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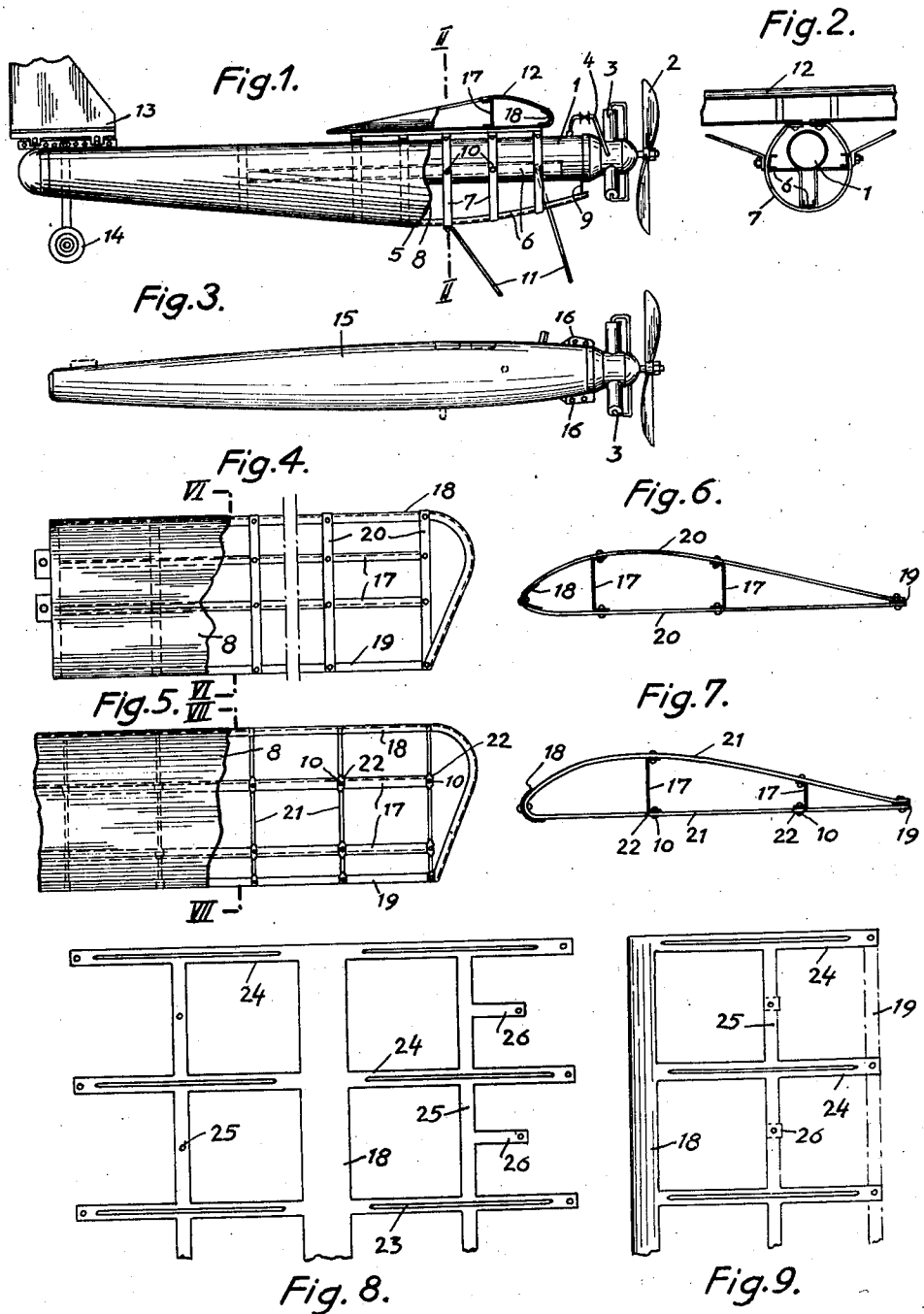
G. BOEHME

1,877,120

TOY AIRCRAFT

Filed Nov. 2, 1929

3 Sheets-Sheet 1



INVENTOR:

Gustav Boehme

Sept. 13, 1932.

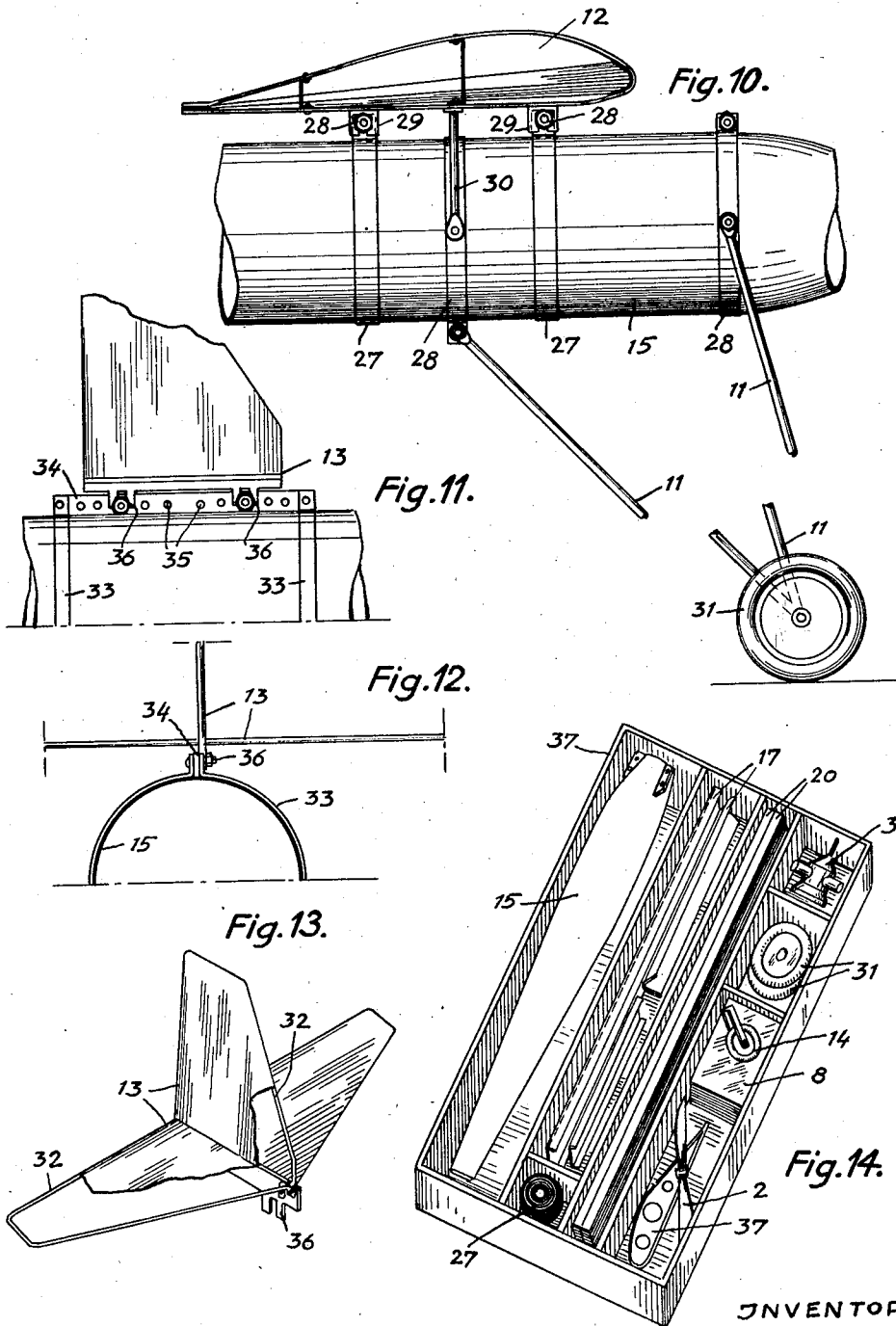
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Gustav Boehme

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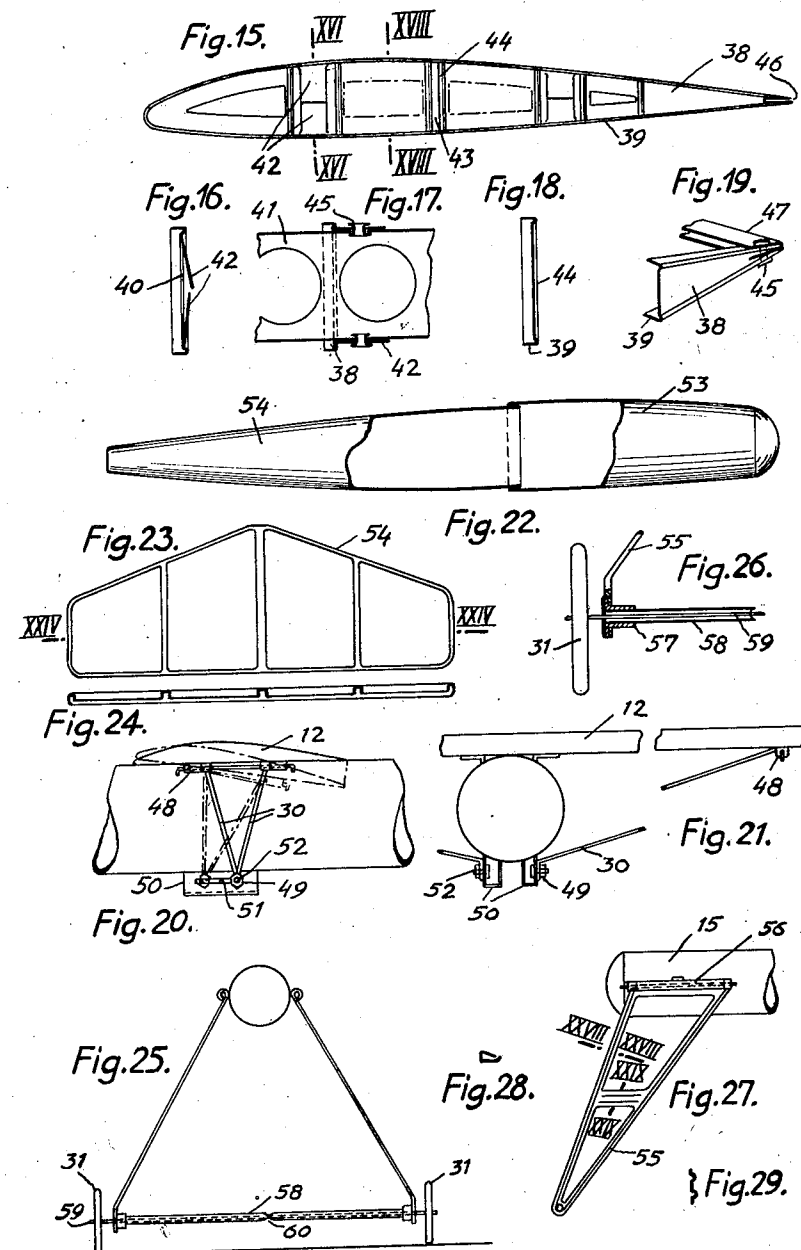
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INVENTOR:

Gustav Boehme

UNITED STATES PATENT OFFICE

GUSTAV ROEHME, OF BERLIN-ZEHLENDORF, GERMANY

TOY AIRCRAFT

Application filed November 2, 1929, Serial No. 404,414, and in Germany November 7, 1928.

The invention relates to toy-aircraft serving as model- or instructive plane, particular training effect resulting from the feature, that the player become acquainted with the principles of construction of metal-aircraft and with the control of the same under varying conditions, learning the shape of the metal frame of the structural elements, recognizing how the plane is assembled and completed by means of the raw materials, determining the part taken by the metal in the total weight of the airplane, learning to distinguish the superiority of wings with hollow section when compared with the simple paper-surface from an aero-technical point of view, and the like. Hereby it is essential, that the principal construction material used is metal, light metal particularly, which is able to resist greater stresses and thus offers the facility to fulfill the instructive purpose by technical construction, actual flying, tests, experimental trials, etc.

Interest in occupation with the new type of aircraft, with which wing loads of approximately 2.5 kg/m^2 can be obtained, is increased, when the toy is not furnished ready for use, but must be built up carefully either to a given plan or according to one's own design, by assembling the metal parts or their skeletons substantially after having constructed them from the supplied materials.

The accompanying drawings show, by way of example, several embodiments of the present invention.

Fig. 1 is a side elevation of an assembled fuselage, some parts of the fuselage covering and wings being broken off.

Fig. 2 is a section on line II—II of Fig. 1.

Fig. 3 represents a bottle-shaped air-reservoir serving as fuselage.

Figs. 4 and 5 are plan-elevations of wings built up from differently-shaped constructive materials.

Figs. 6 and 7 are sections on an enlarged scale on lines VI—VI and VII—VII of Figs. 4 and 5.

Figs. 8 and 9 show a punched part serving as a wing skeleton, unfolded and ready-bent.

Fig. 10 represents a fuselage front part,

on enlarged scale, in side elevation, the wing being shown in section.

Figs. 11 and 12 show, on enlarged scale, a side- and rear-elevation of the tail-unit connection.

Fig. 13 shows a diagram of the tail unit.

Fig. 14 is a perspective view of the individual parts in a packing box.

Fig. 15 is a punched wing-rib in side elevation.

Fig. 16 is a section on line XVI—XVI of Fig. 15.

Fig. 17 is a section on line XVI—XVI of Fig. 15, with pierced members folded back and an inserted longéron shown riveted thereto.

Fig. 18 is a section on line XVIII—XVIII of Fig. 15.

Fig. 19 is a diagrammatical view of a joint between rib and connection-bracket.

Figs. 20 and 21 show an adjustable bracing of the wings, in front and side elevation.

Fig. 22 shows a special embodiment of a combustible tank, partly in view, partly in section.

Fig. 23 shows a plan view of a one-part pressed control-element.

Fig. 24 is a section on line XXIV—XXIV of Fig. 23.

Fig. 25 shows a differently shaped undercarriage, in front elevation.

Fig. 26 is a detail of the undercarriage, on an enlarged scale, partly in front elevation, partly in section.

Fig. 27 is a side elevation of a lateral part of the undercarriage.

Figs. 28 and 29 are sections on lines XXVIII—XXVIII and XXIX—XXIX respectively of Fig. 27.

The instructive plane according to Figs. 1 and 2 shows a cylindrical reservoir of light metal 1 to contain compressed air provided to drive an aero-engine 3 coupled with the air-screw 2. 4 is the air-duct with a shut-off device. The fuselage has a streamline body 5, consisting of a frame of longérons 6 and rings 7, said frame being provided with a preferably treated cover 8 of paper, canvas or the like. Suitably disposed bulkheads 9 serve to support the frame against the reser-

voir 1. Parts 6, 7 and 9 can be made of light-metal of small specific gravity, as, for instance, of aluminum-magnesium alloy with a specific weight of 1, 8, and can be joined with one another by rivets 10, by soldering or the like. At the bow of the fuselage are disposed the landing gear 11 and the wings 12, at the stern of the fuselage the tail unit 13 and the tail wheel 14.

As shown in Fig. 3 the reservoir of compressed air consists of a backward tapering flask 15, which owing to its design needs no covering up and serves directly as an aircraft fuselage, being provided with brackets 16 for the engine 3. If required, further connecting means (as per dotted lines) can be provided for the wings, the landing gear and the tail unit.

Instead of compressed air, liquid air can be used. In this latter case the reservoir 1 or 15 respectively preferably contains also devices and accommodation for rarefaction of the air.

The one or several part wings 12 have U-shaped longérons 17, a cap strip 18 and a trailing edge strip 19. These parts are interconnected by bands 20, according to Figs. 4 and 6, and by wires 21 serving as ribs, according to Figs. 5 and 7. Connection of parts is accomplished by means of rivets 10 driven in flattened portion 22, in the case of the wire ribs 21.

Some light material 8 such as paper, canvas or the like, preferably affixed by pasting, is used as wing covering, in so far as a planking with a light thin metal sheet is not employed. Parts 6, 17, 18, which can not be made with hand tools, are bent plates ready to be assembled. Their shape is adapted to the forces acting upon them.

As shown in Figs. 8 and 9 the wing-skeleton consists of one single punched piece 23 with a large center portion, forming the cap strip 18 after having imparted the final shape to the wing by adequate bending of the plate, channelled ribs 24 leading from said cap strip to the trailing-edge strip 19. Halfway of their length those ribs are interconnected by strips 25 being the girders of a central spar whose web is formed by extensions 26, which latter are integral with one girder, and are riveted to the second girder.

The wings can be of cantilever type or attached by struts. The wing shown in Fig. 10 is attached to the fuselage 15 by means of two clips 27, allowing rapid assembly or disassembly, or, adjustment in the direction of the longitudinal axis to allow easy balancing of the aircraft.

The screws 28 locking the clips pass through vertically slotted wing brackets 29. This embodiment allows easy varying of the wing incidence.

The landing gear 11 is similarly attached by means of clips 28. The rear clip simul-

taneously serves as the supporting member for the wing strut 30. 31 are the landing-wheels carried on an axle.

The tail unit 13 consists of cloth covered wire frames 32, as shown in Fig. 13. In so far as a particularly simple mode of adjustment is desired, a joint is chosen of a manner to have clips 33 to serve as bearers of a perforated bar 34, through the drilled holes of which bolts are passed for securing tightly the tail-unit brackets 36. The said brackets are vertically slotted, thus allowing of easy variation of the tail unit setting. Adjustment of the tail unit in the longitudinal direction is effected by moving the tail unit longitudinally to engage a given set of holes in the bar 34.

The afore-described embodiments are adapted to be realized by the amateur. The parts ready to be assembled or to be manufactured by the amateur are packed in the box 37, which is represented with lid removed, in Fig. 14.

It is evident that a model plane essentially built up of the indicated materials, can be equally well made in an assembled condition as the product of a manufacturing plant, with the difference, that parts, joints and independent bodies, the making of which is a point of special interest and instruction for the amateur constructor, will be made in one piece or in a simplified manner.

The subject matter of the present invention can be constructed as a land- or seaplane (float-plane or flying-boat). Without providing special driving means it can be used as a glider, and can also be driven by rockets. It is likewise possible, for instance, to use in the place of the here described engine, either rubber bands or a combustion engine.

In the modification shown in Figs. 15 to 19 the wing ribs 38 are provided with large flanges 39 and passage-holes 40 for the longérons 41 and straps 42 for spar joints are punched or pressed in one piece of thin plating, the girder edge and web 43 consisting of a full wall or ribs reinforced by channels or grooves. Fig. 17 shows the rib 38 slipped on spar 41 to be attached by rivets 45 to the spar girder with the upward flanged straps 42. The said rivets are hollow and allow to be driven in by means of special pliers to be supplied with the construction box. Another pair of pliers serves to drill the rivet holes, in case the latter are not already punched in the separate structural members. The trailing edge of the ribs is provided with a punched slot 46, into which one flange of an angular metal terminal strip 47 is passed and likewise attached by means of a hollow rivet 45. The metal used can, for instance, be aluminum.

In a broader sense means are provided to twist the wings 12. These means consist in that the preferably tube-shaped struts 30 at-

tached to the wing bottom surface by, for instance, a simple hinge 48, converge in an eye 49, said eye being displaceable in the longitudinal direction of the aircraft. To this effect a bracket 50 with longitudinal slot 51 is provided at the bottom surface of the fuselage, for the bracing by struts of either wing, the bolt of the screw 52 locking the said eye 49 passing through said slot.

As shown in Fig. 22 the fuselage 15 containing the engine combustible, is built up of at least two seamless drawn parts 53, 54 of cylindrical or conical shape, being interconnected by riveting, welding or another suitable process. Brass and copper have proved to be the most suitable materials.

The inner frame of the tail surfaces can be made, for instance, of aluminum tubing, instead of wire. In many cases it is recommendable to press the tail members in one piece of some piece of plate. Thus Fig. 23 shows a pressed frame 54 for an elevator. Fig. 24 is illustrative of the section-shape of the separate bars.

The landing-gear being subject to great stresses has, according to Figs. 25-29, lateral parts 55, each of which is pressed in one piece of plating. They are attached to the fuselage 15 by means of plug-hinges 56. The sections of Figs. 28 and 29 are indicative of the section-shape of the separate bars. The lower ends of the lateral parts are joined with the flanges of short tubes 57, which are screwed on the extremities of a steel tube 58, through which latter is passed a resilient steel wire 59 serving as wheel-axle. 31 are the runner wheels. By flattening down the tube 58 at point 60 approximately, a rigid axial connection between parts 59 and 60 is established, allowing of a little radial lost motion.

The pressed parts can be made of light metal. It is, however, recommendable to use steel-plates for highly stressed parts, since this means not an increase in weight. Instead of metal, many parts could also be made of resinous substance, such as for instance the spars, ribs etc.

What I claim is:

1. A toy aeroplane comprising an assemblage of parts including wings in the form of thick hollow aerofoil bodies, and means for adjusting the angle of inclination of said wings through any angle within given limits.

2. A single deck toy aeroplane comprising an assemblage of parts including wings in the form of thick hollow aerofoil bodies, said wings having metal skeletons comprising flanged longitudinal spars and means for adjusting the angle of inclination of said wings within given limits.

3. A toy aeroplane comprising an assemblage of parts including wings in the form of thick hollow aerofoil bodies adapted to

be twisted about a longitudinal wing axis, and means for twisting said wings to regulate the angle of inclination thereof.

4. A single deck toy aeroplane comprising an assemblage of parts including wings in the form of thick hollow aerofoil bodies, each wing having a skeleton comprising flanged longitudinal spars and cross ribs and a cover of firm, resilient material, said wings capable of being twisted about a longitudinal wing axis and means for twisting the wings.

5. In a toy aeroplane, wings having skeletons comprising flanged longitudinal spars and cross-ribs threaded on said spars, said cross-ribs composed of thin metal bodies made in one piece having lugs stamped out of them for connection to the spars, the latter adapted entirely to fill up the apertures formed by the stamping out of the lugs.

6. In a toy aeroplane, wings having skeletons comprising flanged longitudinal spars, cross-ribs threaded on said spars, said cross-ribs composed of thin sheet bodies having lugs stamped out of them for connection to the spars, the latter adapted entirely to fill up the apertures formed by the stamping out of the lugs, and a terminal strip for the rear edge of each wing, said terminal strip comprising two converging flanges and connected to the wing so that one flange bears against the flanges of the cross-ribs, the other flange of said strip being inserted in slits in the cross-ribs.

7. In a toy aeroplane, the combination with a fuselage of wings connected to said fuselage and adapted to be twisted about their longitudinal axes, and struts connecting said wings with the fuselage, said struts being adjustable on the fuselage in the longitudinal direction thereof for twisting the wings.

8. In a toy aeroplane, the combination with a fuselage of wings connected to said fuselage and adapted to be twisted about their longitudinal axes, two struts connecting each wing with said fuselage and converging to a point on the latter, said struts being adjustable on the fuselage in the longitudinal direction thereof for twisting the wings.

9. A toy-aeroplane comprising an assemblage of parts including a fuselage, wings in the form of thick, hollow aerofoil bodies, a tail-piece, a landing gear, and rigid and adjustable means for connecting said wings, tail-piece and landing gear to the fuselage, said means operative to allow the inclination of the wings and the tail-piece to be varied through any angle within given limits.

10. A toy-aeroplane comprising an assemblage of parts including a fuselage, wings in the form of thick, hollow aerofoil bodies, a tail-piece, a landing gear, and rigid means for connecting said wings, tail-piece and landing gear to the fuselage, said means operative to allow the inclination of the wings and tail-piece to be varied through any angle

within given limits, said connecting means being further adjustable in the longitudinal direction of the fuselage.

11. A toy-aeroplane comprising an assemblage of metal parts including wing and tail skeletons, a streamline fuselage in the form of a reservoir for motive fluid, and a landing gear, said wing skeleton comprising flanged longitudinal spars and cross members covered with fabric to form a hollow aerofoil body.

In testimony whereof, I have signed my name to this specification at Berlin, this 24th day of October, 1929.

GUSTAV BOEHME.

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