

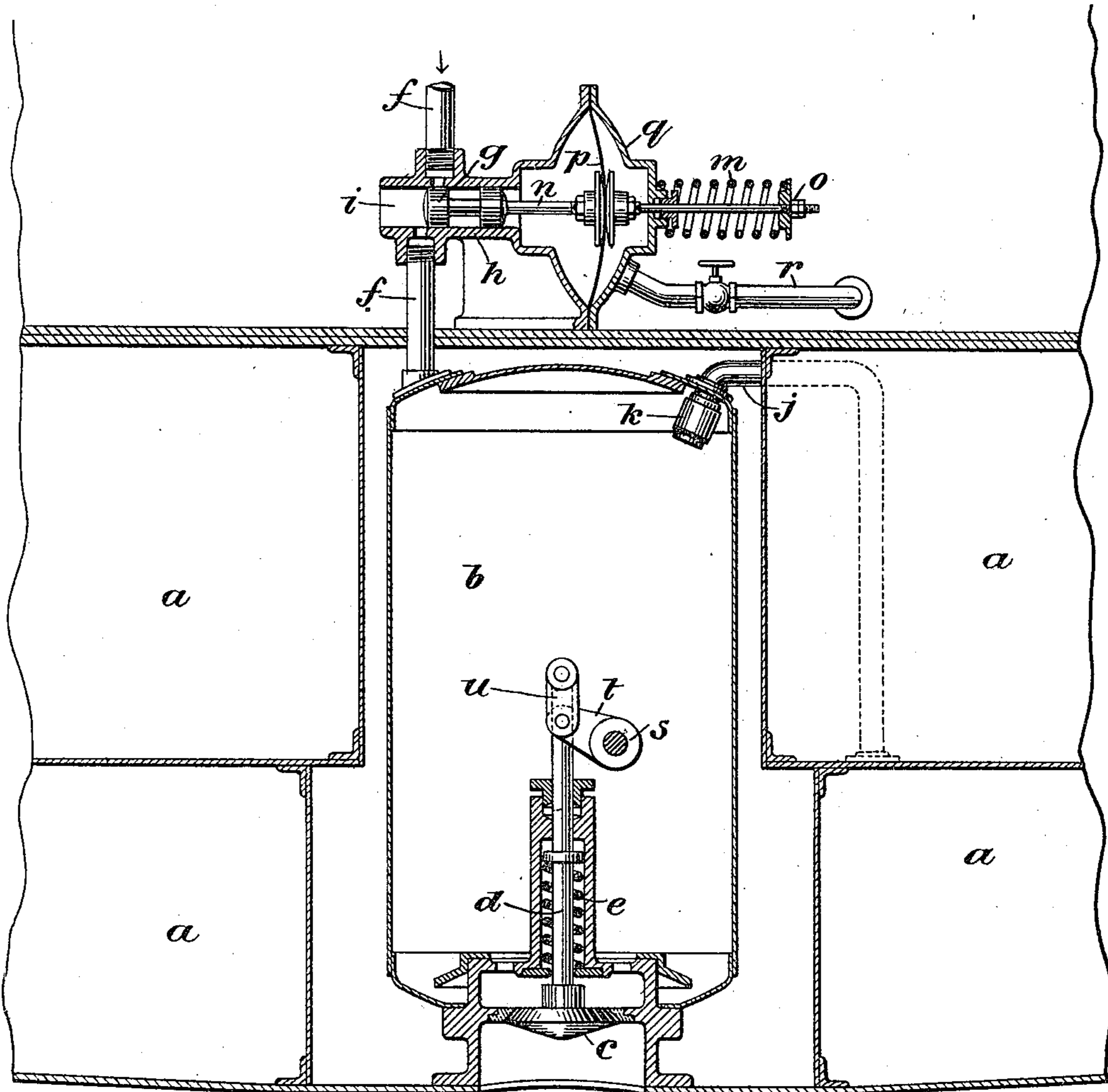
No. 681,221.

Patented Aug. 27, 1901.

J. P. HOLLAND.  
SUBMARINE BOAT.

(Application filed Sept. 27, 1900.)

(No Model.)



Witnesses:

Raphael Ketter

Peter A. Ross.

Inventor

John P. Holland

by *Henry* *Councils*, Atty

# UNITED STATES PATENT OFFICE.

JOHN P. HOLLAND, OF NEWARK, NEW JERSEY, ASSIGNOR TO ELECTRIC BOAT COMPANY, OF NEW JERSEY.

## SUBMARINE BOAT.

SPECIFICATION forming part of Letters Patent No. 681,221, dated August 27, 1901.

Application filed September 27, 1900. Serial No. 31,221. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN P. HOLLAND, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented certain Improvements in Submarine or Submergeable Boats, of which the following is a specification.

This invention relates to diving or submarine boats; and the object of the invention is to provide means to control automatically the depth to which the boat shall descend in order to avoid the risk of injury from striking the bottom of the waterway and from the hydrostatic pressure encountered at too-great depths.

In carrying out the invention the boat is provided with the usual ballast-tanks for water, and these are connected with an auxiliary tank, which is also normally filled with water. This auxiliary tank is connected at its top or upper part with a source of compressed air or aeriform fluid, the valve which controls the admission of fluid to the tank being under the automatic control of a diaphragm device, which is actuated to close said valve by a spring and to open the valve by the hydrostatic pressure on the diaphragm from the water of submersion. There is a valve in the bottom of the auxiliary tank opening outwardly to the water of submersion. When the boat shall have reached the predetermined depth of submersion, the hydrostatic pressure on the diaphragm acts to open the air-valve and admit fluid under tension to the auxiliary tank. The fluid-pressure being greater than the hydrostatic pressure tending to close the outlet-valve of the tank, the water is forced out of the latter and the buoyancy of the boat increased thereby to an extent sufficient to arrest its descent.

The accompanying drawing includes a single figure, which is a vertical transverse section of a part of a submarine boat and illustrates an embodiment of the invention.

*a* represents the ordinary water-ballast tanks of the boat, and *b* is the auxiliary tank. At the bottom of the tank *b* is a valve *c*, which opens outwardly to the water of submersion exterior to the boat. This valve has a guided stem *d* and a spring *e*, which serves to hold the

valve up to its seat. An air-pipe *f* from some source of compressed air or aeriform fluid in the boat is connected with the tank *b*, preferably at its upper part, and this air-inlet is controlled by a valve *g* in a chamber *h*. Preferably the valve *g* will be a balanced double-piston valve, as shown, and the chamber *h* will be open, normally at *i*, to the interior of the boat for the escape of the contained air when the tank is being filled with water.

The tank *b* may be filled from the tanks *a* before diving by means of a suitable connecting-pipe *j*, provided with a check-valve *k* to prevent the water from flowing back when the tank *b* is discharged.

The air-valve *g* is held closed normally by a spring *m* on its stem *n*, and the tension of this spring may be nicely regulated by a nut *o*. Connected with the valve-stem *n* is a diaphragm *p* in a casing *q*, this diaphragm being exposed to the pressure of the water of submergence through a pipe *r* in a manner to antagonize the spring *m*. The spring *m* being set to balance a predetermined amount of hydrostatic pressure on the diaphragm and the tank *b* filled with water, the operation is as follows: The boat descends, and when it shall have reached the predetermined depth of submersion the hydrostatic pressure on the diaphragm *p* will overcome the spring *m* and open the air-valve *g*. The compressed air or fluid will enter the tank *b* and drive out the contained water therefrom at the valve *c*, which will open outward. This will check the descent of the boat and allow it to rise until the pressure on the diaphragm *p* does not suffice to overcome the spring *m*, when the air-valve will be closed by the spring and will cut off the influx of air to the tank *b*.

In order that the valve *c* may be opened by hand if occasion requires it, a shaft *s* extends into the tank *b* and has on it a crank *t*, coupled to the stem of the valve *c* by a link *u*. By rocking this shaft the valve may be opened.

It will be obvious that the invention is not limited to the specific construction herein shown, as this construction may be varied without departing materially from the invention.

The tank *b* may be filled with water from

any source and not necessarily from the ballast-tanks *a*. It is convenient, however, to fill it as described.

It will be understood that the diaphragm-casing and diaphragm herein employed are not new in themselves, and this invention is not restricted to their use. A cylinder and piston might be employed in lieu thereof.

Having thus described my invention, I claim—

1. In a submarine or submergeable boat, the combination with a water-ballast tank having a valve-controlled outlet to the water of submergence, and an inlet for a compressed aeriform fluid, of a valve controlling said fluid-inlet, a spring tending to close said fluid-valve, and a diaphragm, open to pressure from the water of submergence and tending to open the fluid-valve.
2. In a submarine or submergeable boat, the combination with a tight water-ballast tank having a valve-controlled outlet to the water of submergence, and an inlet for a compressed aeriform fluid, of a valve-chamber *h* open at *i* to the interior of the boat, and connected at opposite sides with the fluid-inlet, a balanced valve *g* in said chamber, its stem *n*, a spring *m*, tending to hold the valve *g* closed, the casing *q*, open to the water of submergence, and the diaphragm *p*, operating said valve in said casing.
3. In a submarine or submergeable boat, the combination with the main water-ballast

tanks, of the tank *b*, a pipe controlled by a check-valve and connecting the tank *b* with a main tank for filling the former, a valve *c* in the bottom of the tank *b*, and open to the water of submergence, and means, automatically controlled by the pressure of the water of submergence, for forcing the water from the tank *b* at a predetermined depth of submergence.

4. In a submarine or submergeable boat, the combination with a water-ballast tank having a valve-controlled outlet to the water of submergence, said valve opening from pressure within said tank, of means for opening said valve by hand, and automatic means, controlled by the pressure of the water of submergence for admitting an aeriform fluid to said tank for expelling the contained water.

5. In a submarine or submergeable boat, the combination with a water-ballast tank having a valve-controlled outlet to the water of submergence, said valve opening outwardly, of automatic means, controlled by the pressure of the water of submergence for admitting an aeriform fluid to said tank for expelling the contained water.

In witness whereof I have hereunto signed my name, this 20th day of September, 1900, in the presence of two subscribing witnesses.

JOHN P. HOLLAND.

Witnesses:

PETER A. ROSS,  
L. N. LEGENDRE.