

N^o 9876



A.D. 1914

(Under International Convention.)

Date claimed for Patent under Patents and Designs Act, 1907, being date of first Foreign Application (in Germany), } 21st Apr., 1913

Date of Application (in the United Kingdom), 21st Apr., 1914

At the expiration of twelve months from the date of the first Foreign Application, the provision of Section 91 (3) (a) of the Patents and Designs Act, 1907, as to inspection of Specification, became operative

Accepted, 1st July, 1915

COMPLETE SPECIFICATION.

Improvements in and connected with Wings for Aeroplanes and the like.

I, GUSTAV LILLIENTHAL, of 5, Marthastrasse, Lichterfelde, Berlin, Germany, Architect, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

5 This invention relates to wings or supporting surfaces for flying machines of the kind having their front edge thickened. This has usually been brought about by making the upper and lower surfaces of curves of different radius. This kind of wing has also been made curved in a plane transverse to the direction of flight, the convexity of this curve being upwards so that both ends of the wing are inclined downwards towards the root and tip respectively, the intermediate part being horizontal.

5 A form of supporting surfaces for aeroplanes made in accordance with the present invention is provided with these known features in a combination which permits of the practical application of stream lines during motion of the wing against the wind of a kind discovered by experiment but hitherto unknown.

Accordingly, according to the present invention the cross section of the wing is thickened by being made drop-shaped at the front edge for about one-third of the breadth from the root up to about two-thirds of its length the radius of curvature of the profile being decreased at the same time towards the front, so that the upper bounding line of the wing is curved downwards sharply.

5 Together with this cross-section a similarly curved and bent section of the wing, transverse to the direction of flight is used in such a manner that the parts of the wing towards the body and the tip of the wing are both directed downwards. These parts of the wing converging upwards towards the middle of the wing are connected by a central horizontal portion of the wing, and the end of the wing also terminates in several tips; the strength of the section may be diminished at the extreme ends of the wing, each end terminating in several tips, each of a trough-like section.

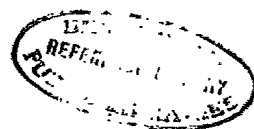
5 The path of the air currents found by extended experiment is illustrated in the accompanying drawings in which:—

Figures 1 and 2 are sections through the wings and cross-sections through the body of the machine, taken at right angles to the direction of flight.

Figures 3, 4 and 5 are sections of the wing taken respectively on lines III—III, IV—IV and V—V of

5 Figure 6 which is a view from below.

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Figure 7 a front view, and

Figures 8 and 9 are cross-sections of Figure 6. In all cases the stream lines in the air discovered are indicated by small flags.

If a surface with the above described profiles is moved against the wind and exposed to a current of air, the air streams away uniformly over the top surface (see Figure 9) while an eddy forms upon the underneath surface (at ω Figure 9) in such a manner that in the neighbourhood of the rear edge the current turns back and moves toward the front edge in the opposite direction to the direction of motion. The eddy moving in a flat ellipse has its second focus near the centre of curvature of the front curve.

The air rotating in an elliptic eddy exerts a considerable centrifugal pressure upon the wing and the friction upon the surface as well as the pressure against the sharp curve of the front parts of the wing exerts a driving effect which opposes the end resistance of the body and front edge; the existence of an eddy below arched surfaces at certain angular positions to the direction of motion is known. However, the path of the stream lines described below is not known.

As is shown in Figures 6 and 7 by the flags which can turn at right angles to the profile, the eddying air moves sideways at the same time, partly towards the body, the remaining part towards the tip of the wing. Thus the eddy spreads to both sides with a screw like movement.

In order to make this movement of the air towards the body and the tip of the wing useful for exerting a driving effort, the tip of the wing as well as the parts of the wing lying toward the body, are constructed to be inclined at a suitable slope downwards.

Further, the above mentioned driving effect of the air streaming forwards is made as effective as possible, the underneath surface being made of such materials which cause a frictional resistance as great as possible, for example, a layer of feathers which are so arranged that the air current is directed against the grain of the feathers and the ends of the feathers rest loosely. Also, for the same purpose a scale-like layer, for example, of suitable material may be employed.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A construction of wing or supporting surface for flying machines having the front part thickened, in which the cross-section of the wing is thickened by being made drop-shaped at the front edge from the root up to about two thirds of its length; so that the upper bounding line of the profile of the wing is curved downwards sharply, and in profile at right angles to the direction of flight, the wing is curved or bent so that it is inclined downwards at the tip and at the root, and these inclined portions are joined by an approximately horizontal intermediate piece, the tip of the wing preferably terminating in several tips and being of a trough-shaped section which is repeated in the separate tips.

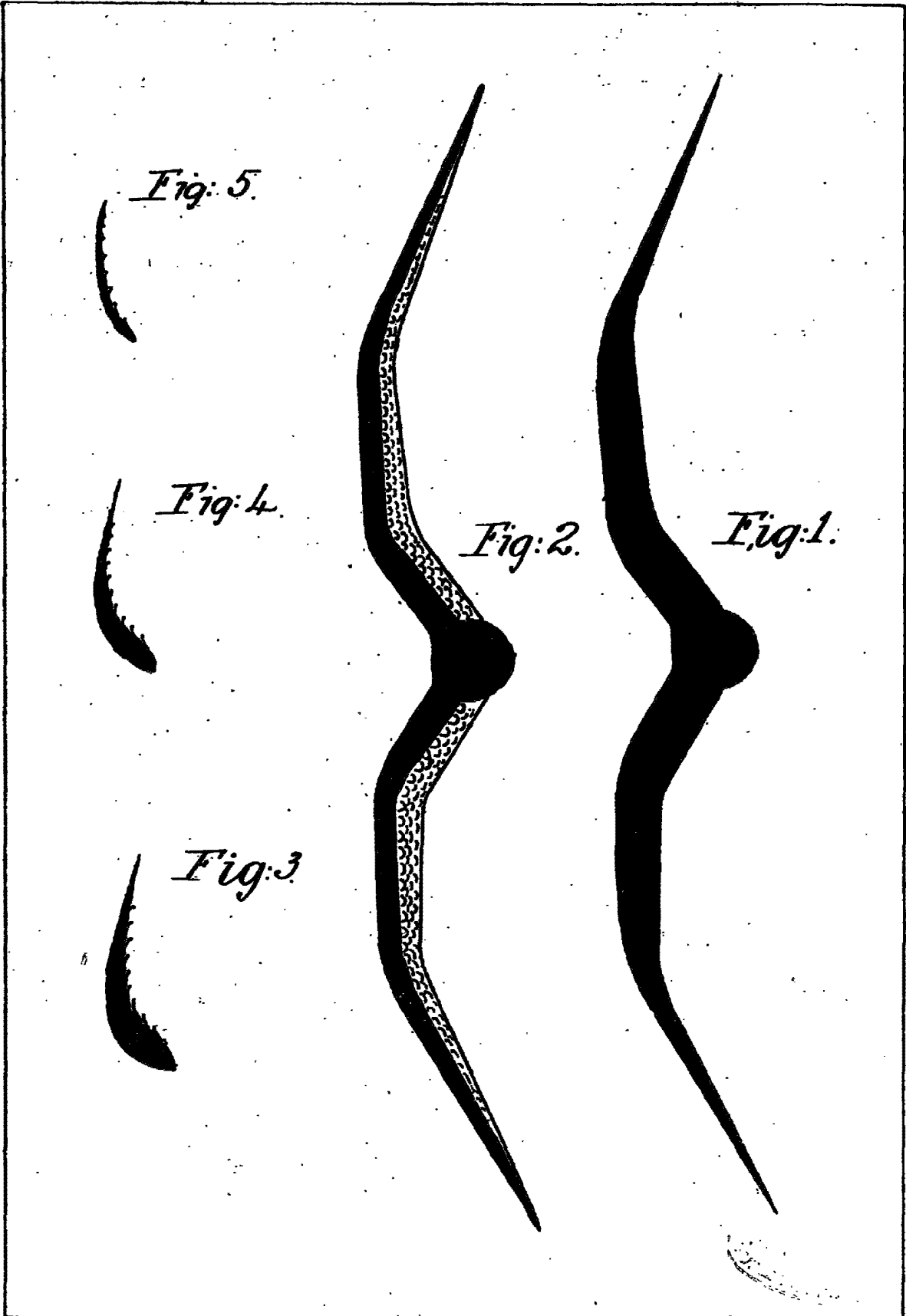
2. A supporting surface as claimed in Claim 1 having a layer of scales with loose rear edges or the like upon the underneath surface.

3. The improved construction of wings or supporting surfaces for aeroplanes, substantially as described with reference to the accompanying drawings.

Dated this 21st day of April, 1914.

W. P. THOMPSON & Co.,
285, High Holborn, London, W.C., and at
Liverpool and Bradford,
Patent Agents for the Applicant.

This drawing is a reproduction of the original on a reduced scale.



SHEET 2

SHEET 3

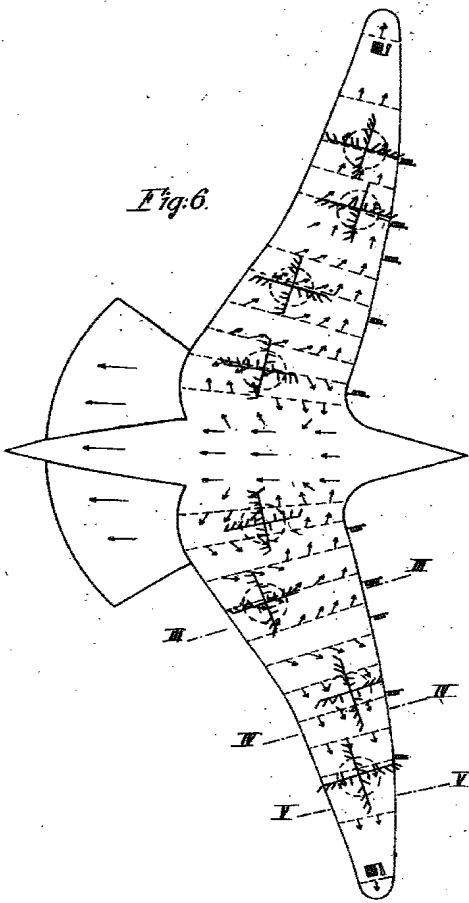


Fig. 6.

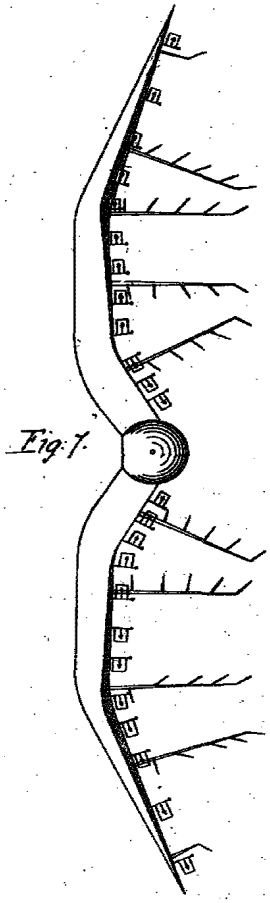


Fig. 7.

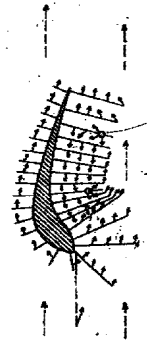


Fig. 9.

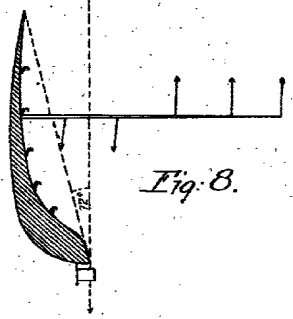


Fig. 8.

[This Drawing is a reproduction of the Original one, reduced scale.]

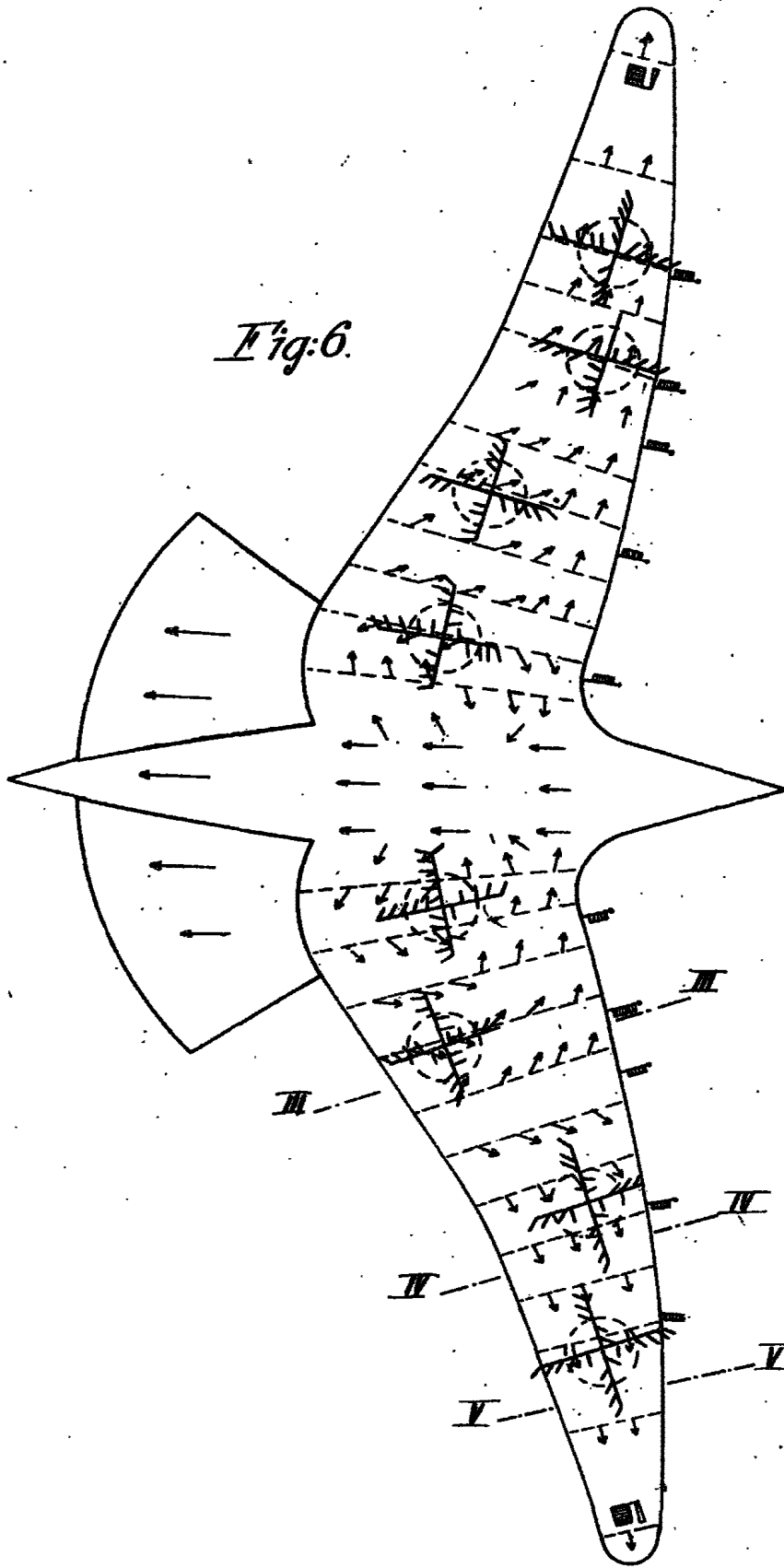


Fig. 6.

Fig

[This Drawing is a reproduction of the Original on a reduced scale.]

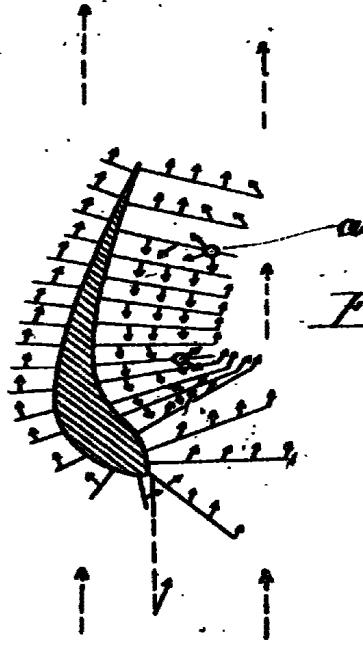
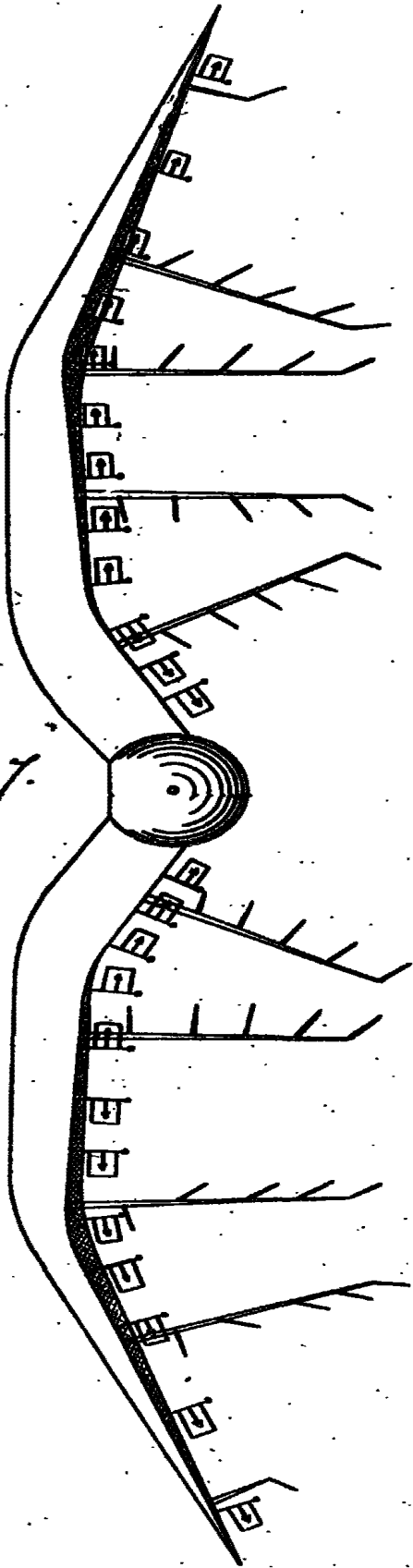


Fig. 9.

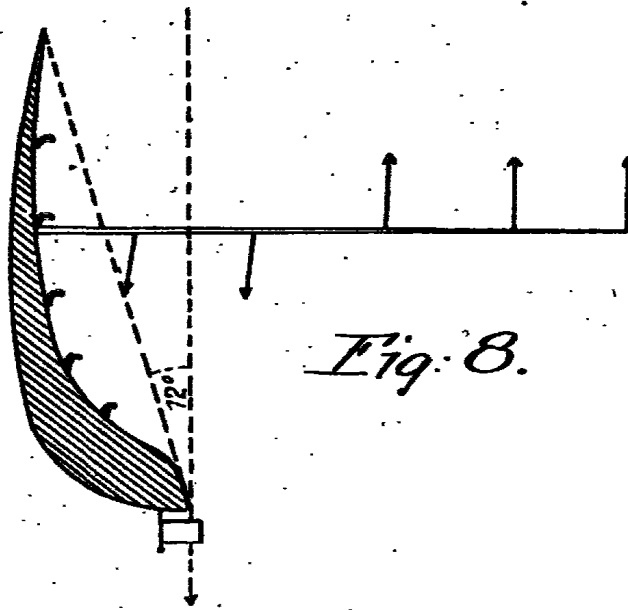


Fig. 8.