(No Model.)

E. W. KELLOGG.

METHOD OF OPERATING GAS ENGINES IN TORPEDO BOATS.

No. 265,423. Patented Oct. 3, 1882.

Fig. 1.

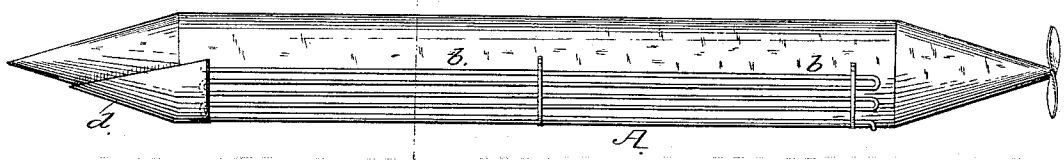


Fig. 2.

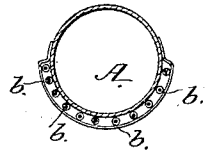


Fig. 3.

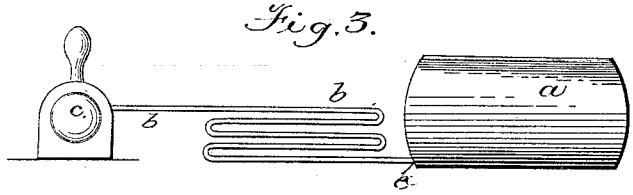
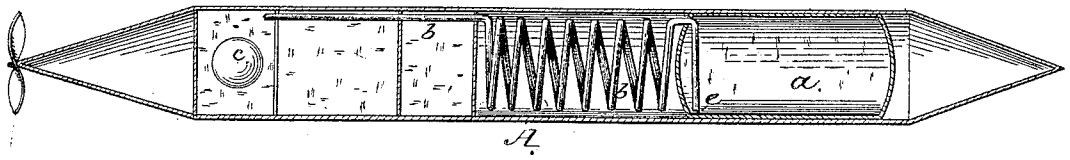


Fig. 4.



Witnesses;

F. Waldo Fowler.

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N. PETERS. Photo-Lithographer. Washington, D. C.

UNITED STATES PATENT OFFICE.

EDWARD W. KELLOGG, OF HARTFORD, CONNECTICUT.

METHOD OF OPERATING GAS-ENGINES IN TORPEDO-BOATS.

SPECIFICATION forming part of Letters Patent No. 265,423, dated October 3, 1882.

Application filed December 21, 1880. (No model.)

To all whom it may concern:

Be it known that I, EDWARD W. KELLOGG, of Hartford, county of Hartford, and State of Connecticut, have invented a new and useful Improvement in the Method of Operating Gas-Engines of Torpedo-Boats and in the Devices for Carrying such Method into Operation; and I do hereby declare the following to be an accurate description of my said invention.

My invention relates to gas-engines for the propulsion of torpedo-boats, and is intended to apply specially to self-propelled or submarine torpedo-boats similar to the Lay or the Whitehead torpedo.

My invention consists in a method of expanding the gas by which such torpedo-boats are propelled in such manner as to avoid the excessive refrigeration or freezing of the liquid gas in the tank or reservoir which contains the gas-supply.

My invention further consists in certain improvements in the mechanism by which the gas-supply is delivered to the engine, whereby refrigeration in the gas-supply flask is avoided.

My invention further consists in the construction of torpedo-boats whereby the refrigeration of the gas in the flask is prevented and the sea-water is enabled to act upon the gas in such manner as to supply caloric as it is absorbed by the rapid expansion of the gas. When carbonic-acid gas is reduced to liquid form under extreme pressure it absorbs heat very rapidly when allowed to expand. The same is true of ammoniacal gas and of most other gases. This rapid refrigeration, which has been utilized in ice-machines for the purpose of freezing, is very objectionable in the working of a torpedo-boat, as it often partially congeals the liquid gas in the flask and reduces or stops the supply of gas from the flask to the engine. I connect my supply-pipe with the flask near the bottom of the flask, so that the gas goes into the coil in liquid form. The aperture through which the liquid enters the coil must be very small, and may be through the flask near the bottom; or the pipe may enter the upper part of the flask and extend down to the bottom. The pipe is many times larger in diameter than the aperture through which the liquid enters. I have found seven-eighths-inch pipe to answer a good purpose; but of course other sizes may be used. The size of the aperture will be regulated as circumstances warrant, and a cock or valve is used to regulate the supply of liquid to the pipe. The pipe is surrounded by a copious water-supply, which gives off caloric to the gas in sufficient quantities to prevent freezing; or the pipe and its contained gas may be heated by the combustion of any substance surrounding it.

One method of carrying out my invention I have illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a torpedo-boat having outside tubes. Fig. 2 is a cross-section of the same on line *x x*. Fig. 3 is a view of a flask and one form of coil which may be used in the boat. Fig. 4 gives a longitudinal view of a torpedo-boat with inside coil.

In the drawings, A is the hull of the boat. *a* designates the flask or reservoir for compressed gas, which may be a simple reservoir or may be tubular, like a tubular boiler. *b* is a pipe or coil leading therefrom to the engine, which may be placed at *c* or elsewhere in the boat, as is most convenient. The pipe *b* is coiled in any well-known way, either flat or circular coils. As shown in Fig. 1, these coils are outside the hull of the boat and exposed to the sea-water, being secured to the boat in any well-known way. The bends of the coil at the front may be protected by a shield, as *d*, to diminish friction and prevent clogging by weeds, &c. Where the coil is inside the boat, as in Figs. 3 and 4, the sea-water is freely admitted to the compartment which contains the coil; or any well-known way of supplying artificial heat may be employed. The inner end of the expansion-pipe communicates with the liquid-gas supply in the flask at a point low down in the flask, as at *e*. A suitable cock shuts off the liquid from the coil at a convenient point, usually just outside the flask.

The operation of my device is as follows: When the cock or valve in the tube is opened the high pressure in the flask expels a small quantity of the liquid into the pipe or coil. Here the liquid immediately resumes the gaseous form, being permitted to expand in the coil, and passes on to propel the engine. This expansion is attended by a rapid refrigeration. The gas is kept at a comparatively high tem-

perature by the contact of the pipes with the water or other source of heat-supply, so that the small quantity of liquid entering the pipe is not frozen, and the expansion being in the coil and removed from the flask, there is no great tendency to freeze the liquid in the flask.

Heretofore in operating engines of this kind the gas has been taken from the flask through an aperture above the liquid. The expansion therefore took place in the flask in contact with the main body of the liquid, which always had a tendency to freeze, and thereupon the gas-supply was diminished and the pressure lessened. I am aware that attempts have been made to heat the liquid and gas in the flask by artificial means. Such devices I do not claim.

What I claim is—

1. The method herein described for using gas in connection with a torpedo-boat, which consists in taking liquid from the reservoir and expanding it into gas in pipes exposed to the sea-water and then passing it to the engine, substantially as described.

2. The combination, with a torpedo-boat, engine, and liquid-reservoir, of coiled pipes arranged to come in contact with the sea water, as described.

3. The combination of a torpedo-boat with an expansion-chamber consisting of a series of pipes arranged on the outside of said boat and in contact with the sea-water, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

E. W. KELLOGG.

Witnesses:
JOHN BULL,
A. A. HUNTER.