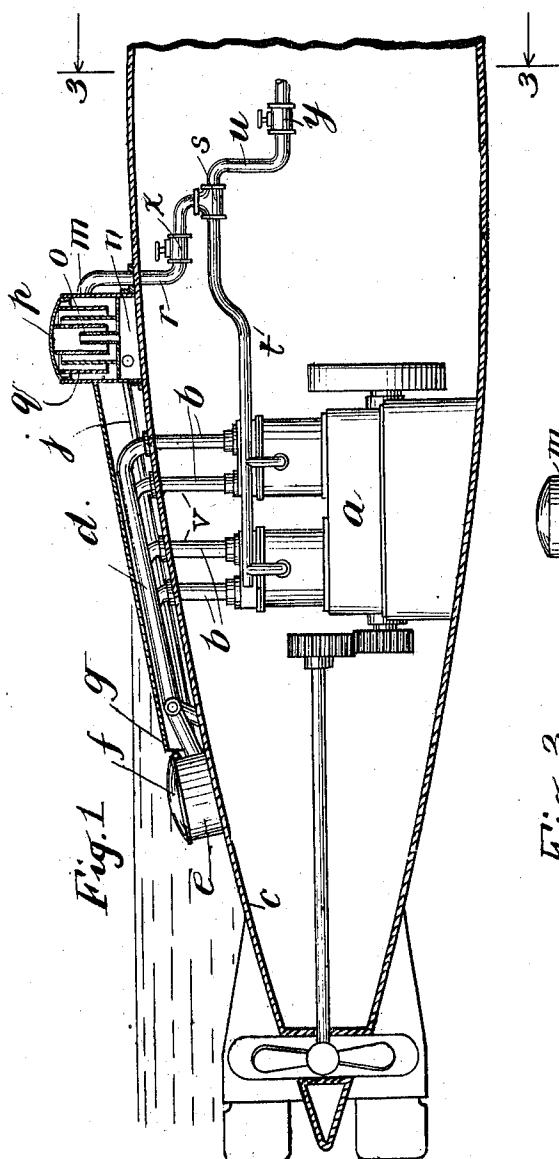


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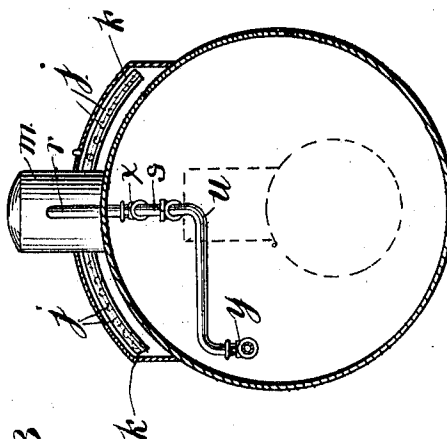
2 SHEETS—SHEET 1.



WITNESSES:

W. D. Breyer
 L. B. Penfield

Fig. 3



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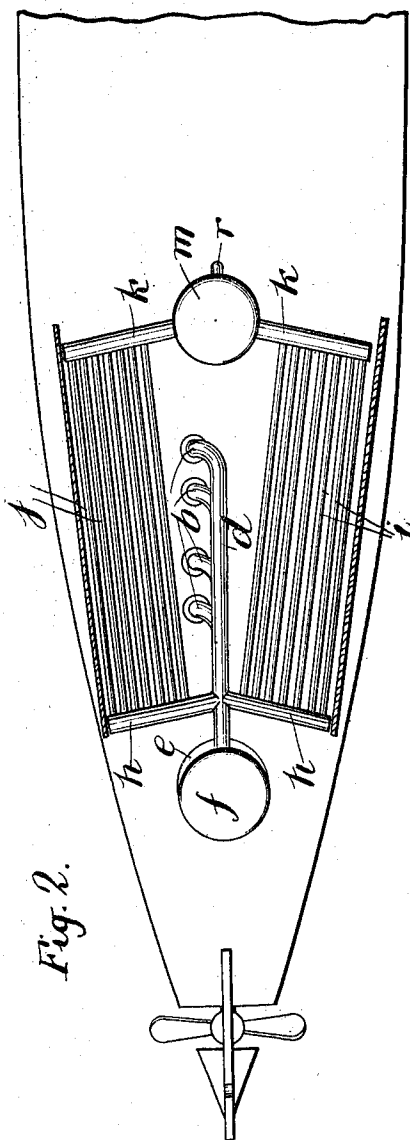


Fig. 2.

WITNESSES:

W. D. Brewer.
 L. B. Purified

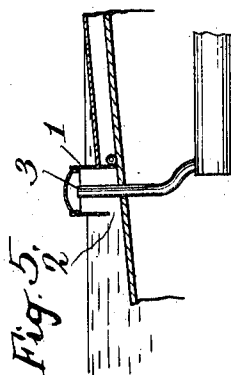


Fig. 5.

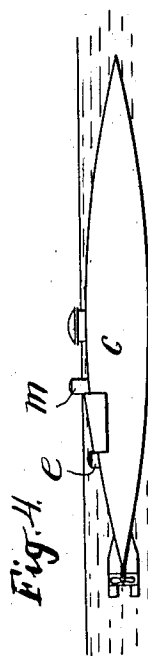


Fig. 4.

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UNITED STATES PATENT OFFICE.

GEORGE FRANÇOIS JAUBERT, OF PARIS, FRANCE.

APPARATUS FOR DISCHARGING EXCESS EXHAUST GASES FROM MOTORS WORKING ON A CLOSED CYCLE.

953,146.

Specification of Letters Patent.

Patented Mar. 29, 1910.

Application filed March 25, 1909. Serial No. 485,848.

To all whom it may concern:

Be it known that I, GEORGE FRANÇOIS JAUBERT, of 155 Boulevard Malesherbes, Paris, France, have invented certain new and useful Improvements in and Relating to Apparatus for Discharging Excess Exhaust Gases from Motors Working on a Closed Cycle, of which the following is a specification.

This invention has for its object a process and corresponding apparatus for the expulsion of the excess of exhaust gases from motors working on a closed cycle, and is principally intended for those used in submarines.

In motors of this kind used for propelling submarines, and working on an open cycle during navigation on the surface and on a closed cycle during immersion, the excess of exhaust gases not used in the formation of a firing mixture by dilution with oxygen, are expelled from the boat by an air pump of the type used for condensers, which is controlled by the motor.

The invention has for its principal object to allow the automatic exhaust of these gases without the help of any special pump, and, moreover, to perform the operation outside the hull, so as to avoid any leakage of bad gases into the interior of the boat.

In the accompanying drawing:—Figure 1 shows part of the longitudinal section of a submarine furnished with an arrangement which allows the invention to be carried into effect. Fig. 2 is a plan view, and Fig. 3 is a cross-section along the line 3—3 in Fig. 1. Fig. 4 is an outside view of the boat. Fig. 5 is a modification of the exhaust chest.

The process consists in passing the exhaust gases from the motor into a chamber which is connected with the cooling and purifying apparatus, and which is provided with a stop-valve or similar mechanism arranged to open at a given pressure in the cycle, and in using the exhaust back-pressure to expel the excess of gas without the help of a pump or the like.

The motor *a* is provided with exhaust pipes *b*, equal in number to the motor cylinders, passing through water-tight joints in the hull *c* of the boat, and leading to a longitudinal receiver *d* (Fig. 2) fixed to the hull. This receiver communicates with an exhaust chest or chamber *e* (Figs. 1 and 4), formed, for example, with a lid or cover *f* opening outward, constantly reclosed by the weight

of water above it, and capable of swinging on a hinge *g*.

Just before the chest *e*, two transverse receivers *h* branch out from the pipe *d*, and communicate by two sets of longitudinal tubes *i j* with two receivers *k*, leading to the dome *m* fixed on the hull. In the lower part of this dome is the admission chamber *n*, from which the pipe *o* leads to the upper part *p*, which is furnished with baffles *q* and communicates by the pipe *r*, passing through the hull of the boat, with a three-way-cock *s*, from which a pipe *t* passes to the motor. This cock *s* may further be provided with a tube *u*, by which oxygen can be introduced. The apparatus is completed by regulators, stop valves, and the like provided to regulate the admission of oxygen as well as the exhaust gases from the motor, and to keep the volume and pressure constant. These details might be placed at *x* and *y* for example.

The working is as follows:—During the working on an open cycle when proceeding on the surface, since the cover *f* of the exhaust chest *e* is freed from the column of water which it supports during immersion, the exhaust gases led by the pipes *b* into the receiver *d* pass into the chamber *e* and cause the cover to rise, escaping into the atmosphere without any appreciable back-pressure. When working on a closed cycle, the lid *f* is weighted by the pressure of the water above it, so as only to open at some determined pressure in the cycle, regulated by means of the valve *w*; the exhaust gases then pass from the motor through the receiver *d*, through the transverse receiver *h*, and through the two series of tubes *i j*, in which they are cooled. They next collect in the receivers *k* from which they pass to the dome *m*. Continuing their course through the baffles *q*, they deposit, due to contact with these, the condensed water, oil and petrol which they contain in suspension; these may be collected inside the boat by a system of draining pipes not shown. (The set of tubes comprises also purifying apparatus which is not shown.) The gases escape from the dome *m* by the regulating device *z*, and the pipe *r*, and after passing through the cock *s* where they receive a suitable addition of oxygen, they pass to the motor as a firing mixture. The excess of gas which is not used in working the motor, tends to in-

crease the pressure in the cycle, and causes the cover *f* to open, allowing the gas to escape outside.

The advantages are as follows:—The invention dispenses with the pumps and similar mechanisms which are used to expel the excess of gas and which are driven by the motor. The efficiency of the motor is thus increased, by diminishing the effort needed without increasing the back-pressure, since it is well-known that even when running in the open air, explosion motors always exhaust at a much higher pressure than that given by the column of water ten to fifteen meters in height which is supported by a submarine during immersion. The exhaust chest may have any shape or arrangement, and may carry any number of valves, furnished with springs or other means of loading, or not, just as desired.

The receivers *h* and *k*, and the sets of tubes *i j*, may be surrounded with sheet-iron so as to obtain a thorough circulation of water around them, and to allow the gases of combustion to be as completely cooled as possible.

The exhaust chest may have the arrangement shown in Fig. 5, consisting of an inverted bell 1 fixed to the hull, having an opening 2 in its lower portion, constantly reclosed after the escape of gas by the weight of water above it, and with the pipe 3 discharging into the upper portion.

The invention can be applied to motors of all kinds working on a closed cycle, and chiefly to the motors of submarines.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:

1. In a power system for submarine boats, an internal combustion motor, cooling and purifying apparatus for the products of combustion, and conduits leading from the combustion chamber of the motor to the cooling and purifying apparatus and returning from such apparatus to the combustion chamber, whereby the apparatus may be worked on a closed cycle, in combination with an exhaust conduit leading outside the hull and a loaded valve in the exhaust conduit, whereby the pressure of the exhaust gases is effective to discharge the excess gases overboard.

2. In a power system for submarine boats, an internal combustion motor, cooling and purifying apparatus for the products of com-

bustion, and conduits leading from the combustion chamber of the motor to the cooling and purifying apparatus and returning from such apparatus to the combustion chamber, whereby the apparatus may be worked on a closed cycle, in combination with an exhaust conduit leading outside the hull and a valve in the exhaust conduit loaded by the water of submersion, whereby the pressure of the exhaust gases is effective to discharge the excess gases overboard against the pressure of the water of submersion.

3. In a power system for submarine boats, an internal combustion motor, cooling and purifying apparatus for the products of combustion, conduits leading from the combustion chamber of the motor to the cooling and purifying apparatus, and returning from such apparatus to the combustion chamber, whereby the apparatus may be worked on a closed cycle, and a valve controlling said conduits, in combination with an exhaust conduit leading outside the hull and a valve in the exhaust conduit loaded by the water of submersion, whereby the pressure of the exhaust gases is effective to discharge the excess gases overboard against the pressure of submersion.

4. In a power system for submarine boats, an internal combustion motor, cooling and purifying apparatus for the products of combustion, such apparatus being composed of a series of tubes *i j*, and a dome *m* containing baffle-plates, conduits leading from the combustion chamber of the motor to the cooling and purifying apparatus and returning from such apparatus to the combustion chamber, whereby the apparatus may be worked on a closed cycle, and a valve *x* controlling the flow of fluid through such conduits, in combination with an exhaust conduit leading outside the hull and an exhaust receiver *e* covering the end of said exhaust conduit and closed by a hinged cap *f*, which, upon submersion is loaded by the surrounding water, whereby the pressure of the exhaust gases is effective to discharge the excess gases overboard against the pressure of the water of submersion.

In testimony whereof I have hereunto placed my hand at Paris, France, this sixteenth day of March 1909.

GEORGE FRANÇOIS JAUBERT.

In the presence of two witnesses:

H. C. COXE,

HENRY SCHWAB.