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METHOD OF AND MEANS FOR PROPELLING CRAFT NAVIGATING A FLUID MEDIUM.

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1,405,482. Patented Feb. 7, 1922.

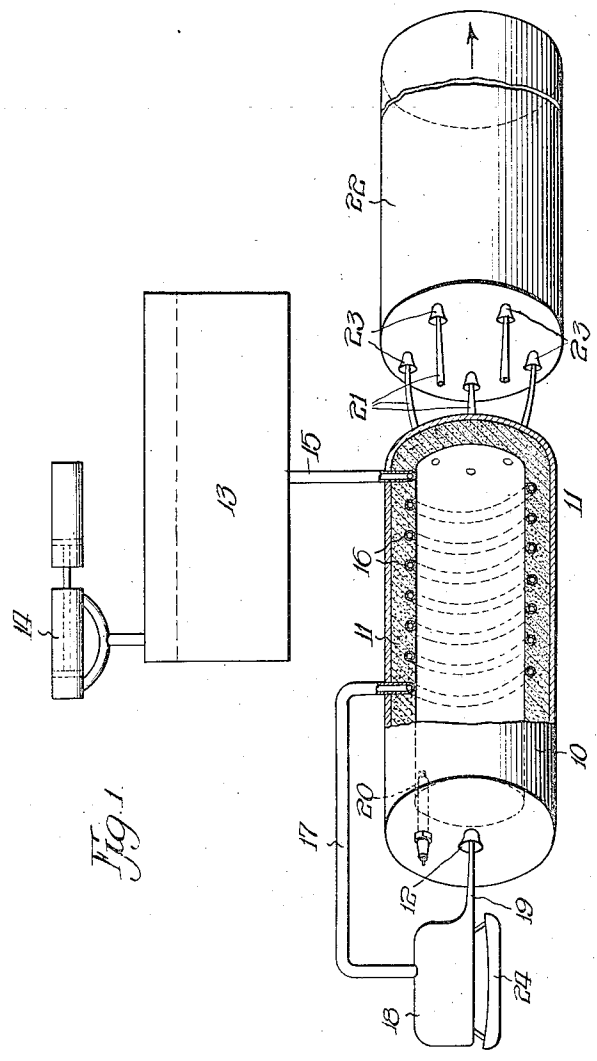


Fig. 1

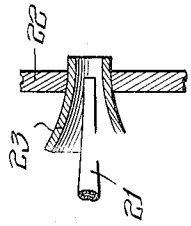


Fig. 3

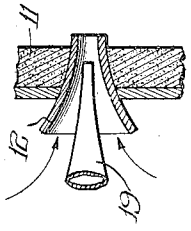


Fig. 2

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UNITED STATES PATENT OFFICE.

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METHOD OF AND MEANS FOR PROPELLING CRAFT NAVIGATING A FLUID MEDIUM.

1,405,482. Specification of Letters Patent. Patented Feb. 7, 1922.

Application filed May 31, 1919. Serial No. 301,111.

To all whom it may concern:

Be it known that I, LOUIS G. BOSTEDO, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Methods of and Means for Propelling Craft Navigating a Fluid Medium, of which the following is a specification.

This invention relates to an improved method of and means for propelling air and water craft, the invention being capable of useful application to the propulsion of surface and sub-surface water craft, and also air craft.

My present invention is based upon the same broad underlying principle of operation as the invention forming the subject matter of Letters Patent No. 1,305,340, granted to me on the 3rd day of June, 1919, this principle residing in causing a gaseous body, the molecules of which are energized by the heat of combustion or otherwise, to expand continuously and with substantially constant pressure directly between the craft and the fluid medium (water or air) through which the craft travels, without the intervention of any motor, engine or propeller blades or any other moving parts.

The present invention constitutes an improved form or embodiment of the basic principle of the invention disclosed and claimed in my aforesaid Letters Patent; and in its physical embodiment comprises an oil tank, a combustion chamber or furnace in which the oil is burned continuously, a propulsion blast tube open at its rear end, and a combustion jet air inducer or injector connecting the furnace and propulsion blast tube and serving to direct the burning products of combustion from the former directly into the latter in the form of one or more jets which also serve as air inducers to induce a large volume of air into the propulsion blast tube, serving to bring the temperature of the resultant mixture of air and furnace gases down to a low temperature, giving a large volume of propulsive blast at reduced pressure which reacts directly upon the fluid medium being navigated. In the preferred and most complete form of the invention I also employ an oil boiler or vaporizer that is preferably heated by the furnace itself, in which the oil from the oil tank is vaporized under high pressure, and a vapor jet draft inducer connecting the oil boiler and the furnace and serving the triple function of feeding the furnace with fuel, feeding it with air, and mixing the air and fuel in proper proportions to secure efficient and continuous combustion.

In the accompanying drawings I have illustrated diagrammatically a form of apparatus in and by which the novel method of effecting propulsion forming in part the subject matter of the present invention may be carried out; it being understood that this apparatus may be widely varied in detail mechanical features without involving any departure from the novel method of operation, or sacrificing any of the advantages of the invention.

Referring to the drawings,—

Fig. 1 is a perspective elevation of the complete apparatus, with the furnace shown partly in section, and the propulsion blast tube broken out between its ends;

Fig. 2 is a longitudinal section through the oil vapor air inducer or injector;

Fig. 3 is a longitudinal section through the flame jet air inducer or injector.

Referring to the drawings, 10 designates the combustion chamber or furnace which, in the case of water craft, will be so located as to be below the water line of the craft, and may consist, as herein indicated, of a cylindrical body formed of or lined with suitable fire-clay insulation 11 to prevent dissipation of heat, and closed at its forward end excepting for a central funnel-shaped air induction opening 12. 13 designates a fuel tank in which a body of hydrocarbon fuel is maintained under high air pressure supplied to the tank from an air compressor conventionally indicated at 14. A delivery pipe 15 from the fuel tank connects with a coil 16 that surrounds the furnace 10, being conveniently embedded in the insulation of the latter. This coil 16 forms an oil boiler or vaporizer, from the forward end of which the oil vapor flows through a pipe 17 into an oil vapor holder 18 preferably located directly in front of the furnace. From the oil vapor holder 18 there

extends an injector pipe 19 into the forward end of the furnace, this injector pipe passing centrally into the throat of the air induction opening 12 so that the oil vapor jet which is under a high pressure serves to induce or entrain through the opening 12 a sufficient body of air to mix with and support combustion of the fuel within the furnace, which combustion may be started by an ordinary electric sparker indicated at 20.

From the rear end wall of the furnace there extend a series of injector pipes 21 into the propulsion blast tube indicated at 22. This latter is located directly behind and preferably in line with the furnace and is of considerably greater cross-sectional area than the latter, and of any suitable or desired length. In the front wall of the propulsion blast tube 22 are a group of cone-shaped openings 23 similar to the opening 12 of the furnace, into the throats of which openings the discharge ends of the injector pipes 21 pass, said openings serving to permit the induction of a considerable volume of air under the influence of the flame jets discharged from the furnace. This induced air mixes with the products of combustion, reducing the temperature and pressure of the latter.

In the operation of the apparatus, there occur substantial decreases or drops of pressure, due to the entrance of the fluid into a region of lower pressure, each time down to about one-seventh, between the vapor jet inducer and the furnace, and between the flame jet inducers and the propulsion blast tube. For instance, assuming that the pressure of the oil vapor in the container 18 is 700 pounds, the pressure in the furnace would be about 100 pounds, while the resultant working pressure in the propulsion blast tube would be approximately 15 pounds. Of course, the degree or extent of reduction of pressure would depend partly upon the relative sizes of the vapor container, furnace and blast tube and partly upon the relative amounts of air induced by the oil vapor injector and the flame jet inducers, these amounts of induced air being governed by the relative diameters of the jet orifices, and the position of the jet orifices relative to the funnel throats. There also occurs a large drop in the temperature of the furnace gases as they enter the propulsion tube due to their expansion in the latter, the object being to bring them as near atmospheric temperature as practicable to avoid waste of heat in the exhaust.

Beneath the oil vapor boiler 18 I have indicated a gasoline pan 24, which may be used for starting.

The air induced into the furnace by the high-pressure vapor jet is compressed without loss of heat such as would occur were the air mechanically condensed by the usual water-jacketed compressor before passing into the furnace, thereby conducing to the efficiency of the apparatus. Furthermore, this retained heat of compression of the air in the furnace partly neutralizes the lowering of temperature of the vapor due to its expansion.

The large volume of air induced into the propulsion blast tube serves to bring the temperature of the resultant mixture with the furnace gases down to a low temperature, giving a large volume of propulsive blast at reduced pressure.

I am aware that it has heretofore been proposed to effect propulsion of water craft through the agency of jets of steam or compressed air on the rocket principle discharging directly into the water, but in the case of steam, the sudden reduction of the temperature from above 225 degrees F. down to or below 60 degrees F. practically kills the propulsive power of the steam jet; while in the case of compressed air, there is necessarily a large waste of power in the form of heat in effecting the compression. Furthermore, the propulsive effort obtainable by one or a series of relatively fine jets discharging directly into the fluid medium is far less than the propulsive effort obtainable by expansion of a heated gas in a propulsion tube of substantial cross-sectional area fed by such jets, the reaction taking place against a very considerable area of the fluid medium being navigated, for the reason that loss of heat by conduction and of energy by useless churning of the fluid medium are reduced to the minimum.

As I have hereinabove stated, the present invention is based upon the same broad principle that underlies the invention of my aforesaid Letters Patent; but presents an improvement thereon in the employment of flame jet induction of air into the propulsion tube, and also in the employment of vapor jet induction of air draft into a furnace burning under pressure, the furnace serving as a head for a lower stage inducer into another chamber also under pressure.

I claim:

1. The herein described method of effecting propulsion of craft navigating a fluid medium, which consists in continuously burning fuel in a furnace, continuously discharging the burning products of combustion from said furnace directly in the form of a jet into a propulsion tube that is open at one end to the fluid medium being navigated, simultaneously injecting air by means of said jet into said propulsion tube, and allowing the mixed products of combustion and air in said propulsion tube to expand and react directly against the fluid medium being navigated.

2. The herein described method of effecting propulsion of craft navigating a fluid

medium, which consists in continuously burning fuel in a furnace, discharging the burning products of combustion directly in the form of a plurality of separate jets into one end of a propulsion tube that is open at its opposite end to the fluid medium being navigated, simultaneously injecting air by means of said jets into said propulsion tube, and allowing the mixed products of combustion and air in said propulsion tube to expand and react directly against the fluid medium being navigated.

3. The herein described method of effecting propulsion of craft navigating a fluid medium, which consists in continuously supplying fuel under pressure in the form of a jet into a furnace, simultaneously injecting air into said furnace by means of said jet to maintain continuous combustion, continuously discharging the burning products of combustion from said furnace directly in the form of a jet into a propulsion tube that is open at one end to the fluid medium being navigated, simultaneously injecting air by means of said jet into said propulsion tube, and allowing the mixed products of combustion and air in said propulsion tube to expand and react directly against the fluid medium being navigated.

4. The herein described method of effecting propulsion of craft navigating a fluid medium, which consists in continuously supplying fuel under pressure in the form of a jet into a furnace, simultaneously injecting air into said furnace by means of said jet to maintain continuous combustion, continuously discharging the burning products of combustion directly in the form of a plurality of separate jets into one end of a propulsion tube that is open at its opposite end to the fluid medium being navigated, simultaneously injecting air by means of said jets into said propulsion tube, and allowing the mixed products of combustion and air in said propulsion tube to expand and react directly against the fluid medium being navigated.

5. In a propulsion device of the character described, the combination of a furnace, a propulsion tube open at its rear end and having an air opening in a wall thereof, and an injector pipe leading from said furnace into said air opening, whereby the products of combustion from said furnace are delivered in jet form into said propulsion tube and entrain air into the latter through said opening.

6. In a propulsion device of the character described, the combination of a furnace, a propulsion tube of greater cross-sectional area than said furnace in rear of the latter, said propulsion tube being open at its rear end and having an air opening in its front wall, and an injector pipe leading from the rear end of said furnace into said air opening, whereby the products of combustion from said furnace pass in jet form into said propulsion tube and entrain air into the latter through said opening.

7. In a propulsion device of the character described, the combination of a furnace, a propulsion tube of greater cross-sectional area than said furnace in rear of the latter, said propulsion tube being open at its rear end and having a plurality of spaced air openings in its front wall, and a corresponding plurality of injector pipes leading from the rear end of said furnace into said air openings, whereby the products of combustion from said furnace are divided and pass in the form of separate jets into said propulsion tube and entrain air into the latter through said openings.

8. In a propulsion device of the character described, the combination of a furnace having an air opening in a wall thereof, a fuel container adapted to hold fuel under pressure, an injector pipe leading from said fuel container into said air opening whereby the fuel is delivered in the form of a jet to said furnace and entrains air through said opening, a propulsion tube in rear of said furnace, said tube being open at its rear end and having an air opening in its front wall, an injector pipe leading from the rear end of said furnace into said last-named air opening, whereby the products of combustion from said furnace pass in the form of a jet into said propulsion tube and entrain air into the latter through said last-named opening.

9. In a propulsion device of the character described, the combination of a furnace having an air opening in a wall thereof, a fuel container adapted to hold fuel under pressure, an injector pipe leading from said fuel container into said air opening whereby the fuel is delivered in the form of a jet to said furnace and entrains air through said opening, a propulsion tube of greater cross-sectional area than said furnace in rear of the latter, said tube being open at its rear end and having a plurality of spaced air openings in its front wall, and a corresponding plurality of injector pipes leading from the rear end of said furnace into said last-named air openings, whereby the products of combustion from said furnace are divided and pass in the form of separate jets into said propulsion tube and entrain air into the latter through said last-named openings.

10. In a propulsion device of the character described, the combination of a furnace having an air opening in a wall thereof, an oil tank, an oil vaporizer connected to said oil tank and heated by said furnace, an injector pipe leading from said vaporizer into said air opening whereby the vaporized oil is delivered in the form of a jet to said furnace and entrains air through said opening, a

propulsion tube of greater cross-sectional area than said furnace in rear of the latter, said tube being open at its rear end and having a plurality of spaced air openings in its front wall, and a corresponding plurality of injector pipes leading from the rear end of said furnace into said last-named air openings whereby the products of combustion from said furnace are divided and pass in the form of separate jets into said propulsion tube and entrain air into the latter through said last-named openings.

LOUIS G. BOSTEDO.