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W. L. GILMORE

AIRPLANE WING

Filed Dec. 27, 1920

2 Sheets-Sheet 1

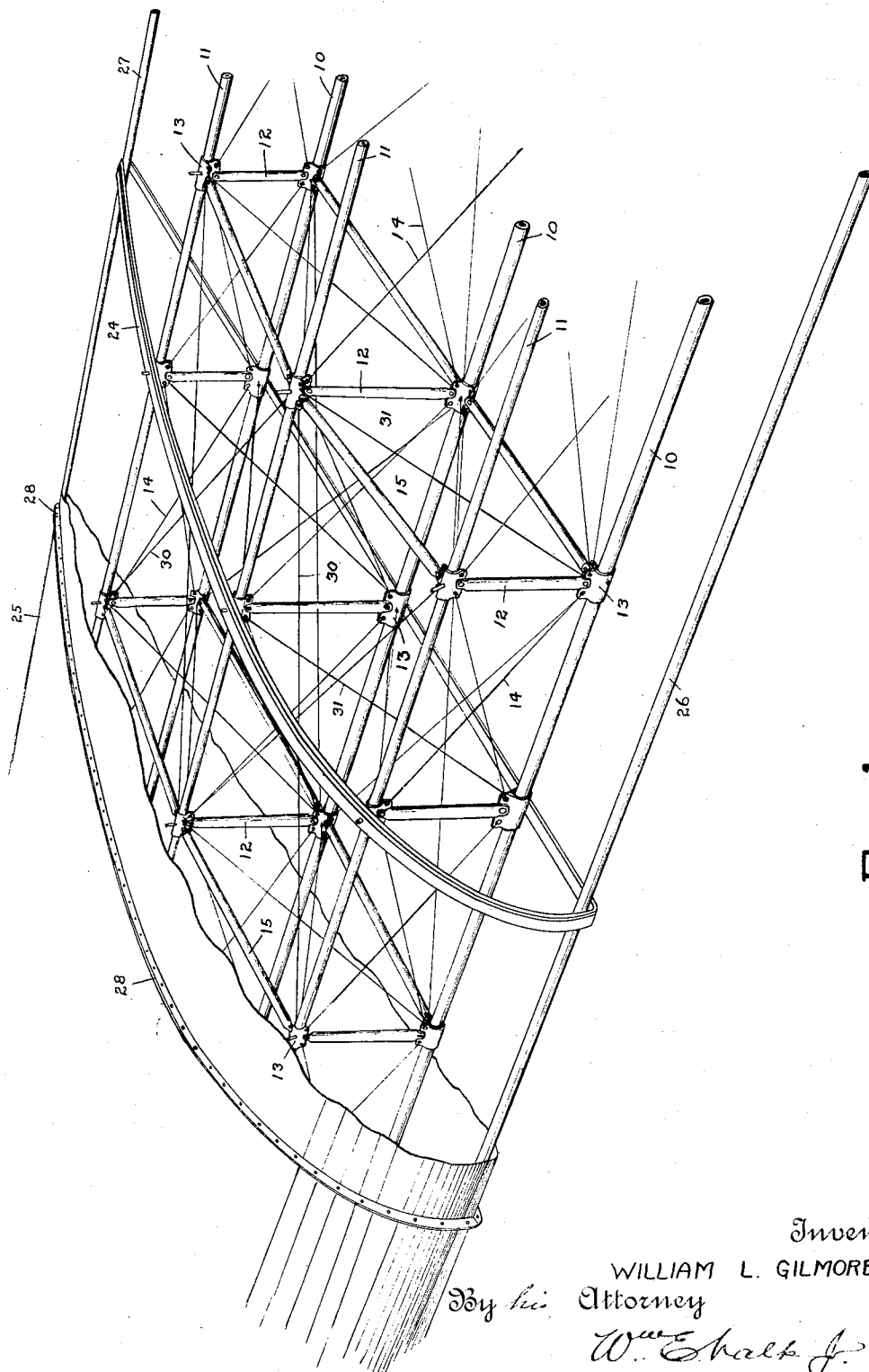


FIG. 1

Inventor

WILLIAM L. GILMORE

By his Attorney

W. E. Chalk J.

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FIG. 2.

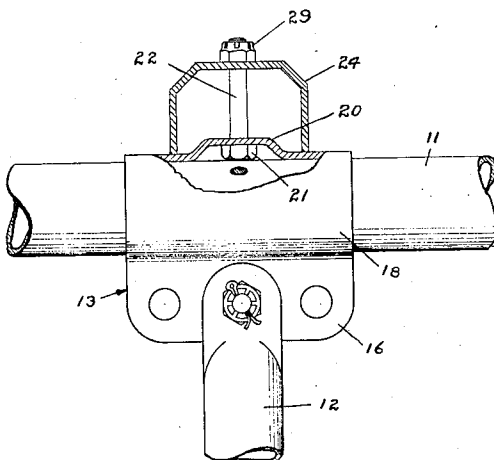
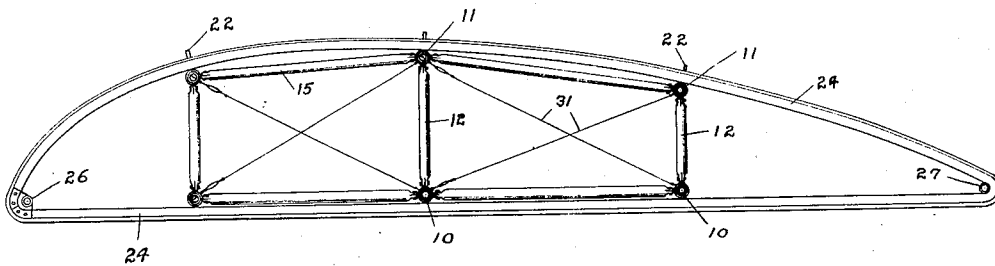


FIG. 3.

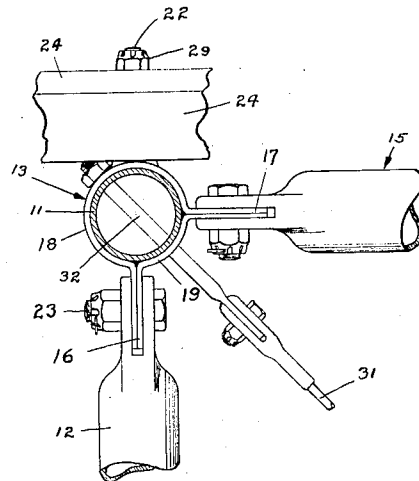


FIG. 4.

Inventor

WILLIAM L. GILMORE

By *his* Attorney

Wm. Chalco Jr.

UNITED STATES PATENT OFFICE.

WILLIAM L. GILMORE, OF PORT WASHINGTON, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CURTISS AEROPLANE AND MOTOR COMPANY, INC., OF GARDEN CITY, NEW YORK, A CORPORATION OF NEW YORK.

AIRPLANE WING.

Application filed December 27, 1920. Serial No. 433,092.

To all whom it may concern:

Be it known that I, WILLIAM L. GILMORE, a citizen of the United States, residing at Port Washington, in the county of Nassau and State of New York, have invented certain new and useful Improvements in Airplane Wings, of which the following is a specification.

My invention relates to airplane wings and more particularly to airplane wing construction.

A characteristic of the invention is the use of rigid sheet material (aluminum preferred) as a covering; the covering being made removable and fastened to the wing framework in such manner that the covering in its entirety or, if desired, a given section of the covering, may be removed and replaced at will. A wing thus characterized can be recovered either wholly or in part without inconvenience, and should the supporting framework need repair, such repair can be quickly and easily made by the removal of one or more of the cover sections. Preferably the cover fastening is so arranged that access can be had to the fastening means from without the wing confines.

A further characteristic of the invention is the use of a multiple number of connected parts in the construction of the wing framework; suitable fittings being provided for fastening the parts together. At predetermined stations throughout the length of the wing transverse formers are provided. These formers embrace the framework in a fore and aft direction and give to the wing the desired cross sectional form or profile. To the outer face of the transverse formers the wing covering is removably fastened. The fastening devices are preferably carried by the fittings and are preferably let through the transverse formers to project outwardly therefrom. Apertures are formed in the outer covering to fit over the projecting fastening devices.

Still another characteristic of the invention is the use of longitudinal and transverse beams in the formation of the wing framework, each beam comprising top and bottom longitudinals, spaced vertical struts and wiring cross arranged. Thus constructed maximum strength with minimum weight is assured. Moreover, since it is the formers

rather than the wing framework which gives to the wing its predetermined profile, little regard need be given the structural configuration of the framework and in its construction only straight structural members are required.

Further characteristics and advantages will be set forth hereinafter.

In the drawings, wherein like characters of reference designate like or corresponding parts,

Fig. 1 is a perspective view of a portion of an airplane wing with its outer covering partly broken away;

Fig. 2 is a transverse section of the wing; and

Figs. 3 and 4 are detail views in elevation and section respectively of one of the fittings forming a part of the wing.

In the embodiment of the invention selected for illustration but three longitudinal beams are provided. The number of beams, however, may be varied. Each of the three beams illustrated comprise contiguous longitudinal tubular members 10 and 11; 10 indicating in each instance the lower and 11 the upper longitudinal. At predetermined stations throughout the length of each beam, vertical struts 12 are provided. These struts, like the members 10 and 11, are preferably tubular and are preferably fastened to the longitudinals by fittings 13 hereinafter more particularly described. Between adjacent struts longitudinally of the beams cross arranged wires 14 are provided. Like the struts 12, the wires 14 are fastened to the fittings 13. Together the struts and wires 12 and 14 respectively truss the longitudinals 10 and 11 to produce in effect continuous longitudinal beams of minimum weight and maximum strength.

Transversely the three longitudinal beams are interbraced by compression members 15, also of tubular section. The number of compression members, like the number of wing beams may be varied. Each compression member includes a plurality of tubular members, the tubular members in each instance interconnecting the adjacent top and the adjacent bottom longitudinals of the three longitudinal beams. Certain of the vertical struts 12 by reason of their location at the points of intersection of the longi-

tudinals 10 and 11 with the compression members 15 enter into and form a part of the compression members.

The vertical struts 12 and the tubular members of the compression members 15 are each provided with bifurcated ends within which ears 16 and 17 respectively of the fittings 13 are fitted. The fittings 13 preferably include two metal straps lying contiguous and being extended off from the longitudinals 10 and 11 at an angle. Together the straps 18 and 19 encircle the longitudinals, the strap 18 intermediately of its ends being off set as indicated at 20 to receive the head 21 of a securing bolt 22 for the wing covering. Accordingly, the head of the bolt 22 is held firmly between the strap 18 and the longitudinal over which the fitting 13 is fitted. For fastening the tubular members and the vertical struts to the fittings, pins 23 are provided.

In the foregoing, it will be noted that the use of grooved or bent parts in the formation of the wing framework is entirely eliminated. It will be noted further that the depth of the supporting framework may be measured from the leading to the trailing beam rather than from the leading to the trailing edge of the wing as heretofore. The shape of the wing framework does not, in the present invention, determine the ultimate shape of the wing.

In giving the wing its desired cross sectional form or profile, a plurality of formers 24 are provided. Each former preferably comprises a channelled strip arranged to encircle or embrace the framework of the wing. In the assembly of the formers, the open side of the channelled strip faces inwardly to present a smooth flat outer surface for the subsequent attachment of the wing covering designated generally as 25. Preferably, though not necessarily, the formers 24 are located in the transverse vertical plane of the compression members 15 and since it is the formers 24 which give to the wing its profile, they, the formers, necessarily extend respectively forwardly and rearwardly beyond the foremost and rearmost of the wing beams. To hold the formers rigidly in place and to carry out the desired wing section from end to end of the wing, a nose strip 26 likewise of tubular section is provided at the leading edge of the wing and a trailing edge strip 27, preferably of channelled cross section is provided at the trailing edge of the wing. By fastening the formers to the nose strip 26 and the trailing edge strip 27, and by extending the fastening bolts 22 through openings formed in the formers, they, the formers, are firmly held in place with the bolts 22 projecting through and beyond their outside smooth flat surfaces.

Having given the wing the desired profile

through the use of the formers, the outer covering 25 is next laid on the wing. Preferably the outer covering is made up of a plurality of sections of rigid sheet material such as aluminum, the sections being joined together by flanging adjacent edges outwardly as at 28 and bolting or otherwise fastening the flanges together. Thus fastened, the flanges 28 will be made to extend in a fore and aft direction and to project outwardly respectively from the top and bottom surfaces of the wing. The bolts 22 which project outwardly from the formers 24 provide the means for fastening the cover sections to the framework of the wing. In laying the cover sections over the wing, the bolts 22 are fitted in openings formed in the covering material and upon the bolts, when thus projected through the outer covering, nuts 29 are fitted, the nuts, when tightened down, firmly holding the outer covering in place.

In addition to the cross arranged wires 14 for interbracing the longitudinals 10 and 11 of the three main beams, wiring 30 can be provided for interbracing corresponding top and bottom longitudinals of adjacent beams and wiring 31 can be provided for interbracing the top and bottom members of the transverse or compression members 15. The anchorages for the wires 30 and 31, however, instead of being formed by ears extending off from the fittings 13, are formed by extending bolts angularly through the several tubular members which the wires 30 and 31 interbrace. These latter anchorages are designated as 32.

In actual practice, the number of cover sections employed, and also the number of formers, may be varied at will, or, if desired, only the top cover sections (or the bottom cover sections) may be made up of connected parts. What is most important is that a sufficient number of separately removable cover sections be provided to admit of access to any given part of the wing framework by the removal of one or more of such sections and that at least two formers be provided to support each of the several individual cover sections. Moreover, insofar as the idea of providing separately removable cover sections is concerned, it is not essential that the wing framework be constructed as herein disclosed since any character of wing framework can be used to advantage. I prefer, however, to use a framework of all metal construction; the use of metal covering necessarily giving strength to the wing and enabling me to use a materially lighter framework without any reduction whatsoever in the ultimate factor of safety according the wing.

While I have described my invention in detail in its present preferred embodiment, it will be obvious to those skilled in the art

after understanding my invention, that various changes and modifications may be made therein without departing from the spirit or scope thereof. I aim in the appended claims to cover all such modifications and changes.

What is claimed is:

1. An airplane wing including a supporting framework in the form of a rigid truss and a covering for the framework provided on its inside with formers, said formers being webless and wholly independent of the framework truss though fastened to it as a means of attachment for said covering.

2. An airplane wing including a supporting framework, a removable outer covering comprising separate cover sections, abutting out-turned flanges formed on the cover section for fastening the sections together, and means for fastening the cover sections to the framework.

3. An airplane wing including a supporting framework in the form of a rigid truss, and a covering for the framework wholly independent of the framework truss, said covering including in its ensemble a plurality of webless transverse formers, each said former being removably fastened to the framework as a means of attachment for said covering.

4. An airplane wing including a longitudinally extending wing beam, transverse members connected to the wing beam, webless formers arranged to embrace the wing beam in a fore and aft direction and to give the wing the desired cross-sectional form, a cover for the wing within which the beam and the transverse members are enclosed, and a means for fastening the covering to the transverse formers.

5. An airplane wing including a supporting framework and an outer covering of rigid sheet material, the top covering being made up of connected sections; the bottom covering being made up of connected sections; each section (either top or bottom) being separably removable from and detachably fastened to the framework of the wing.

6. An airplane wing including a rigidly trussed supporting frame work, separate formers arranged to embrace the supporting frame work in a fore and aft direction, each said former being webless and wholly independent of the frame work truss, means for fastening the separate formers to the supporting frame work, and an outer covering for the supporting frame fastened to the transverse formers.

7. An airplane wing including a trussed supporting frame work, a plurality of webless formers carried around the supporting frame work in a fore and aft direction, each said transverse former being separately removable from the supporting frame work

without weakening or in any way affecting the completeness of the frame work truss, and an outer covering of rigid sheet material fastened to the transverse formers and enclosing the supporting frame work.

8. An airplane wing including a supporting framework, a removable outer covering comprising separate cover sections, flanges formed on the covering sections for fastening the sections together and means let through the outer covering for fastening the individual sections to the framework.

9. An airplane wing including a supporting framework, a removable outer covering comprising separate cover sections, abutting out-turned flanges formed on the cover sections for fastening the sections together, and means let through the outer covering for fastening the individual sections to the framework.

10. An airplane wing including a supporting framework, a removable outer covering comprising top and bottom cover sections, each section being in turn divided into a plurality of cover sections, flanges formed on the smaller cover sections for fastening the sections together, and means let through the outer covering for fastening the sections to the framework.

11. An airplane wing including a supporting framework, a removable outer covering comprising separate cover sections, each cover section being transversely divided to provide a plurality of smaller sections, flanges formed on the smaller cover sections for fastening the sections together, the flanges being out-turned and arranged to abut in a fore and aft direction exteriorly of the wing, and means let through the outer covering for fastening the individual sections to the framework.

12. An airplane wing including a supporting framework, transverse formers arranged to embrace the framework in a fore and aft direction, and an outer covering fastened to and enclosing the transverse formers.

13. An airplane wing including a supporting framework, transverse formers arranged to embrace the framework in a fore and aft direction, each former including a channeled member having its open side toward the framework, and an outer covering fastened to the outside face of and enclosing the transverse formers.

14. An airplane wing including a supporting framework, transverse formers arranged to embrace the framework in a fore and aft direction, an outer covering fastened to and enclosing the transverse formers, and means carried by the transverse formers and let through the outer covering for fastening the covering to the framework.

15. An airplane wing including a framework comprising a plurality of connected

parts, an outer covering enclosing the framework, fittings provided at certain of the joints between the connected parts, and fastening devices for the outer covering carried
5 by certain of the fittings.

16. An airplane wing including a framework comprising a plurality of connected parts, an outer covering enclosing the framework and comprising a plurality of cover
10 sections, fittings provided at certain of the joints between the connected parts of the framework, and fastening devices for the cover sections carried by certain of the fittings.

17. An airplane wing including a plurality of longitudinally extending wing beams, each comprising top and bottom longitudinal
15 longitudinals interconnected by diagonal wires and vertical struts, a plurality of transverse members similarly formed, transverse formers arranged to embrace the total number of longitudinal beams, and an outer covering
20 carried by the transverse formers.

18. An airplane wing including a plurality of longitudinally extending wing
25 beams, each comprising top and bottom longitudinal

longitudinals interconnected by diagonal wires and vertical struts, a plurality of transverse members each comprising a plurality of parts arranged to interconnect adjacent
30 longitudinals of the wing beams, transverse formers arranged to embrace the total number of wing beams and to give to the wing the desired cross sectional form, and an outer covering enclosing the beams and
35 transverse members, said outer covering being fastened to the transverse formers.

19. An airplane including a rigidly trussed supporting frame work, separate transverse formers carried by the supporting
40 frame work, the formers in each instance being of a construction such that, in the assembly of the wing, they are capable of being slipped over the frame work, longitudinally of the wing, from one end thereof,
45 means for fastening the transverse formers to the supporting frame work, and an outer covering for the wing.

In testimony whereof I hereunto affix my signature.

WILLIAM L. GILMORE.