W. L. R. EMMET.

PROPULSION OF SUBMARINE VESSELS.

APPLICATION FILED JULY 15, 1918.

1,345,757. Patented July 6, 1920.

Fig. 1.

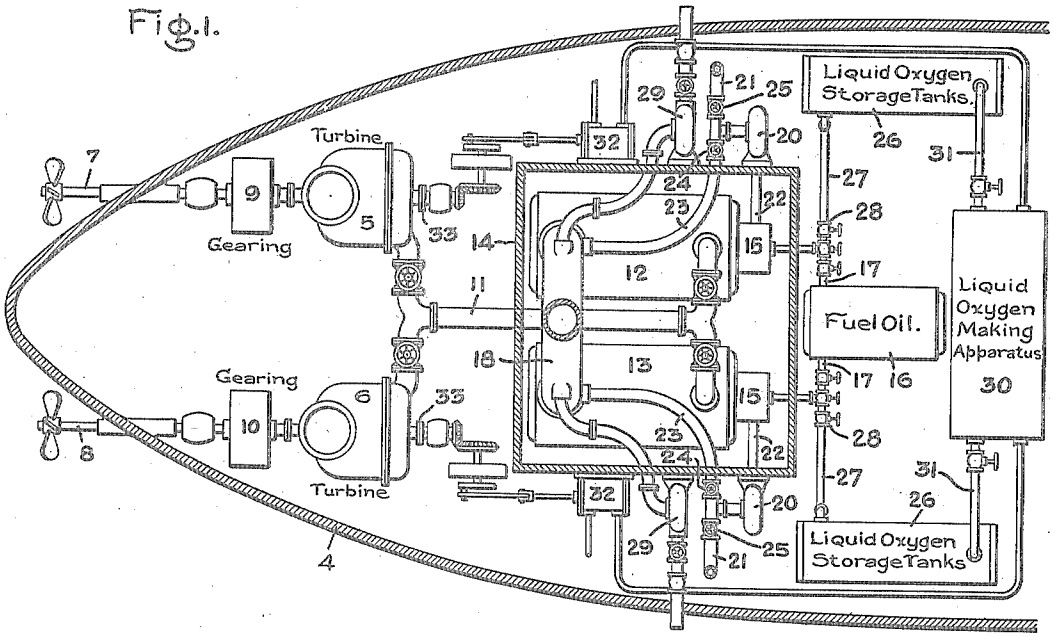
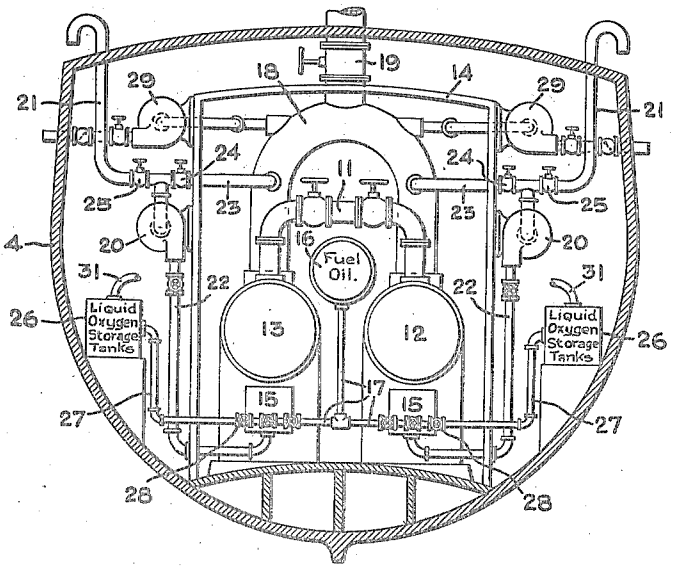


Fig. 2.



Inventor:
William L.R. Emmet,
by Albert G. Davis
His Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM L. R. EMMET, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

PROPULSION OF SUBMARINE VESSELS.

1,345,757. Specification of Letters Patent. Patented July 6, 1920.

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To all whom it may concern:

Be it known that I, WILLIAM L. R. EMMET, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Propulsion of Submarine Vessels, of which the following is a specification.

The present invention relates to the propulsion of submarine vessels and has for its object to provide an improved system for propelling such vessels on the surface and when submerged.

According to my invention I utilize an elastic fluid turbine as a prime mover and connect it to a propeller shaft through suitable reduction gearing, and I supply elastic fluid to the turbine from a suitable boiler installation which is preferably oil fired. When running on the surface the boiler installation is fired in the usual manner oil being supplied from an oil tank and air from the atmosphere.

When running submerged atmospheric air of course is not available and I then use oxygen in firing the boiler installation. The oxygen is stored in liquid form in suitable tanks and preferably under considerable pressure. The tanks may be supplied ready charged or I may provide liquid oxygen making apparatus on the vessel itself for charging them. Any suitable apparatus may be utilized for this purpose. I preferably employ an apparatus which separates the nitrogen from liquid air by distillation and delivers the oxygen under pressure to the storage tanks.

The method followed in firing when submerged is that the furnace gases are continuously circulated through the boiler installation by means of a suitable blower and these gases are enriched at or in the neighborhood of the oil burner by a suitable supply of oxygen from the storage tanks in such a manner as to maintain proper combustion condition. In order to carry this out the boiler installation may be inclosed inside a sealed compartment the supply of fuel, as for example, oil, and oxygen to the burners being controlled from the outside. The excess of furnace gases produced by the introduction of fuel and oxygen may be pumped overboard or allowed to pass out by the pressure generated in the combustion compartment. As will be readily appreciated, the amount of excess gases is not nearly as great as in the case of air being used because of the absence of nitrogen.

In the drawing, Figure 1 is a diagrammatic plan view of a ship propulsion system embodying my invention, and Fig. 2 is a sectional end elevation, the front of the sealed chamber being removed.

Referring to the drawing, 4 indicates the hull of a submarine, and 5 and 6 indicate elastic fluid turbines which drive propeller shafts 7 and 8 through suitable reduction gearings 9 and 10. Elastic fluid, as steam, is supplied to the turbines 5 and 6 by conduit 11 which leads from a suitable boiler installation, here shown as two boilers 12 and 13. Boilers 12 and 13 are located in a sealed compartment 14 and they are provided with oil burners 15 to which oil is fed under suitable pressure from a tank 16 through pipes 17. Leading from boilers 12 and 13 is a stack 18 which terminates outside hull 4, and in stack 18 is a suitable valve 19. When running on the surface oil is supplied to burners 15 from tank 16 and air is supplied thereto by blowers 20 which take air from the atmosphere through pipes 21 and deliver it to the burners through pipes 22. The inlet sides of blowers 20 are connected by pipes 23 to stack 18 and when running on the surface these pipes are closed by valves 24. The valve 19 in stack 18 is open.

When running submerged valve 19 in stack 18 is closed and also valves 25 in pipes 21, and valves 24 in pipes 23 are opened. This connects the blowers 20 to the stack 18. Oxygen is then supplied to the burners from suitable storage tanks 26 which are connected to burners 15 by pipes 27 in which are valves 28. The blowers 20 now circulate furnace gases through the burners 15 which gases are enriched by the oxygen from tanks 26. The excess of furnace gases are pumped overboard by suitable pumps as indicated at 29.

In the present instance the vessel is shown as being equipped with apparatus for making liquid oxygen. 30 indicates such an apparatus the same being connected to the storage tanks by pipes 31. Compressed air is supplied to the apparatus 30 during surface operation by suitable air compressors 32 driven by the turbines 5 and 6. The compressors 32 are connected to the turbines 5

and 6 by suitable releasable couplings 33 so that they may be disconnected therefrom.

With the above described apparatus I am enabled to use high efficiency elastic fluid turbines for driving the vessel both on the surface and when submerged. As a result the total installation is comparatively light in weight and very compact so as to occupy a minimum space in the boat. At the same time the equipment is simple and reliable and requires the operation of no electrical apparatus in a confined space. Also by confining the boiler installation in a sealed compartment the engine room is not greatly heated or charged with oil.

The oxygen making apparatus and the oxygen storage tanks may be of any suitable type and structure. They are shown only diagrammatically. In the case of the storage tanks, the liquid oxygen is preferably stored under considerable pressure and suitable heat installation is provided so that the heat losses are small.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In combination, an elastic fluid engine, a boiler for supplying elastic fluid thereto, means for circulating furnace gases through the boiler, liquid oxygen storage tanks, means for supplying oxygen from said tanks and fuel to said furnace gases to form a combustible mixture, means for discharging the excess of furnace gas over-board, and apparatus for supplying liquid oxygen to said tanks.

2. In a vessel adapted to operate on the surface or submerged, the combination of an elastic fluid turbine for driving it, a boiler for supplying elastic fluid to the turbine, means for supplying fuel and air to the boiler when the vessel is on the surface, a stack for the boiler, means for closing the stack when the vessel is submerged, means for circulating furnace gases through the boiler, means for discharging the excess of furnace gas overboard, liquid oxygen storage tanks, and means for supplying oxygen from said tanks and fuel to said furnace gases to form a combustible mixture.

3. In a vessel adapted to operate on the surface or submerged, the combination of an elastic fluid turbine for driving it, a boiler for supplying elastic fluid to the turbine, means for supplying fuel and air to the boiler when the vessel is on the surface, a stack for the boiler, means for closing the stack when the vessel is submerged, means for circulating furnace gases through the boiler, liquid oxygen storage tanks, means for supplying oxygen from said tanks and fuel to said furnace gases to form a combustible mixture, and means for pumping the excess of furnace gases overboard.

4. In a vessel adapted to operate on the surface or submerged, the combination of an elastic fluid turbine for driving it, a boiler for supplying elastic fluid to the turbine, means for supplying fuel to the boiler when the vessel is on the surface or submerged, a stack for the boiler, means for closing the stack when the vessel is submerged, a pump having its suction side connected to the stack and to atmosphere and its discharge side connected to the boiler whereby it may be utilized for supplying either atmospheric air or furnace gases to the boiler, liquid oxygen storage tanks, means for supplying oxygen from said tanks to the boiler, and a second pump connected with the stack for pumping furnace gases overboard.

In witness whereof, I have hereunto set my hand this 13th day of July, 1918.

WILLIAM L. R. EMMET.