To all whom it may concern:

Be it known that I, ADOLF BORBBACH, a citizen of Germany, residing at Berlin-Charlottenburg, Germany, have invented certain new and useful Improvements in Landing Chassis for Aircraft (for which I have filed applications in Germany, June 10, 1919, July 2, 1920, and February 14, 1921), of which the following is a specification.

My invention relates to landing gear for aircraft. It is an object of my invention to provide a landing gear of simple design adapted to yield when landing in the normal manner as well as when lateral forces are exerted on the gear without detracting from its ability to return to normal position.

These objects are attained according to my invention with a landing gear in which the wheels are not mounted on a common axle but each wheel is free to turn resiliently about an axis rigidly connected with the hull and extending at least approximately in the longitudinal axis of the craft. With this arrangement each axis of oscillation lies substantially outside the axis of the wheel, so that the wheel, on swinging upwards, at the same time swings laterally. As it is only essential for the particular object to be attained, that the rocking axis which extends preferably at right angles to the wheel axle, has a fixed position in relation to the hull, there may be connected for instance to the lower part of the hull a substantially triangular support extending in parallel to the longitudinal direction of said body, which, at one corner, carries the wheel axle and is hinged to the hull in two axially aligned points, means being provided for resiliently counteracting rocking motion of this support and the wheel carried by it.

A particularly simple and reliable arrangement is obtained if two struts converging towards the wheel are used for supporting the wheel axle, their free diverging ends being hinged to the hull in such manner that their relative position is variable, while they are capable, of swinging about a fixed axis extending in parallel to the direction of driving, against the resistance of a third resilient strut.

The points, in which the resilient struts referred to engage the wing, and their inclination relatively to the wing are so chosen that the wing bases are relieved from strain near the body of the craft and a minimum of stress is produced when landing.

The wing thus obtains the character of a girder supported in two points, that is, by the two resilient struts. It may consequently be designed much lighter than if, as in the constructions heretofore used, the wing base in landing has to transmit all the forces tending to bend the wing onto the hull from which they are transmitted to the landing gear. The moment curve is thereby considerably changed.

I may further employ one of the rocking struts as wheel axle, this being possible particularly in the case where the two rocking struts extend in an approximately horizontal plane.

As a rule, favourable conditions will be obtained with approximately horizontal rocking struts and vertical resilient struts, but it may be preferable to more or less incline the resilient struts.

The approximately horizontal struts may further be designed to form stump wings. I am aware that it is old, to so design the axles of a normal landing chassis or to provide them with a casing of such form that it will act as a stump wing. As compared with this arrangement the horizontal rocking struts involve remarkable advantages particularly in relation to a simplification of design. In the constructions heretofore known many constructional difficulties presented themselves which rendered the arrangement of wing sections as casings for the axles of the landing gear very difficult. In the landing gear according to the present invention these difficulties are overcome. The casing can be arranged without paying attention to the motion of the springs in relation to the struts and their bracing. The casing will always operate as a dynamic member. The angle of incidence to which it has been adjusted, will be maintained under all conditions.

In the drawings affixed to this specification, and forming part thereof, several de-
vicee embodying my invention are illustrated by way of example. In the drawings—

Fig. 1 is a cross section of the body and landing gear of an aeroplane,
Fig. 2 is a side elevation, partly in section, Fig. 3 is a front elevation of an aeroplane, in which the wheel axes of the wheels form the rocking struts,
Fig. 4 is the moment curve of this aeroplane at the moment of landing,
Fig. 5 is a corresponding curve for a strut not engaging the wing,
Fig. 6 is an elevation illustrating the application of my invention to an aeroplane having two engines one on either side of the body.
Fig. 7 is an elevation of an aeroplane in which the rocking struts form stump wings,
and
Fig. 8 is a section on lines 8—8 of Fig. 7.

Referring now to Figs. 1 and 2 each longeron a of the hull a supports in ball shaped joints a' the free ends of two struts b', b2 which are rigidly connected with one another. At the point, where the two struts meet, the axle of a wheel c is attached. This point further carries a ball bearing b for the lower portion d1 of a strut consisting of two portions d1 and d2. The upper portion of the strut is adapted to telescope in relation to the other and is supported in the upper longeron a2 of the hull a by means of a ball joint a2. The portions d2 and d3 of the strut are under the action of a spring in a casing e and tend to assume the position illustrated in Fig. 1. However, when shocks are exerted in landing, they may be displaced in relation to each other, so that the distance a' b3 is shortened. Instead of ball joints, hinges might be used, which would however render an exact adjustment difficult, which adjustment, besides, would hardly be maintained in operation. The spring connecting the portions d2 d3 might also be entirely enclosed within the struts.

Referring now to Fig. 3, to the hull a are pivoted horizontal struts b, which carry the wheels c. The struts b are maintained in position in relation to the hull by struts b', which, being disposed behind struts b, are not visible in the drawings. These struts are vertically braced against the wing by means of struts d, in which there are inserted springs e. In Fig. 6, the strut b' is visible, the struts d engage strut b on the outside of the wheels c and the motor casing f from underneath.

Referring now to Figs. 7 and 8, the struts b pivoted to the body a and braced in relation to the wings by the resilient struts c are encased in a stump wing d.

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. A flying machine comprising a hull, two wheels, on each side of the hull, mounted independently of one another, a substantially triangular support for each wheel carrying the wheel at one corner and hinged to the lower part of the hull in two axially aligned points and means for resiliently counteracting a rocking of said support about said points.

2. A flying machine comprising a hull, two wheels, one on each side of the hull, mounted independently of one another, two struts converging towards and carrying each wheel and having their diverging ends hinged to axially aligned points on the lower part of said hull and means for resiliently counteracting a rocking of said support about said points.

3. A flying machine comprising a hull, two wheels, on each side of the hull, mounted independently of one another, a substantially triangular support for each wheel carrying the wheel at one corner and hinged to the lower part of the hull in two axially aligned points, a wing on each side of the hull and a resilient strut bracing said support against a fixed point situated substantially on the level of said wing.

4. A flying machine comprising a hull, two wheels, on each side of the hull, mounted independently of one another, two struts converging towards and carrying each wheel and having their diverging ends hinged to axially aligned points on the lower part of said hull, a wing on each side of the hull and a resilient strut bracing said support against a fixed point situated substantially on the level of said wing.

5. A flying machine comprising a hull, two wheels, on each side of the hull, mounted independently of one another, a substantially triangular support for each wheel carrying the wheel at one corner and hinged to the lower part of the hull in two axially aligned points, a wing on each side of the hull and a resilient strut bracing said support against said wing.

6. A flying machine comprising a hull, two wheels, on each side of the hull, mounted independently of one another, two struts converging towards and carrying each wheel and having their diverging ends hinged to axially aligned points on the lower part of said hull, a wing on each side of the hull and a resilient strut bracing said wheel carrying struts against said wing.

7. A flying machine comprising a hull, two wheels, on each side of the hull, mounted independently of one another, a substantially triangular support for each wheel carrying the wheel at one corner and hinged
to the lower part of the hull in two axially aligned points, said support normally extending in a substantially horizontal plane, and means for resiliently counteracting a rocking of said support about said points.

8. A flying machine comprising a hull, two wheels, one on each side of the hull, mounted independently of one another, two struts converging towards and carrying each wheel and having their diverging ends hinged to axially aligned points on the lower part of said hull, said struts normally extending in a substantially horizontal plane, and means for resiliently counteracting a rocking of said support about said points.

In testimony whereof I affix my signature.

Dr. Ing. ADOLF ROHRBACH.
to the lower part of the hull in two axially aligned points, said support normally extending in a substantially horizontal plane, and means for resiliently counteracting a rocking of said support about said points.

8. A flying machine comprising a hull, two wheels, one on each side of the hull, mounted independently of one another, two struts converging towards and carrying each wheel and having their diverging ends hinged to axially aligned points on the lower part of said hull, said struts normally extending in a substantially horizontal plane, and means for resiliently counteracting a rocking of said support about said points.

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Dr. Ing. ADOLF ROHRBACH.

DISCLAIMER.

1,559,912.—Adolf Rohrbach, Berlin-Charlottenburg, Germany. LANDING CHASSIS FOR AIRCRAFT. Patent dated November 3, 1928. Disclaimer filed January 12, 1929, by the patentee.

Enters this disclaimer to said Letters Patent as follows:

I. To a “flying machine” as specified in each of the claims except a flying machine of the monoplane type, and

II. To that part of claims 1, 2, 7, and 8 reading as follows: “means for resiliently counteracting the rocking of said support about said points,” except where such means is interposed between the monoplane wing and the wheel support, as for example exemplified in Fig. 6 of the patent drawings, and as distinguished for example from the structure of Figs. 1 and 2 where such means is interposed between the hull and the wheel support.

[Official Gazette January 24, 1929]
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