

B. QUEZADA.
FLYING MACHINE.
APPLICATION FILED AUG. 31, 1911.

1,048,429.

Patented Dec. 24, 1912.

3 SHEETS—SHEET 1.

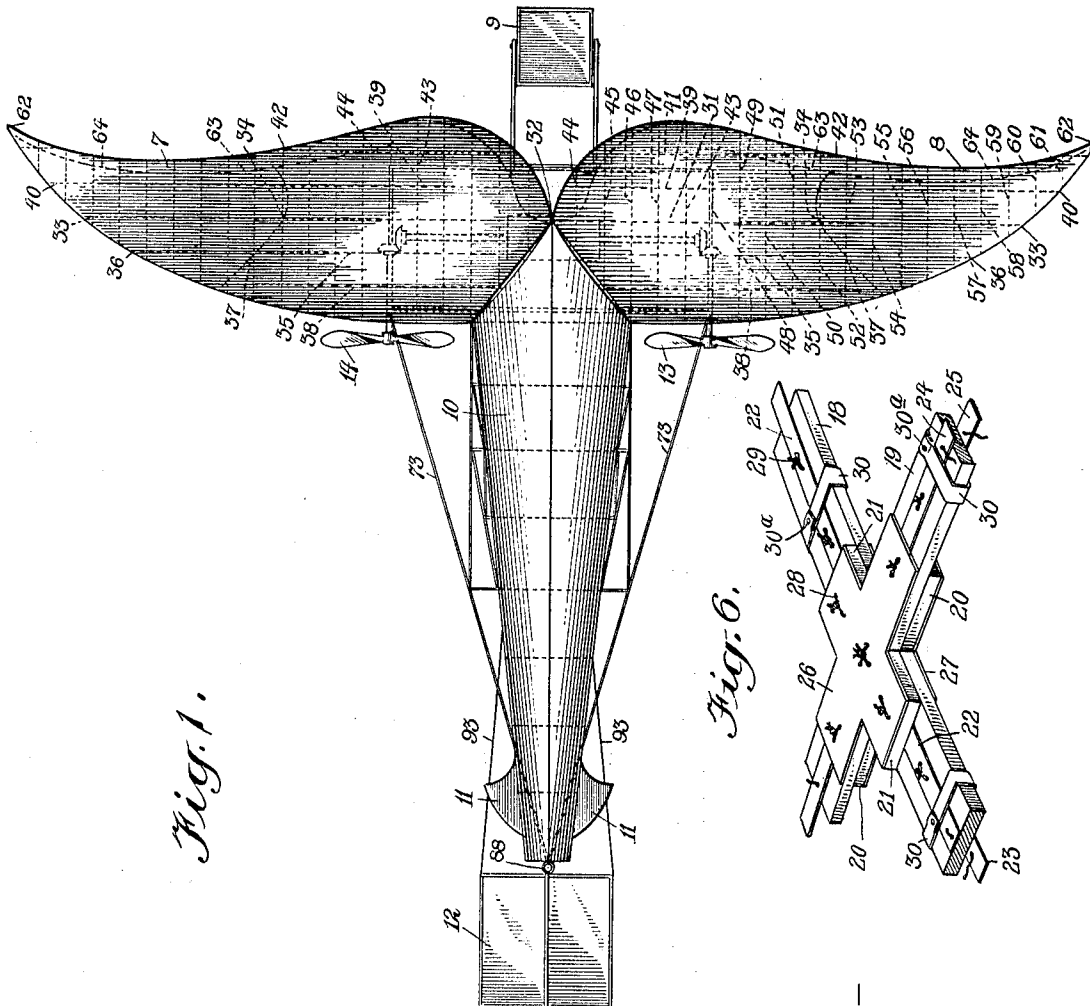


Fig. 1.

Fig. 6.

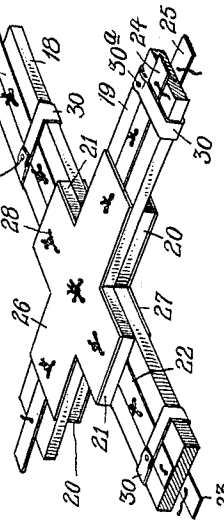
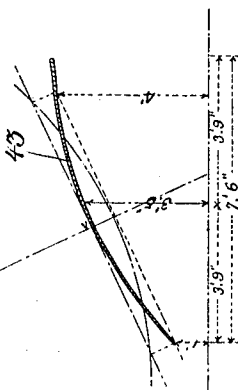


Fig. 5.



WITNESSES
Geo. W. Haydon
Walton Harrison

PARAMETER V.V. OF MAIN TRANSVERSE PARABOLA = 20°

INVENTOR
Belen Quezada
BY *Mumford Co.*
ATTORNEYS

1,048,429.

3 SHEETS—SHEET 2.



Geo. W. Maylor
Walton Harrison.

INVENTOR
Belen Quezada
BY *Munro*
ATTORNEYS

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3 SHEETS—SHEET 3.

Fig. 4.

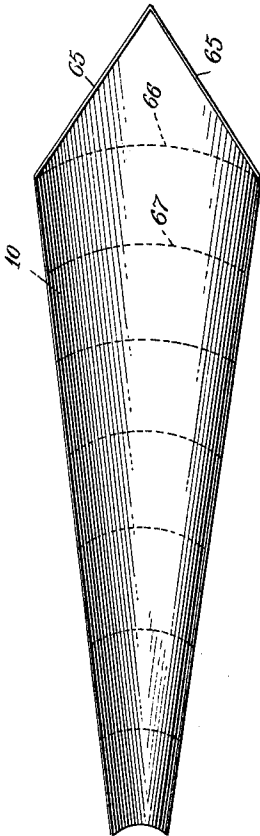
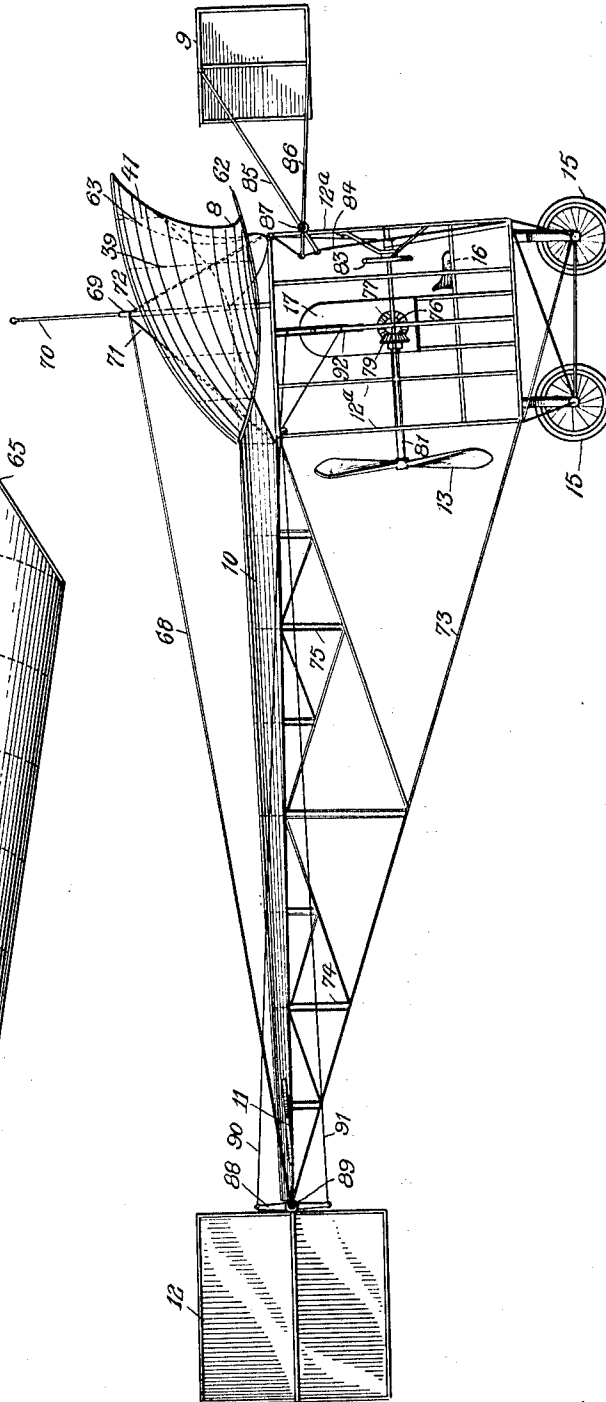


Fig. 3.



WITNESSES

Geo. W. Naylor
Walton Harrison

INVENTOR

Belén Quezada
BY *Mumford & Co.*
ATTORNEYS

UNITED STATES PATENT OFFICE.

BELEN QUEZADA, OF SAN JOSE, CALIFORNIA.

FLYING-MACHINE.

1,048,429.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, BELEN QUEZADA, a citizen of the United States, and a resident of San Jose, in the county of Santa Clara and State of California, have invented a new and Improved Flying-Machine, of which the following is a full, clear, and exact description.

My invention relates to flying machines and comprehends a number of distinct features relating to the wings, the prime mover and its connections with the propellers, a truncated conical body portion, and various other mechanical features for increasing the general efficiency of the device.

My invention includes particularly certain improvements in wing construction, the essence of these improvements being the particular curvatures given to different parts of the wings, and the mechanism for conferring these curvatures and for maintaining the same.

I have made the discovery that the stability of a flying machine may be increased to an almost incredible extent by shaping the wings as hereinafter described, the stability obtained by this means, being almost positive and enabling the flying machine, as a whole, even after the power is shut off completely, to descend almost as easily and as gracefully as a parachute.

I find that if different portions of the wings be given different conformities based upon parabolic lines, as hereinafter described, the above mentioned object of stability is assured, and also that far less power is required in operating the machine than would otherwise be necessary. Aside from this, the grace and elegance of the flying machine is likewise enhanced, the device simulating, to a great extent, the movements of a large bird.

Reference is to be had to the accompanying drawings forming a part of this specification in which like characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a plan view of my improved flying machine complete; Fig. 2 is a front elevation of the same; Fig. 3 is a side elevation of the device; Fig. 4 is a detail showing the truncated body portion; Fig. 5 is a cross section through one of the wings and is taken upon a line coinciding with the main transverse parabola; and Fig. 6 is a detail showing in fragmentary perspective, the

manner in which the rafters and ribs crossing the same are secured together.

The wings which are of the monoplane type and are two in number, appear at 7, 8. The rudder, used for steering vertically and commonly designated as the head, is shown at 9. The truncated body portion appears at 10 and is provided adjacent to its rear end with two fins 11 disposed upon its opposite sides, as will be understood from Fig. 1. At 12 is a rear rudder which is mounted upon the adjacent end of the truncated body portion 10, and is free to swing either horizontally or vertically; in other words, it is a so-called "universal" steering rudder. The car for carrying the aviator is shown at 12^a. The propellers are shown at 13, 14, and rotate in opposite directions. The car 12^a is provided with wheel skids 15 to facilitate the alighting of the machine. The aviator's seat is shown at 16 and at 17 is the prime mover, which in this instance is an internal combustion engine.

The framework of the wings may be understood by aid of Fig. 6. A number of rafters 18 of different lengths, and having different curvatures, as hereinafter described, are crossed by a number of ribs 19, these parts being of light, thin resilient wood of any kind suitable for the purpose. Two blocks 20 are brought edge to edge with each rafter 18, and two other blocks 21 are similarly placed oppositely to each other in engagement with each rib 19. Strips 22, 23 of light metal, in this instance, aluminum, are disposed respectively above and below each rafter 18. Similar strips 24, 25 are disposed respectively above and below each rib 19. Clamping plates 26, 27, each having generally the form of a cross and made of metal, preferably of aluminum, are disposed above and below each crossing thus formed between a rafter and a rib. Fastenings 28, made of strong, hard string, are threaded through holes in the various parts just described, and tied into loops, as will be understood from Fig. 6. I preferably employ about half a dozen rafters which extend in the general direction of the wing, and about a dozen and a half of ribs which are disposed transversely of the general length of the wing. There is thus formed a considerable number of crossings between the rafters and the ribs, but as these crossings are all substantially alike and correspond with Fig. 6, they need not be fur-

ther described. Adjacent to each crossing, and wherever else desirable, I employ a number of metallic bands 30, in this instance made of aluminum, each band having its ends secured together by aid of a rivet 30^a. These rivets may be secured one at a time as the bands are placed in position.

The wings 7, 8 are provided with covers of cloth or other appropriate material which is secured directly upon the framework above described and shown fragmentarily in Fig. 6. In Fig. 1 the line 31 represents the general direction in which one of the rafters 18 extends from the central point 32 between the wings to both wings, and the point 33 located upon the rear edge of the wing and not far from the tip thereof. The wing along the line 31 from the point 32 to a point 34 located about one-half the length of the wing from the point 32 has the form of a parabola, as will be understood from Fig. 2. The parameter of this parabola diverges from the vertical by 35 degrees, and is fourteen feet long for a total wing length of twenty feet. The vertex of the parabola represented by the line 31 from the point 32 to the point 34 coincides with the location of the parameter, as will be understood from Fig. 2.

Disposed parallel to the line 31 is another line 35 which extends outwardly to the point 36 where it intersects the rear edge of the wing. The line 35, from its inner end up to the point where it crosses a curved line 37, has the form of a parabola. The line 37 is merely a continuation of the point 34. Another line 38, also parallel with the line 31, extends lengthwise of the wing and is disposed adjacent to the rear edge of the latter. The outer end of this line terminates not far from the outer end of the line 37. This line 37 is a line of limitation for the parabolic curve of the line 38 and of all other lines which cross the line 37; that is to say, each line crossing the line 37 is parabolic up to the point where it crosses. A line 39 extends from the inner surface of the wing out to the point 40 which is not far from the tip of the wing. Still another line 41 extends along lengthwise of the wing and adjacent to its anterior edge. This line terminates at a point 42 and is parallel with the line 39, and a portion of the line 41 is parabolic.

The various ribs 19 extend crosswise of the wings, and the general positions occupied by the ribs are indicated in Fig. 1 by lines extending transversely of the wing. One of these lines is the one numbered 43. This line also indicates the direction along which, if the wing be cut transversely as indicated in Fig. 5, the edge of the wing thus left exposed is parabolic in form. I designate the parabola by the line 41 and by the section line surface disclosed in Fig. 5, as the main

transverse parabola. For a machine in which the wings are each twenty feet in length, the parameter of this parabola is twenty feet in length, as will be understood from Fig. 5, and independently of proportions this parameter always diverges by 25 degrees from the vertical, the wing of course being assumed to be in its normal or so-called "horizontal" position.

Disposed between the line 43 representing the main transverse parabola, and the point 32 representing the innermost extremity of the wing, is a number of other lines 44, 45, 46, 47. Each of these lines represents a parabola, the curvature, however, differing with each line and being greater in proportion to the closeness of the lines to the line 43; that is to say, the respective parameters of the parabolic curves represented by these lines increase as the distance increases from line 43 toward the point 32. Upon the opposite side of the line 43, that is, the side toward the adjacent wing tip, is a number of other lines 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61. These respective lines are successively shorter as the distance between them and the line 43 increases. The lines 48, 49, 50, 51 are parabolic, and parts of the lines 52, 53, 54 are also parabolic. The three lines last mentioned cross the line 34 which, as above described, is the line of limitation up to which the lines crossing it are parabolic. The several parabolas represented by the various transverse lines 48, 49, 50, 51, 52, 53, 54 have gradually increasing parameters according to the respective distances of these lines from the line 43. The wing tips are shown at 62. From these wing tips to the central point 32, the forward portions of the wings, that is, the portions adjacent to the front edges of the wings and bounded by curved lines 63, are not parabolic in cross section, but are reverse curves. The part of each wing located between its front edge and the adjacent line 63, is straight fore and aft with its rear edge merging into a parabola, the straight portion being tangential to said parabola. I find that if the front edges of the wings be given the conformity just described, the ability of the machine to cleave its way through the air is greatly increased.

Joined to the line 63 is another curved line 64 which extends completely out to the tip. The direction of curvature of the line last mentioned is the reverse of that of the line 63. Each wing may, therefore, be considered as comprising a main parabolic curve, the general direction of which coincides with that of a rafter extending along the approximate middle of the wing in a direction crossing the line of flight, and a main transverse parabola crossing the wing and also crossing the parabola last mentioned and coinciding in position and direction with one of the ribs; and upon opposite

sides of these two main parabolas, thus crossing each other, are a number of successive parabolas varying in curvature and coinciding in direction with the various rafters and ribs. It will be noted that the main longitudinal parabola and the various parabolas upon its opposite sides terminate in the line 37 which is itself a parabola, and that outside of this line the various lines crossing it curve gradually in the opposite direction; that is, their ends turn slightly upward as will be understood from Fig. 2.

Adjacent to the wings 7, 8 and extending partially between the same is a truncated body portion 10. This body portion is provided at its front end with two beveled edges 65 properly reinforced, and back of these the truncated body portion contains a number of arcuate ribs 66, 67 spaced apart, as indicated in Fig. 4, and of different curvature for the purpose of rendering the truncated body portion 10 convex upon its upper surface, and concave upon its lower surface. Guy wires 68 extend from the rear end of the truncated body portion to a mast 69 carrying, if desired, a small flag pole 70. Guy wires 71 extend from the mast 69 to the opposite sides of the truncated body portion 10. Two other guy wires 72 extend from the mast 69 to the rear edges of the wings. Two guy wires 73 extend from the rear of the body portion 10 to the bottom of the car 12^a, as will be understood from Fig. 3. Two trusses 74, 75 are located upon the under side of the body portion 10 and connected to the guy wires 73. A prime mover 17 (in this instance an internal combustion engine) is provided with a driving shaft 76 extending entirely through the engine and projecting from the opposite sides thereof. The shaft 76 is, in this instance, made in a single integral piece which always turns in the same direction. Mounted upon the opposite ends of the shaft 76 are bevel gears 77, 78, and meshing with these bevel gears respectively are two other bevel gears 79, 80, the latter being mounted respectively upon, and rigid with, two propeller shafts 81, 82, the latter extending parallel with the line of flight. It will be noted that the gears 79, 80 necessarily turn in opposite directions, the result being that the propellers 13, 14 also necessarily rotate in opposite directions, thus balancing each other, as regards their relative torque.

Adjacent to the aviator's seat 16 is a steering wheel 83 (see Fig. 3), and operatively connected with the latter are tiller cords 84 which are connected to levers 85, 86, the latter supporting the steering head 9 which has the general form of a box kite. The levers 85, 86 are journaled upon the car by aid of a pivot rod 87, as will be understood from Fig. 2.

A tiller lever 88 (see left of Fig. 3) is,

by aid of a universal joint 89, connected with the left end of the body portion 10, and this tiller lever is also connected with the steering rudder 12. Tiller cords 90, 91 are connected respectively with the top and bottom ends of the steering levers 88. These tiller cords are also connected with a steering lever 92. Connected with the rudder 12 are two other cords 93 for turning the rudder in a horizontal plane.

The machine as a whole is rendered exceedingly stable in the air for a number of independent reasons. The wings constructed as above described, turn slightly upward at their tips, as will be understood from Fig. 2. Suppose, now, that for any reason the machine for a moment has a tendency to lurch sidewise, say, in the direction in which the wing 8 extends. The tip of this wing, by projecting slightly upward, causes the machine as it lurches sidewise to sail slightly upward so that a moment afterward the wings 7, 8 present a considerable aggregate surface to the wind and this checks the further lurching of the machine, and causes the latter to regain its equilibrium. The same is true, of course, if the machine tends to lurch in the opposite direction, that is, in the direction in which the wing 7 extends. Suppose, again, that the machine tends to take a sudden lurch downward. The tips of the wings being slightly elevated and the general shape of the wings considered with reference to their several transverse parabolic curves, or in other words, the wings considered in regard to their curvature, and parallel to the general direction of flight, they are so balanced and proportioned that the machine would tend to incline slightly upward at its forward extremity and when in rapid motion the truncated body portion 10 would tend to gradually become horizontal. This would restore the equilibrium of the machine.

It is conceivable that in rare and exceptional cases the machine might have a tendency to lurch directly backward. In this event the truncated body portion 10, by virtue of its angle relatively to the wing structure as a whole, would tend to rise slightly at its rear end so that the machine would, even in this extreme instance, tend to right itself.

All of the various tendencies just mentioned for the machine to right itself automatically are entirely independent of any movable part under control of the aviator, the idea being that independently of rudders controllable by hand, or of any other mechanism directly subjected to the will of the aviator, the machine has more or less tendency to set itself right under various vicissitudes of wind pressure to which it may suddenly be subjected at any moment. The fins 11 are stationary and

merely serve as auxiliary planes for steadying the rear end of the body portion 10.

The theoretical and practical effect of giving the wings the curvature above described may be noted from Figs. 2 and 5. The broken line extending from U' to the point U (upon the wing 7) represents the parameter of the main longitudinal parabola of the wing 7. This parameter is displaced by an angle of 35 degrees from the vertical, and for wings each twenty feet in length, it has a length of fourteen feet. According to Fig. 5 the parameter of the parabola representing the crossed curvature of the wing, along the line 43, is displaced by an angle of 25 degrees from the vertical, and for a wing of the dimensions indicated would have a length of twenty feet. Various other measurements can be deducted from the structure shown in Fig. 5 and are indicated in this figure in accordance with well understood geometrical symbols which need not here be described. The measurements shown at the bottom of Fig. 5 represent the respective lengths of various vertical and horizontal lines derived from the dimensions of the corresponding measurements of the wing.

The operation of my device can be readily understood from the foregoing description. The engine being in action, the propellers 13, 14 are turned in opposite directions, and upon the recognized principles of the aeroplane the machine is driven forward. Under control of the aviator the rudders are actuated as desired, and the machine steered somewhat after the manner of other machines of this type. When the aviator wishes the machine to descend, he curtails or shuts off the power of the engine, thereby enabling the machine to glide gently to earth, and it alights upon the wheel skids 15.

I do not limit myself to the use of any particular material in making any or all of the parts above described, nor to the precise arrangement shown, the scope of my invention being commensurate with my claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A flying machine comprising a body to be carried through the air, and wings for supporting said body, each of said wings being provided with ribs extending crosswise

of the general length of the wing, and parallel with each other, each rib having generally a parabolic form and parallel rafters extending longitudinally of the wings, each of said rafters having a different parabolic form.

2. A flying machine comprising a body to be carried through the air, and wings for supporting said body, each wing being provided with a portion describing a parabolic curve in the general direction of the length of the wing, and said portion further describing a parabolic curve extending crosswise of the wing, said wing further comprising portions disposed upon opposite sides of the respective parabolic curves mentioned and describing parabolic curves varying in curvature from the two parabolic curves first mentioned.

3. A flying machine comprising a body to be carried through the air, and wings for supporting said body, each of said wings being provided with a portion having a parabolic curve so disposed in a direction lengthwise of the wing that when the machine is in its normal position the parameter of said parabolic curve describes an angle from the vertical, said portion having also a parabolic curve so disposed in a direction crosswise of the wing that when the machine is in its normal position the parameter of said parabolic curve describes an angle from the vertical.

4. A flying machine comprising a body to be carried through the air and, wings for supporting said body, each of said wings being formed so as to describe a main parabolic curve in a general longitudinal direction and centrally of the wings, a main transverse parabola crossing the wings substantially centrally thereof and also crossing the first mentioned parabolic curve, a plurality of parabolas on each side of each of said first mentioned parabolas, said last mentioned parabolas varying their curvature according to the distance they are positioned from the first mentioned parabolas.

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

BELÉN QUEZADA.

Witnesses:

L. D. HOBACK,
KATHERINE HOBACK.