FLIGHT

RIGGING

THE ERECTION AND TRUEING-UP OF AEROPLANES

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The Why and Wherefore of Rigging

CONSIDERING an aeroplane simply as a structure built to resist certain stresses, the necessity for rigging in some form or other, is apparent. In the case of an ordinary tractor biplane, the *fuselage* is subjected to bending moments, combined with torsion about its longitudinal axis. In general, it resists the bending moments as a cantilever beam, supported for some loads at its centre of gravity and for others at its centre of lift, both of which are situated somewhere approximately just behind the front spar of the top plane in a moderately staggered biplane. The usual construction consists of four longitudinal members or *longerons* running the entire length of the machine, braced together by struts and diagonal wiring so that the whole forms a box lattice girder.

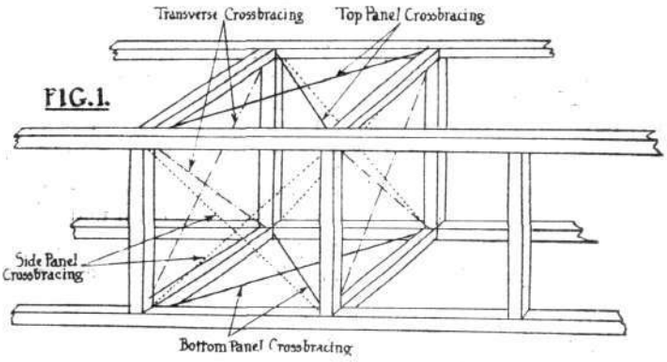

FIG. 1.

Each of these panels in the side of the *fuselage* helps to take bending moments in an upward or downward direction, while the corresponding panels in the top and bottom enable the structure to stand up to side loads of a similar nature.

Fig. 1 shows *fuselage* wiring.

Looking at the *fuselage* at right angles to its length the internal panels, formed by the struts running transversely across the top and bottom, and down the sides, are also braced by diagonal wiring, so that each separate bay in the *fuselage* structure forms by itself a complete rectangular cell, the six sides of which are composed of bracing wires. This transverse wiring from the top *longeron*, on one side, to the bottom *longeron* on the other side, and *vice versa*, renders the *fuselage* capable of resisting torsion.

The main planes are also subjected to cantilever loads, and in a biplane arrangement they form a truss girder suitable for taking such stresses. The top and bottom planes are braced together by means of interplane struts and cross-bracing wires or cables. Fig. 2 shows a typical arrangement. When the machine is in flight its weight is being supported by the planes, which are loaded as cantilevers supported at the *fuselage*. The stress set up in each pair of wings (top and bottom pairs) resolves into tension in the lower plane, and compression in the top plane, and compression also in each interplane strut. While the load is in this direction, that is, the machine is flying, the wires marked "F" are being stressed according to the reaction obtaining at their point of anchorage. They are known as "flying wires," because they function only while the machine is in flight. When the machine is stationary upon the ground the reverse conditions obtain, the wings are supported by the *fuselage* and the stress in the wing structure is reversed in direction, the bottom plane being in compression and the top in tension. The opposite wires, marked "L," are sustaining the weight of the planes; these are called "landing wires." If the wing covering were stripped off it would be seen that each plane is braced internally between the front and rear spars in an exactly similar manner, viz., by means of interspar struts and diagonal wiring. This is in order to resist the stresses set up in a direction opposite to that in which the machine is travelling by the drag of the planes.

From the foregoing it will be seen that the function of the rigging or wire bracing of an aeroplane, is simply to hold the structure together with the necessary rigidity which will enable it to withstand the stresses it is subjected to. The term "rigging" is often used to imply the assembly of the completed units of a machine, and the subsequent adjustment of all the external wiring, but taken in its wider sense it should mean the fitting of the whole of the wire bracing in every part of an aeroplane, and the correct adjustment of same. The operations of correctly adjusting the wiring in all components is known as "trueing-up," and is probably the most difficult part of the rigger's work. It will thus be seen that rigging begins in the factory, as soon as the assembly of either *fuselage* or wings commences.

Construction and Erection

Inseparably associated with the actual wire bracing of a machine, are the struts and other wooden members, which, together with the wiring, form the cells and panels which constitute the structure; and the better the rigger understands the nature of the material with which he has to deal, the better is he fitted for his work.

Before timber can be regarded as a material, it must be properly seasoned. Unseasoned wood should be looked upon as raw material, much as iron ore, or similar natural products; it is just as unfit for use, and needs treatment, which if properly understood is just as involved. Actually, wood is not a material, it is a structure, and its construction varies with the species of tree it is obtained from. Its constituents are hollow and generally spindle shaped or tubular. These constituents fit closely together, honeycomb fashion, and each cell contains either water, or air, or both; the walls of these cells are composed of what may be termed wood substance. The process of seasoning consists of the drying up of the water contained in these constituents during which drying the wood shrinks. The effect of seasoning is to decrease the weight of the timber, while increasing its strength, hardness and elasticity, as distinct from pliability. The increase in strength is directly proportional to the decrease in weight. In effect, the seasoning process turn the natural product into a material fit for the constructor's use.

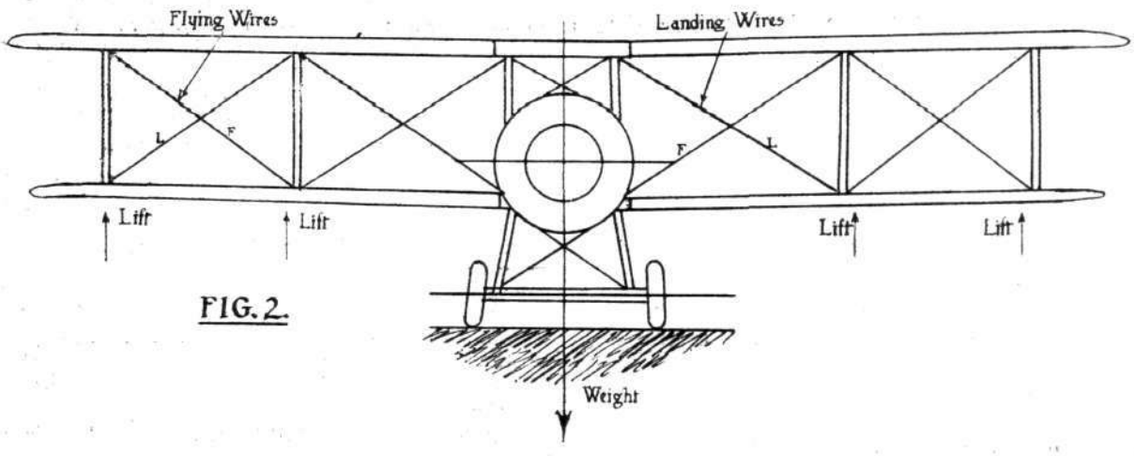

FIG. 2.

(To be continued)