

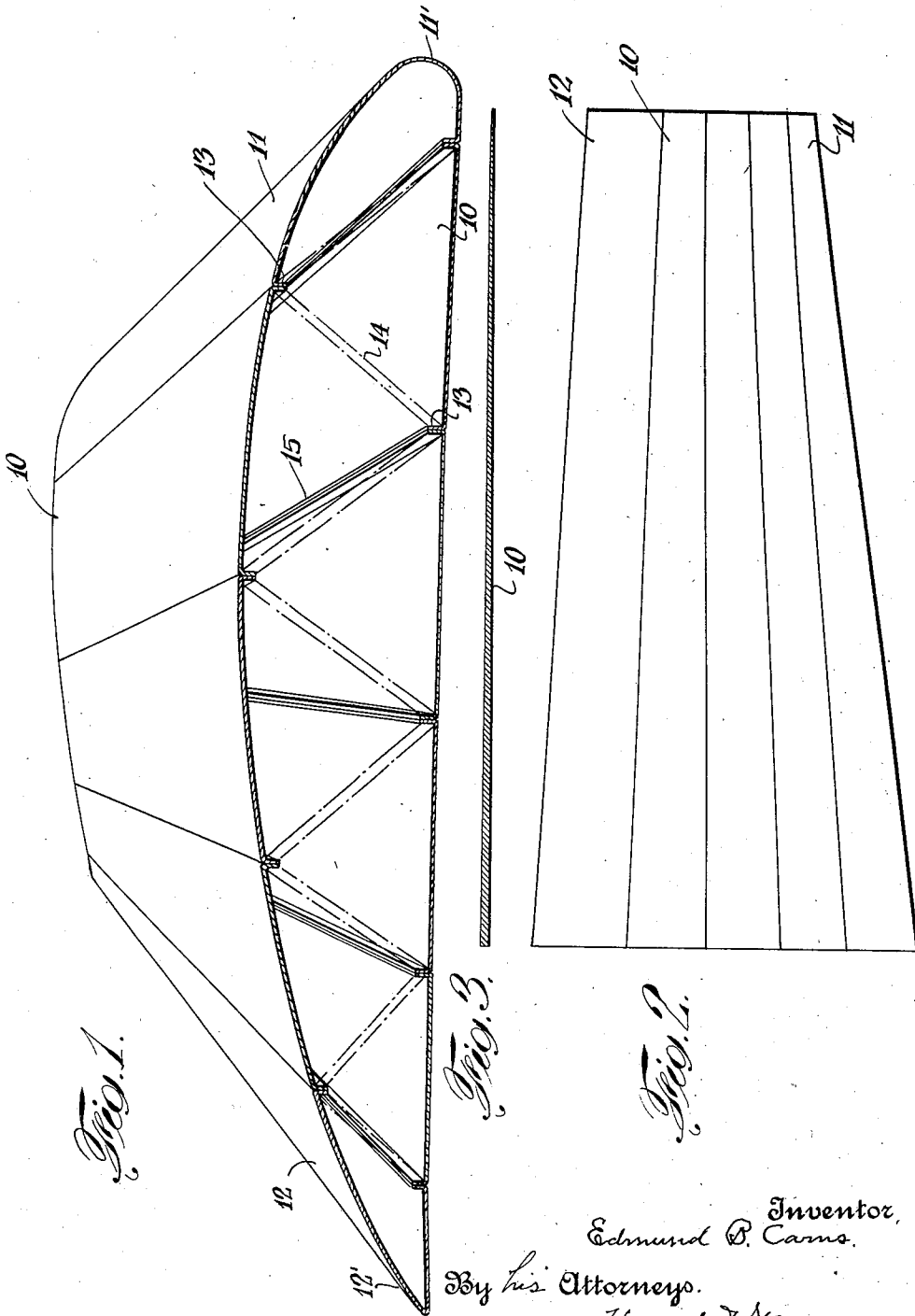
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AEROFOIL

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UNITED STATES PATENT OFFICE

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AEROFOIL

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My invention relates to improvements in aerofoils or wings of airplanes. The general object of my invention is to produce a simple, inexpensive and effective structure of this kind in which the parts are shaped and assembled in such a manner that the aerofoil will, as a whole, have the desired stream-line cross sectional shape and taper in all its parts toward the spread edge to the end that the structure may be as light as possible consistent with the requisite strength, and that the weight of the parts may be distributed perfectly so that there will be no undue material at any place.

My invention is further intended to produce a structure which, unlike those in which a stressed cover is attached to an internal frame work, has the cover parts shaped in sections in such a way that when united they will give to the aerofoil the desired shape, will obviate the necessity of internal spars and a definite frame work, but will permit the arrangement of such internal bracing as may be most effective.

My invention is further intended to produce an aerofoil in which the body and cover are one and formed of assembled strips extending lengthwise of the aerofoil and tapering toward the outer or spread edge both in width and in gauge of material to the end that the wing as a whole may taper in all directions with the parts gradually lightening toward the outer extremity.

The invention is further intended to produce a structure particularly applicable for quantity production in which the several strips or parts of the aerofoil can be made in duplicate and in desired numbers and then readily assembled.

The invention is further intended to produce a structure in which the strips which run lengthwise of the aerofoil have flanged abutting parts adapted to be fastened together to stiffen the structure as a whole, also to facilitate the attachment of desired internal bracing and struts and further disposed so that the meeting parts of the upper and lower cover sections can be conveniently arranged to break joints thereby strengthening the structure and avoiding the use of heavy con-

nections which would be required if the joint breaking effect were not carried out.

Further objects and benefits of the invention will appear from the following description and accompanying drawings in which like reference characters refer to similar parts throughout the several views.

Figure 1 is a cross sectional development of an aerofoil showing my improvements;

Figure 2 is a diagrammatic plan of the structure; and

Figure 3 is a diagrammatic section lengthwise of one of the covering strips showing the tapering of the material.

The aerofoil is composed of a series of strips running lengthwise of the foil which can be of desired sheet metal and also of strips 11 and 12 at the fore and after edges of the foil. The fore strips 11 are bent as shown at 11' to give the desired front edge shape to the foil and the after strips 12 are similarly shaped as at 12', while the several strips 10, 11 and 12 are curved transversely to give the desired stream line effect to the structure as a whole.

The several strips are peculiar in that they all taper in every dimension from the inner to the outer end part of the aerofoil, that is to say, the several strips 10, 11 and 12 taper transversely of each strip as shown in the diagram by Figure 2 and the strips are rolled or shaped so that the gauge of metal also tapers from the inner to the outer extremity as illustrated in Figure 3. The several strips are each formed at the edges with flanges 13 adapted to abut with flanges of adjacent strips thus forming longitudinally extending braces which materially strengthen the structure, stiffen it against flexing and which can be fastened together by welding, riveting or otherwise.

It will be noticed that the fore and after sheets 11 and 12 are curved so that they are shorter transversely on the under side than on the upper although this position may be reversed and it results in making the meeting parts of adjacent sheets out of vertical alignment as clearly shown in Figure 1 so that when assembled the meeting parts of the upper and lower sheets will break joints. This

is a distinct advantage because if the joints were in vertical alignment it will be readily seen that a far stronger and heavier bracing would be required to prevent the meeting sections from flexing at the adjoining parts.

When the structure is made as illustrated and described, however, the meeting flanges 13 of adjacent sheets enable braces or struts 14 and 15 to be placed as desired and to extend from the flanges 13 on one internal surface of the aerofoil to corresponding flanges on the upper internal surface. The struts or braces can be arranged transversely and diagonally as shown or may be arranged diagonally in both the transverse and longitudinal directions to give the necessary stiffening effect. It will be seen that in such a structure spars are not necessary, neither are ribs as generally used in structures of this kind, because the peculiar transverse and longitudinally tapering form of the several strips give a very stiff effect to the structure as a whole and the heavy internal frame work or bracing generally used is not necessary or desirable.

While I have shown the cover strips 10 with abutting flanges which is the preferred construction, still it will be understood that the tapering strips shown with the tapering metal gauge can be fastened together in other ways which will suggest themselves to one skilled in the art without departing from the spirit of the invention.

It will be noticed also that the several strips necessary for making the aerofoil can be numbered and a great many duplicate strips made so that they can be selected by number and assembled into a complete aerofoil with the greatest facility.

It will also be apparent that it is desirable and a part of my conception in making a structure of this kind to have the internal bracing, that is the struts and parts 14 and 15, reduced in all dimensions as they approach the outer or spread edge of the aerofoil.

I claim:

1. As an improved structure an aerofoil formed of longitudinally tapering strips, said strips tapering in form and wall thickness having flanged abutting parts and disposed to break joints with relation to the upper and lower portions of the foil.

2. An aerofoil formed of cover strips shaped to give the desired cross sectional form to the aerofoil, said strips extending lengthwise of the aerofoil and tapering in form and wall thickness.

3. An aerofoil tapering in width and thickness and formed of longitudinally tapering strips tapering in form and wall thickness and formed with abutting flanges.

4. An aerofoil having a surface of longitudinally tapering strips which also taper in gauge and having inwardly projecting abutting flanges with the flanges at the upper and

lower parts of the aerofoil in staggered relation.

5. An aerofoil formed of tapering strips of material shaped transversely to give the desired stream line effect to the aerofoil, said strips extending longitudinally of the aerofoil and provided with inwardly projecting meeting flanges, and braces connecting the upper and lower flanges of the tapered parts.

6. An aerofoil of longitudinally tapering strips which also taper in gauge, and means for fastening the adjacent strip edges together.

7. A wind exposed surface for aircraft composed of strips tapering in form and wall thickness and secured together at their longitudinal edges.

8. A wind exposed surface for aircraft composed of strips tapering in form and wall thickness and having flanged meeting edges which are fastened together.

9. A structure of the kind described forming a wind exposed surface for aircraft having strips tapering in form and wall thickness and secured together at their longitudinal edges, and means for fastening internal reinforcing structures to said strips.

In testimony whereof, I have signed my name to this specification this 28th day of March, 1929.

EDMUND B. CARNES.