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PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in or relating to Engines or Motors.

I, HERBERT STOCKER HARRIS, of Buckland House, Esher, in the County of Surrey, Surgeon, 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:—

This invention relates to engines or motors of the kind in which the combustion of a suitable fuel is utilised to produce a gaseous stream for propelling or driving purposes. For example such motors have been suggested for use on aircraft, in which case the gaseous stream is discharged into atmosphere to cause by reaction the propulsion of the aircraft. Motors of this kind have also been proposed for other uses in which a mechanical element such as a turbine rotor has been actuated by the gaseous stream. In a prior proposal the fuel is introduced under high pressure and on issuing in the form of a stream from a combustion chamber is allowed to expand in a tube having an open end surrounding the combustion chamber the diameter of the said tube increasing towards the outlet or discharging end; the expansion it is stated causes the air to be introduced into the tube through the said open end surrounding the combustion chamber to mix with the gaseous stream and by means of a series of baffle plates the speed of the stream is diminished and the mass augmented.

The chief object of the present invention is to avoid expansion of the gaseous stream on entering the discharging tube as it is found that the stream in expanding produces eddy currents adjacent to the nozzle from which the stream issues, and thereby prevents or hinders the entry of air into the discharging tube thus, reducing the efficiency of the motor.

According to my invention, the gas issues from the combustion chamber into the discharging tube at atmospheric pressure or thereabouts in the form of a stream which is of parallel or cylindrical form that is to say it does not expand, so that on cooling and contraction in the discharging tube a partial vacuum or suction effect is produced that induces the inflow of air which freely enters and mixes with the gaseous stream thereby increasing the mass of the latter. The discharging tube may be made of fairly considerable length and owing to the continued cooling of the stream throughout the tube and the consequent decrease in volume of the air and gas the tube is tapered towards its discharging end so as to reduce its cross sectional area. The length of the tube should be such that the gaseous stream is completely cooled at the discharging end to prevent any suction effect at that end and the entry of air in the direction opposite to the direction of flow. Additional air may be introduced at several points along the discharging tube in any suitable or convenient manner

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for further augmenting the mass of the gaseous stream. The combustion chamber is enlarged to allow for the expansion of the products of combustion and towards its discharging opening it is contracted slightly to increase the velocity of the gas which however as stated above does not expand after leaving the combustion chamber. By means of the present invention the mass or weight of the stream is considerably augmented and practically the whole of the heat of the stream is converted into kinetic energy. The fuel for the combustible charge may be of any suitable kind, for example, a liquid fuel such as petrol, paraffin or the like or coal dust may be used in any known or convenient manner.

In order that the said invention may be clearly understood and readily carried into effect, the same will now be described more fully with reference to the accompanying drawings, in which:—

Figure 1 is a sectional plan of one embodiment of the invention suitable for use on aeroplanes.

Figure 2 is a front elevation, half of which is in section as viewed on the line 2—2 of Figure 1.

In the example illustrated, A is a tank for containing liquid fuel such as petrol; B B are pipes leading from the tank and terminating in suitable nozzles C C; D is a small petrol motor for rotating a fan E located in a casing F provided with an air inlet G shaped to form rearwardly extending tubular portions H H around the nozzles C C and having suitably shaped outlets J J such as shown in Figure 1.

A tube K surrounds each tubular portion H of the casing F and extends rearwardly for a suitable distance, both ends of each tube being open as shown in Figure 1. Petrol is supplied from the tank to the nozzles C and the rotary fan E drawing air through the inlet G delivers it at low pressure into the tubular portions H of the casing F; the petrol issuing from the nozzles C C mingles with the air supplied by the fan E thus forming the combustible mixture which on being ignited or burnt in the combustion spaces L L expands within the enlarged parts of the tubular portions H H and then passes through the slightly contracted outlets J J from which the gas issues at atmospheric pressure or thereabouts in substantial cylindrical form. The gas on cooling in the discharging tube K produces a partial vacuum which draws the air into the tube in the direction of flow and owing to the non-expanding stream issuing from the outlets J the entry of air is not impeded. Owing to the continued cooling of the stream and the consequent decrease in volume the discharging tube is made tapered towards its discharging end to prevent entry of air at that end. The tube should be long enough to ensure complete cooling prior to the stream reaching the discharging end from which the stream greatly increased in mass by the air, is discharged at atmospheric pressure or thereabouts. The mass of gaseous stream on being discharged at the rear end of the tubes into atmosphere and impinging on the air produces the reaction and propulsion of the aeroplane.

It will be understood that the example above described and illustrated in the drawing is purely diagrammatic and is only intended to show one mode of carrying the invention into effect. Several changes and modifications may be effected, for instance, it may be desirable to employ a series of nozzles or burners arranged in any convenient manner; additional air may be introduced at several points along the tubes K at successive stages.

Furthermore, it may be desirable to provide a single tube of large cross sectional area which may be used instead of two comparatively small tubes as shown. In this case one or more nozzles may be provided as aforesaid and the single tube may be so shaped or arranged at its forward part to provide accommodation for the pilot and a fuel tank and an engine such as D for driving a fan which delivers air under slight pressure to the combustion space or spaces.

Instead of supplying the air into the combustion spaces by a fan the arrangement may be such that a current of air is caused to flow through a suitable collector or deflector and to pass around the burners or nozzles to mingle with the petrol or the like supplied through the same. The current of air may be utilised for sucking the petrol or the like through the burners or nozzles, or the petrol issuing from the nozzle may draw in the air for combustion which will draw in additional air for increasing the weight of the discharged gas. For starting the engine a small propeller or fan may be provided in the tube for drawing in the air and petrol, or the like and the rear end of the tube could be partially closed for a time by a suitable valve capable of being readily operated to open the discharging end of the tube when desired. In a further modification a fan situated in the tube K and driven by the gas flowing through the latter may be coupled to a compression fan so as to drive the latter which delivers air required for combustion.

The tube or tubes such as K may in some instances be mounted in such a manner that the position thereof could be controlled for the purpose of varying the direction of discharge. For instance the tube may be angularly movable in a vertical direction on horizontal trunnions or pivots for enabling or assisting the aeroplane to rise or descend, and/or the tube may be movable laterally for enabling or assisting the aeroplane to turn. Normally of course the tube would occupy a position in which the aeroplane would be propelled horizontally in a straight path, and to change the movement of the aeroplane means may be provided to enable the pilot to readily alter the position of the tube as required. The tube may be moved to discharge the stream in the front of the aeroplane to produce a braking action and thus retard the speed of the aeroplane when landing. Instead of moving the tube for this purpose, the rear end thereof could be temporarily closed in suitable manner, so that the gas is discharged through the front end of the tube.

It will be understood that the invention is capable of being used for or in connection with the propulsion of vessels or vehicles other than aeroplanes and airships.

Moreover, the invention is applicable for use as a motor or engine in which a mechanical element is actuated; for example the aforesaid tube may be connected to a casing containing a rotary element having blades or vanes or the rotary element may be arranged in the cylinder the arrangement being such that the pressure of the gas on the blades or vanes effects the rotation of the said element thereby forming a gas operated turbine or rotary engine.

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

1. An engine or motor of the kind referred to, in which the gas issues from the combustion chamber into a discharging tube at atmospheric pressure or thereabouts in the form of a non-expanding stream so that air can be freely drawn into the discharging tube to mix with and increase the weight of the stream owing to the partial vacuum or suction effect produced by the cooling and contraction of the stream in the discharging tube.

2. An engine or motor as claimed in Claim 1, in which the discharging tube is of fairly considerable length compared with its transverse measurement at any point along the length and decreases in cross sectional area towards the discharging end, substantially as and for the purpose specified.

3. An engine or motor as claimed in Claim 1, in which additional air is introduced at several points along the discharging tube, substantially as and for the purpose specified.

4. An engine or motor as claimed in Claim 1, in which the combustion chamber is formed with an enlarged portion to allow for expansion of the products of combustion which enlarged portion is contracted towards the outlet of the combustion chamber, substantially as described.

5. An engine or motor of the kind set forth in any of the preceding claims in which the discharged gases are utilised to move a mechanical element, substantially as described.

6. An engine or motor having its parts constructed, arranged and adapted to operate substantially as hereinbefore described with reference to the accompanying drawings, for the purpose specified.

Dated this 16th day of August, 1917.

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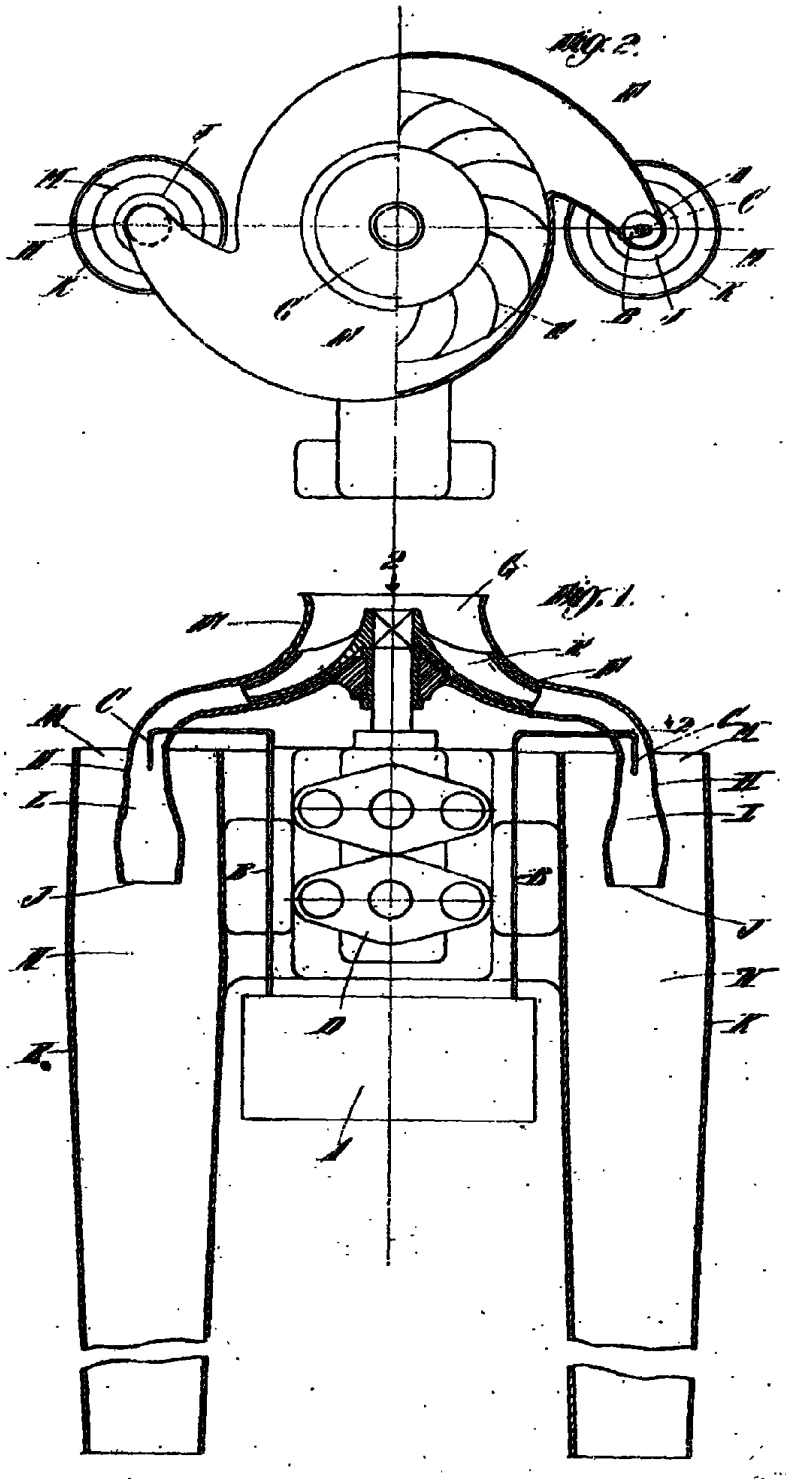
[This Drawing is a reproduction of the Original on a reduced scale.]



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