casing by any suitable means.

In the construction as shown the liquid and gas under pressure are delivered into the receptacle 10 through a pipe 20 which communicates with the exterior of the casing and which is provided with a valve, not shown, at 21 for preventing back or return flow of gas from the said receptacle.

The pipe 12 is in communication at 22 with the receptacle 10. From its point of connection to the said receptacle the said pipe 12 extends in one direction to the valve 11, as above described, while in the opposite direction it extends to and operates the mechanism for causing the submersible body to rise or sink as may be desired.

The said pipe 12 is interrupted by means for controlling the passage or flow of the liquid therethrough. The said means comprises a block 23 having holes 24 and 25 in its opposite ends, which holes are connected at their inner ends with laterally extending holes 26 and 27 which communicate with a space or opening 28 in a side of said block. The ends of the pipe 12 are secured in the said holes 24 and 25.

30 designates a valve supported upon a flexible diaphragm 31 which extends across the opening 28 to close the same and its outer edges are clamped and held in position by means of a hollow or tubular member 33 which is screwed into said opening 28.

Normally the valve 30 is held in position to close the opening 26 to thereby prevent the passage of liquid through the pipe 12. The said valve is held closed by means of pressure exerted by the inner end of a member 35 which is movably supported within the hollow or tubular member 33. The inner end of the member 35 is provided with a head 36 against which the inner end of a coiled spring 38 is situated. The outer end of said spring is seated against a shoulder 40 projecting inwardly from the outer end of the hollow or tubular member 33.

The outer end of the movable member 35 is provided with a reduced or neck portion 41 which terminates in a button or head 42 which is adapted to be engaged by a lug or projection 43 upon a sleeve 44 secured to a shaft 45, said shaft having connection with and being actuated by clock mechanism indicated in dotted lines of any known construction.

As the shaft 45 is rotated the projection 43 contacts with the button or head 42 and operates to pull the member 35 outwardly sufficiently to release or remove the pressure from against the diaphragm 31. Upon the release or removal of such pressure the pressure of the liquid exerted through the portion of the pipe 12 which communicates with the opening 24 against the valve 30 opens the latter and permits such liquid under pressure to pass forwardly through the continuation of the pipe 12 to the valve chamber 50.

As illustrated the projection 43 is in position just ready to act upon the head or button 42 to move the member 35 to permit the pressure of the liquid in the pipe 12 to open the valve 30 so that said liquid may flow forward into the chamber 50.

If it is desired that at the expiration of a predetermined time the submersible body, such as a mine, shall rise to the surface the adjustable screw valve 51 should be adjusted into position, as is shown in Fig. 2, to open the passageway 52 which is connected with the valve chamber 50. On the other hand if it be desired that said body shall sink at the expiration of a predetermined time the screw valve 51 should be adjusted so as to close the passageway 52.

The passageway 52 at its outer end connects with an open passageway 53 which communicates with the exterior of the casing of the submersible body.

Upon the entry of the liquid or other suitable fluid under pressure into the valve chamber 50 the pressure thereof upon the annular surface 54 of a plunger 55 causes inward movement of said plunger in its supporting housing 56. The greater portion of the plunger 55 is of reduced size and is adapted to project into and through an opening at 57 in the inner end of a plug 58 having screw threaded connection with the inner end of the housing 56. The said plug 58 is provided with a flange forming a shoulder 60 against which the inner end of a coiled spring 61 is seated. The opposite or outer end of said spring is seated against a shoulder 62 upon the plunger 55. Said spring tends to hold the said plunger in its outer position, as shown in Fig. 2 of the drawings.

The plunger 55 is provided with a central opening 63 extending from its outer end to a point near its inner end.

64 designates a valve which is adapted to open and close the passageway 52, said valve being shown in closed position in Fig. 2 of the drawings. The said valve 64 is movably or slidably supported in the outer end portion of the opening 63, the inner end portion of said opening being somewhat enlarged, as shown. The inner end of the valve 64 is provided with a flange 66 against the inner side of which the outer end of a coiled spring 67 is seated, the opposite or inner end of said spring being seated against the bottom of the opening 63 in the plunger 55.

Upon the admission of a liquid under pressure into the chamber 50 the pressure thereof against the annular surface 54 causes inward movement of the plunger 55. Such inward movement has no effect upon the valve 64 until the shoulder 68 upon the interior of the said plunger contacts with the outer side of the flange 66. Upon contact of the said shoulder 68 with the flange 66 any further inward movement of the plunger 55 causes movement of the valve member 64 to open the same whereby communication between the passageway 52 and the chamber 50 is established.

Prior to the time that the shoulder 68 contacts with the flange 66 the inner end of the plunger 55 has contacted with the outer or upper end of a compensating plunger structure comprising a contact member 70 which projects from the interior of a hollow slidable plunger member 71 supported in a sleeve 72 on a bracket 73 secured to a portion of the inner surface of the casing 1.

The opposing end of the contact member 70 is provided with a shoulder at 72^a which is held in contact with the inner surface of the outer or upper end of the member 71 by means of a coiled spring 74 situated within the slidable plunger 71. The adjustable plug 75 is connected by means of a link 76 to the outer swinging end of a lever or arm 77 pivoted at 78 upon a valve structure supporting member 79 secured upon the inner surface of the casing 1 in position over an opening 80 in said casing. 81 designates a coiled spring connected at one end to the bracket 73 and at its opposite end to the arm 77, said spring tending to hold the said arm in elevated position at all times.

The spring 74 previously referred to is of such strength relative to that of the spring 81 that when the plunger 55 is moved inwardly and contacts with the contact member 70 the said member, slidable plunger 71 and the spring 74 are moved as one, causing a stretching or expansion of the spring 81 and also causing, through the action of the link 76, pivotal movement of the arm 77.

The arm 77 is provided with a laterally extending contact projection 83, which is

adapted to contact with the inner end of a valve stem 84 slidably supported in an opening through a plug 85 having screw threaded connection with a valve member 86. The outer end of the valve stem 84 is provided with a valve 87, the inner side of which is adapted to contact with a washer 88, of leather or other suitable material, interposed between the plug 85 and a shoulder upon the valve member 86.

The valve 87 is provided with an annular flange 90 of a diameter somewhat less than the diameter of the opening 91 in the valve member 86. 92 designates a spring the inner end of which is seated against the outer side of the flange 90. The opposite end of the said spring is seated against a shoulder 93 upon the said valve member 86. The pressure of said spring tends to hold the valve 87 in closed position. The said spring is coiled around a reduced portion 94 of an adjustable stop 95 situated within and having screw threaded connection with the outer end portion of the opening 91 through the valve member 86.

The stop 95 may be adjusted toward and from the valve 87 so as to permit or prevent movement of said valve relative to the valve member 86.

The valve stem 84 is provided with openings 96 in the outer surface thereof while the adjustable stop 95 is provided with a central longitudinal opening 97 which communicates at its inner end with branch openings 98. The purpose of these branch openings is to permit water to pass inwardly through the opening 97 and out through the said branch openings 98 when said stop 95 has been adjusted outwardly away from the valve 87, which is the position to which it is adjusted when it is desired that the submersible body, as a mine, shall sink after a predetermined time.

The valve member 86 is slidably supported in a bearing 100 formed in the member 79. The outer end of said valve member comprises a projection 101 which is covered with a suitable material such as rubber 102, constituting the part of the said member which contacts with a seat 103 formed upon the inner side of a diaphragm plate 104 which is secured to a diaphragm 105, the outer edges of which are clamped between a shoulder 106 upon the member 79 and the outer edges of a diaphragm clamping or cover plate 107, the said plate being clamped in position by means of nuts 108 upon bolts 109. The valve member 86 is adapted to open and close the opening 111 which is in alinement with an opening 110 in the said valve.

A spring 112 interposed between the diaphragm plate 104 and a flange 113 upon the outer side of the valve member 86 tends to hold the latter in an inward position and the former in an outward position.

An opening 114 is provided in the member 79 through which water that may enter the chamber formed between the diaphragm 105 and the said member 79 passes into the interior of the casing 1. This happens or may happen when the body, as a mine, is thrown into the water, the water thus entering the interior of the casing acting as ballast for causing the body to sink. When the body is moved down a certain distance in the water, depending upon the specific gravity of the latter and upon the strength of the spring 112, the external pressure of the water upon the diaphragm 105 causes inward movement of the same to press the valve seat 103 against the end 102 of the valve 86 and thereby prevent the further entry of water into the said chamber and thence through the opening 114 into the interior of the casing 1.

Assuming that it is desired that the submersible body, such as a mine, or any other form of submersible body, shall be caused to rise to the surface at the expiration of a predetermined time, the screw valve 51 should be adjusted so as to leave the passageway 52 open and the stop 95 should be adjusted so as to hold the valve 87 tightly against its seat to close the same. Both of these parts, 51 and 95, are shown so adjusted in Fig. 2 of the drawings. The clock mechanism indicated in dotted lines should be set so that at the expiration of such predetermined time the projection 43 will contact with the head or button 42 so as to move the member 35 outwardly to release the pressure from the valve 30 to permit the pressure of the liquid within the pipe 12 to cause the opening of the said valve to permit the said liquid to flow forwardly through the said pipe 12 into the chamber 50. As above described, the pressure of the said liquid in the chamber 50 causes an inward movement of the plunger 55. Upon such inward movement the inner end of said plunger contacts with the opposing end of the contact member 70 to effect movement of the plunger 71 which in turn acts through the medium of the link 76 to cause pivotal movement of the arm 77.

The stop member 95 having been adjusted so as to hold the valve 87 in closed position relative movement of said valve with respect to the valve member 86 is prevented. The consequence is that when the projection 83 acts against the stem 84 of valve 87 it causes outward movement not only of the valve 87 but also of the valve member 86. The outer part 102 of the said valve member being in contact with the seat 103 such outward movement causes outward movement of the diaphragm 105 and the diaphragm plate 104

to press the outer side of the latter against the inner side of the diaphragm clamping or cover plate 107.

It should be remembered that the seat 103 is already pressed firmly against the part 102 of the valve member 86 by the external pressure of the water upon the diaphragm 105.

During the first part of the inward movement of the plunger 55 the valve 64 is not affected thereby. However, when the said plunger 55 has moved inwardly a sufficient distance to cause the shoulder 68 thereon to contact with the flange 66 upon the inner end of said valve, movement of the latter is caused to open the same. Such opening of the said valve 64 permits the liquid to pass or flow outwardly from the chamber 50 through the passageway 52 to be discharged into the water surrounding the submersible body. The discharge of such liquid not only operates to decrease the weight of the body but also decreases the pressure exerted by the liquid. As a result the plunger 55 is caused by the action of the springs 61 and 81 to move outwardly. Such outward movement permits the spring 67 to effect outward movement of the valve 64. However, such valve moves through only a very slight distance before it is seated to close the passageway 52, and while the plunger 55 may move a short distance thereafter it can not move farther to any great extent because there is still sufficient pressure of liquid within the chamber 50 to prevent such movement. Consequently the plunger 55 is held projected inwardly a sufficient distance to hold the arm 77 in position to in turn hold the valve 86 inwardly to press the end part 102 thereof against the seat 103 and hold the diaphragm plate 104 firmly against the diaphragm clamping or cover plate 107 even after the body has risen to the surface. If the part 102 of the valve were not so held firmly and closely against the seat 103 at such time the spring 112 would effect the separation of the part 102 of the valve member 86 from its seat 103 so as to permit water to flow into the space inside of the diaphragm 105 and thence through the opening 114 into the interior of the casing 1 to again cause the body to sink.

It will be seen, therefore, that when the stop member 95 is adjusted so as to hold the valve 87 in closed position, thereby closing the passageway through the valve member 86 and the valve member is moved and held outwardly as last above described, a certain portion of the liquid having been permitted to escape from the receptacle 10 and no water being permitted to enter into the interior of the casing 1 the said submersible body will rise to the surface and will float thereon and may be picked up when desired.

If it should be desired to cause the body to sink at the expiration of a predetermined time the screw valve 51 should be adjusted into position to close the passageway 52 while the adjustable member 95 should be adjusted outwardly so as to remove the inner end thereof from in contact with the outer side of the valve 87. When so adjusted the projection 83 from the arm 77 operates, when the plunger 55 is moved inwardly, to cause outward movement of the valve 87 to open the passageway through the valve member 86 without causing movement of the latter to press the diaphragm 105 outwardly as above described. In the same way that the valve member 86 is held in outward position, as above described, the valve 87 is held in outward or open position. When in such position water will enter the opening 110 and travel through the opening 97 out through the branch openings 98; thence around the flange 90 of the valve 87 and out through the openings 96 into the interior of the casing 1. The passage of water into the interior of the casing without permitting the escape of any of the liquid from the receptacle 10 through the passageway 52 increases the weight of the body so that its specific weight becomes greater than that of the surrounding water and in consequence the said body sinks.

I claim:—

1. In apparatus of the character described, the combination of a receptacle carried thereby which is adapted to contain a liquid under pressure, means for maintaining the said apparatus at predetermined depths below the surface of a body of water, means for connecting the interior of said receptacle with the said first named means, mechanism which is adapted to cause the said apparatus to rise or sink in the said body of water and means for supplying the said liquid under pressure to the said mechanism for causing the operation thereof.

2. In apparatus of the character described, the combination of a receptacle carried by said apparatus, said receptacle being adapted to contain liquid under pressure, means for causing the said apparatus to occupy positions at predetermined depths below the surface of the body of water in which the said apparatus may be situated, means for supplying liquid from said receptacle to the said means, mechanism for causing the said apparatus to rise or sink, means for supplying liquid under pressure from said receptacle to the said mechanism for causing operation of the latter and means for permitting liquid to pass to the said mechanism at the expiration of predetermined times to cause the operation thereof.

3. In a device for causing a submersible body to rise or sink, the combination of means for permitting water to enter the in-

terior of said body when it is placed in a body of water to cause the sinking of the same, the said means acting when the body has moved to a certain distance below the surface of the water to prevent the further entry of water into the said body, valve mechanism associated with said means and means for actuating the said valve mechanism at the expiration of predetermined times to thereby control the position of the said body within the water.

4. In a device for causing a submersible body to rise or sink, the combination of a casing for said body, said casing having an opening therethrough, a diaphragm for closing the said opening, said diaphragm having an opening therethrough, a valve cooperating with the said diaphragm adapted to control the passage of water through said opening, said valve having an opening extending therethrough, a valve supported by the first named valve for closing the said opening therethrough, an adjustable stop member situated within the said valve opening and adapted to be adjusted into position to permit or prevent relative movements of the said valves, means for actuating the said valves and means for actuating the last mentioned means to cause actuation of the said valves.

5. In a device for causing a submersible body to rise or sink, the combination of the casing of said body, said casing having an opening therethrough, a valve structure for permitting or preventing the passage of water through said opening into the interior of said casing, a movable device, means for causing movement of said movable device, and means intermediate the said movable device and the said valve structure whereby movement of the said movable device may cause or permit movement of the said valve structure.

6. In a device for causing a submersible body to rise or sink, the combination of a casing for said body, an opening through the wall of said casing, a diaphragm for closing said opening, said diaphragm having an opening therethrough, a valve structure which coöperates with said opening for controlling the passage of water therethrough from the exterior to the interior of said casing, a movable member, a housing for said movable member, a receptacle containing a liquid under pressure, means for supplying liquid under pressure from said receptacle to the chamber of said housing upon one side of said movable member to cause movement of the latter and means intermediate the said movable member and the said valve structure whereby movement of said movable member causes actuation of the said valve structure.

7. In a device for causing a submersible body to rise or sink, the combination of a casing for said body, a movable member, a housing for said movable member, said housing having an opening therethrough which communicates at its inner end with the chamber of said housing and at its outer end with the exterior of said casing, a valve which is adapted to be adjusted into position to open or close the said opening, a valve supported upon the said movable member which is adapted to open and close the inner end of said opening, a receptacle adapted to contain a liquid under pressure, means for connecting said receptacle with the chamber of said housing, means operating at the expiration of predetermined times to permit the passage of liquid under pressure through the said connection to the chamber of said housing to thereby effect movement of the said movable member a distance in one direction to open the valve secured to said movable member to thereby establish communication between the chamber in said housing and the said opening whereby the said liquid may escape through said opening if the said adjustable valve occupies open position, means to permit or prevent the passage of water through the said casing from the exterior to the interior thereof and connections between the said means and the said movable member whereby movement of the latter controls the action of the said last mentioned means.

8. In a device for causing a submersible body to rise or sink, the combination of the casing of said body, said casing having an opening therethrough to permit the passage of water into its interior, a movable valve for closing said opening, said valve having an opening extending therethrough, a valve supported in said last named opening for closing the same, an adjustable stop in the opening through said valve, said stop being adjustable into positions to permit or prevent movement of the second named valve, a movable member situated a distance from said valves, means for actuating said movable member and means intermediate said movable member and said valves whereby movement of said movable member causes actuation of said valves.

9. In a device for causing a submersible body to rise or sink, the combination of the casing of said body, said casing having an opening therethrough, valve mechanism for permitting or preventing the passage of water through said opening into the interior of said casing, a movable member situated a distance from said valve mechanism, a housing for the said movable member, means for actuating the said movable member and for controlling the position of said movable member in its housing and means intermediate the said movable member and the said valve mechanism, said means comprising relatively movable parts and being adapted

to be actuated by the said movable member to cause actuation of the said valve mechanism.

10. In a device for causing a submersible body to rise or sink, the combination of the casing of said body, said casing having an opening therethrough, valve mechanism for permitting or preventing the passage of water through said opening into the interior of said casing, a movable member situated a distance from said valve mechanism, a housing for said movable member, said housing having a passageway for connecting the interior thereof with the exterior of said casing, means adapted to be adjusted into positions to open or close the said passageway, a valve supported upon the said movable member for controlling the opening from the interior of said housing to the said passageway, said valve and movable member being relatively movable, means for supplying a liquid under pressure to the interior of said housing to first cause movement of the said movable member, movement of the latter ultimately causing movement of the valve supported thereon to open the opening in the said passageway leading from the interior of the said housing and means intermediate the said movable member and the said valve mechanism, said means being adapted to be contacted with by the said movable member and its actuation begun before movement of the valve supported upon the said movable member is started, the actuation of the said last mentioned means causing actuation of the said valve mechanism.

11. In a submersible body, the combination of a casing having a plurality of openings extending therethrough which are adapted to admit water into the said casing, one of the said openings normally being closed and the other normally being open to permit the passage of water into the interior of said casing when the said body is thrown into a body of water, means which is adapted to be actuated by the external pressure of the water to close the said normally open opening when the said body has reached a predetermined depth in the water, means for causing the said body to rise to the surface of the water, and means interiorly of the said casing for maintaining the means for closing the said second named opening in closed position whereby the said body is caused to float upon the surface of the said body of water.

12. In a submersible body, the combination of a casing having a plurality of openings therethrough through which water is adapted to pass into the interior of said casing, one of the said openings being normally open and the other normally closed, means adapted to be actuated by the external pressure of the water thereon to close the first named opening after the said body has reached a predetermined depth in the water, and means situated interiorly of the said casing and acting at predetermined times to open the second named opening to permit water to enter the said casing to cause the said body to sink.

13. In a submersible body, the combination of a casing having a plurality of openings through which water is adapted to pass into the interior thereof, one of said openings normally being open, a valve for closing the other opening, said valve normally being closed, means whereby when the body has reached a predetermined depth in the water the first named opening is closed by the action of the external pressure of the water upon said means, internally situated and automatically acting means operating at predetermined times to open the said valve to permit water to enter the second named opening to cause the said body to sink.

14. In a submersible body, the combination of a casing having an opening therethrough through which water is adapted to pass to cause a sinking movement of said body, a valve for closing said opening, adjustable means adapted to be adjusted into positions to hold said valve in closed position or to permit the same to be opened, means for permitting the said body to sink to a predetermined depth in the water, and means situated interiorly of the said casing and acting automatically upon the said valve to open the same provided the said adjustable means occupies a position to permit opening movement of said valve or to act upon the said means which permits the said body to sink to a certain depth in the water.

15. In a submersible body, the combination of a casing having a plurality of openings therethrough through which water is adapted to flow into the said casing, one of the said openings normally being open, a valve for closing the other opening, said valve normally being in closed position, an adjustable device adapted to be adjusted into position to hold said valve in closed position or to permit the same to be opened, a valve structure adapted to control the flow of water into the first named opening, a member of said valve structure adapted to be actuated by the external pressure of water thereon to close the same after the said body has reached a predetermined depth in the water, and means situated within the said casing and acting automatically upon the first named valve to open the same to permit water to flow through the said second named opening to cause the sinking of said body in case the said adjustable device is adjusted to position to permit relative movement of the said valve or to hold the parts of the valve structure for closing the first named opening in closed relation with

respect to each other in case the said adjustable device shall be adjusted into position to hold the first named valve in closed position.

16. In a submersible body, the combination of a casing having a plurality of openings therethrough through which water is adapted to flow to cause a sinking movement of said body in a body of water, one of the said openings normally being open, a valve for controlling the other opening, said valve being normally in closed position, means whereby the external pressure of the water effects the closing of the first named opening when the said body has reached a predetermined depth in the water, means for maintaining the said body at a nearly constant depth in the water, said means comprising a liquid under pressure, a receptacle for holding the said liquid, means adapted to be actuated by the pressure exerted by said liquid, and mechanism intermediate said means and the said valve whereby upon the actuation of said means movement of said valve is effected to open the said second named opening.

17. In a submersible body, the combination of means for maintaining the same predetermined distances below the surface of water, an opening into the interior of said body through which water is adapted to flow, means for opening and closing said opening to permit or prevent the flow of water into said interior, and means intermediate the first and second named means for actuating the latter to control said opening.

18. In a submersible body, the combination of a casing having openings therethrough, means for opening and closing said openings, means for causing the said body to remain below the surface of a body of water, mechanism situated within the said casing for controlling the opening and closing means for one of said openings, and means for actuating said mechanism at predetermined times.

19. In a submersible body, the combination of a casing having openings leading from the exterior to the interior thereof through which water is adapted to pass when the said body is placed in a body of water, means for controlling the said openings, means for maintaining the said body at a nearly constant depth in the water, said means comprising a receptacle containing a liquid under pressure, a conduit leading from said receptacle to a chamber from which a passageway leads to the exterior of the said casing, a valve for closing said conduit, means adapted to open the said valve at predetermined times, an adjustable device for opening and closing the said passageway, a plunger device situated in said chamber and provided with a valve for closing said passageway, said plunger device and valve being adapted to be actuated by the pressure of liquid from said receptacle upon the opening of the said conduit, and mechanism intermediate the said plunger and the said first named means for controlling the latter.

20. In a device for controlling the position of a submersible body in a body of water, the combination of means for permitting water to enter the said submersible body for a period after it has been placed in said body of water until it has become submerged to a predetermined depth therein, means for maintaining said submersible body at a nearly constant depth below the surface of the water, means for causing the said body to rise to the surface of or sink in said water, said last mentioned means comprising valve mechanism for controlling the passage of water into the interior of said submersible body, means for actuating said valve mechanism to control the same to cause the said submersible body to sink or rise to the top of the said water, and means acting at predetermined times to operate said actuating means.

In testimony that I claim the foregoing as my invention, I have hereunto signed my name this 14th day of August, A. D. 1917.

ELOF H. MEDÉN.