R. F. BURGA.

AEROPLANE.

APPLICATION FILED SEPT. 30, 1911.

1,068,811.

Patented July 22, 1913.

3 SHEETS—SHEET 1.

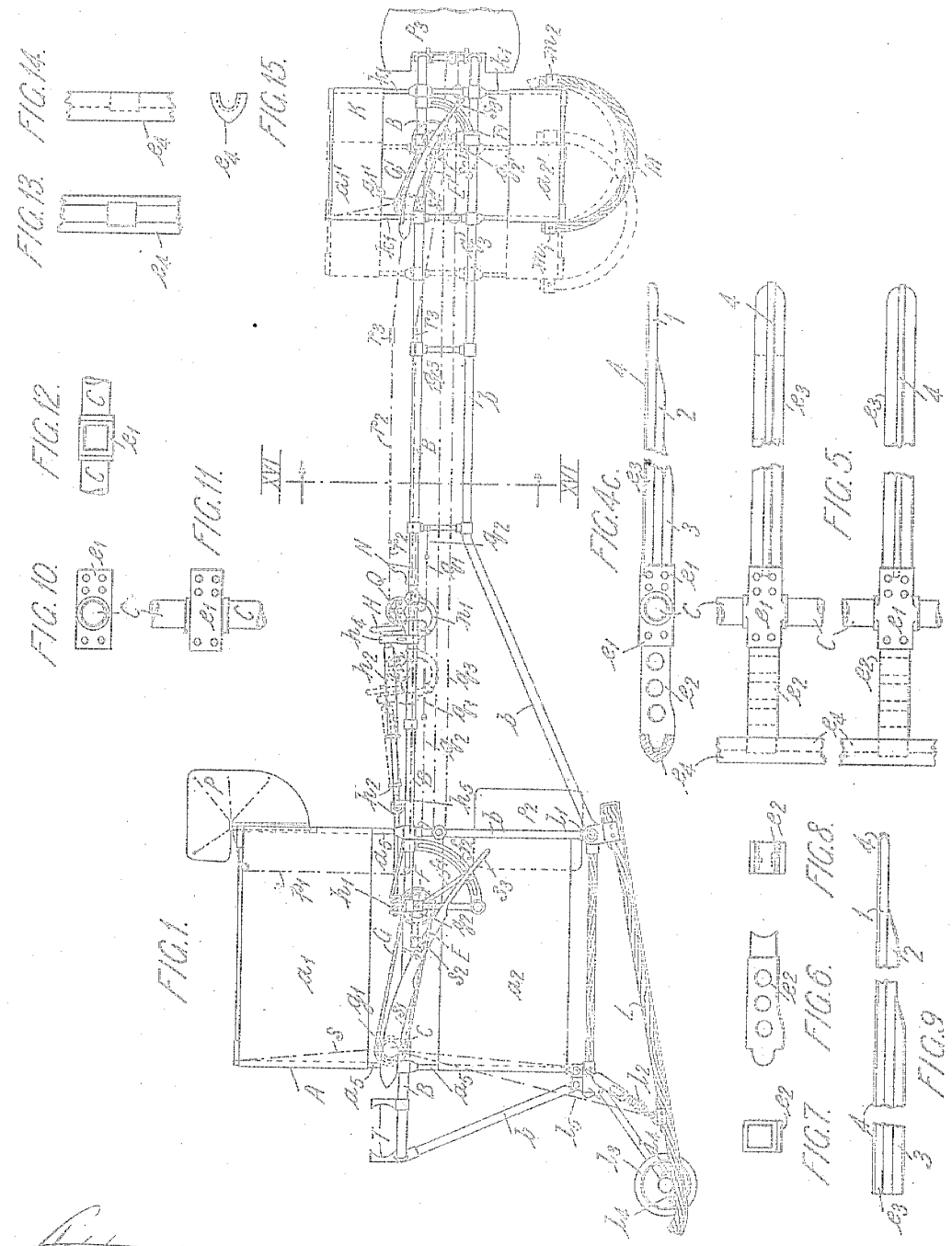


FIG. 1.

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 7.

FIG. 8.

FIG. 9.

FIG. 10.

FIG. 11.

FIG. 12.

FIG. 13.

FIG. 14.

FIG. 15.

Attest:

Benton M. Stahl

Chas. E. Parsons

Inventor:

Romulo F. Burga.

By Spear Middleton Donaldson & Shea

Attys.

R. F. BURGA.

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3 SHEETS—SHEET 2.

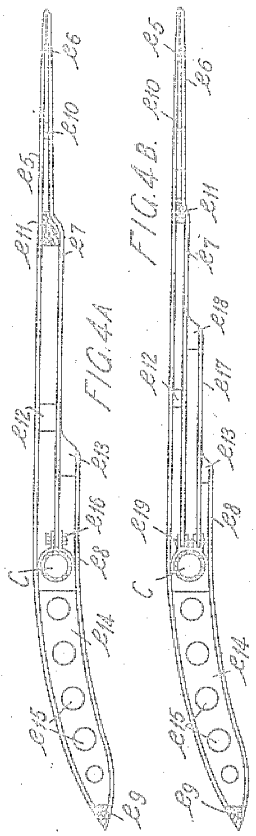


FIG. 4A.

FIG. 4B.

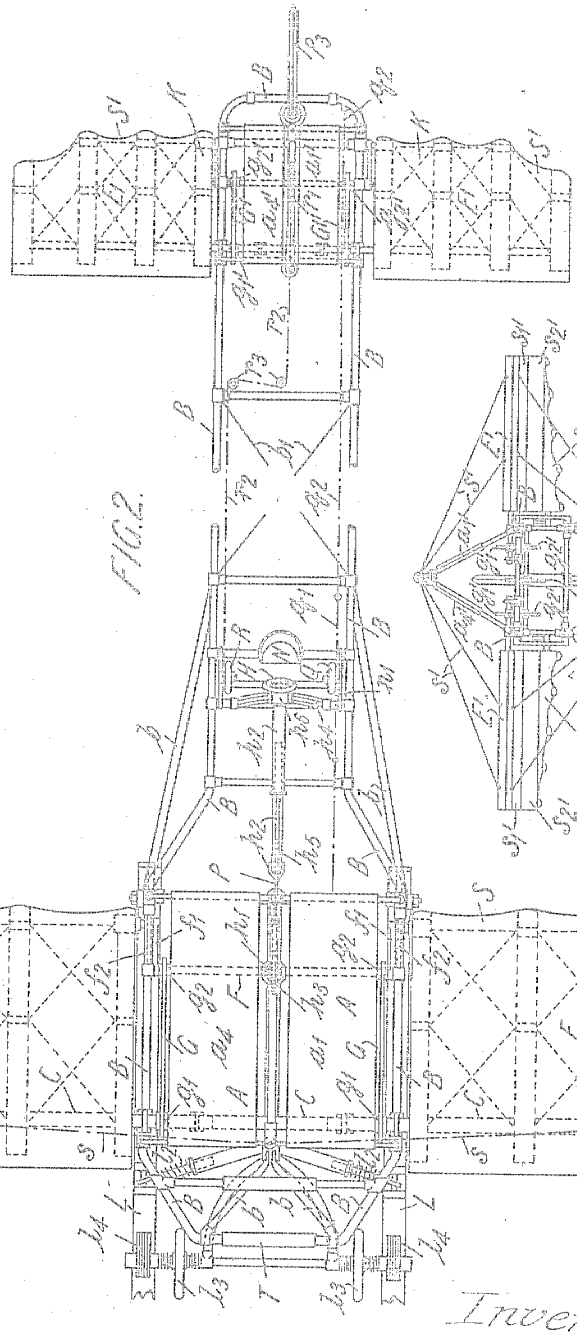


FIG. 2.

FIG. 1C.

Witnesses:

Benton McHaff

Chas E Parsons

Inventor.

Rómulo F. Burga.

By Spear Middleton Donaldson & Spear

Attys.

R. F. BURGA.

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3 SHEETS—SHEET 3.

FIG. 1.

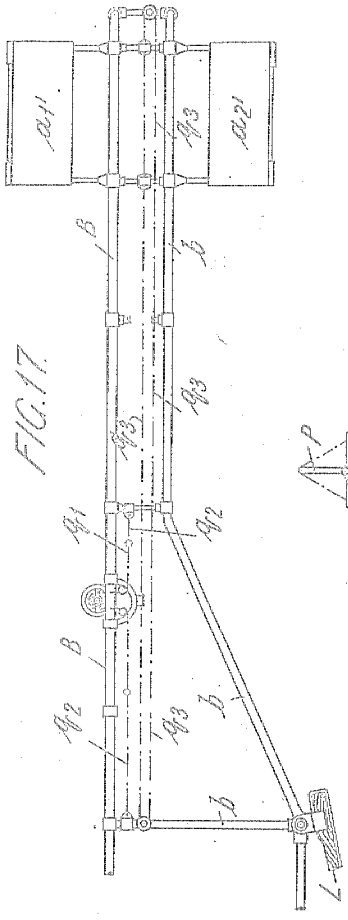


FIG. 3.

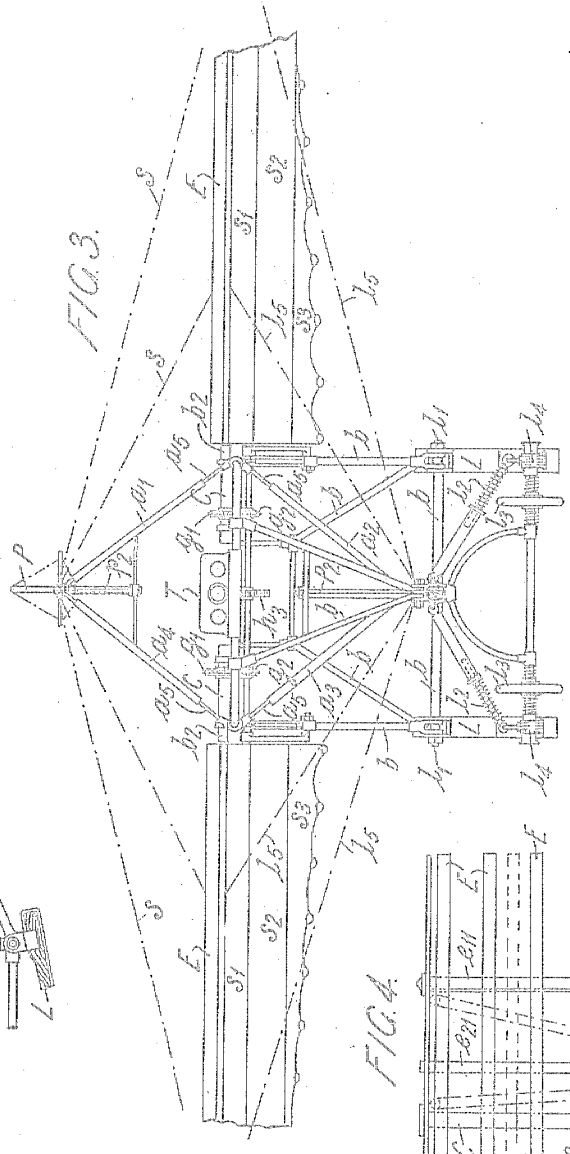


FIG. 4.

Attest.

Chas E Parsons

Inventor.

Rómulo F. Burga,

By Dyer Brickell & Dyer Attys.

UNITED STATES PATENT OFFICE.

RÓMULO FÉLIX BURGA, OF LIVERPOOL, ENGLAND.

AEROPLANE.

1,068,311. Specification of Letters Patent. Patented July 22, 1913.

Application filed September 30, 1911. Serial No. 652,112.

To all whom it may concern:

Be it known that I, RÓMULO FÉLIX BURGA, a citizen of Peru, and residing in Liverpool, in the county of Lancaster, England, have invented certain new and useful Improvements in Aeroplanes, of which the following is a specification.

This invention relates to aeroplanes of the tailed monoplane type, and has reference to;—improvements in the main structure to give lightness, strength and stability; improvements in the balancing of the machine by making the aviator's seat and tail movable relatively to the main body; improvements in the construction of the main planes whereby the degree of curvature of their surfaces may be under the control of the aviator; and improvements in connection with the wheels and skid.

I have illustrated my invention in the accompanying drawings, in which—

Figure 1 is an elevation of the aeroplane, Fig. 2 a corresponding plan, and Fig. 3 a corresponding front elevation. Fig. 4 is a detail of a modification; Fig. 4^A is an elevation of one of the fore and aft bars; Figs. 4^B and 4^C are similar views of modifications; Fig. 5 is a plan of Fig. 4^C. Fig. 6 is an elevation, and Figs. 7 and 8 views of opposite ends of the forward part of the fore and aft bars, and Fig. 9 is an elevation of the rear part of the fore and aft bars of Fig. 4^C. Fig. 10 is a side elevation, Fig. 11 a plan, and Fig. 12 an end elevation showing the mode in which the central bracket of the fore and aft bars of Fig. 4^C is connected to the tubular axis. Fig. 13 is an elevation, Fig. 14 a plan, and Fig. 15 a side elevation of the front edge of the main plane. Fig. 16 is a view of the tail, the section being taken on the line XVI, XVI, of Fig. 1, and Fig. 17 is a diagram of the seat and tail moving mechanism.

A is the main body of the aeroplane, and comprises four planes a^1, a^2, a^3 and a^4 forming a four sided prismatic frame; these planes do not meet at the angles. The main body is connected by tubular members a^5 to the tubular members B of the main frame which extend rearwardly to carry the tail. The members B are strengthened by a tubular frame work b, the various members being rigidly united by sockets and couplings, and being braced together by tension members such as b^1.

C is the transverse tubular axis which carries the main planes E. This axis is mounted in bearings b^2 rigidly attached to the main frame B. The tubular axis C carries a number of fore and aft bars or ribs constructed as shown in Fig. 4^A, 4^B or 4^C; referring in the first instance to the construction shown in Fig. 4^C and in Figs. 5 to 15; the bars comprise a central bracket e^1 through which the tubular axis passes, and to which the latter is rigidly attached, a forward portion e^2 of wood lightened by drilling connected to the front end of the said bracket, and a rear portion e^3 connected to the rear of the said bracket. The rear portion is made up of a number, say three, of flexible wood rods 1, 2 and 3, the rod 2 being less in length than the rod 1, and the rod 3 being less in length than the rod 2; the rods are strengthened by a suitable metallic binding tape 4.

The front edges of the ribs e^2 of each respective plane fit into the transverse front edge piece e^4, of wood, shaped as shown in Figs. 13 to 15, to form the front or cutting edge of the plane.

Fig. 4^A shows a modification in the construction of the bars or ribs where a very light structure is required.

The external shape of the rib is similar to that already described, but instead of solid wood rods, 1, 2 and 3, the external configuration desired is obtained (see Fig. 4^A) by bending a flexible strip of the necessary width so that the part e^5 forms the top of the rib, the part e^6 the first stepped portion of the under-side the part e^7 the second stepped portion of the under-side, and a piece e^8 the under-side of the front portion of the rib. The front part of e^5 and the part e^8 are both connected to the transverse front edge piece e^9 which like e^4 extends across the main planes; the parts e^5 and e^8 are also united together by a central web e^{14} lightened by drilling-out at the holes e^{15}. Distance pieces e^{10}, e^{12}, and e^{13} are fitted to connect the strips together, and a transverse bar e^{11} extends across and connects all the ribs on the one side together. The tubular axis C is gripped by a clip e^{16} which is attached to e^5 and e^8, and is clamped to C by bolts which also serve to connect it to e^7.

The construction illustrated in Fig. 4^B is in respect to the parts e^5, e^6, e^7, e^8, e^9, e^{11}, e^{12}, e^{13}, e^{14} and e^{15}, similar to the construction last described; a fourth strip e^{17} is, however, added to increase the number of stepped

parts on the under-side, an additional distance piece e^{18} being added; the metallic fitting e^{19} is now arranged to be connected to both e^7 and e^{17}.

In some cases it may be desired to shorten the main planes transversely and in this case the outer ribs E may be arranged to slide transversely along the tubular part C, the front edge e^9, and the transverse bar e^{11}; this transverse movement of the ribs is effected by stretched wires e^{20}.

F is a transverse shaft for actuating the planes, which carries two levers f^1, one on each side, the ends of the levers being articulated to the rear portion e^3 of the inner rib of each plane (see Fig. 1) and working in a quadrantal slot f^2 connected to the main frame work. The shaft F and the axis C are connected by a chain G working on two chain wheels g^1 on C and g^2 on F, g^1 having usually a greater number of teeth than g^2.

An operating handle H is connected by telescopic gear h^2 to a worm h^1 adapted to operate a worm wheel h^3 on the shaft F; operation of the handle H imparts angular movement in the same direction (say clockwise in Fig. 1) to the axis C and the shaft F, with the result that the front portion of the main frame inclines about the axis C while the rear portion is deflected through a greater angle by the rotation of the shaft F and levers f^1; the inclination of the main planes and their axis of curvature are thus simultaneously altered.

The construction of the tail K and the elevating planes E′ is similar to that of the main body and main planes, the analogous parts being indicated by the same reference letters distinguished by the addition of an accent.

The elevating planes E′ are operated by the chain G′ and toothed wheels g^{11} and g^{12} but instead of a worm gear as in the main planes the shaft F′ is provided with a chain wheel r^1 connected to the elevator plane operating wheel R by a band r^2 consisting of lengths of chain, to pass around the toothed wheels, connected by lengths of wire passing around guide pulleys r^3 to form an endless band.

The arrangement for moving the aviator's seat and the tail along the frame B is as follows:—The seat N and its frame n^1 are adapted to slide easily on the frame B; and the tail frame k^1 is adapted also to slide on the frame B. The movement of N and K is effected by a wheel Q over which a chain q^1 passes, the ends of the chain being attached by the wire q^2 to the ends of the frame B; an endless wire band q^3 passes over pulleys q^4 fixed to the frame work B and the top side of the endless band is attached to the frame n^1 of the seat and to the frame k^1 of the tail. Rotation of the wheel Q moves q^1 and the seat N and the endless band q^3 causes simultaneous movement of the frame k^1 and the tail K.

The front skid L is pivoted to the frame at l^1, elastically connected to the center of the frame by the spring connected telescopic stays l^2, and supported by the wires l^5, which may be used for lifting the skid.

The wheels l^3 are carried in bearings connected to the skid by elastic bands l^4 which yield under less force than the spring stays l^2.

The rear skid M consists of a curved wood piece M rigidly connected at one end to the tail frame k^1 by the bracket m^1; the other end sliding in the bracket m^2 so as to yield under pressure.

P is the rudder which is carried over the normal center of gravity and pivoted on a vertical bar p^2 and is operated by the wire p^1 connected to the laterally movable bracket h^6 carrying the hand wheel H. This hand wheel bracket h^6 moves about the center h^5 on a circular race h^4, and its lateral movement, which is ineffective to operate the worm gear, operates the rudder.

The main planes and the elevator planes are covered with fabric S and are stayed by the tension stays s.

It will be seen that by the construction of the ribs described, the under sides of the planes E and E′ are shaped so as to provide curved surfaces s^1, s^2 and s^3, successively displaced as shown, the configuration resembling that of the under side of a bird's wing, and giving considerably increased lifting power.

The engine is attached to the engine clips T and the propeller is connected in the usual manner to the engine shaft.

The aeroplane can be steered by the one rudder P located above the main body and over the normal position of the center of gravity, but it is preferable to fit the three rudders shown and to use them coupled in pairs as described.

The mechanism described consisting of the levers f^1 and the quadrant f^2 for curving the main planes may be dispensed with, in which case the planes are angled about the tubular axis C but are not altered in curvature.

The details of construction may be modified within the limits of my invention; for instance, the aviator's seat may be fixed, and the tail only be adapted to move, or the tail may be adapted to move, and the number of displaced curves s^1, s^2 and s^3 may be increased and their shape altered to suit particular requirements.

Having now fully described my invention, I declare that what I claim, and desire to secure by Letters Patent is;—

1. In an aeroplane, in combination; a main body constructed of four planes arranged to form a hollow prismatic structure; a tail of similar shape but smaller in

size arranged approximately co-axial with and movable relatively to the main body; a main frame connecting the tail to the main body; main planes attached to the main body; elevating planes attached to the tail; a rudder attached to the main body; a skid attached to the main frame below the main body; and means under the control of the aviator for moving the tail and for operating the main and elevating planes and the rudder; substantially as described.

2. In an aeroplane, in combination; a main body constructed of four planes arranged to form a hollow prismatic structure; a tail of similar shape but smaller in size arranged approximately co-axial with and movable relatively to the main body; a main frame connecting the tail to the main body; main planes attached to the main body; elevating planes attached to the tail; a rudder attached to the main body; a skid attached to the main frame below the main body; an aviator's seat movable relatively to the main frame; and means under the control of the aviator for moving the tail and the aviator's seat and for operating the main and elevating planes and the rudder; substantially as described.

3. In an aeroplane, the combination with the main body, the tail and the main frame, of main planes having the underside formed in substantially horizontal successively stepped planes connected by curved parts; substantially as described.

4. In an aeroplane, in combination with the main body, the tail, the main frame and the main planes, the means for adjusting the inclination and curvature of the main planes, comprising a transverse axis geared to an actuating shaft, the simultaneous angular movement of the said axis and shaft differentially angling the front and rear portions of the planes; substantially as described.

5. In an aeroplane, the combination with the main body, the tail and the main frame, of main planes, comprising a plurality of ribs of different lengths, joined so as to shape the under side of the main planes in successively displaced planes, substantially as described.

In testimony whereof, I affix my signature in presence of two witnesses.

RÓMULO FÉLIX BURGA.

Witnesses:
J. E. Lloyd Barnes,
Joseph E. Hirst.