Jan. 15, 1929. 1,698,849

C. J. LEISY

AIRPLANE

Filed June 16, 1927 3 Sheets-Sheet 1

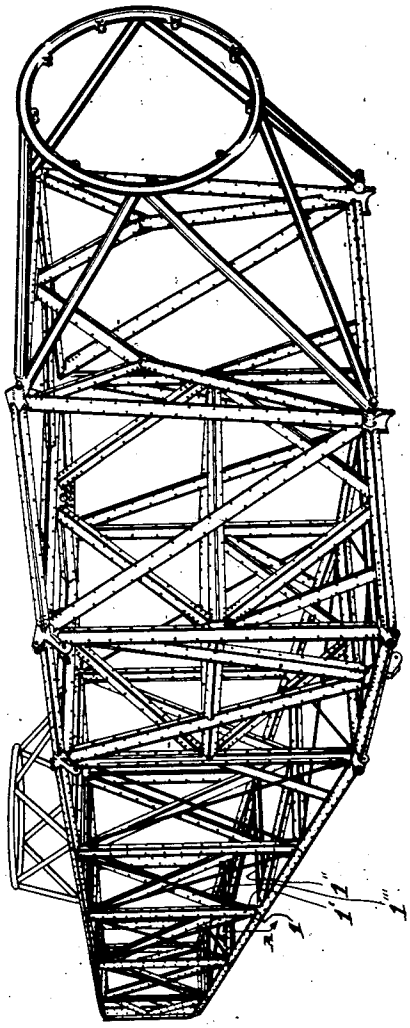


Fig-1

INVENTOR
Clifford J. Leisy
BY Kerr Hudson & Kent
ATTORNEYS

Jan. 15, 1929. 1,698,849

C. J. LEISY

AIRPLANE

Filed June 16, 1927 3 Sheets-Sheet 2

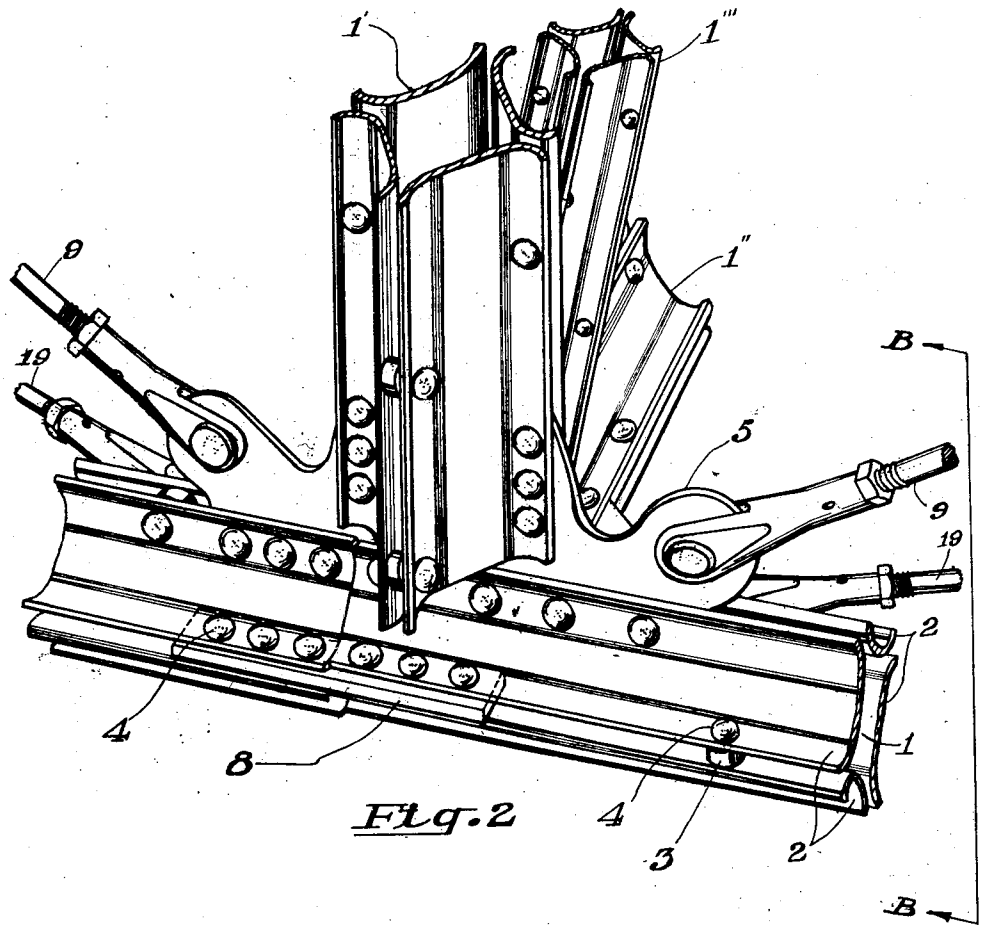


Fig. 2

INVENTOR
Clifford J. Leisy
BY Kerr Hudson & Kent
ATTORNEYS

Jan. 15, 1929. 1,698,849

C. J. LEISY

AIRPLANE

Filed June 16, 1927 3 Sheets-Sheet 3

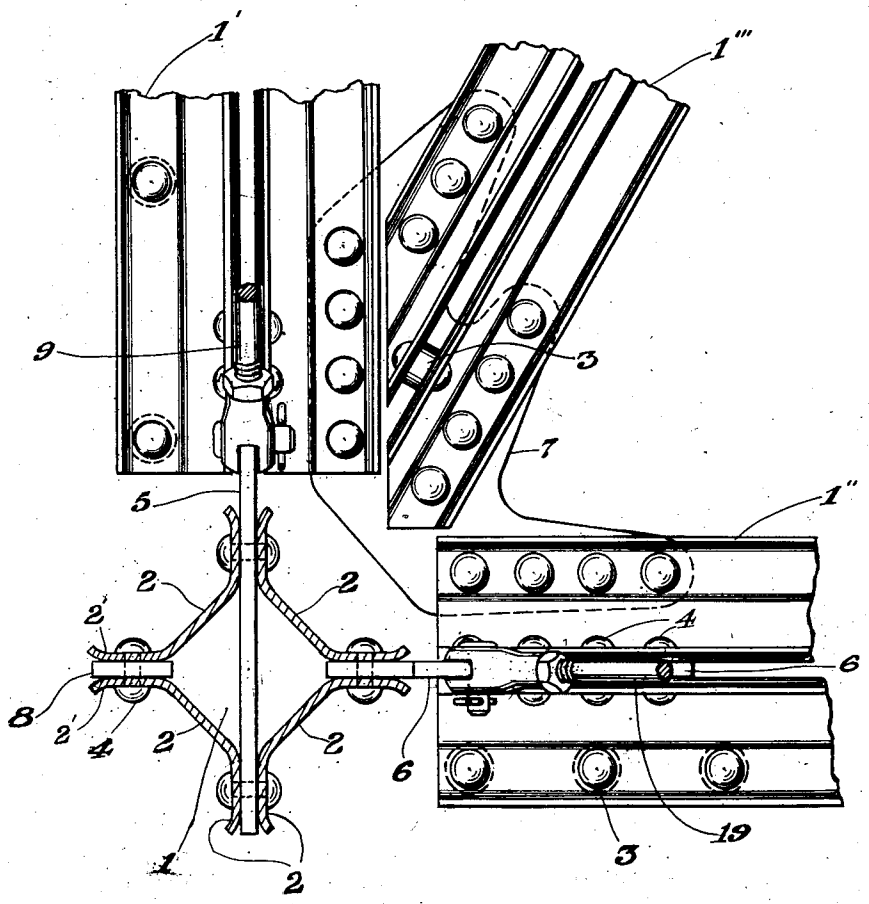


Fig. 3

INVENTOR
Clifford J. Leisy
BY Rowe Hudson & Kent
ATTORNEYS

Patented Jan. 15, 1929. 1,698,849

UNITED STATES PATENT OFFICE.

CLIFFORD J. LEISY, OF CLEVELAND, OHIO, ASSIGNOR TO THE GLENN L. MARTIN COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

AIRPLANE.

Application filed June 16, 1927. Serial No. 199,184.

This invention relates to improvements in airplanes, and particularly to structural members for the framing of airplanes, and joints between such members.

The interior surfaces of airplane struts, chords, tie members, etc. are subject to rapid deterioration, particularly when made of a certain alloy of aluminum. In order to meet this difficulty it has been proposed to so form such structural members as to permit inspection and treatment of the interior surfaces thereof. The present invention in some of its aspects seeks to improve upon the means heretofore devised for that purpose.

One of the objects of the invention, therefore, is to provide for the inspection and treatment of internal surfaces of built up metal structural members designed for use in airplanes.

Another object is to provide a structural member of the character specified, which is possessed of a high strength-weight ratio.

A further object is the provision in connection with structural members of the kind mentioned, of means for easily and rigidly uniting such members at their joints in airplanes.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which:

Figure 1 is a perspective view of the framework of an airplane fuselage, comprising structural members and joints embodying my invention.

Figure 2 is a fragment of said framework, upon a larger scale, the view being taken in the direction of arrows A, Figure 1.

Figure 3 is a view partly in elevation and partly in section of the joint shown in Figure 2, looking in the general direction of arrows B, Figure 2.

Similar reference characters refer to like parts throughout the views.

In the drawings a longéron of the fuselage is shown at 1, being made up of four channel elements 2, having inclined side flanges 2′. Adjacent flanges 2′ on the channel elements are spaced apart by occasional spacing collars or washers 3, or by other spacing means to be mentioned herein later. The edge portion of each flange 2′ is curled or deflected toward the center line of the corresponding channel elements, for the purpose of resisting "crinkling", that is to say, local bending such as frequently occurs in thin metal strips in the regions thereof which are most subject to compression or crushing strains.

Rivets or equivalent fastening means 4 extend through the spacing collars or washers 3 to hold the flanges 2′ together in spaced relation. Pairs of flanges which are diametrically opposite preferably have their fastenings 3—4 in transverse alignment, while the fastenings for the remaining joints are preferably transversely opposite to each other being arranged in staggered relation with respect to the first mentioned fastenings.

In carrying out my invention I prefer to employ structural elements of the kind described for all of the heavier frame parts of the machine, and in the drawings I have illustrated some of these parts at 1, 1′, 1″, and 1‴, the member 1′ being vertical and perpendicular to the member 1, the member 1″ being horizontal and perpendicular to the members 1 and 1′ and the member 1‴ being a diagonal cross strut. I prefer to employ an aluminum alloy as the material for the channels 2.

The structural member herein illustrated lends itself very nicely to the formation of the joints at meeting points of the fuselage of the frame, as indicated in Figures 2 and 3. In Figure 2 the longéron 1 is shown composed of two parts spliced together. At the joint shown there is a splice plate 8 arranged between flanges 2′ connecting the two parts of the longéron, being fastened with rivets 4 or the like. Opposite the splice plate 8 there is a gusset plate 6 which takes the place of a splice plate on this side of the joint, but also extends between elements of the structural member 1″ and is secured thereto by rivets 4. The plate 6 extends entirely through the member 1″, being secured thereto on each side edge.

The splicing of the two parts of member 1 in the vertical plane is accomplished by another gusset plate which extends entirely through the member 1 and is riveted thereto through the top and bottom flanges 2′. Above the member 1 the gusset plate 5 extends through the vertical member 1′ and is riveted thereto along both side flanges, as shown in Figure 2. It is also provided with lateral ears to which are pivotally attached tie rods 9. Other tie rods 19 lying in a horizontal

plane are similarly attached to the gusset 6. The two structural members 1′ and 1″ are joined by a gusset plate 7 which extends only into those members and not through them, being riveted to them along one edge as shown. This plate 7 serves as the attachment means for the inclined structural member 1‴, through which it extends and to which it is riveted along two edges.

The channels 2 are, of course, rolled shapes and are obtained from the rolling mill in standard lengths. The structural members may then be put together in standard lengths, also, with spacers 3 and rivets 4 positioned at regular intervals. When, in assembling a frame work of any kind the spacers and rivets would interfere with a fitting, such as a splice plate or gusset plate, they can be very readily removed by drilling through the rivet and breaking out the rivet shell which remains. Of course, special lengths for special purposes with all needed rivet holes properly located can be made up from the rolled shapes where that method of procedure seems desirable.

While for airplane purposes I prefer structural members composed of four channel elements such as those shown in the drawing, such members being highly satisfactory where connections between members are to be made at right angles, nevertheless my invention may be carried out by the use of any number of channels greater than two, and where connections at angles other than right angles are to be made it will be found best to employ a member with such a number of channels as will produce joints separated by the desired angles.

The interior surfaces of structural members formed according to my invention can be readily inspected in all their parts, and these surfaces can be suitably treated when necessary as by spraying with paint or other materials which resist deterioration.

Having thus described my invention what I claim as new is:

1. In an airplane three structural members arranged with their axes each perpendicular to the other two, said members each comprising four elongated elements evenly spaced around the axial center of the member and secured together with their adjacent edges spaced apart slightly, and means for securing said three members together, comprising three gusset plates each arranged at right angles to the other two and each said gusset plate being mounted between two adjacent elements of one member and two adjacent elements of another member.

2. In an airplane, a pair of structural members arranged at right angles to each other, a third member extending diagonally toward the joint between the pair of members, said members each comprising four elongated elements evenly spaced around the axial center of the member and secured together with their adjacent edges spaced apart slightly, and means for securing said three members together comprising a gusset plate mounted between two adjacent elements of one member and two adjacent elements of another member and extending diametrically through the intermediate member between two sets of adjacent edges therein.

In testimony whereof, I hereunto affix my signature.

CLIFFORD J. LEISY.