

CHRISTOPHER JOHN LAKE (NAME CHANGED FROM JOHN CHRISTOPHER LAKE
BY JUDICIAL ORDER).

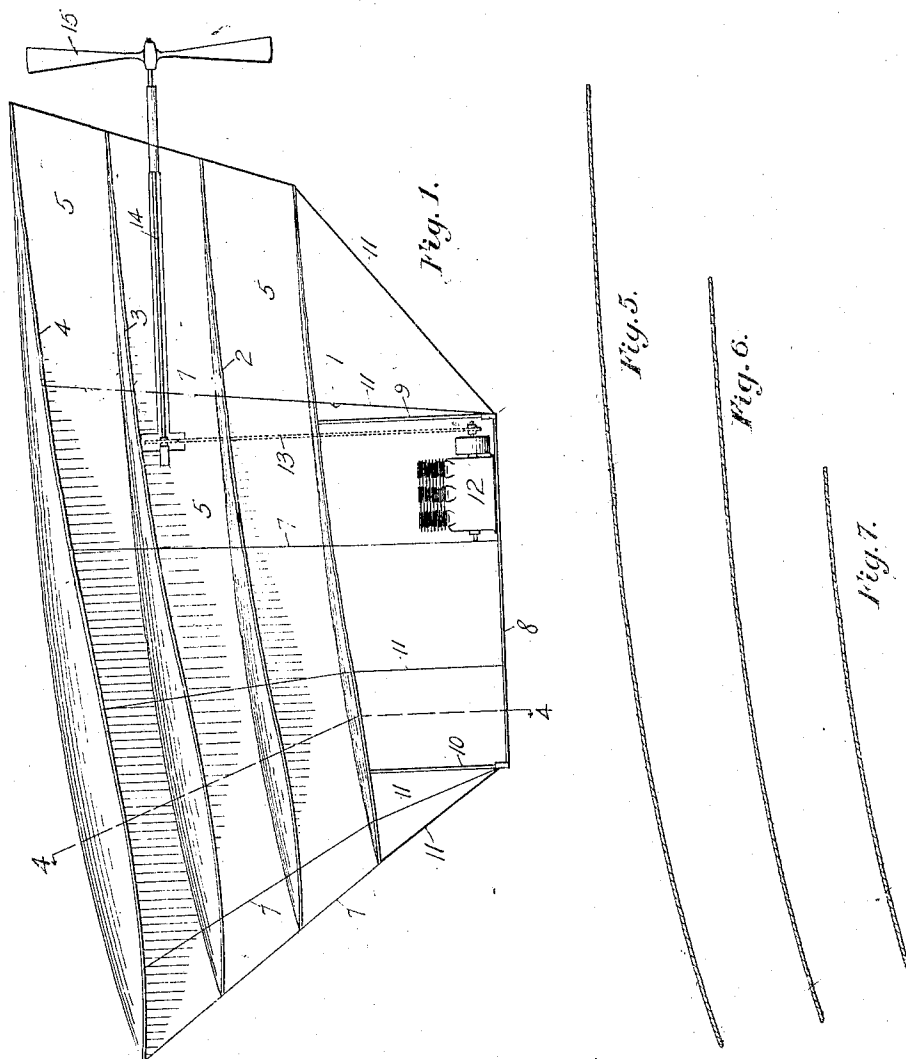
AIR CRAFT.

APPLICATION FILED, SEPT. 30, 1908.

Patented July 18, 1911.

3 SHEETS-SHEET 1.

998,295.



Witnesses:

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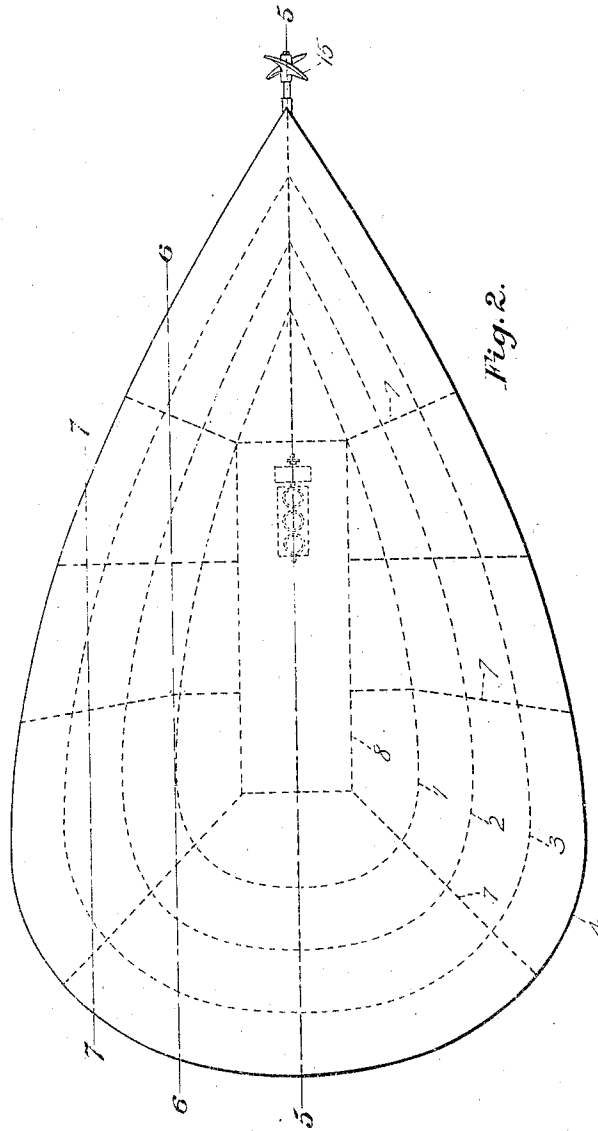
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3 SHEETS—SHEET 2.

998,295.



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3 SHEETS—SHEET 3.

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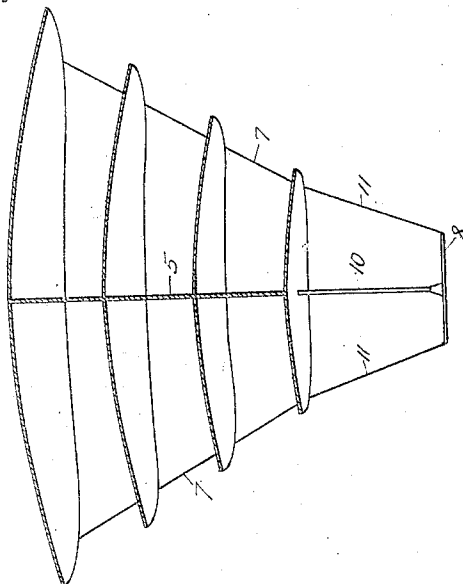


Fig. 4.

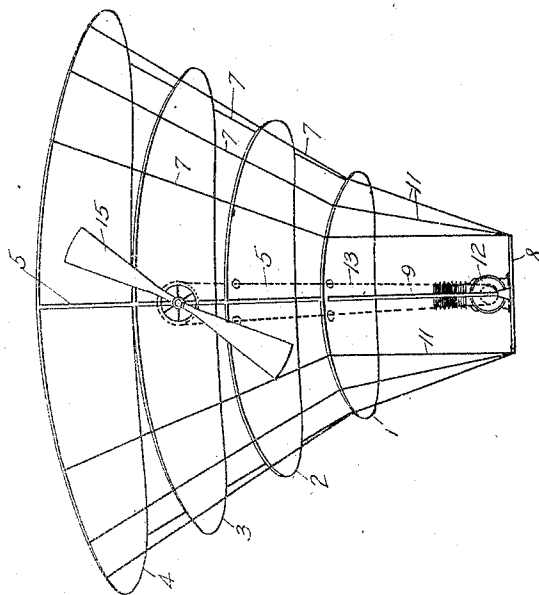


Fig. 3.

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UNITED STATES PATENT OFFICE.

CHRISTOPHER JOHN LAKE, (NAME CHANGED FROM JOHN CHRISTOPHER LAKE BY JUDICIAL ORDER,) OF BRIDGEPORT, CONNECTICUT.

AIR-CRAFT.

998,295.

Specification of Letters Patent.

Patented July 18, 1911.

Application filed September 30, 1908. Serial No. 455,537.

To all whom it may concern:

Be it known that I, CHRISTOPHER JOHN LAKE, (formerly JOHN CHRISTOPHER LAKE,) a citizen of the United States, and resident of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Air-Craft, of which the following is a specification.

This invention relates to that class of aerial machines in which the effect of gravity is resisted by the upward components of air pressures acting upon suitably arranged surfaces. The chief difficulty encountered by this class of devices is to maintain both lateral and longitudinal stability in the air under varying conditions of wind and speed. Many experimenters have learned that upon increasing their speed the center of air pressure upon their planes has a distinct tendency to move forward with increase of speed or wind, thus disturbing the longitudinal stability with the result sometimes of causing the machine to fall to the earth with disastrous and dangerous results. Some constructors have sought to minimize this tendency by using planes of short longitudinal dimensions and great lateral spread. This, however, increases the head resistance and also causes a much greater lateral instability which necessitates the use of pivoted wing tips or some means of warping or otherwise constantly manipulating the ends of the planes so as to equalize or vary the pressure thereon and thus balance the machine. From the fact above referred to that the stability and poise of the devices now known and used is altered and effected by the speed with which they move through the air, they have been constructed with particular care to preserve their balance when under a given speed and with too little regard to maintaining their stability in case of failure of their propelling mechanism.

The general and principal object, therefore, of my invention is to construct a machine that will tend inherently to a condition of equipoise and stability in the air irrespective of whether it is being acted upon by variable winds or motive power or by the force of gravity alone.

A more particular object is to so dispose and arrange the sustaining surfaces of the machine that whenever the propelling

power is cut off, either by accident or by design, the machine can drift or glide in none other but a forward direction and with gradual descent toward the earth.

A further object is to so proportion and design the air impinging surfaces as to obviate or compensate the well-known tendency of the center of air pressure or "lift" to move forward thereon when there is an increase of speed or when encountering gusts of wind.

A further object is to so arrange the propelling device that the current of air set up thereby will envelop the machine and cause it to ride on its own created current, thus also protecting it from the effects of uneven wind against its surfaces.

With the above objects in view and such further objects as will appear when the particulars are more fully disclosed, I have invented certain improvements in aerial craft which I have embodied in the form of construction that I shall describe by reference to the accompanying drawings, in which,

Figure 1 is a side elevation, Fig. 2 is a top view, Fig. 3 is a front elevation, Fig. 4 is a section on line 4-4 of Fig. 1, and Figs. 5, 6 and 7 are typical longitudinal sections through the supporting surfaces.

Similar reference numerals refer to corresponding parts throughout the drawings.

The machine consists mainly in a series of superposed lifting surfaces 1, 2, 3 and 4 of similar form and contour, but increasing in size from bottom to top. These surfaces are of peculiar and novel formation, being of a generally triangular or wedge shape, pointed or narrow at the forward end and increasing in width throughout nearly their entire length, and being of concave form both laterally and longitudinally on the side of wind contact. These surfaces may be constructed of any preferred materials and in any manner that will secure the desired shape, strength and lightness. They are, therefore, represented diagrammatically on the drawings, without reference to any particular method or materials of construction. The several surfaces are secured together in proper relation by a vertical plane or web 5 which for lightness or appearance may be given a perforated or skeleton form in its lower portions. The surfaces are also connected at their edges by the members 7 extending between them. A platform or car 110

8 is suspended beneath the lowermost surface by hangers 9 and 10 and is further supported by cords or wires 11 extending from the lower supporting surface 1. This platform carries an engine 12 from which power is conveyed by the sprocket chain 13 to the shaft 14 which carries the propeller 15 in front of the supporting surfaces.

The steering of the machine in both vertical and horizontal directions may be effected by the use of pivoted planes or rudders under control of the operator. These have not been represented on the drawings, since their use is well known in the art and they are not claimed as any part of the present invention.

The transverse curvature of the supporting surfaces is clearly illustrated in Fig. 4, and the longitudinal curvature by Figs. 5, 6 and 7. This double curvature of the surfaces increases their sustaining power and improves the stability of the machine, especially when the series of surfaces is arranged as shown with each one extending beyond the edges of the one below, so as to collect in its concave portion the upward pressure of the air.

It will be noted by reference to Figs. 5, 6 and 7, which are sections taken through lines 5—5, 6—6 and 7—7 of the uppermost surface 4 and which are typical of corresponding sections through all of the surfaces, that the forward portion is approximately straight and that the curvature increases toward the after end. This in connection with the constantly increasing width of the surfaces toward the after portion is an important feature for overcoming the tendency exhibited by the usual forms of planes of acquiring under a condition of speed and excessive pressure upon their forward portion—a pressure which so increases the angle of incidence of the wind that the machine will be raised forward and thrown backward with dangerous results. The phenomenon of the advancing center of upward pressure is believed to be due to disturbances attending the sudden impact and deflection of the air upon meeting the forward edge of the plane. I obviate this effect by reducing the forward edge to a point or to very narrow dimensions and causing the disturbance due to the initial effect of the wind on the plane to be distributed over the greater part of the sides of the supporting surfaces instead of being concentrated at the extreme forward edge, and so much of the disturbance or increased pressure as does take place in that portion is limited in its effects to a very much reduced area of surface. The increasing downward curvature toward the rear of the lifting surfaces also contributes to confine the center of upward pressure to its normal position. The currents of air meeting or

traversing the curve act upon it with a continually increasing angle of incidence toward the rear. This increases the upward component of air pressure in that portion and serves to counterbalance whatever excess of forward air pressure has not already been prevented by the reduced area and angular form of that portion. By this means a longitudinal equilibrium of forces is maintained throughout variations of speed and wind. If the propelling device is stopped or becomes disabled the machine cannot fall sidewise owing to the vertical plane or partition between the sustaining surfaces and the form of the surfaces with their greater area at the rear insures that the machine will take a forward as well as downward course. The propulsion which results from this gradual descent now serves in lieu of the propelling power that has been lost and the triangular form and increasing curvature of the supporting surfaces continues to prevent any advance of the center of upward pressure sufficient to tip up the surfaces and slacken the speed and cause irregular and dangerous gyrations in the air. The machine will glide gradually to the earth in a straight course without special guidance or under control of the operator.

Another important advantage arising from the rearwardly broadened supporting surfaces with the propeller at the front is that the surfaces are so arranged as to be acted upon over their entire area by the current of air sent back by the propeller which reduces all gusts, eddies and the like irregularities of wind to a regular and constant stream which is first concentrated on the forward part of the surfaces and spreading out envelops them entirely with its influence. The machine may thus much more easily rise in the air by reason of creating and directing an artificial current of air to act upon the entire area of its lifting surfaces which when properly proportioned to the weight and power will cause the machine to ascend immediately without need of a running start or special launching apparatus.

A machine of the character and simplicity that I have described has also the advantage of being easily constructed so as to be readily assembled or knocked down for storage or transportation, in which case the concave sustaining surfaces can be nested together and the whole formed into a convenient parcel. These features should render the machine peculiarly adaptable to naval and military purposes.

Having now described a form of apparatus which embodies my invention, what I claim is:

1. A flying machine having, in combination, a series of superposed concave sustaining surfaces of a generally triangular and

forwardly pointed shape and a propeller located in front of said series, each of said sustaining surfaces being larger and extending beyond the edges of the one below.

5 2. A flying machine having, in combination, a series of superposed concave sustaining surfaces of a generally triangular and forwardly pointed shape and a propeller located in front of said series, each of said
10 sustaining surfaces being larger and extending beyond the edges of the one below and being concavely curved both transversely and longitudinally.

3. A flying machine having a series of
15 superposed concave sustaining surfaces and a vertical plane or web extending between them, said surfaces being concavely curved both transversely and longitudinally.

4. A flying machine having a series of
20 superposed concave sustaining surfaces and a vertical plane or web connected longitudinally to the uppermost of the sustaining surfaces, said uppermost surface being con-

cavely curved both transversely and longitudinally.

25 5. A flying machine having a series of superposed concave sustaining surfaces of a generally triangular and forwardly pointed shape and a vertical web or plane extending between them, each of said surfaces being
30 larger than and extending beyond the edges of the one below.

6. A flying machine having a series of superposed concave sustaining surfaces of a
35 generally triangular and forwardly pointed shape and a vertical web or plane extending between them, each of said surfaces being larger than and extending beyond the edges of the one below and being concavely curved both transversely and longitudinally.

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