My invention refers to the construction of flying machines and more especially to means whereby the several structural parts constituting the wings and other substantially plane-shaped parts of a flying machine can be easily assembled and mounted in place in the wing or the like. My invention more especially aims at simplifying the assembling of the several parts with a view to quantity production.

It is a particular object of my invention to provide a fixture for the erection of the wings, rudders and the like forming part of an aeroplane, by means of which these parts can be erected in the shortest possible time and with the highest degree of exactness.

In the fixture according to the present invention a plurality of supports capable of being fixed in predetermined positions are provided, which allow fixing in correct relative position the spars or other main structural members of the wing or other body to be constructed. I am thereby enabled to mount on the main structural members all connecting parts in absolutely correct position without any difficulty and without requiring any separate templates, the main structural members themselves being rigidly fixed in place.

In a preferred form of a fixture according to this invention the supports extend substantially in vertical direction so as to be enabled to carry the main structural members in superposition one above the other, whereby it is possible to construct the wing or other plane body while it stands on edge. At the same time the body in course of construction is freely accessible from all sides.

The supports forming an important part of the novel fixture preferably comprise two end supports displaceable in the longitudinal direction of the base plate or frame and serving for supporting the spars at their ends, and a number of intermediate supports which can be dismantled in lateral direction. In consequence of this arrangement of parts the spars of the wings are reliably and correctly supported also between their ends, and each part of the wing or the like can be made readily accessible during the construction by temporarily removing such intermediate supports as are not required for the moment. By displacing one or both end supports the finished body can easily be disengaged from the fixture.

In order further to easily mount in place the hinges of rudders or similar parts which must be positioned very exactly, I provide templates with the hinge eyes or corresponding fittings which can be fixed on the supports and the base plate and which warrant from the beginning a correct positioning of all such parts.

In order further to facilitate the construction of flat bodies which are mainly braced in longitudinal direction by means of spars or the like, such as the wings of aeroplanes, I provide auxiliary spars mounted on the fixture in a position adjoining the position which the spars of the wings are designed to occupy, and I further provide templates for preparing the mounting on the spars of other structural parts by marking therein or drilling therein the holes for the fixation of such parts, these templates being mounted on the auxiliary spars. I thereby simplify the mounting in position of the several parts to be connected with each other inasmuch as no gauging is required, the longitudinal and other dimensions being predetermined automatically by means of these templates. The auxiliary spars carrying these latter are preferably mounted on the supports for easy disengagement and adjustment, means resembling for instance buckle or strap fastenings being provided on the supports, which allow the auxiliary spars being removed in proportion as the work proceeds in order to render the finished portion of the wing or the like more readily accessible.

In the drawings affixed to this specification and forming part thereof a fixture embodying my invention is illustrated diagrammatically by way of example. In the drawings:

- Fig. 1 is a perspective view showing a fixture for use in the construction of aeroplane wings having tubular spars.
- Figs. 2 and 3 are a side elevation and cross section respectively of a detail drawn to a larger scale.

Referring to the drawings, 1 is the foundation frame carrying a fixed end frame 2 and a disengagable end frame 3 with screwed sockets or other fastenings 4 for the longitudinal spars extending across the...
entire width of the wing, these fastenings serving for fixing the wing to the fuselage of the aeroplane, or to some other wing portion. The end frame 2 which in the example illustrated is designed to support the tip of the wing, need not be provided with any threaded fastenings for the spars but is fitted with perforations in the end plate 5 through which the plane ends of the spars project during the assembling.

Intermediate the two end frames 2 and 3 there are mounted on the foundation frame 1 three intermediate frames consisting each of two vertical standards 6 with broadened bases 7, transverse staying members 8 and a horizontal tie 9.

The bases 7 and staying members 8 of the intermediate frames are bolted or otherwise mounted on the frame 1 in an easily disengageable manner. The ties 9 are also disengageably connected with the standards 6 by means of bolts or the like, where all these parts can be mounted in place from the outside and can be taken down sideways as the work proceeds.

The intermediate frames 6, 6 carry spar holders 10 capable of adjustment in vertical and horizontal direction and which are fastened on the struts with treenails and secured thereon by means of steady pins or the like after the correct position of the longitudinal spars has been ascertained. By means of the spar holders and the struts or the like connected with them the spars can be mounted and maintained in correct position. The spar holders 10 further carry bearings 11 serving to fix in position auxiliary spars 12, extending substantially in parallel to and sideways of the wing spars proper. Preferably the bearings for the auxiliary spars 12 are also formed after the manner of locking struts. On the auxiliary spars 12 are mounted templets 13 for rocking motion about the spars. These templets can be applied against the spars of the wing after these latter have been mounted in place and by means of holes provided therein facilitate the correct marking or drilling of the holes in the spars required for mounting thereon the connecting members. This is shown more particularly in Figs. 2 and 3, where the templet 13 is shown in inoperative position in Fig. 2, while Fig. 3 shows the templet in operative position where it is applied against the spar and a drill extends through the templet and into the spar.

In the bottom part of the fixture which in the example illustrated takes up the rear edge of the wing to be built, a strong spar 14 is mounted in the end frame 2 carrying the tip of the wing, its other end being supported by a strut 15 mounted on the foundation frame. The spar 14 carries templets 16 with eyes which allow an exact fixation of the support for the aileron which is hinged to this part of the wing.

In fitting up a wing or supporting surface of a flying machine by means of this fixture, I proceed for instance as follows:—

While the foundation frame 1 only carries the end frames 2 and 3 either finally mounted in place or still spaced somewhat further apart, the longitudinal spars are inserted in the end frames and fixed therein. Now the intermediate frames are fixed in position together with the auxiliary spars 12 and the main spars are now fastened to the intermediate frames by means of the straps 10. The marking or drilling templets 13 are now applied one after the other against the main spars, the rivet holes are produced and the several transverse and diagonal bracings are fixed with the aid of these holes by means of special riveting devices introduced into the tubular spars and the members designed to connect the several spars are then mounted on the spars whereupon the skeleton of the wing is finished. The intermediate frames 6 are now taken down and removed together with the auxiliary spars 12 extending sideways of the skeleton, and this latter is now readily accessible for the mounting of the skin or covering, which, in the case of an all metal wing, is now fixed to the spars and connecting pieces by riveting.

Obviously the rudders, ailerons, balancing planes and the like can be assembled in a similar manner.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

I claim:—

1. Fixture for the erection on edge of wings and similar parts of flying machines and the like comprising the combination of a longitudinal foundation frame and a plurality of vertical cross frames, some of them displaceable on said foundation frame, all said frames having a width slightly exceeding the thickness of the wing or the like to be erected, and means forming part of said vertical frames for securing the longitudinal spars of the wing or the like in their final relative position.

2. Fixture for the erection on edge of wings and similar parts of flying machines and the like comprising a horizontal foundation frame extending in the longitudinal direction and having a width slightly exceeding the thickness of the wing or the like to be erected, a plurality of vertical cross frames mounted for longitudinal displacement on and having substantially the same width as said foundation frame and a height slightly exceeding the length of the wing or the like to be erected and means forming...
part of said vertical frames for securing the longitudinal spars of the wing or the like in their final relative position.

3. Fixture for the erection on edge of wings and similar parts of flying machines and the like comprising a horizontal foundation frame extending in the longitudinal direction and having a width slightly exceeding the thickness of the wing or the like to be erected, a vertical cross frame mounted for longitudinal displacement on each end of said foundation frame, an intermediate vertical cross frame mounted on said foundation frame for removal in lateral direction and means forming part of said longitudinally displaceable frames for securing the longitudinal spars of the wing or the like in their final relative position.

4. Fixture for the erection on edge of wings and similar parts of flying machines and the like comprising a horizontal foundation frame extending in the longitudinal direction and having a width slightly exceeding the thickness of the wing or the like to be erected, a vertical cross frame mounted for longitudinal displacement on each end of said foundation frame, an intermediate vertical cross frame mounted on said foundation frame for removal in lateral direction, means forming part of said longitudinally displaceable frames for securing the longitudinal spars of the wing or the like in their final relative position, an auxiliary spar extending between a longitudinally displaceable and an intermediate vertical frame and means on said intermediate frame for temporarily supporting said auxiliary spar.

5. Fixture for the erection on edge of wings and similar parts of flying machines and the like comprising a horizontal foundation frame extending in the longitudinal direction and having a width slightly exceeding the thickness of the wing or the like to be erected, a vertical cross frame mounted for longitudinal displacement on each end of said foundation frame, an intermediate vertical cross frame mounted on said foundation frame for removal in lateral direction, means forming part of said longitudinally displaceable frames for securing the longitudinal spars of the wing or the like in their final relative position, an auxiliary spar extending between a longitudinally displaceable and an intermediate vertical frame, means on said intermediate frame for temporarily supporting said auxiliary spar and a templet rockably mounted on said auxiliary spar.

In testimony whereof I affix my signature.

HUGO JUNKERS.