I. ETRICH & F. WELS.

FLYING MACHINE.

APPLICATION FILED FEB. 28, 1906. RENEWED JAN. 18, 1910.

952,316. Patented Mar. 15, 1910.

2 SHEETS—SHEET 1.

Fig. 3.

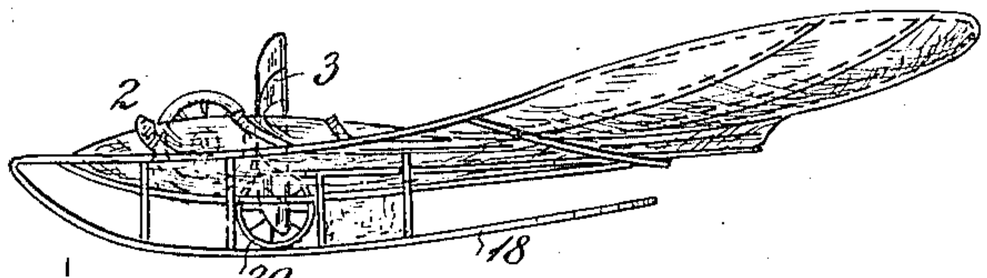
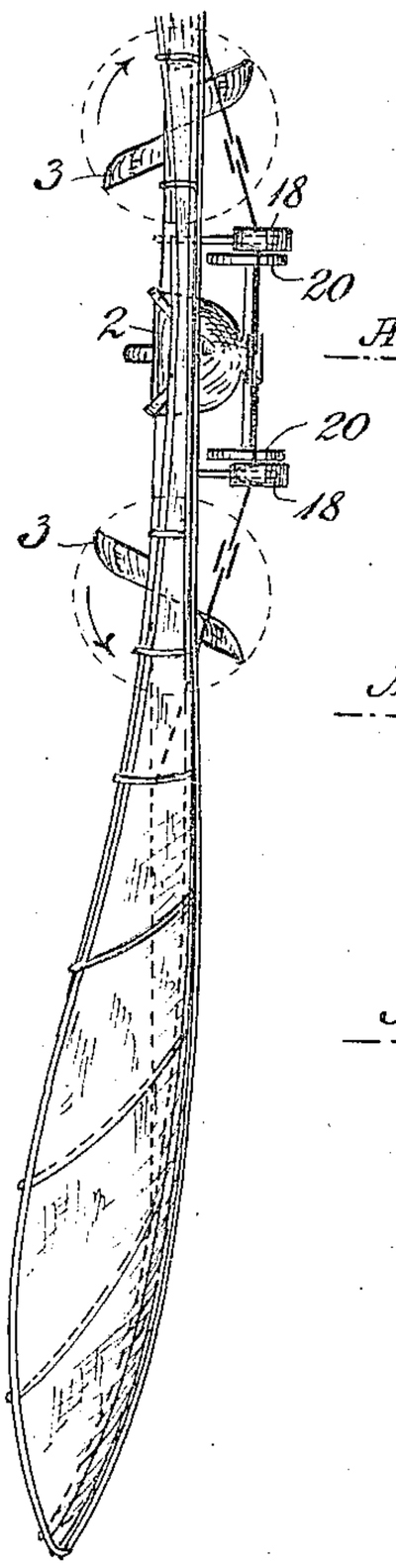


Fig. 2.



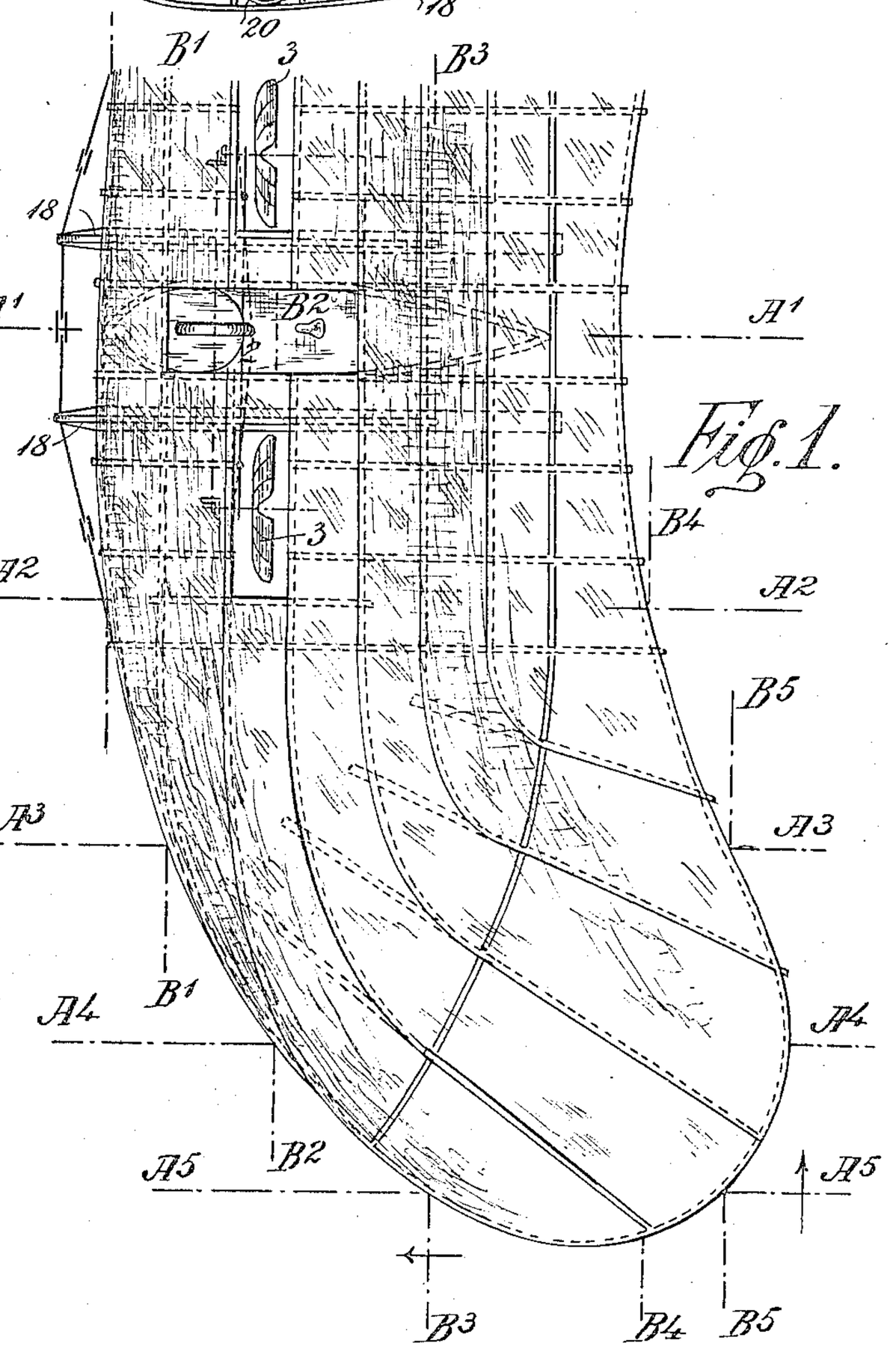


Fig. 1.

Witnesses=

C. J. Kellogg

J. L. Hutchinson

Inventors.

Igo Etrich and

Franz Wels by

Noel Kellogg their atty

I. ETRICH & F. WELS.

FLYING MACHINE.

APPLICATION FILED FEB. 28, 1906. RENEWED JAN. 18, 1910.

952,316. Patented Mar. 15, 1910.

2 SHEETS—SHEET 2.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Witnesses:-
O. F. Keyhoun
J. L. Hutchinson Jr.

Inventors:
Igo Etrich and
Franz Wels by
Hull & Keyhoun Attys

UNITED STATES PATENT OFFICE.

IGO ETRICH AND FRANZ WELS, OF OBERALSTADT, NEAR TRAUTENAU, AUSTRIA-HUNGARY.

FLYING-MACHINE.

952,316. Specification of Letters Patent. Patented Mar. 15, 1910.

Application filed February 28, 1906, Serial No. 303,349. Renewed January 18, 1910. Serial No. 538,728.

To all whom it may concern:

Be it known that we, IGO ETRICH and FRANZ WELS, both subjects of the Emperor of Austria-Hungary, residing at Oberalstadt, near Trautenau, in the Province of Bohemia and Empire of Austria-Hungary, have invented certain new and useful Improvements in Flying-Machines, of which the following is a specification:

Our invention relates to flying machines of the aeroplane class and has for its object to give such a shape and curvature, to the supporting surface that the perfect stability of the machine is secured under any conditions.

Figure 1 is a plan view of a machine embodying our invention. Fig. 2 is a view in front elevation. Fig. 3 is a view in side elevation. Figs. 4 to 8 inclusive, are sections on the lines A′ A′; A^2 A^2; A^3 A^3; A^4 A^4; and A^5 A^5, of Fig. 1. Figs. 9 to 13 are sections on the lines B′ B′; B^2 B^2; B^3 B^3; B^4 B^4; and B^5 B^5 showing the curvature of the wings.

The supporting surface has in plan view, as shown in Figs. 1 and 4 a forward convex curved edge and a rear concave curved edge, the ends of said surface being rounded as shown. The curvature of the supporting surface is clearly illustrated by the sections of the same on the lines A′, A′; A^2, A^2; A^3, A^3; A^4, A^4; A^5, A^5 and B^1, B^1; B^2, B^2; B^3, B^3; B^4 B^4; B^5 B^5.

The section A′ A′ which is in the vertical plane of symmetry of the supporting surface is concave as viewed from bottom at its front end, then passes through a point of inflection and at its rear end it is inclined upward and slightly convex as viewed from bottom. The front ends of the sections A^2, A^2; A^3, A^3 are the less concave as viewed from bottom, and their rear ends are more markedly inclined upward the farther they are from the plane of symmetry and toward the outer ends of the supporting surface the concave part of such sections disappears altogether as shown at A^5, A^5. The section B′ B′ is nearly straight in its central portion and at the ends it is slightly concave as viewed from bottom. The farther rearward these sections at right angles to the plane of symmetry are taken the less marked becomes the concavity of their end portions and at some distance from the front end of the supporting surface the curvature of these end portions is reversed so that those of such sections which are taken more rearwardly consist only of symmetrical branches convex as viewed from bottom as shown at B^3, B^3; B^4, B^4 the inclination of the outer ends of these branches toward the horizontal being the greater the farther rearward the sections are taken.

The car 2 is preferably made fish shaped and its longitudinal axis is in the central line of the supporting surface. Care has to be taken to bring the center of gravity of the entire machine into the longitudinal axis of the car and as far as possible toward the front end of the latter. The flying machine is propelled by screw propellers 3, 3 the axes of which are journaled in openings in the supporting surface of both ends of the car 2 and the inclination or pitch of the propeller blades is so determined that the blades of the two propellers which revolve in opposite directions move toward each other below the supporting surface.

The effect of the configuration above described of the supporting surface is that when the flying machine is left to itself after having been raised moves it downward and forward along an inclined line the inclination of which toward the horizontal is determined by the dimensions of the supporting surface the position of the center of gravity in the supporting surface and particularly by the shape of the sections A^1, A^1; A^2, A^2.

If the machine is besides driven forward by the propellers the inclination toward the horizontal of the line along which the center of gravity moves downward would naturally decrease even without the assistance of the particular configuration of the supporting surface. Now as the resistance or pressure of air acting upon the rear upwardly inclined portions of the supporting surface increases with the speed relatively to the surrounding air of the machine moving forward the supporting surface will be turned rear edge downward around the transverse axis passing through the center of gravity through a greater angle the greater the speed of the flying machine. As, moreover, the inclination relatively to the supporting surface of the resultant of the propelling power produced by the propellers is constant, the propellers being journaled in the

supporting surface, by thus turning the supporting surface around its transverse axis the resultant of the propelling power will soon assume an upward and forward direction and this the more markedly the greater the speed of the machine is relatively to the surrounding air, that is to say the faster the propellers are revolving. But the greater the angle is at which the resultant of the propelling power is inclined upward and forward to the greater extent it will counteract gravity and consequently by properly increasing the number of revolutions of the propellers per unit of time and by properly selecting the inclination or pitch of the propeller blades not only the sinking of the machine due to gravity can be retarded or entirely compensated, but the machine can be caused to descend. Our improved flying machine is thus steered in the vertical direction simply by varying the revolving speed of the propellers. The maximum upward inclination of the resultant of the propelling power and hence also the maximum angle at which the machine may ascend depends—apart from the arrangement of the propellers in the supporting surface that is to say the angle between the axes of such propellers and the supporting surface, and apart from the maximum speed attainable of the propellers—upon the shape of the section curves A^1, A^1; A^2, A^2 and more particularly upon the inclination of the rear portions of such curves relatively to the propeller axes.

The horizontal or lateral steering is effected by temporarily making the speed of one of the propellers higher or lower than that of the other propeller. Thus a special rudder is dispensed with and moreover the lateral steering by means of the propellers is much more reliable and prompt. The desired variations of the speed of the propellers may be produced either by some suitable gearing permitting to change the ratio of speeds of the motor shaft and the propeller shaft or by what is known as a differential gearing interposed between these two shafts and adjustable by hand. The same object may be obtained by temporarily making the inclination or pitch of the blades of one of the propellers greater or smaller than that of the other propeller.

By causing the blades of the propellers to move toward each other on the underside of the supporting surface in air that is so to speak compressed as compared with the air on the upper side of the supporting surface and owing to the fact that the propeller blades moving toward each other tend to still further increase the compression of such air the efficiency of the propellers is materially increased.

By the above described configuration of the supporting surface the stability of the same is secured in case of wind coming from the side or from rear. If wind coming from the side acts upon the machine it can only catch the underside of that half of the supporting surface which is toward the wind. Thereby this half is slightly raised and the machine tends to descend in the direction of the wind, the result of this is, the two halves of the supporting surface being curved upward, that the half of the supporting surface away from the wind meets with an increased resistance in the air and that consequently the supporting surface is returned to its normal position. In case of wind coming from rear the action is similar to that just described but in this case also the front portion of the supporting surface which is concave as viewed from bottom produces a beneficial effect as it causes the bearing point of the resultant of the back wind to come in front of the center of gravity whereby the tilting tendency of the back wind is overcome.

At the bottom side of the flying machine there are provided runners 18 and if desired also wheels 20 by which the machine may rest on the ground. The runners are convex as viewed from bottom so that the machine while on the ground may assume the inclination corresponding to its speed relatively to the surrounding air whereby the rising of the machine from the ground is notably facilitated. In case that there is no snow the wheels are used for starting.

The machine may also be let go without a person being in it the same as a fish torpedo.

Claims.

1. In a flying machine of the aeroplane class, a supporting surface having a forward convex curved edge, a rear concave edge and rounded end portions, the sections of such surface taken on planes parallel to the plane of symmetry being concave as viewed from the bottom at the front end, and convex as viewed from bottom at the rear end, the concave part being the less marked the farther the sections are from the plane of symmetry and entirely disappearing toward the ends of the supporting surface, whereas the convex portion of these sections is the more marked and inclined upward at the greater an angle the farther these sections are from the plane of symmetry, while the sections taken on planes at right angles to the plane of symmetry are approximately straight in their central portion and concave as viewed from bottom in the front portion of the supporting surface such concavity diminishing rapidly and changing into convexity as the sections approach the rear side of the supporting surface the upward inclination of the outer ends of such sections increasing as they approach the rear side of the supporting surface, substantially as and for the purpose described.

2. In a supporting surface substantially as described a frame work comprising two series of rods the rods of one series being approximately parallel to the transverse axis and the rods of the other series being approximately parallel to the longitudinal axis of the supporting surface, the longitudinal rods located toward the ends of the supporting surface diverging outwardly and the transverse rods having rearwardly bent elastic ends, such ends of successive transverse rods being secured to successive longitudinal rods located toward the ends of the supporting surface and diverging outwardly and the free ends of the longitudinal rods being secured to a rod running all around and forming the outer edge of the supporting surface, substantially as and for the purpose described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

IGO ETRICH.
FRANZ WELS.

Witnesses:
T. GEORGE MORD,
ALVESTO S. HOGUE.