Aug. 10, 1937. R. L. GARRETT 2,089,888

TOY SUBMARINE

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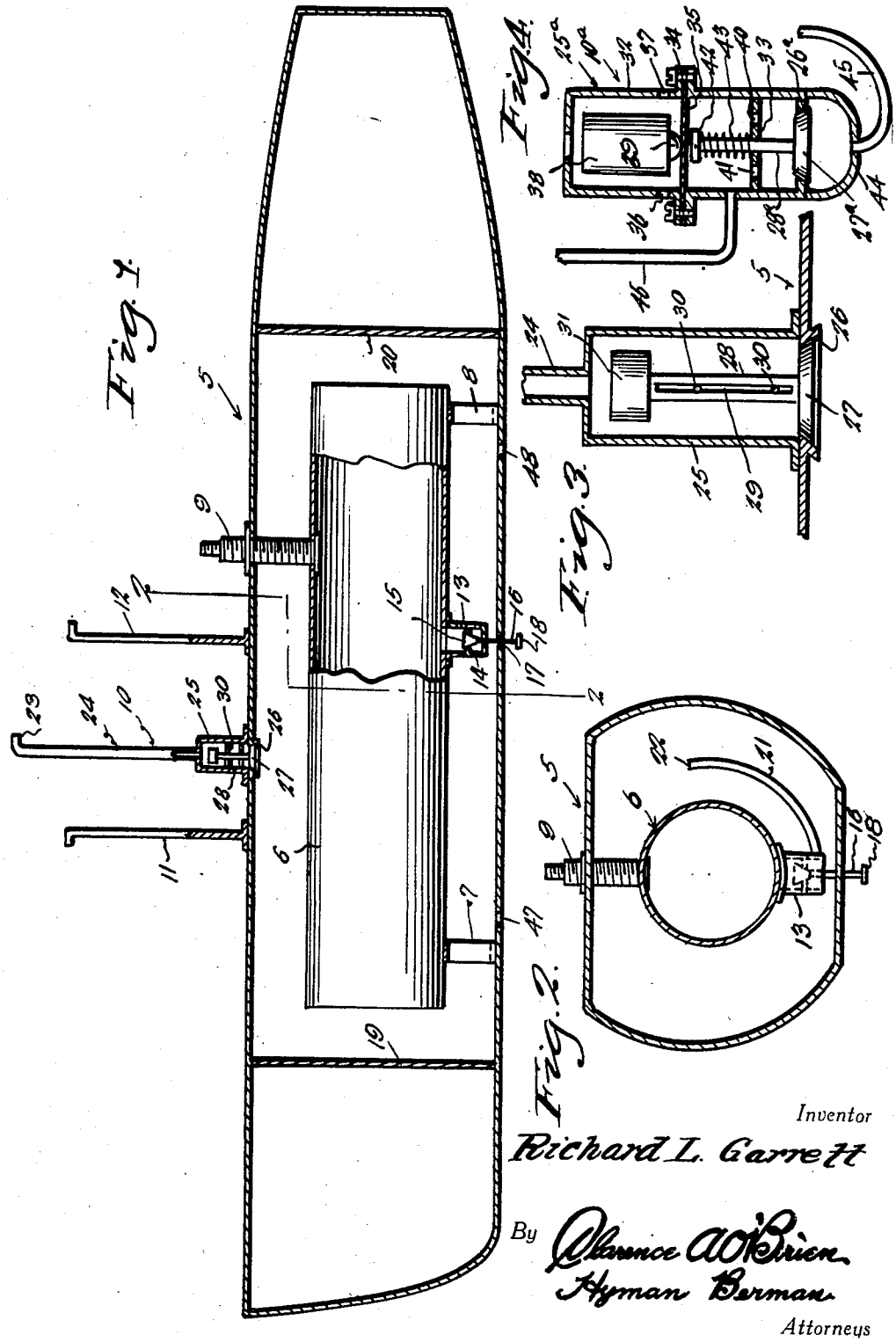


Fig. 1.

Fig. 4.

Fig. 3.

Fig. 2.

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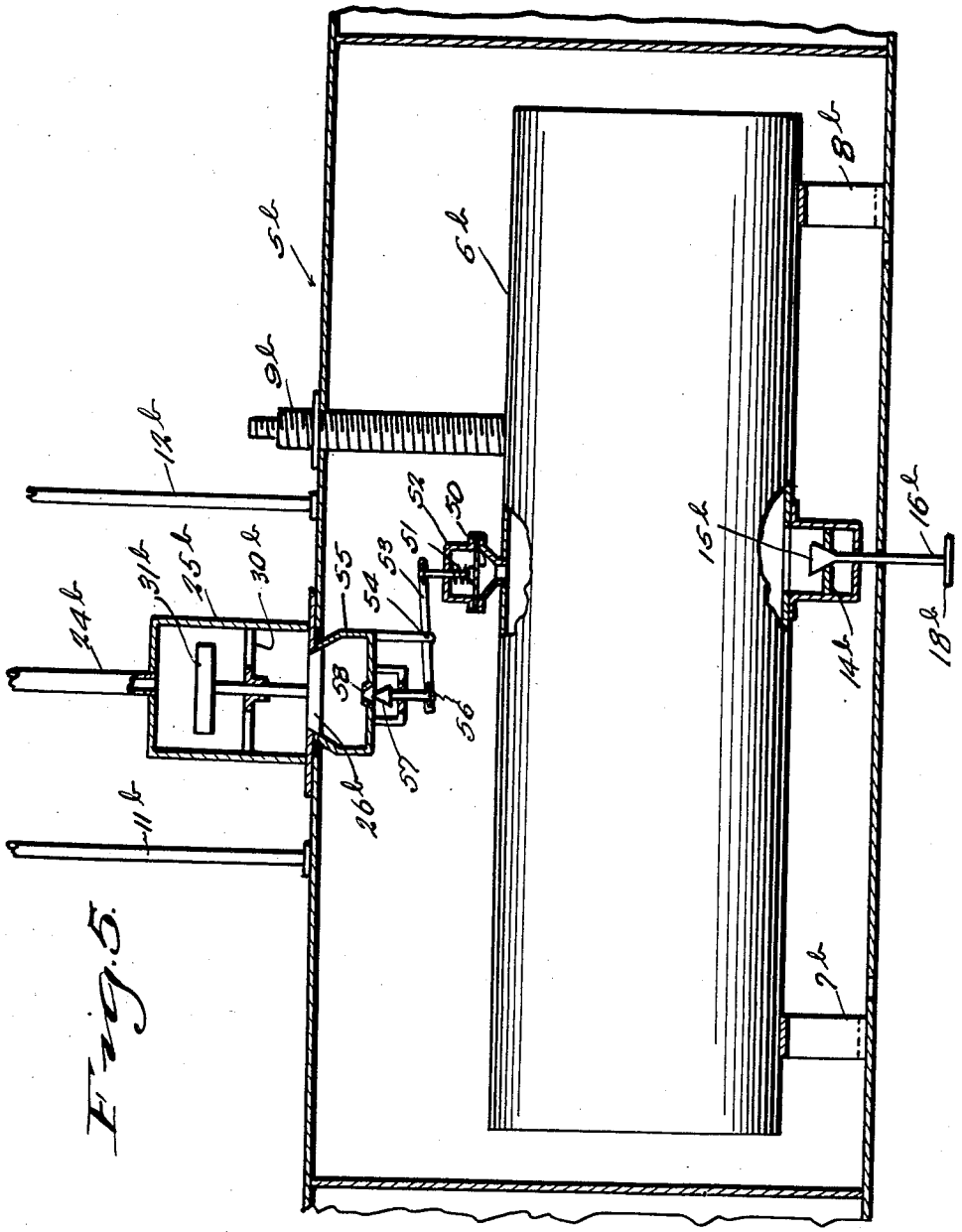


Fig. 5.

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TOY SUBMARINE

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Application October 17, 1936, Serial No. 106,241

6 Claims. (Cl. 46—94)

My invention relates generally to a toy submarine, and particularly to a toy submarine adapted to intermittently dive and rise in a body of water under its own power, and an important object of the invention is to provide a simple and practical construction of this character.

Another important object of my invention is to provide in a toy submarine of the character indicated and of the air pressure operated type, a valve arrangement which is operated by being struck against or contacted with the bottom of a pond or basin during a dive of the submarine, so as to operate to cause the submarine to rise to the surface and sink intermittently until the air supply is exhausted.

Another important object of my invention is to provide a toy submarine of the character indicated, wherein means is provided to cause the submarine to return to and remain floating on the surface of the water when the air charge becomes exhausted.

Other important objects of my invention will be apparent from a reading of the following description taken in connection with the drawings, wherein for purposes of illustration I have shown preferred embodiments of my invention.

In the drawings:—

Figure 1 is a general longitudinal vertical sectional view taken through an embodiment of the invention and showing the operating mechanism thereof.

Figure 2 is a transverse vertical sectional view taken through Figure 1 approximately on the line 2—2.

Figure 3 is an enlarged fragmentary sectional and elevational view taken through the float valve.

Figure 4 is an enlarged vertical transverse sectional view taken through an alternative form of float valve operative to produce a spouting of combined air and water, particularly attractive and realistic when the submarine takes the form of a whale or other simulation.

Figure 5 is a fragmentary view similar to Figure 1 but showing another embodiment of the invention wherein a valve arrangement obtains which insures floating of the submarine on the surface of the water when the air pressure in the supply tank becomes exhausted below a certain point.

Referring in detail to the drawings, the numeral 5 generally designates the hull of the diving or submarine toy which may assume the form of a boat or of an animal or fish such as whale, and which has mounted in a suitably placed position in the intermediate portion thereof the air pressure containing tank 6 which is held in place by brackets 7 and 8 fastened to the hull and by an air connection stem 9 which projects through the top of the hull.

On the top of the hull and in protective relation to the float valve structure which is generally designated 10 are the uprights 11 and 12 which are fastened to the top of the hull and in the case of a simulation of a naval submarine, add to the realistic appearance of the submarine as it courses through the water. The float valve structure which is generally designated 10 has the general appearance of a periscope to add to the realistic appearance.

The bottom of the air pressure containing tank 6 has a valve chamber 13 depending therefrom which opens into the interior of the tank 6 and itself has an interior valve seat 14 adapted to be closed by the conical valve 15 whose stem 16 works vertically through an opening 17 in the bottom of the hull. The lower end of the stem 16 has a head 18 adapted to strike the bottom of the pond or basin during a dive of the submarine, so that the valve 13 is pushed upwardly and unseated against the pressure of the air in the tank 6, so as to permit the air in the tank 6 to escape into the air compartment which is defined by the sides and the top and bottom of the hull 5 and the partitions 19 and 20. An upwardly curved air escape pipe 21 is provided to convey the air from the valve casing 13 to a point 22 above the intermediate level of the tank 6 so as to lead the air to an upper part of the air compartment and thereby more efficiently act upon any water present in the air compartment and drive this water out through the float valve arrangement 10 in the form of a spray issuing from the rearwardly directed nozzle 23 on the upper end of the spray tube 24 whose lower end is fastened in communication with the upper end of the float valve chamber 25 which is fastened to the top of the hull around a valve seat 26 with which cooperates a mushroom type valve 27 which has a stem 28 formed with a vertical slot 29 which slides on cross pins 30 secured to the sides of the valve chamber. The upper end of the stem 28 has a float 31 fastened thereto and which occupies a position below the upper end of the valve chamber when the mushroom type valve head 27 is fully closed as shown in Figure 3 of the drawings.

An alternative form of spray valve is shown in Figure 4 and is generally designated 10a and

this comprises a valve chamber **25***a* composed of upper and lower sections **32** and **33**, respectively, which have a flanged connection **34** operating to hold the edges of a flexible diagraph **35** which is disposed across the valve chamber and below openings **36** and **37** in the upper section **32**. Above the diaphragm **35** is a float **38** which has a rounded reduced portion **39** on its lower end.

Below the diaphragm and in the section **33** is a perforated valve guide **40** which has openings **41** therein and below this a seat **26***a* with which the mushroom type valve end **27***a* is normally engaged, the head being on a valve stem **28***a* which works through the valve guide **40** and has on its upper end a head **42** between which and the valve guide a helical spring **43** yieldingly holds the valve in closed position. A closed dome **44** below the valve seat **26***a* has communication with a tube **45**. A second tube **46** is connected with the interor of the section **33** of the valve chamber just above the valve guide **40**. In the presently described embodiment the tube **46** is connected with the spray arrangement, while the tube **45** corresponds in action to the tube **21** of the first described embodiment.

The diaphragm **35** acts as a seal for the valve chamber so as to cause the escaping water and air to pass up through the tube **46** and have a spouting effect. The weight of the float **38**, when the submarine is coming out of the water, would depress the diaphragm sufficiently to open the valve **27***a* and cause venting through the pipe **45**. The immediately foregoing embodiment is particularly useful and desirable to replace the valve structure **10** in the first described embodiment where some other arrangement of the invention is contemplated, such as a whale form or the like, rather than a naval submarine, where a substantial stream of combined water and air spouting from the simulation would make the same more realistic.

Upon close inspection of Figure 1 it will be found that the bottom of the hull is provided with openings **47** and **48** which communicate with the air chamber. When the submarine is placed in the water these openings admit water into the air chamber so as to cause the submarine to subside in the water and eventually sink in the manner of a submarine diving, and the diving continues until the valve stem head **18** strikes the bottom of the basin or pond, whereupon the air under pressure will be conveyed out of the tank **6** into the air chamber so as to expel the water from the air chamber sufficiently to cause the submarine to rise again to the surface. When the water in the air chamber has been sufficiently discharged to permit the submarine to come to the surface, the level of the water will be below that of the float **31** of the valve **10** in any case, so that the valve **27** will open and the air under pressure in the air chamber together with some water will pass up through the pipe **24** and out through the spout **23** so as to give a realistic spouting effect until the pressure within the air chamber has been dissipated. Of course, it is understood that the valve **14** reseats as soon as the submarine leaves the bottom of the basin or other surface to which the submarine had sunk, so that the action of the air in the air chamber just spoken of does not contemplate any continuous feeding of air from the compressed air tank **6**. It is the air pressure left in the air space which effects the spouting action. The escape of the air through the pipe **21** from the compressed air tank **6** to the upper part of the air chamber is provided in order to drive the water in the air chamber downwardly and out through the openings **47** and **48** by building up a head of compressed air above the water and in the upper part of the air chamber and thereby more efficiently evacuating the water from the air chamber upon the opening of the valve **13**.

Referring now to the embodiment of my invention shown in Figure 5 wherein the parts corresponding to those had in common with the priorly herein described embodiments of my invention are designated by corresponding numerals augmented by the letter "*b*", it will appear that in addition to the features of Figure 1, there is provided a valve arrangement whose purpose is to close the vent of the air chamber leading to the atmosphere, when the air pressure supply within the supply tank has fallen below a certain predetermined level or is about to become exhausted, so that sufficient air will be retained in the air chamber to make the submarine float on the surface of the water until the air pressure supply tank should be recharged.

When the supply tank **6***b* is recharged the air pressure works the diaphragm **50** against the resisting spring **51** in the housing **52**. The stem of the diaphragm is connected to one end of a walking beam **53** which is pivoted at **54** to an arm on the housing **55**. The opposite end of the beam **53** is connected at **56** to the stem of a valve **57** which has a seat **58** in the housing **55** which is mounted at the top of the hull **5***b* in registry with the valve **26***b*.

When the pressure tank **6***b* is recharged the valve **57** will be held open so that air from the air chamber can pass to the housing **25***b* and operate the float valve **26***b* described in connection with Figure 1. The float valve **26***b* would then operate independently until the pressure in the tank **6***b* fell below a pressure necessary to overcome the tension of the spring **51**, whereat the valve **57** would be closed and the air in the air chamber thereby confined therein to float the submarine.

Although I have shown and described herein preferred embodiments of my invention, it is to be definitely understood that I do not desire to limit the application of the invention thereto, and any change or changes may be made in the materials, and in the structure and arrangement of the parts, within the spirit of the invention and the scope of the subjoined claims.

What is claimed is:—

1. A diving toy of the character described comprising a hull including an air chamber formed with small openings in its bottom, a compressed air tank in said hull and having a compressed air discharge opening into said air chamber, a vent valve at the top of said air chamber, and a normally closed second valve having an operating element depending from said hull for contact with the bottom of a water basin in which said hull is operated, said second valve being interposed in said discharge so as to cause discharge of compressed air into said air chamber to replace water coming thereinto via said small openings and cause said hull to rise to the surface of the water.

2. A diving toy of the character described comprising a hull including an air chamber formed with small openings in its bottom, a compressed air tank in said hull and having a compressed air discharge opening into said air chamber, a vent

valve at the top of said air chamber, and a normally closed second valve having an operating element depending from said hull for contact with the bottom of a water basin in which said hull is operated, said second valve being interposed in said discharge so as to cause discharge of compressed air into said air chamber to replace water coming thereinto via said small openings and cause said hull to rise to the surface of the water, said vent valve including a float operated member adapted to fall to open position as the hull comes to the surface of the water so as to permit air and water under pressure in said air chamber to spout from the top of the hull.

3. A diving toy of the character described comprising a hull including an air chamber formed with small openings in its bottom, a compressed air tank in said hull and having a compressed air discharge opening into said air chamber, a vent valve at the top of said air chamber, and a normally closed second valve having an operating element depending from said hull for contact with the bottom of a water basin in which said hull is operated, said second valve being interposed in said discharge so as to cause discharge of compressed air into said air chamber to replace water coming thereinto via said small openings and cause said hull to rise to the surface of the water, said vent valve including a float operated member adapted to fall to open position as the hull comes to the surface of the water so as to permit air and water under pressure in said air chamber to spout from the top of the hull, said float operated member including a diaphragm, a float operatively engageable therewith, and a valve stem adapted to be operatively engaged by said diaphragm.

4. A diving toy of the character described comprising a hull including an air chamber formed with small openings in its bottom, a compressed air tank in said hull and having a compressed air discharge opening into said air chamber, a vent valve at the top of said air chamber, and a normally closed second valve having an operating element depending from said hull for contact with the bottom of a water basin in which said hull is operated, said second valve being interposed in said discharge so as to cause discharge of compressed air into said air chamber to replace water coming thereinto by way of said small opening and cause said hull to rise to the surface of the water, and control valve means effectively interposed between said air chamber and said vent valve, said control valve means being conditioned for operation by the pressure within said compressed air tank, said control valve means being arranged to cut off communication between said vent valve and said air chamber when the air pressure in said compressed air tank falls below a certain level.

5. A toy submarine of the class described comprising a hollow hull embodying a chamber apertured to permit water to enter the chamber and thereby load the hull to cause it to submerge in a body of water, a compressed air reservoir mounted in said hull, said reservoir being provided with a valved air discharge having communication with said chamber to force the water therefrom, and the valve thereof being provided with an operating element including a stem for reciprocation in the bottom of the hull, said stem projecting beyond the hull for contact with the bottom of the body of water in the manner and for the purposes described.

6. A diving toy of the class described comprising a hull including a chamber formed with air intake and discharge openings, a compressed air tank in said chamber, said tank being provided with air discharge means communicating with the chamber, said means including a normally closed valve having an operating device extending to the exterior of the hull for actuation by pressure, a spout rising from the top of said hull and in communication with said chamber, and valve means associated therewith in the manner and for the purposes described.

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