

PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in and relating to the Propulsion of Bodies by Jets.

We, RAUL RIBEIRO DA SILVA and JOSÉ DE MADEIROS E ALBUQUERQUE, of 245, West 51st Street, New York City, United States of America, both citizens of the United States of Brazil, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to improvements in the propulsion of bodies by jets and more particularly to the method of propelling a body in which a high pressure fluid jet is directed through a series of injectors and the velocity of said jet is gradually reduced and its volume increased by the addition thereto of air drawn into said injectors by the action of the jet.

The invention is an improvement in the above described method and consists in discharging the blast substantially eddyless, at the end of the series of injectors, over a comparatively wide or large superficial area rearwardly from the body to be propelled through eddy-eliminating and blast distributing means comprising a funnel shaped mixing and discharge passage and a plurality of planes arranged within the mouth of said funnel shaped mixing and discharge passage.

In order to more clearly understand the invention, reference is made to the accompanying drawings, which show by way of example one way of carrying out the present invention as applied to an aeroplane, and in which:—

Fig. 1 is a plan view of an aeroplane equipped with our invention;

Fig. 2 is a side elevation thereof;

Fig. 3 is a rear elevation thereof; and

Fig. 4 is a detail end section illustrating the propulsive means.

Referring to the drawing, 5 indicates the body of an aeroplane provided with

the usual supporting planes 6, and 7. The form of the vessel may vary widely, and one form is illustrated herein merely for the purpose of making the application of our invention entirely clear.

Preferably supported within the body 5 we provide a combustion chamber 8 surrounded by insulating material 9 to prevent dissipation of the energy developed, and a casing 10 sufficiently strong to withstand the pressure developed. A tank 11 carries a supply of fuel, such as gasoline, which may be maintained under pressure by means of a suitable air pump 12 driven by an engine 13. The pump 12 also ensures a supply of air under pressure to a burner 14, which vaporizes and injects a mixture of gasoline or other fuel and air into the chamber 8, where it burns and develops a considerable quantity of gaseous combustion products at a relatively high temperature and pressure.

The gaseous combustion products pass through a tube 15 to a restricted outlet 16, which maintains the pressure within the chamber 8, and are delivered from the outlet at a velocity of approximately 4000 feet per second. A shell 17 is supported adjacent the outlet 16 forming therewith a true injector. The rear end of the shell 17 is open to permit the passage of a large volume of air which is drawn by the injector action into the restricted portion 18 of the shell, where it is mixed with the combustion products. The mixture issues through the outlet 19 of the shell at a velocity of approximately 2000 feet per second. The mixture passes into a second shell 20 having an enlarged rear portion for the admission of air, which is drawn in and mixed with the previous mixture and issues through the outlet 21 at a velocity of approximately 1000 feet per second. A third shell 22 surrounds the outlet 21 forming therewith an injec-

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[Price 1/-]



tor which draws an additional quantity of air to be further mixed with the heated gases.

Shell 22 is provided with an enlarged funnel shaped extension 23, in which the mixed gases expand and become uniformly heated while they travel at a velocity of less than 500 feet or less per second, and finally issue through the mouth of the funnel shaped extension 23 and react on the atmosphere to propel the aeroplane. The mouth of the extension 23 is provided with a plurality of planes 24 to ensure proper distribution of the blast, and to eliminate eddies.

It will be noted that the relatively small volume of heated combustion products is expanded in the apparatus, with successive decreases in velocity. The final velocity of the blast should not be much greater than the intended velocity of the aeroplane and we preferably regulate the velocity of the blast so that it exceeds the intended velocity of the aeroplane in a proportion previously determined. The increased volume of the blast due to successive additions of air permits a final reaction on the atmosphere over a comparatively large surface. All of the energy developed in the form of heat is thus preserved in the blast and is delivered to the atmosphere in a manner which ensures the full utilization of the energy.

In applying the invention to an aeroplane, the blast is preferably discharged on both sides of the body 5, as indicated in Fig. F of the drawing, though obviously the relation of the blast to the body and the number employed will depend upon the character of the body to be propelled. We have illustrated, however, the use of two blasts because this arrangement best adapts itself to the propulsion of the aeroplane as illustrated.

We wish to particularly emphasize the necessity of reducing the velocity of the gases until it is less than twice the intended velocity of the body to be propelled, and of providing for a large volume of gases delivered substantially eddyless to the atmosphere over a relatively large superficial area, these factors being essential to the successful utilization of fluid jets in aerial propulsion.

It is to be understood that our invention, while described in connection with the aeroplane, is not necessarily limited to such structures, but may be employed in connection with vessels generally, which are intended for use in aerial navigation, and is also of value in the propulsion of

vessels travelling on land, or in or upon the water.

Various changes can be made in the method and means employed without departing from the spirit and scope of our invention or sacrificing any of the material advantages of the invention, the form hereinbefore described being merely illustrative thereof.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A method of utilising the energy of a high pressure fluid jet for the propulsion of bodies, which comprises directing said jet through a succession of true injectors, thereby reducing the velocity of said jet, increasing its volume by the addition of air thereto until the velocity is less than twice the intended velocity of the body to be propelled and discharging the resulting blast substantially eddyless, through eddy-eliminating and blast distributing means at the end of the series of true injectors, over a comparatively wide or large superficial area rearwardly from said body, said eddy-eliminating and blast distributing means comprising a funnel shaped mixing and discharge passage for the blast and a plurality of planes arranged within the mouth of said funnel shaped mixing and discharge passage.

2. In an apparatus for carrying out the method as set forth in Claim 1, a combustion chamber having a restricted outlet through which highly heated gaseous combustion products escape at high velocity and a series of successively larger true injectors communicating with the atmosphere.

3. Apparatus as set forth in the preceding claim comprising two sets of true injectors, funnel shaped mixing and discharge passages and eddy-eliminating means arranged on opposite sides of the axis of the body to be propelled.

4. The method of utilising the energy of a high pressure fluid jet for the propulsion of bodies and apparatus therefor, working, operating, constructed and arranged substantially as described, and as shewn in the accompanying drawing.

Dated this 18th day of June, 1920.

ALBERT L. MOND,
19, Southampton Buildings, Chancery
Lane, London, W.C. 2,
Agent for the Applicants.

[This Drawing is a reproduction of the Original on a reduced scale.]

