Oct. 20, 1925. 1,557,855

F. E. LOUDY

ALL METAL AIRPLANE STRUCTURE

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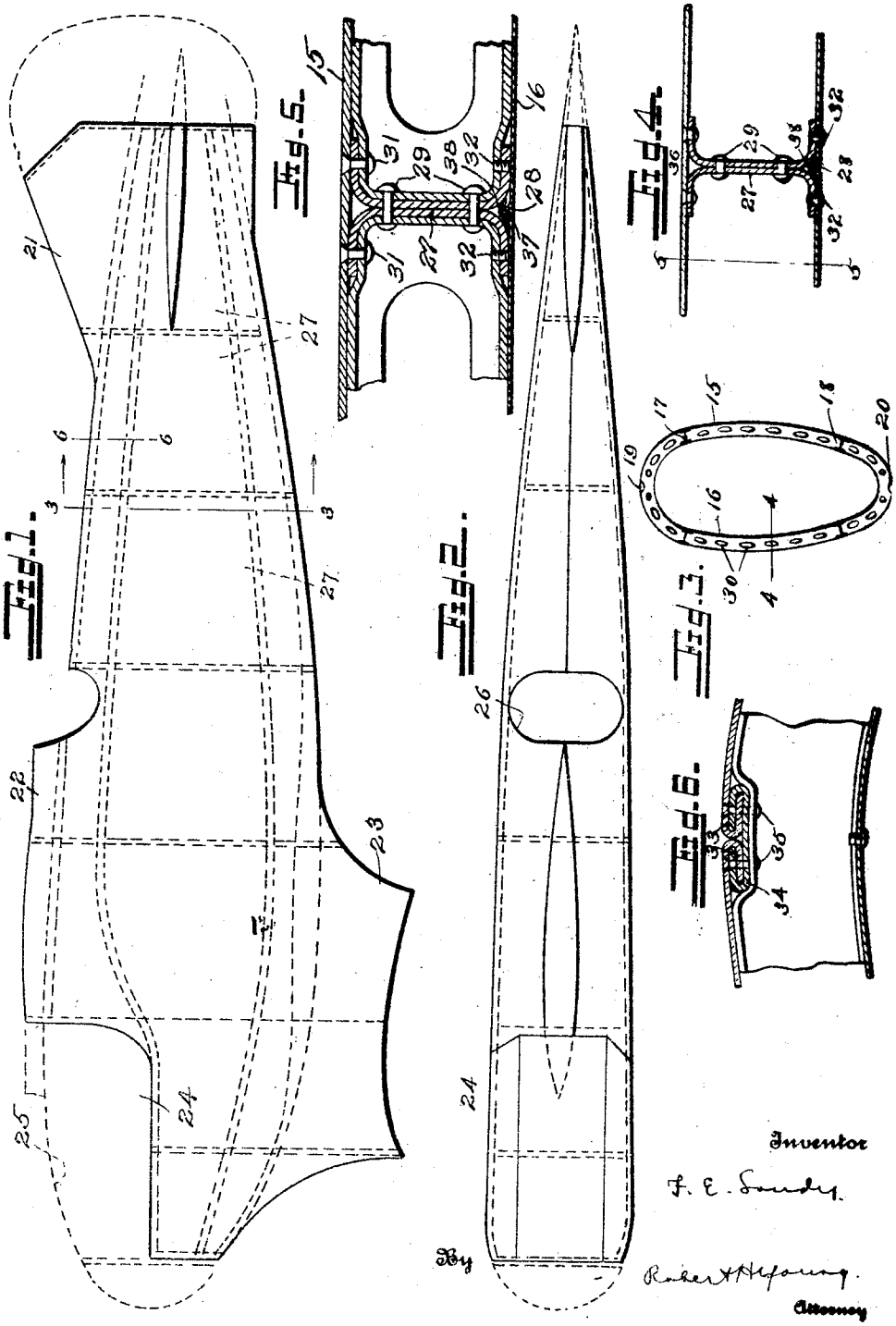

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ALL-METAL-AIRPLANE STRUCTURE.

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To all whom it may concern:

Be it known that I, FLAVIUS E. LOUDY, a citizen of the United States, residing at Mobile, in the county of Mobile and State of Alabama, have invented certain new and useful Improvements in All-Metal-Airplane Structures, of which the following is a specification.

The invention relates to airplanes of the all-metal type, the primary object being to provide a structure which is fundamentally different from that of the all-metal planes heretofore produced, and which possesses several advantages over the latter.

Specifically, it is the purpose of the present invention to produce an airplane of the type mentioned whose external form and other features of design will conform strictly to the conventional practice and at the same time to effect an economy in labor and cost of material.

Accomplishment of the foregoing object is permitted by the fact that readily available commercial articles of metallic building material may be employed in the proposed construction. For instance, strips of sheet metal, channel beams, and the like, may be utilized for the purpose.

It is an object also to provide a fuselage construction which will be very strong and durable, and which will afford a maximum amount of unobstructed interior space for the accommodation of the pilot, passengers and cargo.

Other objects and advantages may appear as the following specific description is read in connection with the accompanying drawings, in which:

Figure 1 is a side elevation of the fuselage of a single-seater biplane of the tractor type constructed in accordance with the invention, the wings being omitted in this view;

Figure 2 is a plan view of the fuselage;

Figure 3 is a transverse sectional view on line 3—3 of Figure 1;

Figure 4 is a longitudinal section through a portion of the fuselage on line 4—4 of Figure 3, and drawn on a large scale to show the minute details of construction;

Figure 5 is a similar detailed sectional view taken on line 5—5 of Figure 4;

Figure 6 is a similar view on line 6—6 of Figure 1, showing a top seam in the outer skin;

For the purpose of illustration, the inventive idea has been shown applied to the construction of a particular type of airplane, but it is to be understood that its principles may be embodied in various other types of craft. It may be pointed out also that certain details of the construction are merely illustrative and may be modified in practice without departing from the scope of the appended claims.

Referring to the drawings, it will be noted, upon reference to Figures 1 to 3 in particular, that the fuselage consists essentially of an outer skin 15, an inner skin 16, a plurality of longérons 17, interposed between skins, and a plurality of segmental bulkheads or ribs 18, which are likewise disposed between skins and are connected with the longérons.

This construction will give more strength to the fuselage throughout its entire length without the use of any cross braces or bulkheads, which would obstruct the interior and divide it into a number of restricted compartments.

Instead, the fuselage will have one long interior chamber of great capacity. The presence of such a large, continuous space within the fuselage is a decided advantage in any type of aircraft, especially in those ships which are designed for carrying heavy loads of cargo or passengers. In military airplanes, this interior space may be utilized for the storage of aerial bombs or other munitions.

The outer skin 15 may be formed conveniently by pressing two large sheets of metal into such shape that each forms half of the fuselage and has the proper streamline external configuration. The best mechanical construction seems to be that shown most clearly in Figures 2 and 3, wherein the two plates are joined at the top and the bottom of the fuselage by longitudinal seams 19 and 20. Each plate thus forms one side-half of the entire outer skin.

At this point it may be well to state that I do not intend to be limited to the use of precisely two plates, nor to the location of the seams at the top and bottom of the fuselage. A greater or lesser number of plates might be employed and the form and arrangement might be varied within the spirit of the present invention. Furthermore, it is not necessary that the plates shall be formed by pressing sheet metal into the desired

form. They may be produced by casting molten metal or by some other suitable and economical method.

When constructing the side plates of the outer skin, stationary parts 21 of the empennage assembly, such as the stabilizers, etc., may be formed on the tail portions of these plates. Also, bases 22 and 23 for the attachment of the upper and lower wings respectively may be formed by providing extensions on the side plates of the outer skin. Each plate will afford half of each one of these bases, and the construction should be such that the latter will have the streamline form shown in Figure 2.

It may be found convenient to leave an opening 24 in the nose of the fuselage for the insertion of the power plant. The engine cowl, when applied, should complete the streamline configuration of the fuselage nose as indicated by the dotted lines 25 in Figure 1. An opening 26 is shown in Figures 1 and 2 at the appropriate location for the pilot's cockpit. In other types of ship, other openings may be necessary. Their number and disposition are immaterial so far as the principles of the present invention are concerned.

In Figure 6 the details of the seam between side plates of the outer skin, which has been adopted for the purpose of disclosure, are shown. This type of seam should prove quite efficient. It will bind the plates securely together and will keep their outer surfaces flush where they join so as to preserve the smooth streamline surface. The details of the seam will be described more fully hereinafter. It is essential to the clearness of the description that other more important parts of the fuselage be described in the meantime.

The inner skin 16 is preferably formed by a series of connected plates 27 which are trapezoidal in general form and are bent transversely into parallelism with the outer skin. These channels are secured together at their meeting edges by seams 28, which are shown in detail in Figures 4 and 5. The longérons 17 and bulkheads 18, which separate the inner and outer skins are formed preferably by appropriate lengths of channel beams. Each of these members may consist of two channel beams placed back to back and secured together by means of rivets 29. The longérons are nearly straight and are of integral construction from one end of the fuselage to the other, whereas the bulkheads are curved in conformity to the transverse curvature of the skins 15 and 16 and are just long enough to bridge the space between adjacent longérons. In order to minimize weight, the bulkheads, which are not subjected to the same stress as the longérons, may be provided with perforations 30 in their web portions. It has been found to be practical to secure the flanges of the longérons and bulkheads to the outer skin by means of rivets 31 and to the inner skin by means of screws 32, but it is obvious that some other form of attaching means might be adopted instead.

As shown in Figures 3 to 6, the outer skin is thicker than the inner skin. This is preferable in most instances, due to the greater stress and wear to which the outer skin is subjected. This is a feature, however, which is not binding. Any desired alterations in the relative thickness of this skin may be made to meet the requirements of practice.

Referring particularly to Figure 5, it will be noted that the ends of the bulkheads 18 are pinched in order that they may fit snugly between the flanges of adjacent longérons.

In Figures 3 and 6 the uppermost and lowermost bulkheads are represented as having depressions formed contiguous to the respective top and bottom seams of the outer skin for the reception of those parts of the seam structure which would otherwise cause the seams to bulge outwardly. Referring to Figure 6 in particular, it will be observed that each seam is formed by bending the meeting edges of both side plates inwardly and then back into parallelism with the major portions of these plates. The bent edges are indicated at 33. A binding strip 34 is crimped around the edges 33 of the side plates, then rivets 35 are passed through the side plates, the binding strip, and the flanges of the adjoining bulkhead so as to complete the formation of a very tight, durable seam.

By cutting the panels 27 of the inner skin so that their meeting edges will extend along the longérons and bulkheads, the formation of seams will be facilitated. The channel beams which unite to form each longéron or bulkhead are of such cross-sectional shape that longitudinal grooves 36 will be provided between the flanges where they turn outward from the web. These grooves are shown clearly in Figures 4 and 5. The meeting edges of adjacent panels may be bent inwardly as at 37 so as to project into the corresponding groove 36 of the longéron or bulkhead, as the case may be, and a binding strip 38, which is U-shaped in cross-section, may be mounted within the groove and crimped around the edges of the panels.

It has been stated throughout the specification that the various parts of the structure are metallic in nature. While the principal object in view has been to produce a satisfactory all-metal plane, it is not my desire to be confined to the use of metal. Future developments may make it practical to use some other kind of structural material possessing such qualities that it may be made into the various spars, ribs, longérons, bulkheads and skins, which form the essential elements of the present invention.

I claim:

1. In an aircraft fuselage, an outer skin composed of two side plates co-extensive in length with the length of the fuselage and seamed together along the top and bottom of the fuselage, said plates being shaped to provide a vertical offset forming an abutment for wings.

2. In an aircraft fuselage, an outer skin composed of two side plates co-extensive in length with the length of the fuselage and seamed together along the top and bottom of the fuselage, said plates being shaped to provide a vertical streamlined abutment for wings.

3. In an aircraft fuselage, an outer skin composed of two side plates co-extensive in length with the length of the fuselage and seamed together along the top and bottom of the fuselage, said plates being shaped to provide upper and lower vertical abutments for wings.

4. In an aircraft fuselage, an outer skin composed of two side plates co-extensive in length with the length of the fuselage and seamed together along the top and bottom of the fuselage, the longitudinal edge of said plates being bent inwardly and away from each other, and a C-shaped binding strip clinched around such bent edges.

5. In an aircraft fuselage, an outer skin composed of two side plates co-extensive in length with the length of the fuselage and seamed together along the top and bottom of the fuselage, open center bulkheads internally bracing said plates, and an inner skin composed of plates having meeting edges resting against said bulkheads and fastened thereto.

6. In an aircraft fuselage, an outer skin composed of two side plates co-extensive in length with the length of the fuselage and seamed together along the top and bottom of the fuselage an inner skin, and longérons interposed between and connecting said skins and each composed of a pair of channel beams having their webs united and having the oppositely extending flanges thereof fastened to the outer and inner skins.

7. In an aircraft fuselage, an outer skin composed of two side plates co-extensive in length with the length of the fuselage and seamed together along the top and bottom of the fuselage an inner skin, and longérons interposed between and connecting said skins and each composed of a pair of channel beams having their webs united and having the oppositely extending flanges thereof fastened to the outer and inner skins and segmental bulkheads of sheet metal flanged and having the segments thereof compressed inwardly and fitted and fastened between the flanges of the longérons.

8. In an aircraft fuselage, outer and inner skins, and internal bracing members each composed of channel beams having their webs united and the oppositely extending flanges thereof fastened to said outer and inner skins.

9. In an aircraft fuselage, outer and inner skins, internal bracing members each composed of channel beams having their webs united and the oppositely extending flanges thereof fastened to said outer and inner skins, and outer bracing members having flanges fastened to said outer and inner skins and made in sections terminally fastened to the first named bracing members.

10. In an aircraft fuselage, a frame of streamline form including longérons and segmental bulkheads connected together, and an inner skin comprising a plurality of segmental plates having their edges extending along adjacent longérons and bulkheads, adjoining edges of the said plates being joined together.

In testimony whereof I have affixed my signature.

FLAVIUS E. LOUDY.