H. E. YARROW.

COOLING AIR IN SUBMARINE AND SUBMERSIBLE SHIPS.

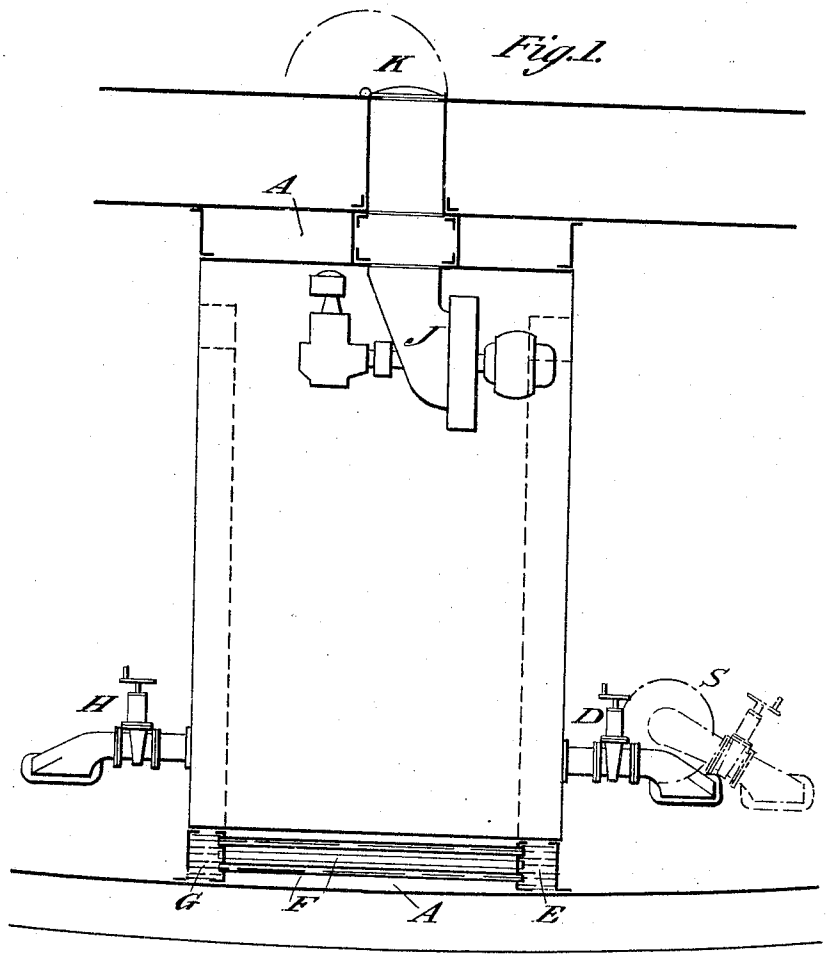
APPLICATION FILED MAR. 28, 1917.

1,327,509.

Patented Jan. 6, 1920.

4 SHEETS—SHEET 1.

Fig. 1.



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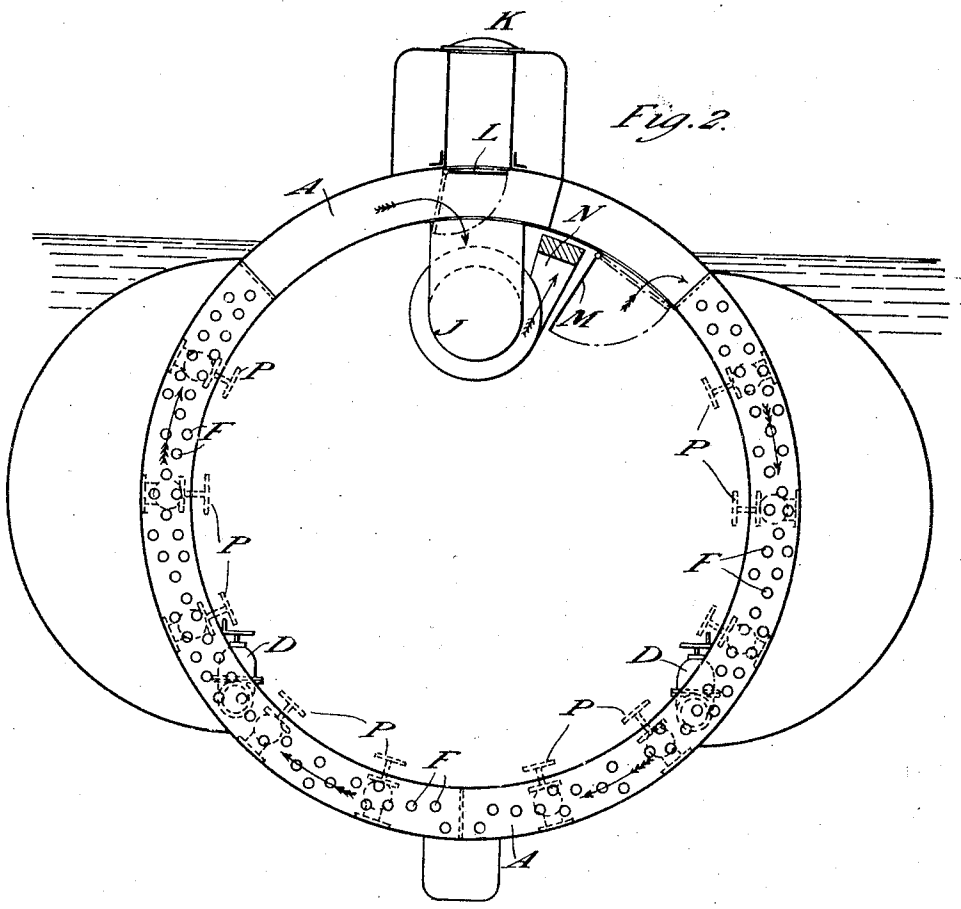
4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 3.

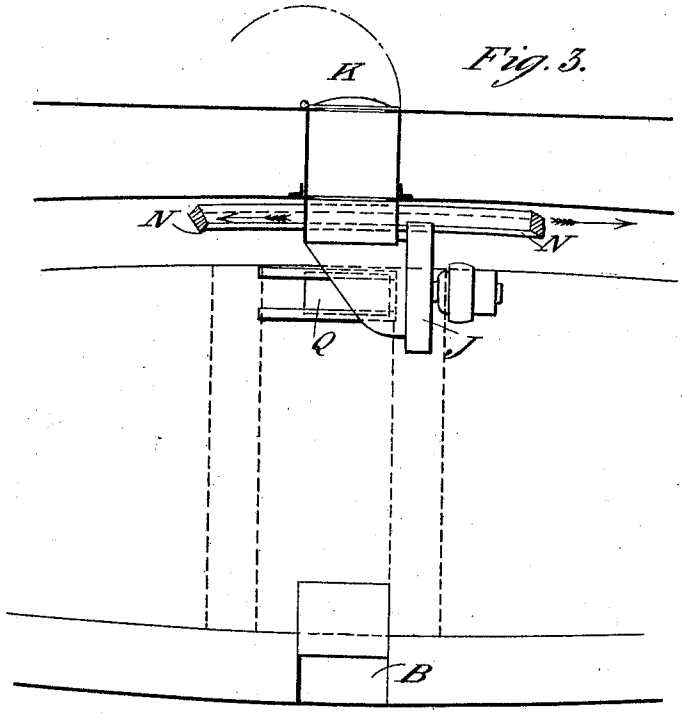
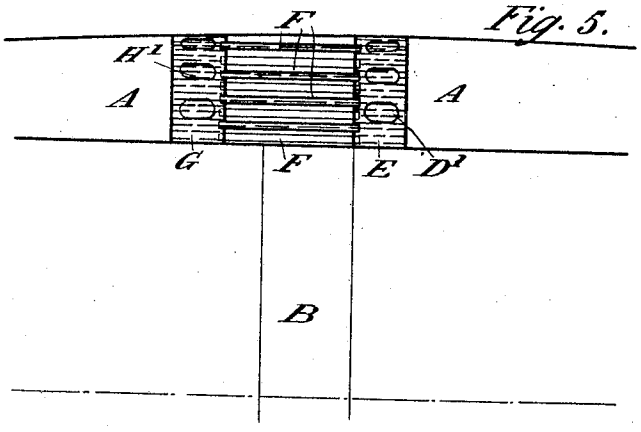


Fig. 5.



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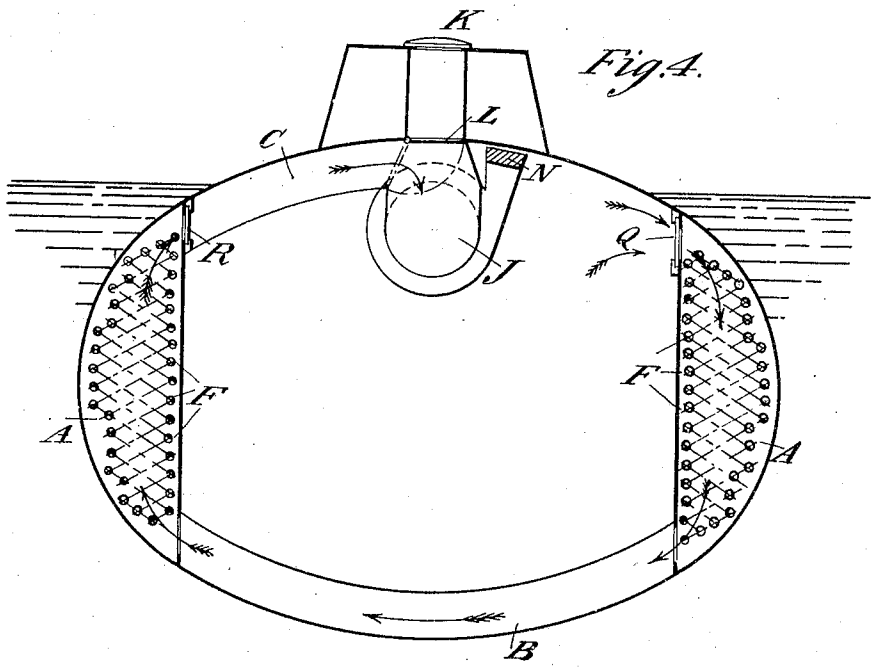
4 SHEETS—SHEET 4.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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COOLING AIR IN SUBMARINE AND SUBMERSIBLE SHIPS.

1,327,509. Specification of Letters Patent. Patented Jan. 6, 1920.

Application filed March 28, 1917. Serial No. 158,081.

To all whom it may concern:

Be it known that I, HAROLD EDGAR YARROW, a subject of the King of Great Britain, residing at Scotstoun, Glasgow, Scotland, have invented certain new and useful Improvements Relating to the Cooling of Air in Submarine and Submersible Ships, of which the following is a specification.

According to the present invention, in a submarine or submersible ship, air is caused to circulate through a chamber of approximately tubular form extending over, or nearly over, a transverse section of the ship, in which chamber are disposed tubes or coils traversed by sea water or other cooling medium and the air thus cooled is led to the parts of the ship as may be required. The sea water or other cooling medium may be caused to circulate through the tubes by mechanical means, or by the movement of the ship, or by the natural circulation due to convection; in the latter cases a special distribution of the tubes would facilitate the circulation.

The hull of the ship may conveniently form the outer wall of the compartment.

One or more fans may cause air to circulate through the chamber and at other times to draw air directly from the atmosphere and deliver it into the ship without passing through the chamber. These fans may be used to provide forced draft to the fires.

In the accompanying drawings, Figure 1 is an elevation, partly in section, of the air chamber and the circulating devices. Fig. 2 is a transverse vertical section. Figs. 3 and 4 are similar views, and Fig. 5 is a part horizontal section of a modified arrangement.

In Fig. 1, A is a tubular chamber extending around the inside of the hull of a submarine vessel, provided, in the example shown, with external ballast tanks. D and H are respectively inlet and outlet valves for the sea water to and from the parts E and G of the chamber A which are in connection with the tubes F, through which the cooling water circulates. S is a pump, which may be provided for the circulation of the water. J is a fan adapted to draw air through the door or scuttle K, when the ship is on the surface, or through the chamber A, when the vessel is submerged. This fan may be used to provide forced draft to the boilers. The air doors L and M are shown by full lines in the positions for circulating air through the cooling chamber A, the cooled air being conveyed through the trunk N to the stoke hold or other parts of the vessel, as required. The path of the air is indicated by arrows. In the dotted positions of the doors L and M the air supply to the fan J is through the door K.

The valves D and H may be supplemented or replaced by groups of valves P.

In the example shown in Figs. 3, 4 and 5, in which similar parts are denoted by the same letters as in Figs. 1 and 2, the submarine vessel represented is not provided with external ballast tanks. A, A are the internal main tanks, parts of which are disposed respectively on each side of the ship and are adapted with the connecting trunks B and C to form a chamber of approximately tubular form around the inside of the hull.

In this case the water is admitted to the part E of the chamber A by means of large ports D^1 in the ship's plating and passes through tubes F to the part G of the chamber A and thence out through the ports H^1. This arrangement enables advantage to be taken of the flow of water due to the movement of the ship, but a circulating pump may be provided. In the example shown, the tubes F are only provided in the parts of the chamber A B A C which are formed by the internal main tanks. The fan J is adapted, as in the previously described arrangement, to draw air either through the door K when the ship is on the surface, or through the chamber A B A C when the ship is submerged and the cool air is led through the trunks N to the stoke hold, or other parts of the vessel, as may be desired.

Water-tight doors Q, R of any suitable type, can be used in case of accident to shut off the chamber A B A C from the rest of the ship.

It is obvious that instead of the water flowing through the tubes and the air circulating around them the converse arrangement may be adopted in which the air is drawn through the tubes around which the water circulates.

Having thus described the nature of the said invention and the best means I know of carrying the same into practical effect, I claim:—

1. In a submersible ship, a chamber extending approximately completely around a transverse section of the ship and having its

outer surface formed at least in part by the external hull of the ship; means for circulating air through said chamber; and means for distributing the air, cooled by its passage through the chamber, to compartments of the ship as may be desired.

2. In a submersible ship, a chamber containing water; inlet and outlet valves in the chamber communicating with the water in which the ship is submerged; a pump for circulating the water in said chamber; a fan for circulating air through the chamber; and means for distributing the air, cooled by its passage through the said chamber, to compartments of the ship as may be desired.

3. In a submersible ship, the combination with a water chamber, of means for drawing air alternatively from the external atmosphere or from the interior of the ship through said water chamber, and for delivering said air to the compartments of the ship.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HAROLD E. YARROW.

Witnesses:
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