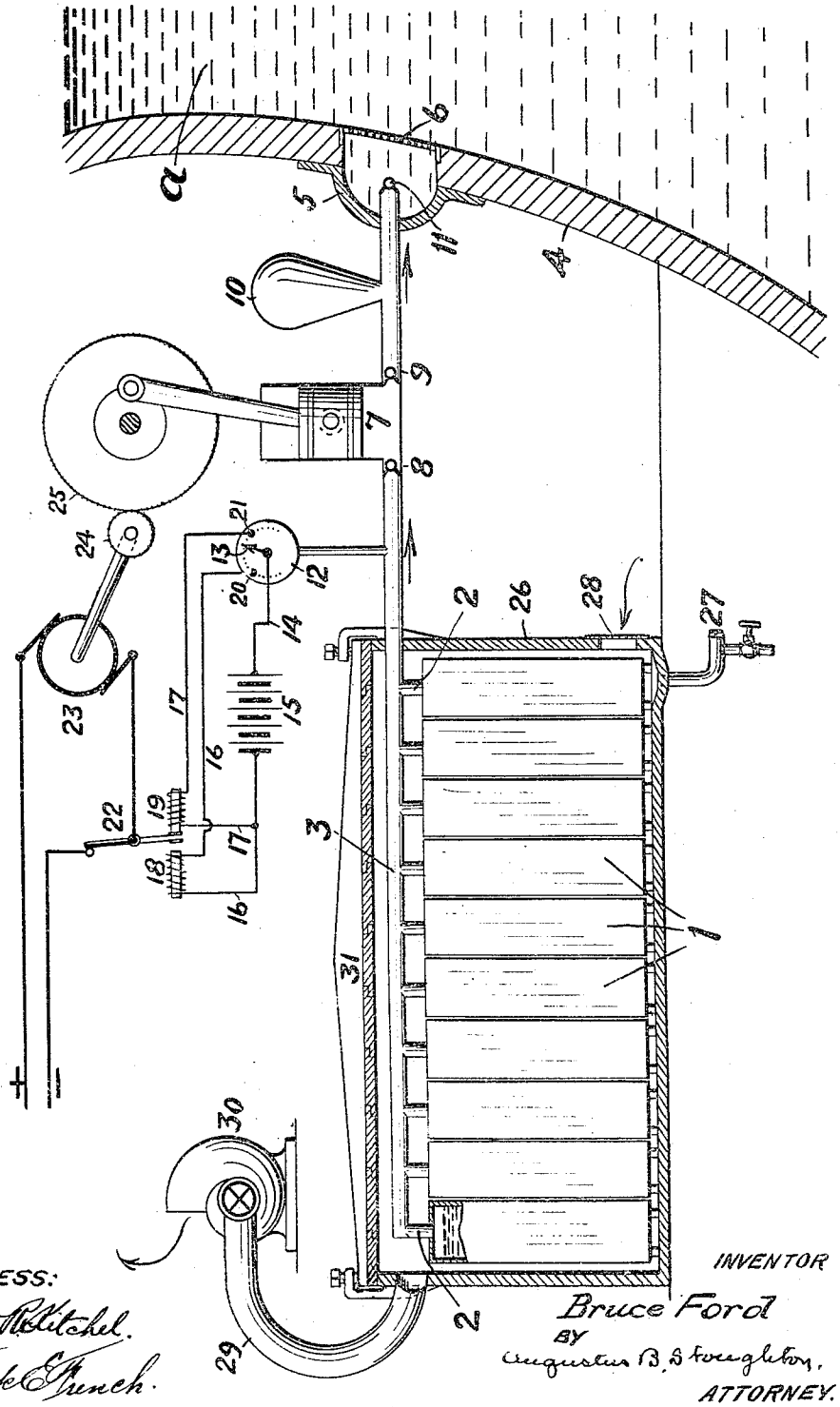
B. FORD.

STORAGE BATTERY VENTILATION FOR SUBMARINES.

APPLICATION FILED MAR. 20, 1916.

1,285,659. Patented Nov. 26, 1918.



WITNESS:

Robt. Robitchel.

Frank E. French.

INVENTOR

Bruce Ford

BY

Augustus B. Stoughton,

ATTORNEY.

UNITED STATES PATENT OFFICE.

BRUCE FORD, OF PHILADELPHIA, PENNSYLVANIA.

STORAGE-BATTERY VENTILATION FOR SUBMARINES.

1,285,659. Specification of Letters Patent. Patented Nov. 26, 1918.

Application filed March 20, 1916. Serial No. 85,305.

To all whom it may concern:

Be it known that I, BRUCE FORD, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Storage-Battery Ventilation for Submarines, of which the following is a specification.

The principal object of the present invention is to provide for ventilating the battery cells to the exterior of the shell of a submarine or the like, even when submerged, whereby the interior of the shell of the submarine is kept free from battery vapors or gases, and another object of the present invention is to provide for automatically accomplishing the above result.

The invention will be claimed at the end hereof but will be first described in connection with the accompanying drawings forming part hereof and in which there is diagrammatically illustrated, partly in section and partly in elevation, apparatus embodying features of the invention.

In the drawings 1, are the storage battery cells. Each of these cells is closed and its interior is connected with a vent pipe 2. The vent pipes 2, are respectively connected with a ventilating pipe 3, which is arranged to discharge through and to the outside of the shell or wall 4, of a submarine or like boat. As shown this pipe 3, has its discharge end arranged through a fitting 5, and terminating short of a screen 6, so that the pipe terminates between the fitting 5, and screen 6, and can discharge into the water *a*. 7, is a pump interposed in the pipe 3, and provided with inlet and outlet check valves shown diagrammatically at 8 and 9. 10, is a pressure chamber in communication with the pipe 3, on the outlet side of the pump. At or near the end of the pipe 3, there is a check valve shown diagrammatically at 11. On the pipe 3, at the battery side of the pump 7, there is a gage 12, (either vacuum, pressure or combination) the hand 13, of which controls the circuit 14, with source 15, and branches 16 and 17, respectively including solenoids 18 and 19, and leading to dial contacts 20 and 21. The solenoids or electro-magnets operate the motor switch 22, which starts and stops the motor 23. The motor 23, as by gears 24 and 25, operates the piston of the pump 7. The cells constituting the battery are shown as arranged in a box or chamber 26, drained as at 27, and having an inlet 28, through which air can be drawn by the connection 29, and its exhauster 30. The purpose is to dispose of any acid, electrolyte or other matter that may escape from the cells by some accident or other, for it is the intention that the cells shall remain closed; and primarily to provide a distinct and separate system of air circulation around and between the cells for regulating the battery temperature. The cover 31, of the box or chamber 26, is shown as removably clamped to place.

In describing the operation in connection with the accompanying drawings the pump 7, is assumed to be running because the motor switch 22, is in proper position for running the motor although neither of the solenoids or electro-magnets 18 or 19, is energized. The pump operates to remove gas or vapor from the interior of each of the cells 1, and to discharge the same past the check valves 8, 9 and 11, into the water *a*, against the head thereof, building up the pressure necessary for that purpose, and in this operation the pressure chamber 10, is useful. The pump is started and stopped in response to the gas or vapor pressure of the cells 1. The term pressure is relative and includes partial vacuum. When that pressure is relatively low, the hand 13, in connection with the contact 20, and electro-magnet 18, operates the switch 22, to stop the motor 23, and pump 7. When this gas or vapor pressure rises sufficiently to bring the hand 13, to the contact 21, the motor 23, is started by the operation of the electro-magnet 19, and motor switch 22. In intermediate positions of the hand 13, the pump is running. The relative positions of the contacts 20 and 21, is adjustable so that the ventilating system can be run at all times under partial vacuum, which has its advantage. The check valve 11, serves to exclude water from the system and more particularly from the chamber 10. It is possible that gas and vapor may be collected in the chamber 10, at a pressure insufficient to overcome the head of the water *a*, but as the boat rises the head diminishes and such gas and vapor is expelled into the water. The described system is of course useful when the battery is being re-charged and in that case it may be discharged into the air since the boat is at the surface and the discharge end of the pipe 3, may be above the water line. The source 15, may be any source of current available.

Obviously changes may be made in details of construction and arrangement so that the invention is not limited as to those matters or otherwise than as the prior state of the art and the appended claims may require.

What I claim is:

1. The combination in a submarine of a plurality of closed battery cells, a ventilation connection extending from the interior of each cell through the shell or wall of the submarine, and a pump for said connection adapted to operate against the hydraulic head when the submarine is submerged to ventilate the cell through the water.

2. In a submarine the combination of a plurality of closed cells, a ventilation connection from the interior of the closed cells to the exterior of the submarine, a pump for said connection, means for driving the pump, and a pressure device responsive to predetermined maximum and minimum pressure in the connection and adapted to automatically control the operation of the pump.

3. In a submarine a closed battery cell, a ventilation connection from the interior of the cell through the wall of the submarine, a pump for said connection, a pressure chamber for said connection arranged on the outlet side of the pump, and a check valve on the outlet side of the pressure chamber, substantially as described.

4. In a submarine the combination of a storage battery consisting of a plurality of closed cells, a receptacle containing the storage battery, means for inducing a circulation through said receptacle and outside of the closed cells, and independent means for ventilating the interior of the cells of the battery.

BRUCE FORD.