E. BOURDELLES.

TORPEDO.

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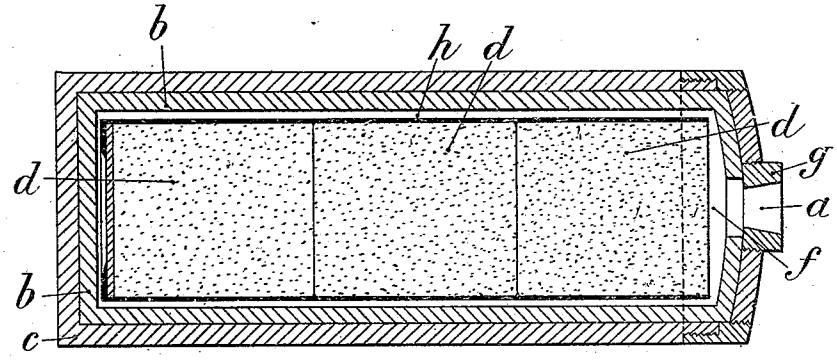
958,990. Patented May 24, 1910.



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UNITED STATES PATENT OFFICE.

EMILE BOURDELLES, OF PARIS, FRANCE.

TORPEDO.

958,990. Specification of Letters Patent. Patented May 24, 1910.

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To all whom it may concern:

Be it known that I, EMILE BOURDELLES, a citizen of the Republic of France, residing at Paris, France, have invented Improvements in or Relating to Torpedoes, of which the following is a specification.

My invention relates generally to self-propelling submarine torpedoes, and has reference, especially, to the means employed for propelling such torpedoes through the water.

The invention contemplates an improvement in the class of propelling means employing a powder charge in a chamber of the torpedo, and the principal object of the invention is to provide means whereby a constant area of combustion for the entire powder charge is provided, resulting in a reactive action of the gases to obtain a constant propelling force.

Stated in general terms, my invention consists in inclosing one or more blocks of powder, placed in the torpedo chamber in a sheath or covering of extensible material, such as rubber for example, the rubber being tensioned about the powder.

An embodiment of the invention is illustratively exemplified in the accompanying drawing which shows a longitudinal sectional view of a powder charge such as herein referred to.

In any suitable part of a torpedo, preferably its rear part, there is formed a suitable chamber into which is inserted a metallic envelop *c* which is preferably lined with a non-conductor of heat *b*. One end of both envelop and lining is removable and has formed therein one or more gas exhaust orifices *a*, these orifices being so arranged that the resultant of the escaping gases coincides with the axis of the torpedo. The lined envelop is adapted to contain the powder charge *d*, which may consist of a single block or a plurality of juxtaposed blocks of powder adapted to burn in parallel layers. Prior to the introduction of the powder into the envelop, the former is inserted into a tube *h* of extensible material such as rubber, the diameter of the tube being less than that of the powder whereby the tube is extended or stretched about the blocks.

The outer surface of the powder block should be smooth. Should a block be employed which has a rough or uneven surface, the latter should be coated with a material having about the same consistency as rubber solution.

After the powder has been inserted into the tube *h*, the entire charge is introduced into the envelop *c*, appearing as shown in the drawing and being ready for ignition. The powder charge may, if desired, be ignited at both its ends, or one end only may be left free and the other protected by a layer or coating *i* of a material which is a non conductor of heat. When the powder charge is ignited the same will burn in parallel layers, the combustion being uniform and not extending to the lateral surface of the cylinder, owing to the combined pressure of the gas in the cylinder and the rubber sheath *h*. The gases will pass out through the orifices *a*, and the reactions thereof in the water will be uniform and the forward propulsion of the torpedo will also be uniform. The gas pressure prevailing in the entire envelop *c* is uniform, and is sufficiently great to counterbalance the pressure of any gas which might attempt to enter between the inner surface of the tube *h* and the outer surface of the block *d*.

Experience has shown that, if the rubber tube is from 1 to two millimeters thick and if the duration of combustion of the powder block is from 1 to two minutes, one part of the tube (the rear half or two thirds) remains intact in the casing. The tube presents traces of combustion and fusion, but continues to cover that part of the powder-block that has not been burned. The reason for the preservation, intact, of the tube on the unconsumed part of the powder block is based on the following facts: 1. As all powders, except pure nitroglycerin, are not completely combustible because of the insufficient oxygen content of their molecules, the rubber, which is not readily inflammable, can burn only under the action of the combustible power of the powder. 2. Even though it be assumed that the rubber has in its molecules enough oyygen to burn, and that its own rate of combustion be equal to one half of that of the powder (and as a matter of fact the rate is less than that), it will be apparent that the combustion of powder will progress parallel to the axis twice as quickly as that of the rubber. Thus the tube will serve its intended purpose, namely, to prevent the combustion of the

powder cylinder from extending on its outer side.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a torpedo having a chamber formed therein, the combination with a powder charge in the chamber, of an extensible tensioned sheath about the powder charge.

2. In a torpedo having a chamber formed therein, the combination with a plurality of juxtaposed powder blocks in the chamber, of an extensible tensioned sheath about the powder blocks.

3. In a torpedo having a chamber formed therein, the combination with an orificed metallic envelop in said chamber, of a powder charge in said envelop, and an extensible tensioned sheath about said powder charge.

4. In a torpedo having a chamber formed therein, the combination with an orificed metallic envelop in said chamber, of a lining of material in said envelop which is a non conductor of heat, a powder charge in said envelop, and a sheath of extensible tensioned material about said powder charge.

5. In a torpedo having a chamber formed therein, the combination with an insulation lined metallic envelop in said chamber, of a plurality of juxtaposed powder blocks in the envelop, and a tensioned rubber sheath about said powder blocks.

Signed at Paris, France this twenty-sixth day of October 1908.

EMILE BOURDELLES.

Witnesses:
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