July 28, 1931. W. HEFTI 1,816,371

SHIP PROPELLED BY INTERNAL COMBUSTION ENGINE

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Fig. 1.

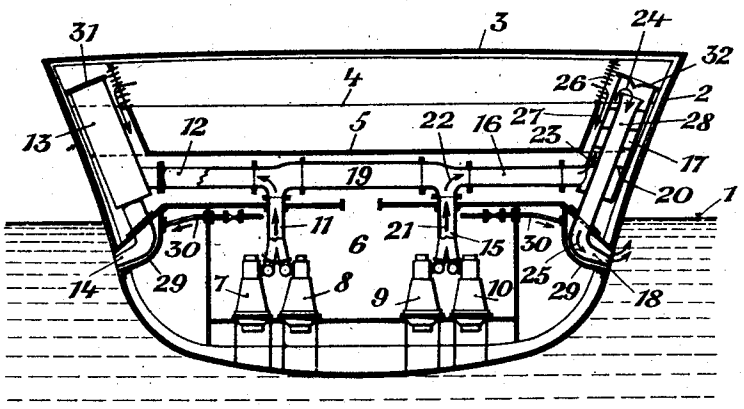
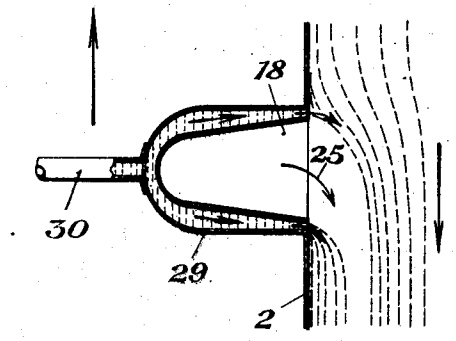


Fig. 2.



INVENTOR
Wilhelm Hefti
BY
Pennie Davis Marvin & Edmonds
ATTORNEY

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WILHELM HEFTI, OF WINTERTHUR, SWITZERLAND, ASSIGNOR TO THE FIRM OF SULZER FRERES SOCIETE ANONYME, OF WINTERTHUR, SWITZERLAND

SHIP PROPELLED BY INTERNAL COMBUSTION ENGINE

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This invention relates to ships propelled by internal combustion engines of the kind in which the discharge end of the exhaust pipe is submerged or below the normal water level, and is particularly applicable to ships of the aircraft carrier type having a large, unbroken deck surface.

According to this invention the immersed end of the exhaust pipe is wholly or partly surrounded by a nozzle through which water under pressure is discharged into the sea so as to form a baffle or screen which will diminish the back pressure and prevent any sea water entering the open end of the pipe.

The outlet end of the exhaust pipe from the engine is preferably led first upwards to such a height above the normal water level that the sea or other water in which the vessel is being navigated cannot enter the exhaust pipe and so damage the engine due to the motion of the sea forming in the exhaust pipe a depression or partial vacuum.

Means are preferably provided by which air can enter the exhaust pipe should a depression take place within it and in some cases a check valve or the like may be provided which will enable the products of combustion to escape above the water level, for example through the upper end of the silencer should the submerged end of the exhaust pipe become subject to excessive pressure owing to heavy seas.

A ship according to this invention is preferably so arranged that the products of combustion are discharged simultaneously on both sides of the ship and these two separate exhaust pipes are connected together so as to ensure the products of combustion escaping from at least one side of the ship should the outlet on the opposite side be temporarily obstructed.

One construction according to this invention is diagrammatically illustrated by way of example in the accompanying drawings, in which

Figure 1 is a cross-section of an aircraft carrier ship furnished with two sets of driving engines each arranged in pairs, and

Figure 2 is a diagram on an enlarged scale showing the means for discharging water under pressure around or adjacent to the exhaust pipe.

In the construction shown in Figure 1 the normal water level is indicated at 1, the hull of the ship 2 being shown as having a flying deck 3 upon which aeroplanes can land and from which they can take off and with lower decks 4 and 5 serving to accommodate aircraft or repair shops.

In the engine room 6 four internal combustion engines 7, 8, 9 and 10 are provided, the exhaust ports of the engines 7 and 8 communicating through a branch pipe 11 with a common exhaust pipe 12 leading into a silencer 13 provided with an outlet branch 14 which is normally submerged as its open end is below the normal water level. Similarly the exhaust ports of the engines 9 and 10 communicate by means of a branch 15 with a common exhaust pipe 16 communicating with a silencer 17 of which the outlet opening 18 is also immersed. A pipe 19 serves to connect the two main exhaust pipes 12 and 16 and the silencers may be provided with baffle plates similar to those indicated at 20 for the silencer 17.

The path of the gases from the engines 9 and 10 is indicated by the arrows 21, 22, 23, 24 and 25 and the air to support combustion for the engines may be drawn through the louvre-like shutters 26 as shown by the arrows 27 so that the air flows over the walls of the silencers and exhaust pipes into the engine room. The upper ends of the silencers 31 and 32 are furnished with inlet valves through which air can enter the silencers should a depression or partial vacuum be formed within them.

Normally the exhaust gases of the engines 7 and 8 (Figure 1) pass to the silencer 13 and the exhaust gases of the other engines to their adjacent silencer 17. Both silencers not only serve to reduce the noise of the engines should the open ends of the exhaust branches come above the water but further serve to prevent sparks being formed or scattered and absolutely to preclude any chance of the sea from entering the engines through the open ends of the exhaust pipes.

If, for example, the engines 9 and 10 are

not working, the contents of the exhaust pipes 15 and 16 and of the silencer 17 will cool to such an extent that there is a tendency for sea water to be drawn in through the open end of the exhaust pipe 18. Before, however, the sea can reach the open end of the exhaust pipe 28 within the silencer 17 the automatic inlet valves in the cover 32 will open owing to the formation of a depression in the silencer 17 so that the exhaust pipe 28 can be filled with air which will prevent the rise of sea water in the pipe 28 and the consequent risk of this water reaching the engines. Any known form of inlet or suction valve may be provided in the cover of the silencer.

Should the ship roll or heel over owing to heavy seas one of the exhaust pipes 14 or 18 may come out of the water and the normal depth to which the other exhaust pipe is immersed will be appreciably increased. In such a case instead of the exhaust gases from one pair of engines, for example the engines 7 and 8 escaping through their adjacent silencer 13 and exhaust pipe 14 they will pass into the atmosphere through the pipe 19, silencer 17 and exhaust pipe 18. For this purpose the connecting member 19 and the pipes which it connects are so dimensioned that the exhaust gases from both engines can be temporarily discharged through one or other of the exhaust pipes and silencers should necessity arise.

In Figure 2 the outlet end of the exhaust pipe 18 is shown in plan on an enlarged scale surrounded by a water jacket 29 to which water under pressure is supplied by the pipe 30. This water is preferably discharged in the form of an annular column surrounding the exhaust branch so as to deflect the sea water from the open end of the exhaust pipe and permit the exhaust gases to escape freely into the sea water. Thus the water under pressure acts as a screen for the exhaust branch and reduces the hydraulic back pressure which the exhaust gases have to overcome owing to the open end of the exhaust pipe being immersed. Instead of the jet of water completely surrounding the exhaust branch it may be discharged adjacent to the exhaust pipe forward or in advance thereof with relation to the normal direction of travel so as to screen the open end of the pipe from the sea water.

Preferably the cooling water from the engines is used to act as a screen in the above manner which is of advantage as it necessitates making only one opening in the hull of the ship, a point of considerable advantage in the case of armoured ships. The water in the jackets 29 further protects the engine room from becoming overheated by radiation from the exhaust pipe.

By drawing the air to support combustion through the louvres 26 ventilation of the engine room in hot climates is assisted and in colder climates only a proportion of the air is preferably drawn through these louvres, the remaining air being drawn directly from the atmosphere.

In a modification according to this invention one or both of the silencers 13 or 17 may project above the aircraft deck, the cover of the silencer instead of or in addition to the suction valves being provided with relief valves. Such an arrangement is of advantage if the ship has to travel in heavy seas in a path at right angles to the direction of the waves as two successive mountainous waves may simultaneously so increase the normal pressure to which both the exhaust pipes 14 and 18 are exposed that there may be a serious risk, particularly in the case of two-stroke engines, of the engines being stopped.

When the pressure to which both the exhaust pipes are simultaneously exposed exceeds a predetermined pressure, for instance two meters water column, the relief valves in the covers of the silencers will open to permit the escape of the products of combustion. As this will only happen when a very heavy sea is running and then only in particularly unfavourable cases in which flying is impossible the occasional discharge of the exhaust gases through the check valves will not in any way interfere with flying.

A ship according to this invention enables the exhaust gases to be discharged in a way which does not interfere with the flying deck or inconvenience the ship's crew. Further, the risk of fire which is always present in an aircraft carrier on account of the large stores of petrol which must be carried, is reduced owing to the manner in which the products of combustion are discharged.

It is to be appreciated that the invention is not limited to the particular construction illustrated and that the number and general arrangement of the engines may be modified at will.

I claim:

1. An aircraft carrier or other ship propelled by internal combustion engines with the open end of the exhaust pipe submerged, characterized by the immersed end of the exhaust pipe being wholly or partly surrounded by a nozzle through which water under pressure is discharged so as to screen the open end of the exhaust pipe from the sea water.

2. An aircraft carrier or other ship propelled by internal combustion engines as claimed in claim 1, characterized by the exhaust pipe from the engine being led first upwards to such a height above the normal water level that the sea or other water can-

not enter the exhaust pipe or pass to the engine either owing to heavy seas or of a partial vacuum occurs in the exhaust pipe.

3. A ship propelled by internal combustion engines as claimed in claim 1, in which means are provided by which air is automatically admitted into the exhaust pipe so as to check the advance of the sea water up the pipe should a partial vacuum be formed therein.

4. An aircraft carrier as claimed in claim 1, in which the upper end of the silencer or the highest point of the exhaust pipe projects above the flying deck.

5. A ship propelled by internal combustion engines as claimed in claim 1 in which the products of combustion are discharged on both sides of the ship, and when two or more engines are employed the separate exhaust pipes being connected together in the manner and for the purpose described.

In testimony whereof I have affixed my signature.

WILHELM HEFTI.