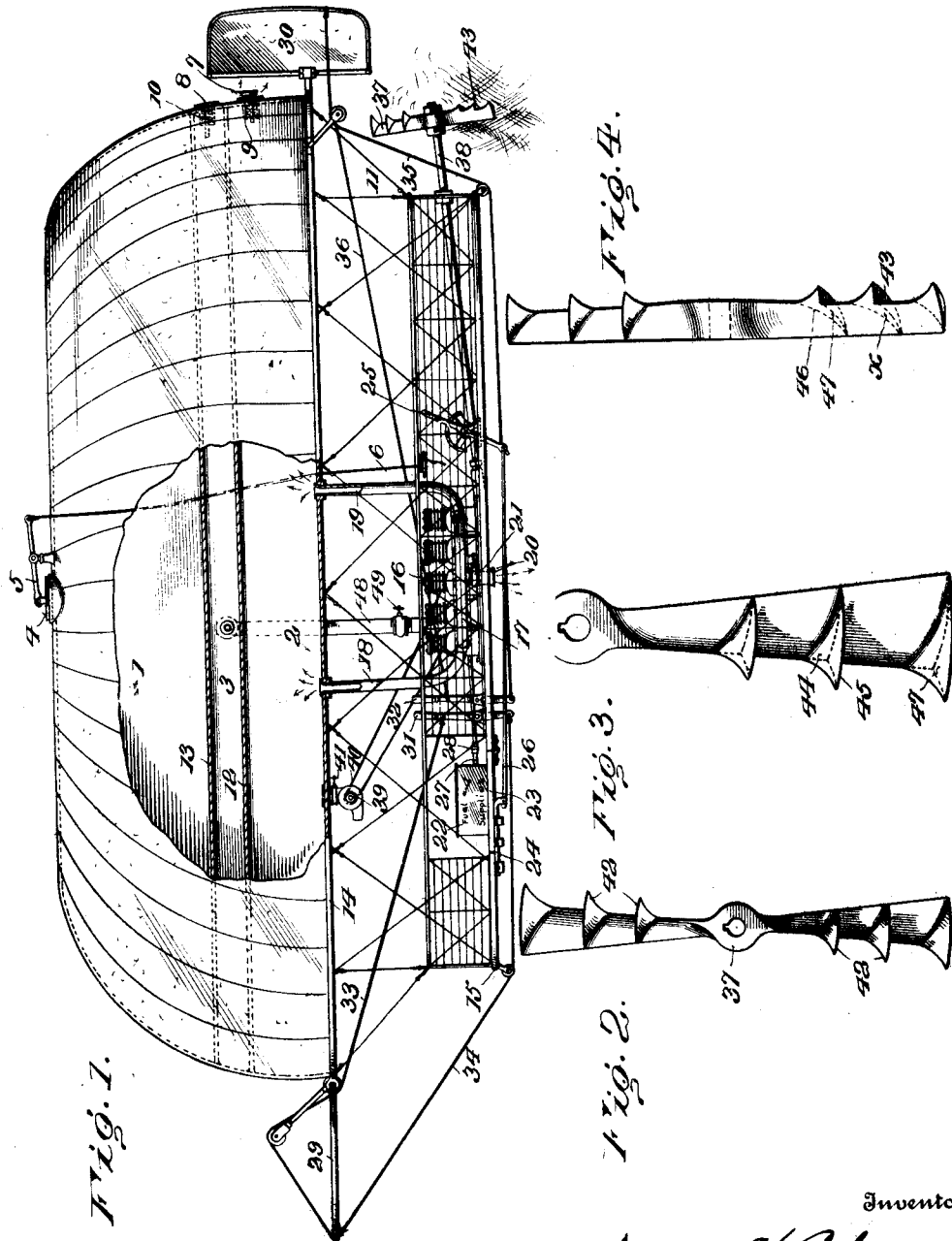


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AIRSHIP.

APPLICATION FILED JAN. 25, 1911.

Patented Apr. 15, 1913.

1,059,036.



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# UNITED STATES PATENT OFFICE.

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## AIRSHIP.

1,059,036.

Specification of Letters Patent.

Patented Apr. 15, 1913.

Application filed January 25, 1911. Serial No. 604,514.

*To all whom it may concern:*

Be it known that I, DAVID HAMILTON COLES, of Brooklyn, New York, have invented a new and useful Improvement in Airships, which invention is fully set forth in the following specification.

This invention relates to improvements in dirigible balloons or airships and more particularly to aero-plane airships and has for its chief objects to utilize the exhaust products and heat of the engine for effecting ascent and descent, also to do away with the use of ballast and to enable much longer flights to be made than hitherto attained.

Further objects are to improve the construction of the propeller in order that it may exert a greater force to advance the ship and also to improve the general construction in airships. These and other objects will be fully explained in the detailed description.

In airships as heretofore constructed, it has been the practice to provide a large quantity of ballast which is discharged during the flight at times ascent is desired. Should the ship enter warm air currents and expand the field, after ballast has been discharged, then recourse is had to discharging the field to counteract the ascensional effect of this expansion. Such discharge of gas has the serious objection of diminishing the extent of the flight. It has also been proposed in ships of this class to use the hot exhaust products from the motor to heat the gas field thereby expanding the gases therein and causing ascent when desired. Descent, however, is effected by discharge of the gas field accompanied by the above objection that the length of flight is materially shortened. Furthermore, there is more or less danger attending the heating of such a field by the products of combustion from the exhaust which attains at times the kindling temperature of the gas in the field.

My invention overcomes the objections and secures the advantages above described by constructing the airship with a permanent gas field which is capable of equalizing the weight of the ship and cargo but not capable of elevating the ship. I associate with this field a chamber adapted to receive and discharge the hot exhaust gases from the engine, the supply and discharge being regulated by valves under control of the operator. This chamber is as far as practical out of heat interchanging relation with the gas field. To this end the upper wall of the chamber is

provided with heat insulating material such as asbestos and is preferably separated from the permanent gas field by an interposed gas chamber which receives a light gas such as hydrogen or illuminating gas the presence of which acts as a heat insulator and which also serves in operating the ship as will be presently explained. The capacity of the hot gas chamber permits confinement of a volume of exhaust gases sufficient to effect the elevation of the ship from the ground and to the height desired. When this elevation is attained the exhaust supply is regulated to maintain the elevation, the advance being made by the engine driven propellers.

I preferably provide the underside of the exhaust gas chamber with a flat surface parallel to the floor of the car and capable of acting as an aero-plane surface and I also prefer to set the drive shaft for the propeller at an angle to this plane. When the propeller is in action the bow of the ship is thereby slightly elevated so that the plane has a lifting power to assist sustaining the weight of the ship.

Another feature of importance in the construction of my airship resides in the structural form of the propeller blades which, by reason of curved flanges thereon, reduce the air slip and give increased thrust. While my propeller is particularly designed for use on airships, it may also be used in water and secure the same advantages.

Certain mechanical expressions of the inventive ideas involved are shown in the accompanying drawings which are designed merely as illustrations to assist in the description of the invention and are not intended as defining the limits thereof, the claims being relied on for this purpose.

In the drawings:—Figure 1 shows a view in partly broken elevation of an airship provided with my improvements. Fig. 2 shows in elevational view a propeller on the side provided with flanges. Fig. 3 is an enlarged detail view of one of the propeller blades, and Fig. 4 is a side view in elevation of the same propeller.

Referring to Fig. 1, the super-structure of the ship comprises a gas field 1 filled with hydrogen or like gas, a chamber 2 for reception of the hot exhaust from the engine and an intermediate gas chamber 3 which holds a light gas such as hydrogen or illuminating gas. The contour of the super-structure may assume any form such as round, oval or cigar shape, but I prefer an oval or round

shape which lends itself to the use of a flat bottom surface which can act as an aeroplane. The gas field is provided with a discharge valve 4 normally closed but adapted to be raised by a lever 5 and cord 6 under the control of the operator. Valves 7 and 8 normally held closed by springs 9 and 10 and adapted to be operated by cords 11 are provided in each of the chambers 2 and 3. The partition wall 12 which separates the hot gas chamber 2 from chamber 3 is made of or provided with a heat insulating material which confines the larger part of the heat present in the exhaust gases to the lowest chamber. The gas field 1 is further protected against heat transfer across wall 12 by the non-heat conducting gases confined between walls 12 and 13 forming chamber 3 which acts in the nature of a "dead air space". The bottom wall 14 of chamber 2 is flat for the purpose of acting as an aeroplane surface.

The car body 15 which is attached to the bottom 14 of the super-structure by cables in the usual manner supports the engine 16 here shown as of the multiple cylinder type. An exhaust conduit 17 receives the discharge of hot products of combustion from all the cylinders and delivers the hot gases through vertical pipes 18 and 19 into gas chamber 2 or they may be delivered in whole or in part into the atmosphere through exhaust pipe 20 by opening valve 21. The fuel for running the engine is stored in a tank 22 which may also serve for holding other supplies. This tank preferably rests on a hinged door 23 which is provided with a locking means such as by a bolt 24 adapted to be drawn when occasion requires by means such as a lever 25 acting through a connecting rod 26. The tank is connected through a fuel supply pipe 27 with the engine and is provided with a slip joint 28 which permits of instant uncoupling of the tank and engine when the bolt 24 is drawn to drop the tank through the floor.

The vessel is steered by means of fore and aft planes of any desired type such as by planes 29 and 30 which are manipulated by levers 31 and 32 connected therewith by operating cables 33, 34, 35, and 36 in the usual manner. The propeller 37 is mounted on a propeller shaft 38 which is inclined to the aeroplane surface 14 and when in operation raises the prow of the ship to enable the aeroplane to exert a lifting force. I may, and preferably do, provide a fan 39 for pumping cold air into the chamber 2 to drive out the heat products of combustion and thereby hasten descent. This fan may be operated by the movement of the vessel alone or it may be positively driven from the engine by connection 40. A valve 41 is provided to cut off communication with the atmosphere as desired.

The propeller itself is of peculiar design and is clearly illustrated in Figs. 2, 3 and 4 to which attention is called. The oppositely disposed blades of the propeller are each provided on the advancing side with one or more flanges 42. Since each flange is the same in form, the description of one will serve for all. The flange has its origin in the entering edge of the propeller blade and increases in height and thickness toward the rear. The back 43 of the flange 42 or the face nearer the periphery of the propeller blade is a part of a cylindrical surface having its axis coinciding with the axis of the propeller and normal to the surface of the blade. The inner face 44 of the flange intersects the back face to form a thin edge 45 and its intersection with the surface of the propeller blade in line 46 makes an acute angle with the intersection line 47 of back face 43 with the surface of the propeller. The inner face of the flange is concave and may vary in size and curvature according to the conditions of service for which the propeller is to be used. The form illustrated I prefer for propellers which are to be used on airships, the idea being to gradually increase the pressure on the blade as the air passes across it.

The operations are as follows: The ship may be assumed as resting on the ground and provided with its supply of fuel and cargo. The gas field is adjusted so that the weight of the ship is equal to the weight of the air displaced or the ship is neither heavier nor lighter than air. When the gas chamber 3 is used, its buoyant effect is designed to compensate for the weight of the fuel and its capacity is therefore small compared with that of the gas field 1. After starting the engine the exhaust gases are directed into chamber 2 through pipes 18 and 19 by cutting off the exhaust to the atmosphere by aid of valve 21. The heated exhaust gases from the engine displace through the opened port 7 the cool air in the chamber 2, and fill it with a specifically lighter gas which, while confined in the chamber, causes the ship to rise from the ground and to such elevation as desired for continuing the flight. The exhaust is then directed to the atmosphere through pipe 20. Ascension is also assisted by the action of the propeller and aeroplane 14 by reason of the angular relation of the propeller shaft and aeroplane surface. The thrust of the propeller causes the forward end of the aeroplane to elevate thereby enabling the plane to exert a lifting force. Should the ship enter warm air currents and expand the gas field 1 causing the ship to ascend during its course, this effect may be counteracted by partially opening port 7 and regulating the exhaust valve 21. The hot gases in chamber 2 escape and thereby diminish its lifting power. The discharge

may be hastened by starting fan 39 which will introduce cold air in this chamber.

On long trips for which this ship is particularly designed, there will be considerable loss of weight by consumption of fuel, the effect of which is to cause the ship to rise. To compensate for this the gas in chamber 3 is permitted to escape by occasionally opening port 8. While this permits a certain amount of gas to escape, it also permits air to enter, the result being that the density of the mixed gases in chamber 3 approaches that of air thereby diminishing the lifting power of this chamber to correspond to the diminished weight of fuel. It is, therefore, seen that chamber 3 performs a double function. It serves in operating the ship and it also serves by reason of the non-heat conducting property of gases to cooperate with the heat insulating partition 12 to interpose a barrier to the heating effect of the exhaust gases on the gas field which latter may be considered a permanent part of the structure of the ship. Landing is effected by discharge of chamber 2 and admission of cold air. Should it become necessary to suddenly lighten the ship in case of an emergency, the bolt 24 is withdrawn by manipulating lever 25 thereby opening trap door 23 and dropping the weight of fuel and supplies. The tank pipe 27 breaks connection with the engine at slip joint 28. Even in case all ascensional means fail the aeroplane may be relied on to glide to earth without serious accident to the occupants of the ship.

My propeller as stated above is designed to give increased thrust which it effects by means of the superposed flanges 42. The air sweeping across the blades is confined to a straight course over their surface, the pressure increasing from the entering edge of the blade to the rear because of the gradual elevation of the flange toward the rear. This is in contrast with the tendency of the air sweeping over a plane surfaced blade to slip toward the periphery of the propeller blades with less of propelling power. This form of propeller has a better grip on the air, is notably efficient and in water no churning occurs between the flanges.

Instead of discharging the gas from chamber 3 into the atmosphere when it is desired to compensate for loss of weight by consumption of fuel, I may conduct this gas by means of pipe 48 to the engine and thus prevent waste of gas and effect an economy of liquid fuel and materially increase the length of the flight. A valve 49 is provided in pipe 48 for the purpose of controlling the flow of gas therethrough.

What is claimed is:—

1. In an airship, the combination of a

car body, an engine thereon for propelling said ship, a gas field associated with said car and adapted to exert a lifting force equal to the weight of the ship and cargo, a chamber for hot exhaust gas and a gas chamber intermediate said field and exhaust chamber, said exhaust chamber having a valved connection with the exhaust port of the engine for the purpose of controlling ascent and descent, said intermediate gas chamber acting to compensate for loss in weight of fuel.

2. In an airship, the combination of a car body, an engine thereon for propelling said ship, a gas field associated with said car and adapted to exert a lifting force equal to the weight of the ship and cargo, a chamber for hot exhaust gases having a heat insulating wall between said chamber and said field and an aero-plane bottom surface, a valved connection between said chamber and the engine exhaust whereby ascent and descent of the ship is effected by control of exhaust products to said chamber.

3. In an airship, the combination of a gas field, a car body and an engine thereon, a hot gas lifting chamber out of heat interchanging relation with said gas field and in valved communication with the exhaust of said engine for the purpose described.

4. In an airship, the combination of a gas field, a car body and an engine thereon, a hot gas lifting chamber out of heat interchanging relation with said gas field and in valved communication with the exhaust of said engine, said chamber having an aeroplane bottom surface for the purpose described.

5. In an airship, the combination of a gas field, a car body and an engine thereon, a hot gas lifting chamber out of heat interchanging relation with said gas field and in valved communication with the exhaust of said engine and means for introducing cold air into said chamber to displace the hot gases therein.

6. In an airship, the combination of a gas field, an engine, and a chamber for receiving the hot exhaust products from the engine, a second gas chamber intermediate said field and first named chamber and containing a combustible gas lighter than air and a conduit connecting said last named chamber and said engine for the purpose described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

DAVID HAMILTON COLES.

Witnesses:

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