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No. 440

METAL AIRCRAFT CONSTRUCTION AT VICKERS

Some Interesting New Forms Developed

From "Flight," September 15, 1927

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METAL AIRCRAFT CONSTRUCTION AT VICKERS.*

Some Interesting New Forms Developed

It is comparatively easy, with any form of metal construction, to design for maximum efficiency from the strength-weight point of view. But often it is found that sections which give a very high value of this ratio are difficult and costly to produce in the shops. On the other hand, it is very easy to design forms which are cheap to produce, but in nearly all cases it is found that such sections fail to develop anything like the full strength of the material. It is true that in time of war the actual cost in money is of secondary importance, but what is of the very greatest importance is the question of man-hours, and any form of metal construction which requires a disproportionate number of man-hours is practically doomed, no matter how excellent it may be in the matter of strength for weight.

In evolving the new forms of metal construction at Vickers' Weybridge Works, these considerations have been kept prominently in mind, with the result that simplicity is the keynote of the design. In fact, it seems likely that in case of urgent demand, Vickers would be able to produce duralumin aircraft parts at almost any rate required, and in the main by semi-skilled, or even unskilled labor. At the same time, the forms of construction

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evolved are such that the resulting structure is considerably lighter than the corresponding wood structure, for the same strength, or conversely, for the same weight, the duralumin structure is a great deal stronger, so that efficiency has by no means been sacrificed on the altar of simplicity.

As far as the wing construction is concerned, the basis of the Vickers system is the novel form of spar web. Mr. Sutherland, of Vickers, terms this rather aptly a "wandering web," from the fact that the web, made from a single strip of the metal, meanders along from front face to rear face and back to front face of the spar. In order to give the necessary rigidity, vertical flutings are stamped in the web in places where it meets the front and rear faces, the fluting forming a sort of short strut, which prevents the secondary buckling of the sheet under compression loads.

The "wandering web," it will be seen, forms alternately the spar front wall, the diaphragm or bulkhead, and the spar rear wall, the diaphragm being diagonal instead of, as is more usual, at right angles to the spar walls. By arranging the web in this manner, a very great deal of work is saved. To begin with, there are no separate diaphragms to stamp out, which saves one operation at least, and probably two or more. Then, from the fact that the web is a continuous strip, there is far less riveting to be done than would be required were the diaphragms separate pieces needing to be attached to walls and flanges.

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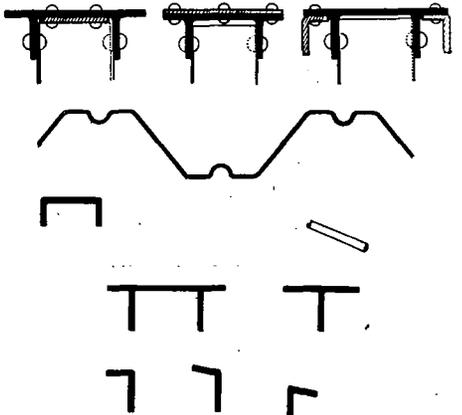
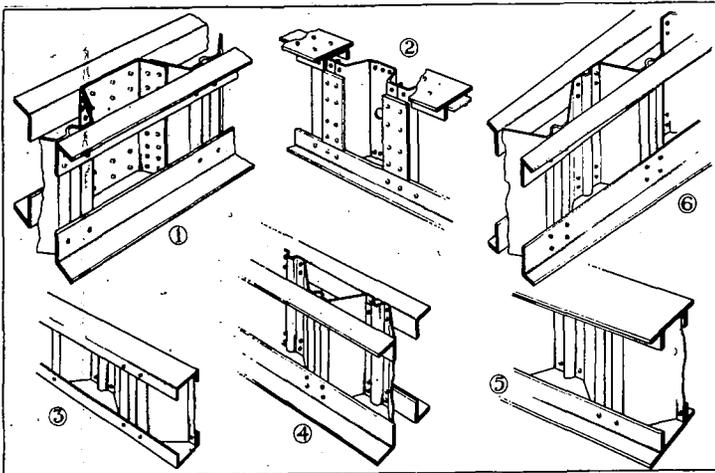


Fig. 1

Some standard sections used for spar flanges. The zig-zag line shows the formation of the "wandering web."

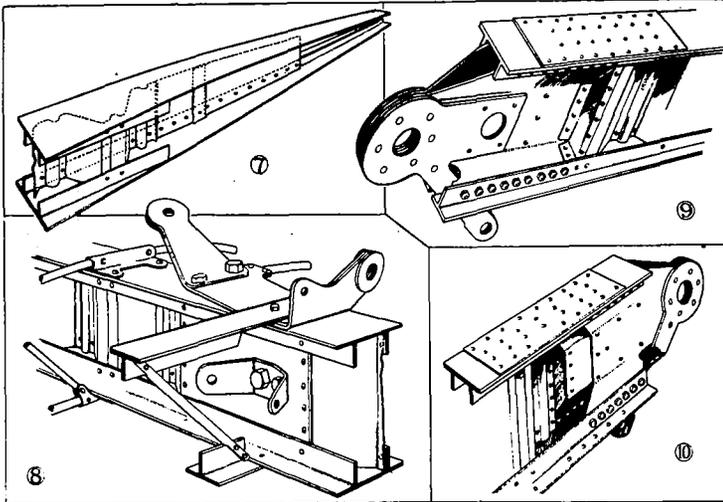


Fig. 2

A splice in the "wandering web" is shown in (1), and special reinforcement for compression strut in (2). Various flange forms are illustrated in (3), (4), (5) and (6), all using the same "wandering web." The manner of tapering a spar end down is shown in (7). In (8) a typical wing strut fitting is shown, while (9) and (10) show end fittings for attachment to center-section.

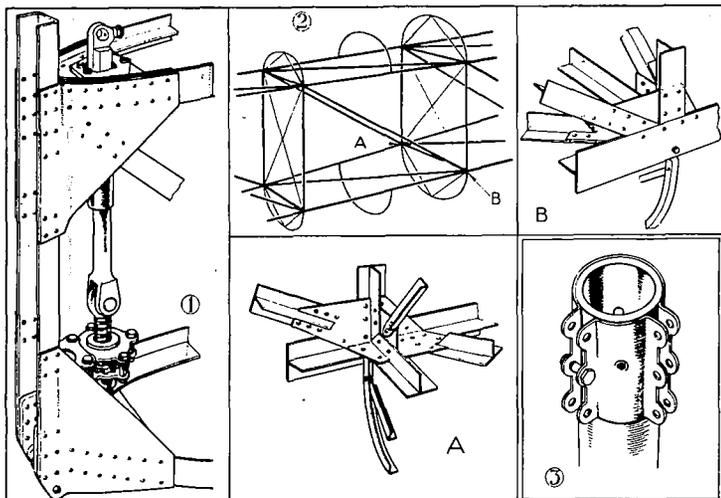


Fig. 4

Details of fuselage members. (1) Shows the construction at the stern post. (2) Illustrates in diagram the arrangement of struts and longerons, with details at A and B. The sketch in (3) illustrates a fuselage fitting for use with tubular longerons.

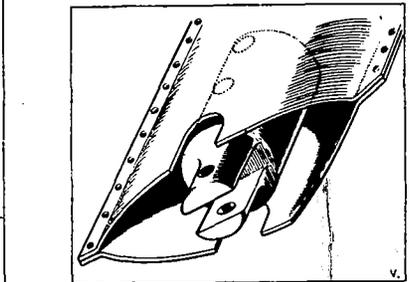


Fig. 5

VICKERS METAL CONSTRUCTION: Inter-plane struts are made from sheet Duralumin, the strut being of streamline section as shown. The end fitting is a simple fork end.

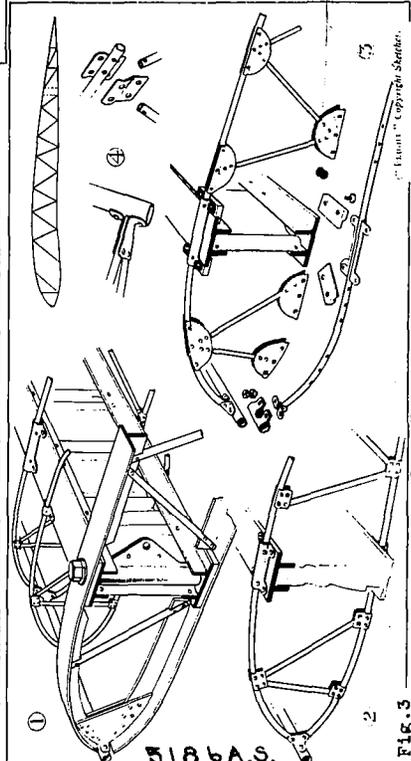


Fig. 3

Some rib details. (1) Shows an end rib and some nose ribs, while (2) shows a normal rib attached. The type of rib used for replacements is illustrated in (3). It will be noted that no riveting is required. The general lay-out of a rib is shown in (4), with details of brackets, etc.

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