

L. NOÉ.  
 MEANS FOR EXPELLING THE GAS ENGINE EXHAUST OF SUBMARINE BOATS.  
 APPLICATION FILED OCT. 24, 1908.

953,283.

Patented Mar. 29, 1910.

Fig. 1.

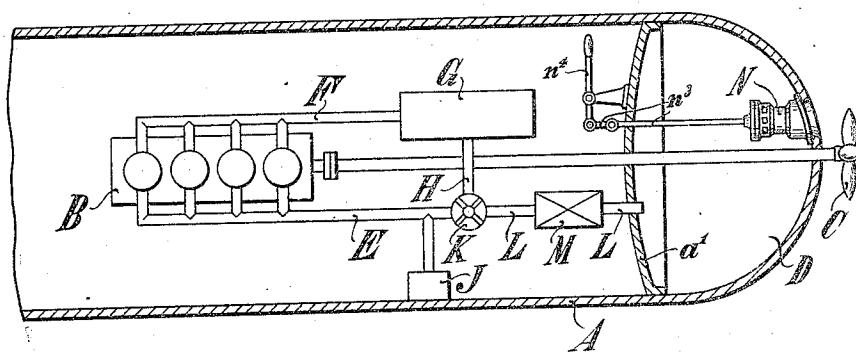
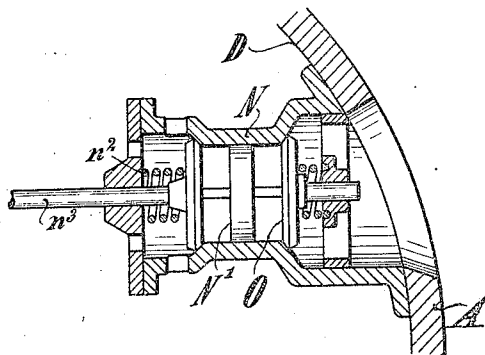


Fig. 2.



Witnesses;  
 J. M. Kynkoop.  
 G. B. Mellon

Inventor:  
 Ludwig Noé.  
 By Knight & Co.  
 Attorneys.

# UNITED STATES PATENT OFFICE.

LUDWIG NOÉ, OF KIEL, GERMANY, ASSIGNOR TO FRIED. KRUPP AKTIENGESellschaft  
GERMANIAWERFT, OF KIEL-GAARTEN, GERMANY.

MEANS FOR EXPPELLING THE GAS-ENGINE EXHAUST OF SUBMARINE BOATS.

953,283.

Specification of Letters Patent.

Patented Mar. 29, 1910.

Application filed October 24, 1908. Serial No. 459,393.

*To all whom it may concern:*

Be it known that I, LUDWIG NOÉ, a subject of the Emperor of Germany, and residing at Fleethorn 32, Kiel, Germany, have invented certain new and useful Improvements in Means for Expelling the Gas-Engine Exhaust of Submarine Boats, of which the following is a specification.

The present invention relates to the type of diving boats which, during the submarine travel, is driven by gas-engines the exhaust gases of which are not condensable. These exhaust gases are, according to a known process, conducted to the exterior of the boat and rise to the surface of the water in the form of gas bubbles, and at intervals corresponding to the cycle of the gas-engine. Experience has demonstrated that the rising gas bubbles are readily discernible on the surface of the water and therefore give the ships of the enemy a reliable means for getting knowledge of the presence of a diving boat and permit them to draw conclusions as to the direction and speed of travel of the boat. The enemy is therefore in position to take measures for defense or counter-attack.

The object of the present invention is to provide a process of expelling the exhaust gases which makes it difficult for the enemy to ascertain the direction of travel and the speed of the boat.

The invention consists in conducting the exhaust gases to the exterior of the boat at great intervals of time, the gases being stored in receptacles in the known manner. The escape of the gases preferably takes place at irregular intervals of time and in such a manner that the gases as far as possible rise to the surface in a single gas-bubble. It is true that these great gas bubbles, which according to the present invention become visible on the surface at irregular intervals of time, indicate the presence of the boat at the time they rise, but they do not assist in ascertaining the direction of travel and speed of the boat.

The accompanying drawings show a submarine boat constructed for carrying out the process according to the present invention.

Figure 1 shows a portion of the boat in horizontal longitudinal section, and Fig. 2 shows a detail in section.

A indicates the hull of the boat, B a gas engine which drives the propeller C; and D

indicates a strong receptacle which is separated from the interior space of the boat by an arched wall  $a^1$  and which serves for storing the exhaust gases of the engine. A suction-pipe E is connected to the engine B at one side and an exhaust-pipe F is connected to the engine at the other side. The exhaust-pipe F leads to a gas-purifier and cooler G which in turn is connected with the suction-pipe E by a pipe H so that the gas engine B can work in a closed cycle E B F G H E in the known manner. An oxygen tank J is connected with the suction-pipe E.

At the junction of the pipes E and H is inserted a pressure-valve K which is constructed in such a manner that it opens automatically when the pressure in the pipes H E exceeds a predetermined limit. When the valve K is open it provides communication between the pipes E H and a pipe L which leads to the receptacle D. The pipe L contains a pump M by means of which the surplus of gas can be forced from the pipes E H into the receptacle D when the valve K is open. The pipe L is provided at its end with a check-valve (not shown in the drawings) to prevent the stored gases in the receptacle D from flowing back into the pipe L.

In order to make it possible to rapidly empty the receptacle D a valve  $N^1$  is provided near the propeller C in a housing N which valve is held closed by a spring  $n^2$  (Fig. 2). In the housing N of this valve is inserted a check-valve O which serves for preventing the outside water from entering the receptacle D after equalization of pressure has been established between the interior of the receptacle and the water exterior to the boat.

During the surface travel the air for combustion necessary for the operation of the gas engine is drawn in from the interior of the boat through a suction-pipe (not shown in the drawings) while the exhaust gases are conducted to the exterior of the boat through an exhaust-pipe (not shown). However, during the submarine travel the operation of the gas engine takes place in a closed cycle, that is in such a manner that the exhaust gases expelled from the engine through the pipe F are cooled and purified in G and after they have been enriched with oxygen from the tank J they are again drawn in by the engine through the pipe E. When the pressure in the pipes F G H E

exceeds the counter-pressure permissible for the practical operation of the engine (and it will do so in a short time due to the continuous introduction of fuel and oxygen) the surplus of the exhaust gases escapes through the valve K into the pipe L and is forced into the receptacle D by the pump M. The exhaust gases are stored in the receptacle D until a favorable opportunity presents itself for the expulsion of the gases, this opportunity being dependent on the fighting position, or until the pressure in the receptacle has reached the permissible limit. The receptacle is then emptied by opening the valve N N<sup>1</sup> by means of a hand-lever n<sup>4</sup> connected with the valve spindle n<sup>3</sup>.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:—

20 1. A process of expelling the exhaust-gases of gas-engines during the submarine

travel of diving boats, consisting in storing the gases and expelling them at great intervals of time.

2. A process of expelling the exhaust-gases of gas-engines during the submarine travel of diving boats, consisting in storing the gases and expelling them at great and irregular intervals of time.

3. A process of expelling the exhaust-gases of gas-engines during the submarine travel of diving boats, consisting in storing the gases and expelling them at great and irregular intervals of time, to cause the gases to rise to the surface in a single gas-bubble.

The foregoing specification signed at Kiel, Germany, this 5th day of October, 1908.

LUDWIG NOÉ.

In presence of—

JULIUS RÖPKE,  
HEINRICH HAUSCHILDT.