H. JUNKERS.

FLYING MACHINE.

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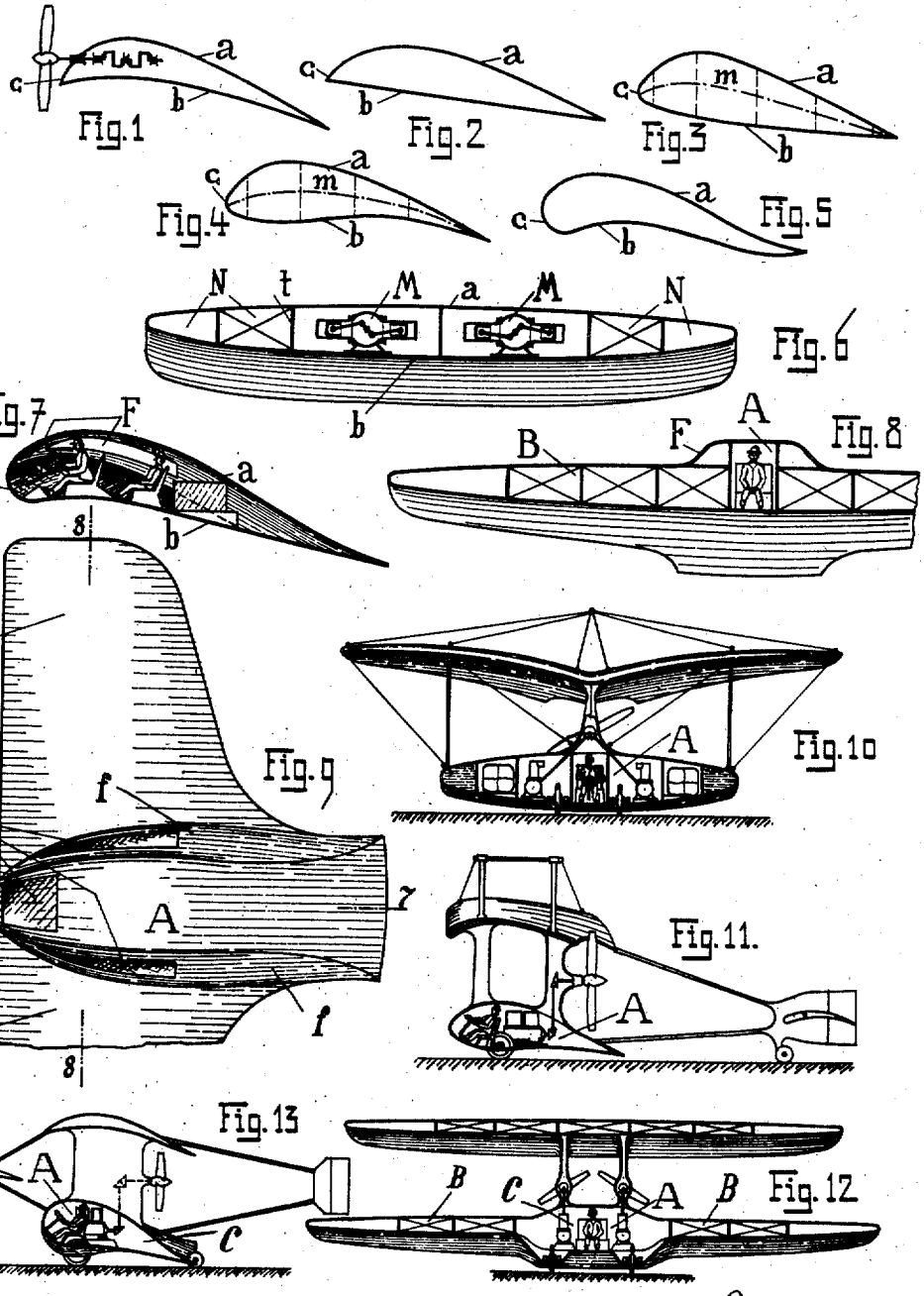
1,114,364. Patented Oct. 20, 1914.



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FLYING-MACHINE.

1,114,364. Specification of Letters Patent. Patented Oct. 20, 1914.

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To all whom it may concern:

Be it known that I, HUGO JUNKERS, a subject of the Emperor of Germany, residing at Aachen, Germany, have invented certain new and useful Improvements in Flying-Machines, of which the following is a specification.

My invention relates to improvements in flying machines particularly of the aeroplane type.

In the construction of flying machines it is most desirable to relieve the motor as much as possible by making the ratio between buoyancy and the resistance caused by the propulsion of the machine, as large as possible. The principle of the present invention is based upon the fact that a supporting surface (or a supporting wing) may be of a relatively large cross-section in its front part without increasing the injurious resistance of the air.

The greater the number of non-supporting parts of a flying machine to the air current adapted to create an injurious resistance, in addition to the injurious resistance offered by the supporting surfaces, the smaller becomes, under otherwise equal circumstances, the ratio between the buoyancy and the entire resistance offered by the flying machine. This ratio between the buoyancy and the resistance becomes more unfavorable with the increase in the speed of the machine, because with the same buoyancy the supporting surfaces can be constructed smaller in proportion to the increase in the speed of the flying machine.

When attempting to relieve the motor it is important to keep the resistance of the non-supporting parts as small as possible in proportion to the resistance offered by the supporting surfaces. For this purpose wind-screens have been used with several types of aeroplanes. In the machine forming the object of the present invention all parts which do not serve to increase the buoyancy of the machine are mounted in hollow spaces closed on all sides so that besides offering the least possible injurious resistance they furthermore greatly assist an increased buoyancy of the machine; this result is obtained by giving to the cross-section of these hollow spaces seen in the direction of movement the substantial form of a whale-back with its broader end in the direction of the flight. The cover consists chiefly of an upper and a lower plane having their front part in spaced relation and gradually approaching each other toward their rear where they unite in a sharp angle. These upper and lower planes are curved in such a manner that a line bisecting the vertical of the two planes is curved upwardly so that the upper plane is always strongly curved in an upward direction while the lower plane may be either bent slightly upward, straight, or may bulge slightly downwardly or partly upwardly and partly downwardly. An envelop or cover of such a cross section possesses a great buoyancy when moving through the air.

The exact shape of the outer surfaces as for instance the curvature, the inclination and dimensions of the closed space may be chosen according to the prevailing conditions in order to obtain the least resistance and the best buoyant action. The shape is further determined by the speed for which the machine is built, the distribution of the weight carried by the machine, the type of the machine, the buoyancy desired to be obtained, the material of construction used, and the dimensions of the object intended to be carried by the machine. Such buoyant envelop may be arranged in flying machines fully independently of the supporting surfaces which latter may receive any desired form.

If the above described envelops are intended for attaining a substantially great lifting capacity their measurements transversely to the direction of flight must be a multiple of their dimensions in the direction of flight in order to reduce as much as possible the injurious influence of the air striking the sides of the machine. However in order to save space for instance, it is possible to make the buoyant envelop smaller transversely to the direction of movement and to make the side current of air harmless by conducting the laterally downflowing air above and below the real supporting planes of the apparatus in order to increase the buoyancy by acting against the underside of said planes. This is done by connecting the supporting wings by means of uninterrupted intermediary means to the buoyant envelop. Finally the supporting wings which are connected by means of uninterrupted intermediary means to the buoyant cover may be formed as hollow bodies having the above described shape in cross section and serving for the reception of the

non-buoyant parts of the flying machine and object carried thereby, as for instance persons, accessories, freight, etc., so that the buoyant envelop *per se* may be made relatively smaller. In the latter case buoyant envelops or covers and supporting wings joined to them can gradually slant one into the other so as to present a smooth surface having no sharp edges at the points of connection discernible from the exterior.

The upper and lower planes of the supporting wings or of the supplementary supporting wings are connected with each other in the interior of the hollow space by means of braces, wires or the like whereby not only the considerable resistance offered by exposed parts is avoided but all these delicate parts are also protected against injuries thus greatly increasing the safety of the machine.

In order to be able to accommodate bodies of comparatively great dimensions within the buoyant envelop or the hollow supporting planes of the flying machine without the necessity of accommodating the entire envelop to the shape of said bodies, compartments, etc., may be arranged for such purpose. These compartments, etc., are formed in such a manner that their cross section in the direction of motion possesses the same or a shape similar to that of the remaining hollow space but of a size corresponding to the body to be carried that means to say such compartments, etc., are constructed so as to present a substantially whale-back form in cross section with the widest part thereof pointing to the front in the direction of flight and the surface or planes thereof are formed in such a manner that an imaginary line drawn through the middle between the upper and lower surface arches upwardly so that also these compartments, etc., produce and possess buoyant effect during the forward motion of the flying machine.

For steering, balancing and other purposes, the hollow supporting wings can be so constructed that the inclination or form (or both) of the wings or the parts thereof can be changed as necessity requires. Moreover the steering, balancing and other appliances may be adapted to the supporting wings or to the flying machines provided with such supporting wings in the customary manner.

By placing the passengers, freight, engines, accessories and the like in closed spaces a shelter against the influences of the weather is provided.

In the accompanying drawing the object of the invention is illustrated by means of examples.

Figures 1 to 5 and Fig. 7 show modifications of my machine, which consists in the main part of an upper plane *a* and the lower one *b* which inclose together a hollow space of substantially whale-back form cross section within which non-buoyant bodies, persons, etc., are located.

The upper surface is always effectively curved upwardly, the lower surface may be slightly curved upwardly (Fig. 1) or may be even (Fig. 2) or slightly curved downwardly (Fig. 3), or finally it may also show these different forms combined (Figs. 4, 5 and 7). In all cases, a line *m* which is drawn through the points of bisection of all vertical lines *h* being drawn between the upper and lower surface, must be curved upwardly as shown for example in Figs. 3 and 4. The front edge *c* may be either sharp (Figs. 1 and 2) or slightly rounded off (Figs. 3 and 4) or completely round (Figs. 5 and 7). Fig. 6 is a section through such a buoyant envelop in a direction transversely to the direction of motion. This envelop incloses for example the motors M assigned for driving the propeller. The envelop has a comparatively great extension transversely to the direction of movement in order to prevent a weakening of its carrying capacity by the pressure of the air current against its sides. The spaces N beside the motors may serve for the storage of fuel, lubricating oil, cooling water or the like. At the same time the envelop is made self-supporting by means of inner braces.

Figs. 7, 8 and 9 show a buoyant envelop A serving for the reception of persons and freight and being of comparatively small dimensions transversely to the direction of motion. Therefore the envelop is on both sides connected to the supporting planes B of the flying machine, these planes are in the example shown also formed as hollow spaces and serve for the reception of non-buoyant parts (as for instance the braces).

The envelop A is provided with windows and entrance openings F which remain closed during the flight and form a smooth surface with the other envelop parts in order to avoid the formation of injurious eddies and friction.

The envelop itself projects upwardly and rearwardly beyond the supporting surfaces and is connected to the latter by means of intermediary surfaces *f* in order to obviate the necessity of accommodating the entire supporting surface to the height of the envelop space A necessary for the reception of passengers. The supporting surfaces B could also be solid or respectively covered on one side only.

Figs. 10 and 11 represent a flying machine (monoplane) the non-buoyant parts of which as well as the passengers and freight, etc., are located in an envelop adapted to assist in the buoyancy of the machine during flight which is quite independent of the supporting plane B.

Figs. 12 and 13 show a biplane in which

the non-buoyant parts are located in a narrow buoyant envelop C which on both sides is connected by uninterrupted smooth intermediary surfaces with the supporting planes B in order to reduce as little as possible the carrying capacity of the envelop C by the side current of air.

I claim:

1. In a flying machine of the character described, a shell of a form adapted to assist in the buoyancy of the machine during flight, providing a space for the reception of persons, motors, accessories and freight, composed of upper and lower planes and having substantially whale-back shape with the wider end in front, hollow supporting wings for said buoyant shell, means for connecting said wings and said shell, so as to offer a smooth surface to the air, said shell inclosing the starting, landing propelling and steering means, substantially as described.

2. In a flying machine, a shell of a form adapted to assist in the buoyancy of the machine during flight and inclosing a hollow space of dimensions adapted for the reception of persons, motors, accessories and freight, an upper and lower plane forming said shell and presenting a whale-back form in cross-section with its broader end in front, said upper and lower plane converging into a rounded edge, tapering gradually rearwardly and ending in a sharp edge and being curved so as to make the line bi-secting the vertical distances between said upper and lower plane curved upwardly.

3. In a flying machine, a shell of a form, adapted to assist in the buoyancy of the machine during flight and inclosing a hollow space of dimensions adapted for the reception of persons, motors, accessories and freight, an upper and lower plane forming said shell and presenting a substantially whale-back form in cross-section with its broader end in front, said upper and lower plane converging briskly in front, tapering gradually rearwardly and ending in a sharp edge, and being curved so as to make the line bi-secting the vertical distances between said upper and lower planes curved upwardly, main supporting wings, and means for connecting the sides of said shell with said main supporting wings.

4. In a flying machine, a shell of a form adapted to assist in the buoyancy of the machine during flight and inclosing a hollow space of dimensions adapted for the reception of persons, motors, accessories and freight, an upper and lower plane, forming said shell and presenting a substantially whale-back form in cross-section with its broader end in front, the upper and lower plane converging briskly in front, tapering gradually rearwardly and ending in a sharp edge, said planes being curved so as to make the line bi-secting the vertical distances between said upper and lower plane curve upwardly, main supporting wings, and means for connecting the sides of said shell with said main supporting wings.

5. In a flying machine, a shell of a form adapted to assist in the buoyancy of the machine during flight and inclosing a hollow space of dimensions adapted for the reception of persons, motors, accessories and freight, an upper and lower plane forming said shell presenting in cross section a substantially whale-back form, with the broader end in front, said upper and lower plane converging briskly in front, tapering gradually rearwardly and ending in a sharp edge and being curved so as to make the line bi-secting the vertical distances between said upper and lower plane curved upwardly, hollow main supporting wings, means for connecting said shell to said main supporting wings and interior supporting and stiffening structures within said shell for producing a self supporting body.

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

HUGO JUNKERS.

Witnesses:
HENRY QUADFEIG,
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