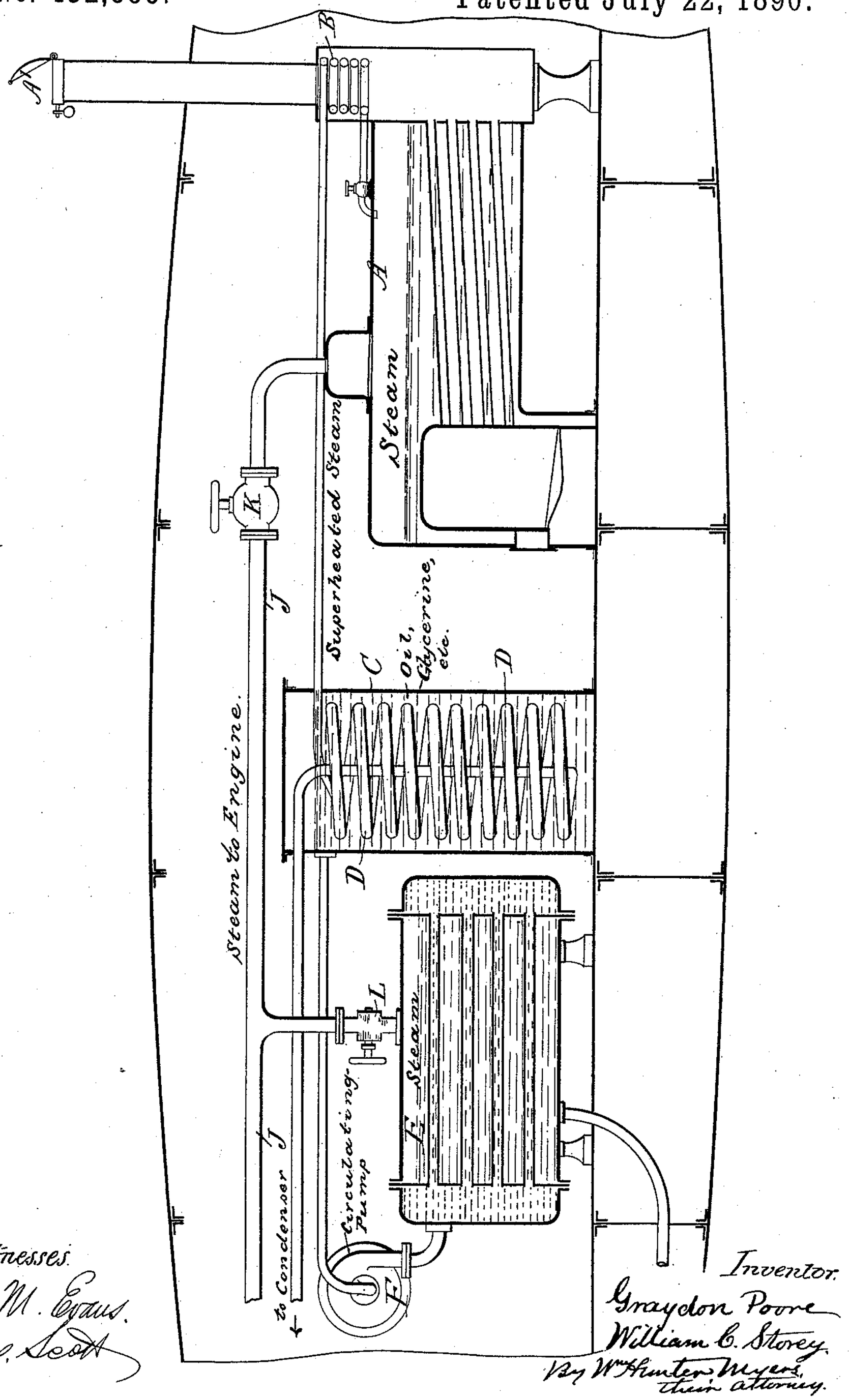
(No Model.)

G. POORE & W. C. STOREY.

STEAM GENERATOR FOR SUBMARINE VESSELS.

No. 432,555. Patented July 22, 1890.



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UNITED STATES PATENT OFFICE.

GRAYDON POORE AND WILLIAM CAMPER STOREY, OF LONDON, COUNTY OF MIDDLESEX, ENGLAND.

STEAM-GENERATOR FOR SUBMARINE VESSELS.

SPECIFICATION forming part of Letters Patent No. 432,555, dated July 22, 1890.

Application filed February 1, 1889. Serial No. 298,406. (No model.)

To all whom it may concern:

Be it known that we, GRAYDON POORE and WILLIAM CAMPER STOREY, subjects of the Queen of Great Britain and Ireland, both residing at Regent Street, in the county of Middlesex, United Kingdom of Great Britain and Ireland, have invented Improvements in or Pertaining to Vessels Constructed to Travel Under Water, of which the following is a specification.

The object of this invention is to provide a large store of energy for use when a vessel is submerged without having to subject the receiver containing it to a high pressure, such as obtains when employing heated water in a manner in which it has heretofore been proposed to employ it in the propulsion of submarine vessels by means of steam-engines. For this purpose, according to the present invention, while the vessel is afloat in the water fuel of any suitable kind is employed to generate steam, and also to highly heat a liquid of any suitable kind having at atmospheric pressure a boiling-point considerably higher than that of water; and the apparatus is so constructed that when the vessel is submerged and combustion of fuel in the furnace has ceased heat stored in the liquid above referred to can be utilized to generate steam for the propulsion of the vessel.

From the foregoing description it will be understood that a vessel, according to our invention, is constructed with apparatus comprising a chamber or chambers to contain water and steam and a chamber or chambers to contain some liquid having at atmospheric pressure a boiling-point considerably higher than that of water—for example, glycerine or a suitable oil—the relative arrangement being such that when the temperature of the oil is higher than that of the water heat may be communicated to the latter from the former.

The furnace may be of any suitable construction and designed for the combustion of either solid or liquid fuel, the construction being such as to admit of ready extinction of fire or flame and of submersion of the vessel. According to one arrangement the liquid in which heat is stored for transmission to the water can be caused to circulate through tubes in the water-space; but it may be otherwise caused to part with the heat to generate steam. This steam may be used to propel the vessel while submerged by any ordinary or suitable means.

In the accompanying drawing there is illustrated a suitable arrangement, according to this invention, for providing a store of energy for use in a submerged boat.

A is a steam-boiler of any ordinary or suitable description. It is designed to supply steam to the engine through the pipe J when the boat is moving at the surface of the water. When the boat is about to be submerged, the valve K is closed and communication between the boiler and the engine is cut off. At the same time entry of the sea to the fire-box, and through the fire-box to the interior of the boat, is prevented by closing of the funnel-valve A′.

When the boat is submerged, steam to work the engine is generated in the heater E by the circulation therethrough of the heated liquid contained in the vessel C. This liquid is heated previous to the submergence of the vessel by means of steam from the boiler A. This steam is first superheated in the coil B in the smoke-box, and is then made to circulate through the coil D in the vessel C, and is finally discharged into the condenser or overboard. In this way the liquid in the vessel C is raised to a high temperature and becomes a reservoir of heat which is available for generating steam. When it is required for this purpose, it is circulated by the pump F through the tubes of the vessel E, which contains water, and the steam produced is conducted by the pipe J to the engine, the valve L being first opened.

There are many liquids and solutions which are suitable for storing heat according to this invention in a vessel constructed to travel under water. Among these oil and a solution of chloride of lime in glycerine are favorable examples.

What we claim is—

1. In apparatus for producing power, the combination of a vessel containing liquid the boiling-point of which at atmospheric pressure is considerably above that of water, a

heating device adapted to transmit heat to said liquid, and a fluid-pressure generator external to but capable of being placed in communication with said vessel, so that said liquid can circulate through and heat said fluid-pressure generator, substantially in the manner herein described, for the purpose set forth.

2. In a vessel constructed to travel under water, the combination of a vessel containing liquid the boiling-point of which at atmospheric pressure is considerably above that of water, a heating device, one part of which is arranged to be heated by the waste heat of a furnace, while another part is arranged to transmit heat to said liquid, wherein said heat is stored, and a fluid-pressure generator external to but capable of being placed in communication with said vessel, so that said liquid can circulate through and heat said fluid-pressure generator, substantially as described, for the purpose set forth.

3. In a vessel constructed to travel under water, the combination of a vessel containing liquid the boiling-point of which at atmospheric pressure is considerably above that of water, with a heating device and a superheater, through both of which there flows a current of steam which first receives an accession of heat in the superheater, and which then in passing through the heating device imparts a portion of its heat to the said liquid, and a fluid-pressure generator external to but capable of being placed in communication with said vessel, substantially as herein described, for the purpose set forth.

4. In a submarine vessel constructed to travel under water, the combination of a vessel containing liquid the boiling-point of which at atmospheric pressure is considerably above that of water, a heating-coil arranged within but not in communication with the interior of said vessel, a steam-generator in communication with said coil, and a fluid-pressure generator external to but capable of being placed in communication with said vessel and of being heated by said liquid, substantially as herein described, for the purpose set forth.

5. In a vessel constructed to travel under water, the combination of a fluid-pressure generator, a vessel containing liquid the boiling-point of which at atmospheric pressure is considerably above that of water, a superheater, a heating device adapted to heat said liquid and in communication with said superheater, an auxiliary fluid-pressure generator, and a circulating-pump adapted to circulate said liquid from said vessel through said auxiliary fluid-pressure generator, substantially as herein described, for the purpose set forth.

6. In a vessel constructed to travel under water, the combination of a vessel containing liquid the boiling-point of which at atmospheric pressure is considerably above that of water, with a heating device, a superheater in the flue of the main boiler, an auxiliary fluid-pressure generator for use when the vessel is submerged, and a circulating-pump, substantially as described, and for the purpose specified.

7. In a vessel constructed to travel under water, the combination of the steam-generator A with funnel-valve A′, steam-pipe J, and valve K, coil B, located within the smoke-box of said generator, vessel C, to contain liquid the boiling-point of which at atmospheric pressure is considerably above that of water, heating-coil D, located within said vessel C and in communication with said superheating-coil B, an auxiliary steam-generator E, pump F, and valve L, substantially as herein described, for the purposes set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

GRAYDON POORE.
WILLIAM CAMPER STOREY.

Witnesses:
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