

B. VON BÜLTZINGSLÖWEN.
AEROPLANE.
APPLICATION FILED SEPT. 20, 1912.

1,163,718.

Patented Dec. 14, 1915.
5 SHEETS—SHEET 1.

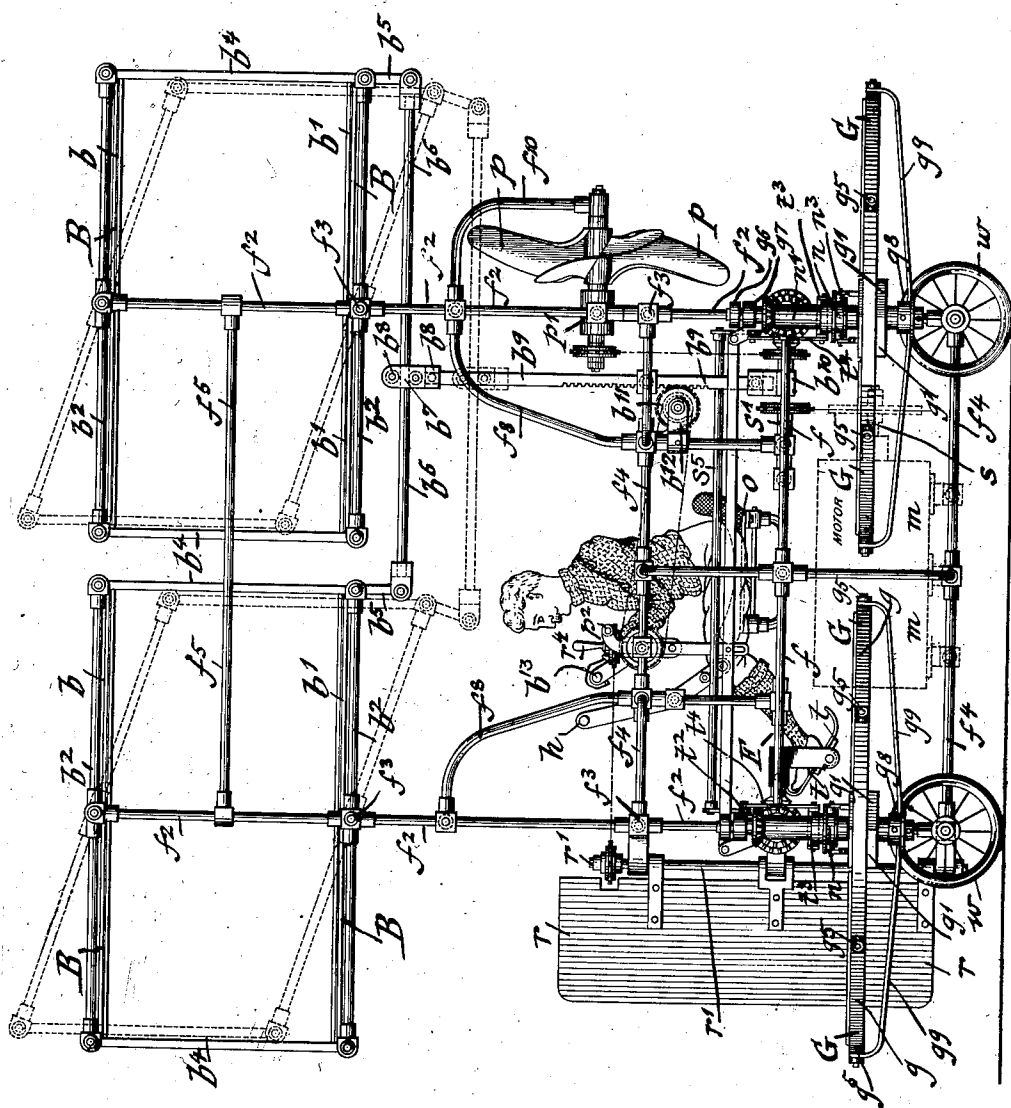


Fig. 1.

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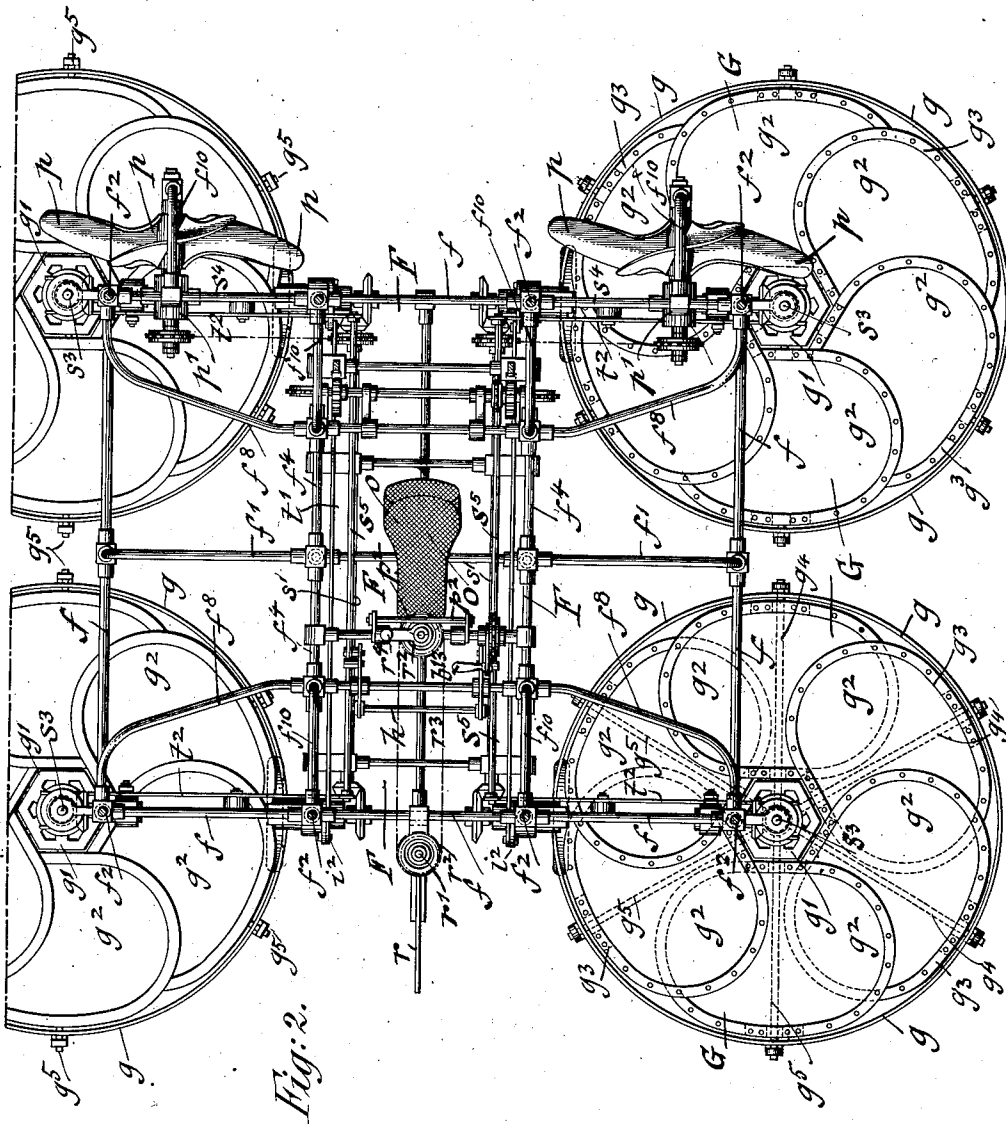


Fig. 2.

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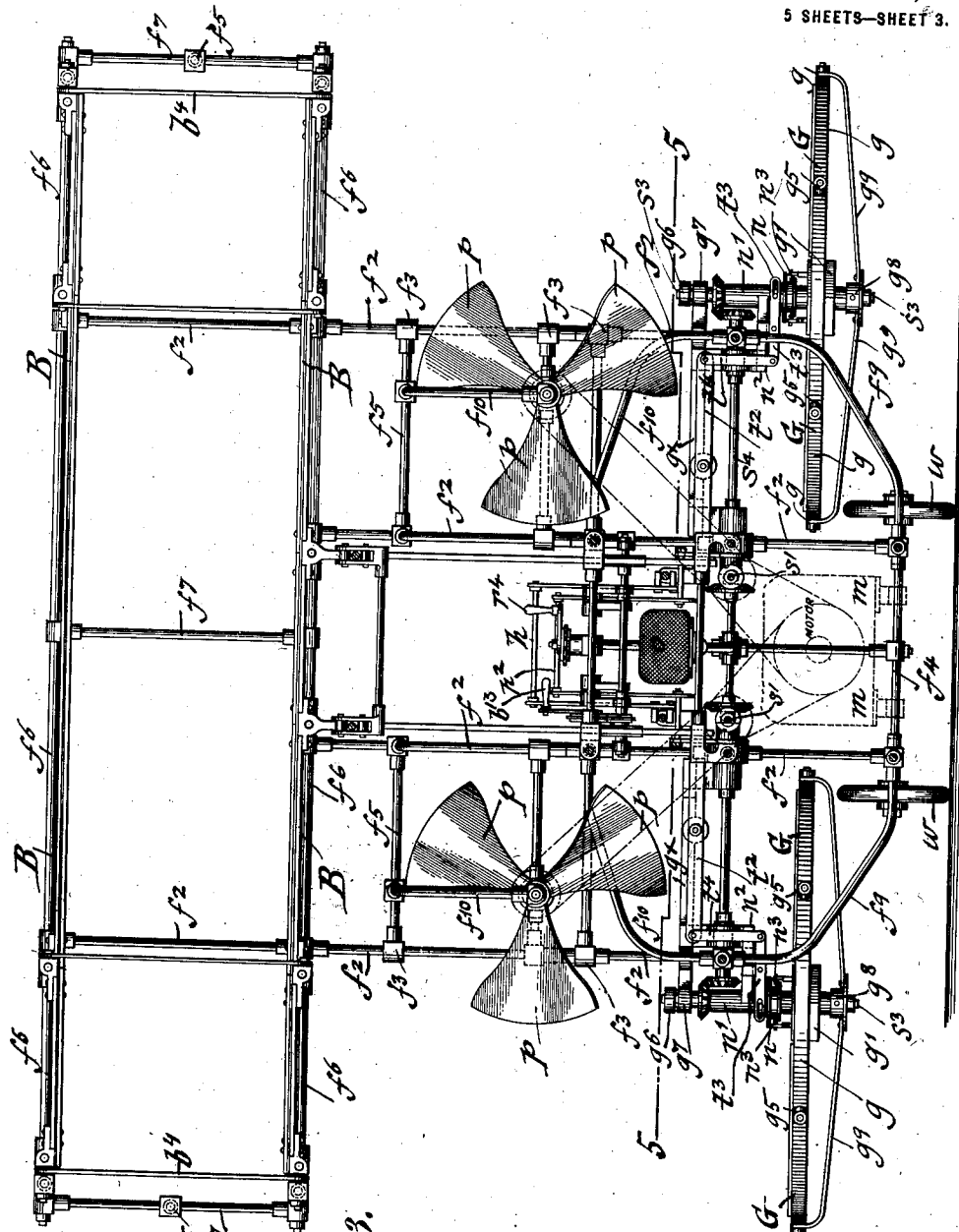
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Fig. 3.

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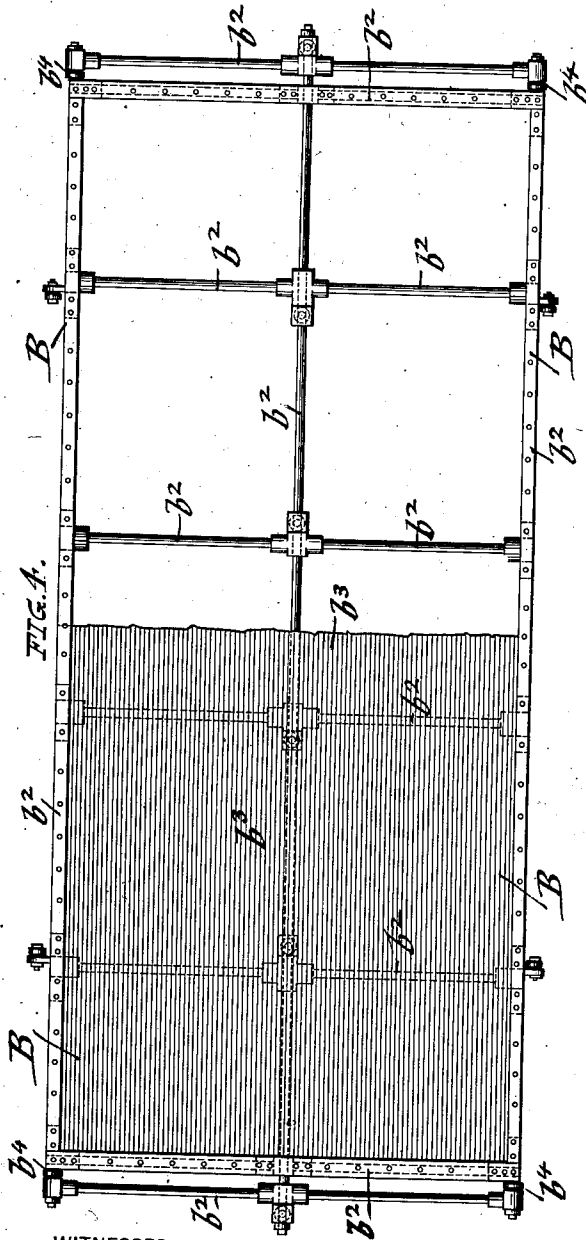
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WITNESSES:

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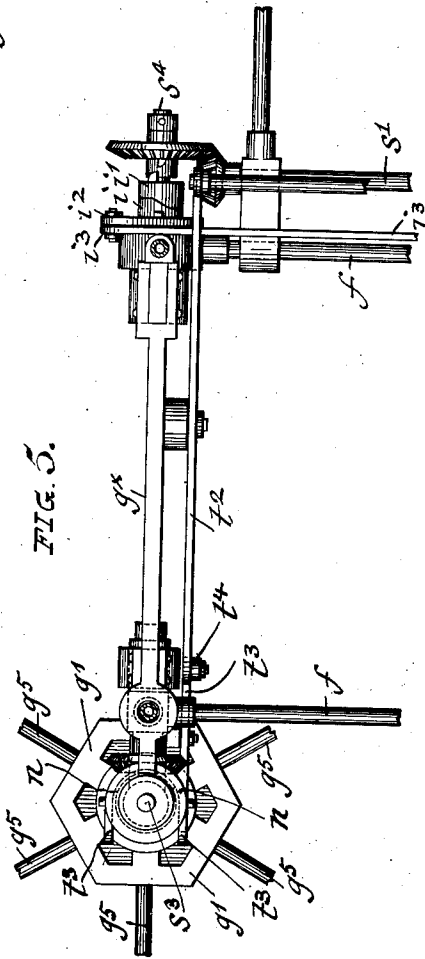
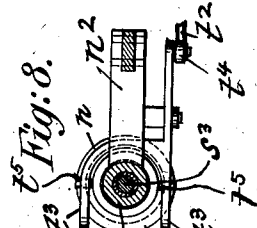


FIG. 8.



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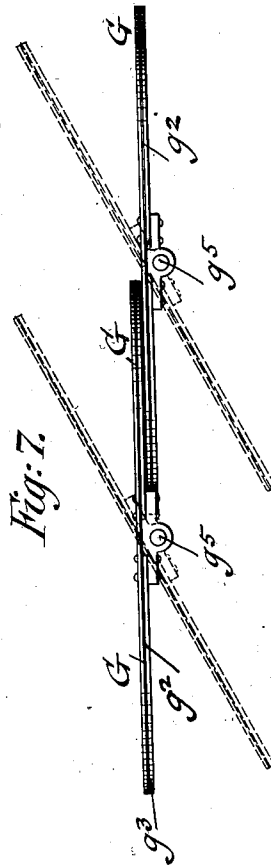
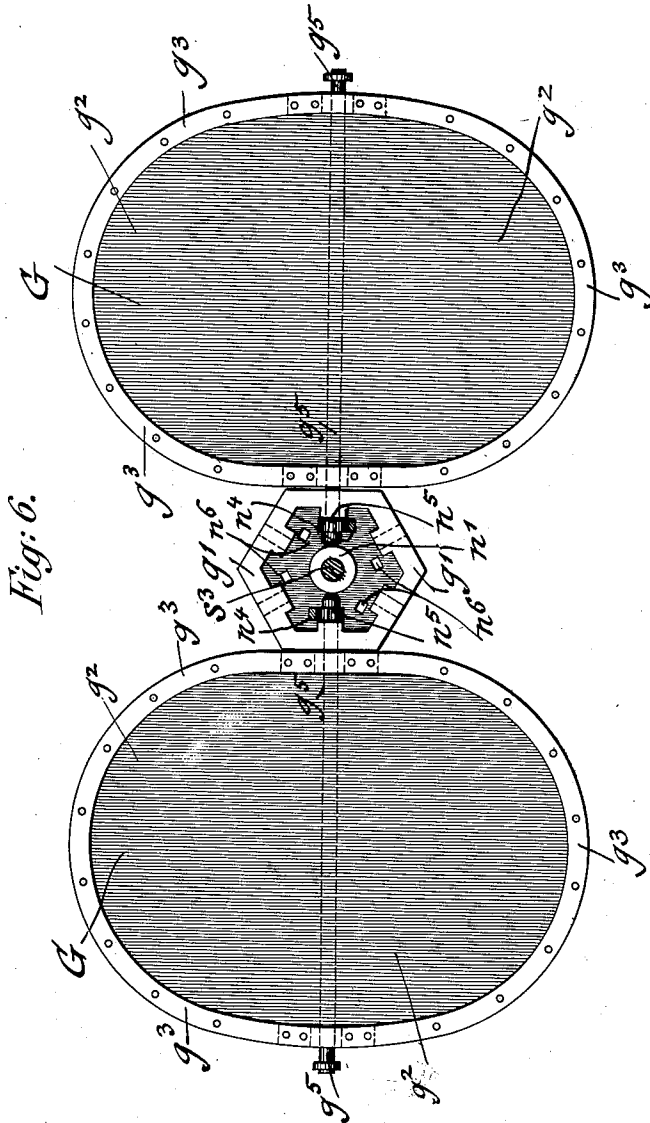
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Witnesses:
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Grace Lowe

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UNITED STATES PATENT OFFICE.

BRUNO VON BÜLTZINGSLÖWEN, OF NEW YORK, N. Y.

AEROPLANE.

1,163,718.

Specification of Letters Patent.

Patented Dec. 14, 1915.

Application filed September 20, 1912. Serial No. 721,449.

To all whom it may concern:

Be it known that I, BRUNO VON BÜLTZINGSLÖWEN, a citizen of the German Empire, residing in New York, in the borough of the Bronx, county and State of New York, have invented certain new and useful Improvements in Aeroplanes, of which the following is a specification.

This invention relates to an improved aeroplane in which, in addition to a plurality of biplanes, means for raising the structure in a vertical direction are employed, so as to adapt thereby the aeroplane more specifically for observation and military purposes.

The invention consists of an aeroplane which comprises a plurality of biplanes, means for setting the biplanes into inclined position, driving propellers, a steering mechanism, and a plurality of horizontally-arranged rotatory lifting propellers provided with pivoted overlapping wings or blades, and means for setting said wings or blades into inclined position.

The invention consists further of means for tilting the biplanes into inclined forward and backward position, means for starting or stopping the rotatory motion of the lifting propellers, and of means for setting the wings or blades of the propellers into inclined position to their plane of rotation.

The invention consists lastly of certain details of construction which will be fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 represents a side-elevation of my improved aeroplane, Fig. 2 is a plan-view of Fig. 1, with parts broken off and other parts in-section, the biplanes being removed so as to show more clearly the driving, steering and lifting instrumentalities below the same, Fig. 3 is a rear-elevation of my improved aeroplane, Fig. 4 is a detail plan-view of one of the biplanes, drawn on a larger scale, Fig. 5 is a detail plan-view, partly in horizontal section, on line 5, 5, Fig. 3, and drawn on a larger scale, of the driving mechanism for the lifting propellers and the mechanism for setting the wings or blades of the same into inclined or tilted position, Fig. 6 is a plan-view of two diametrically-opposite wings or blades, showing their connection with the center-frame and shifting mechanism, Fig. 7 is an end view of two adjacent

blades, and Fig. 8 is a detail sectional top-view of the actuating lever of the shiftable collar for tilting the wings or blades.

Similar letters of reference indicate corresponding parts throughout the different figures of the drawings.

The improved aeroplane consists of a rectangular supporting frame *f*, which is preferably made of light steel-tubing, and stiffened by intersecting longitudinal and transverse brace-tubes like tube *f*¹, which form with the frame *f* an open platform *F* on which the seat *o* of the operator is supported. From the rectangular frame *f* extend in upward and downward direction upright rods or tubes *f*² which are connected by T- and cross-shaped joints *f*³ with horizontal steel-tubes *f*⁴ above and below the platform *F*, the upper tubes *f*⁴ forming a railing for the platform, while the lower tubes *f*⁴ form the supports for the axles of the wheels *w* by which the structure can be moved over the ground. The corner-tubes *f*⁴ are extended in upward direction to a sufficient height and braced by horizontal, transverse and upright tubes *f*⁵, *f*⁶, *f*⁷ for supporting two or more biplanes *B* which are fulcrumed at their opposite sides to the upper ends of the corner-tubes *f*², as shown clearly in Fig. 1. The front and rear corner-tubes *f*² are braced by curved inclined tubes *f*⁸ with the frame of the platform *F* and by curved and inwardly-inclined tubes *f*⁹ with the wheel-supporting frame. In addition to the longitudinal and transverse brace-tubes additional bent reinforcing brace-tubes *f*¹⁰ are arranged at the points where the main-frame is subjected to additional strains by the rotary working parts of the machine.

At the rear-portion of the supporting frame *f*, *f*² are supported the journal-bearings *p*¹ for the shafts of the driving propellers *p*, of which two are arranged, one near each rear-corner of the supporting frame *f*, and at equal distances from the vertical longitudinal center-plane of the machine. A steering rudder *r* is arranged at the front-portion of the supporting frame in line with the vertical center-plane and turns on a rudder-post *r*¹ to any desired angle of inclination toward the right or left hand side of the vertical center-plane of the machine by means of a sprocket wheel and chain transmission *r*², *r*³ and a crank-handle *r*⁴ near the driver's seat, as shown in Figs. 1 110

and 2. A motor or motors m are arranged on the wheel-frame in proper relation to the center of gravity of the machine.

Below the open platform F and intermediately between it and the wheel-frame are arranged at the corners of the supporting frame, four horizontally-rotating lifting propellers G, which are formed of an outer ring-shaped frame g , an inner hexagonal center-frame g^1 , and tilting wings or blades g^2 . The lifting propellers G serve for the purpose of steadying the structure against wind-pressure from one side or the other and permit the lifting of the aeroplane in a vertical direction and the holding of the same at a point of rest in midair.

The seat of the operator is located as close as possible to the center of gravity of the machine. The starting and stopping devices for the operating parts are arranged within easy reach of the hands and feet of the operator.

The novel features consist mainly in the construction of the two sets of adjustable biplanes, and the horizontally-rotating lifting propellers, as the driving propellers and steering mechanism are well known and have been used heretofore. The driving propellers p are operated by means of sprocket wheel and chain transmissions from the motor-shaft s , as shown in Figs. 1 and 3. Two intermediate driving shafts s^1 , which are located parallel with the motor-shaft, and somewhat above the same, are supported in bearings of the supporting frame f and serve for transmitting rotary motion to the different rotating parts. The intermediate driving shafts s^1 are located sidewise of the vertical center-plane of the machine, and transmit by additional sprocket and chain transmissions rotary motion to the shafts of the driving propellers.

The motion of the propellers is started or interrupted by the usual clutch and lever connections (not illustrated), as is well known in the art.

The tilting biplanes.—The biplanes B are fulcrumed in bearings of the extension corner-posts f^2 and are constructed of an upper plane b and a lower plane b^1 , which are formed of rectangular longitudinally and transversely braced tubular rods and pieces b^2 and webs b^3 of waterproofed canvas or other fabric that are tightly stretched thereon. The tubular frames b^2 of the upper and lower planes b , b^1 are connected at their corners by means of pivot-links b^4 , so that the planes b , b^1 can be tilted together into inclined position, as shown in dotted lines in Fig. 1. The tilting of the biplanes from the horizontal into the inclined position is accomplished by the operator by means of intermediate lever-mechanisms which are operated by a hand lever b^{13} in front of the operator. The two sets of in-

termediate lever-mechanisms are located at opposite sides of the vertical center-plane of the machine, and connected with the lower rear-corners of each biplane by two pivot-links b^5 so as to tilt them both simultaneously on their fulcra, which are supported in the upper ends of the upright extension-posts of the supporting frame. The pivot-links b^5 of each biplane are connected by longitudinal pivot-rods b^6 , and the latter by means of rolling keepers b^7 having antifriction-rollers b^8 respectively above and below said pivot-rods b^6 , connect with the upper ends of upright rack-bars b^9 . The rack-bars b^9 are guided at their lower ends in stationary guide-boxes b^{10} on the platform F and are toothed at their middle portions, which are placed in mesh with pinions b^{11} supported in bracket-bearings b^{12} on the intermediate uprights of the supporting frame, the shafts of said pinions being connected by sprocket wheel and chain transmissions with the hand-lever b^{13} , so that the operator can tilt both sets of biplanes from their horizontal position into any desired angle of inclination by turning the hand-lever b^{13} in forward or backward direction. When the biplanes are tilted by the hand-lever and intermediate mechanism into an upwardly and forwardly inclined position, the aeroplane is lifted, while when the biplanes are tilted in downwardly and backwardly inclined position, it is lowered, when a forward motion is imparted to it by the driving propellers. The antifriction-rollers in the keepers b^7 serve to facilitate the motion of the keepers over the longitudinal pivot-rods b^6 , while the friction of the upright rack-bars b^9 in their guide-boxes b^{10} is diminished by antifriction-balls. When the aeroplane is desired to be lifted into the air, the driving propellers are started and the biplanes adjusted into a forwardly and upwardly inclined position, as shown in Fig. 1. The aeroplane will then cut through the air in upwardly-inclined direction until the required height is obtained, when a forward horizontal motion is obtained by turning the biplanes into horizontal position. For the descending motion of the aeroplane the position of the biplanes is reversed.

The lifting propellers.—The lifting propellers serve for several purposes; firstly, for steadying the motion of the aeroplane in the air; secondly, for neutralizing side-pressures exerted by sudden gusts of wind upon the same, and thirdly and mainly for lifting the aeroplane in a vertical direction. The lifting propellers are constructed of an exterior ring-shaped frame g , a hexagonal or inner center-frame g^1 , and a number of approximately elliptical overlapping wings or blades g^2 , each of which is formed of a double clamping frame g^3 and a web of suit-

able waterproof fabric stretched over the same. Each wing or blade g^2 is provided with a pivot-shaft g^5 , which extends radially from the center-frame g^1 to the exterior ring-shaped frame g , said shafts g^5 being supported in suitable bearings on the outer ring-shaped frame g and center-frame g^1 , as shown in Figs. 2 and 6. The center-frame g^1 is mounted on an upright shaft s^3 , which is suspended from a collar g^6 and rotated in a bearing g^7 of a horizontal arm g^x of the platform-frame F . Below the hub of the center-frame g^1 is arranged a collar g^8 which is attached to radial straps g^9 that extend from the ring-shaped frame g to the collar g^8 , as shown in Figs. 1 and 3. Rotary motion is transmitted to the lifting propellers by the intermediate driving shafts s^1 , counter-shafts s^4 and gear-wheels and pinions. A clutch-mechanism i , i^1 and a lever-mechanism i^2 , i^3 enables the operator to start or stop the motion of the lifting propellers. As two links i^2 operated by lever-rod p^2 for operating clutches i , i^1 are arranged, it is possible to start or discontinue the rotary motion of one pair of lifting propellers at one side or the other of the machine, independently of each other, when it is necessary to take up wind-pressure on one side or the other, and thereby balance and steady it in its motion through the air and prevent the upsetting of the same.

The radially-pivoted wings or blades g^2 are capable of being tilted into inclined position, as shown in Fig. 7, so as to impart an ascending motion to the aeroplane in a vertical upward direction. The wings or blades can be set into inclined or tilted position at varying angles to the plane of the lifting propellers. A hand lever h is connected by means of levers S^5 with a fulcrumed lever t^2 , one for each lifting propeller, which lever is connected by a pivot-link t^4 with a fulcrumed lever t^3 the forked outer end of which engages by pins t^5 , a grooved shiftable collar n , and imparts vertical motion to the same. The collar n is located on a stationary guide-sleeve n^1 of the shaft s^3 of each lifting propeller, which sleeve is supported on the arm g^x by a bracket n^2 . Said sleeve n^1 by abutment with the center-frame g^1 receives the upward thrust of the lifting-propeller. The circumferential groove of the collar n acts in the nature of a raceway on antifriction-rollers n^3 , which are located at the upper ends of short vertically-guided rack-bars n^4 , said rack-bars meshing with pinions n^5 at the inner ends of the pivot-shafts g^5 of the wings or blades, as shown in Fig. 6. The lower ends of the rack-bars n^4 are guided in corresponding openings n^6 of the center-frame g^1 . As soon as, therefore, the collars n are lowered by the intermediate lever-mechanism, the overlapping wings or blades are tilted into an angle of

inclination to the plane of the propeller, as shown in dotted lines of Fig. 7, being held in tilted position by the operator, while on the release of the pedals the collars, rack-bars and wings or blades are returned into their former positions. When the wings or blades of all the lifting propellers are adjusted to a suitable angle of inclination to the horizontal plane of the driving propellers, the wings or blades of all the propellers assist in raising the structure into the air. In this case, however, the biplanes have to be placed into a horizontal position, and the motion of the driving propellers interrupted, so that the operator is enabled to hold the machine at any suitable point in the air, lift the same in vertical direction, or lower the same by gravity in the air without leaving the vertical line of motion, so as to permit observations to be taken, explosives to be dropped, and other operations to be carried out. This is a great advantage over the aeroplanes heretofore in use, which have to move with great speed through the air, and cannot be arrested and held at any desired point in midair.

As the weight of the main-portions of the aeroplane is located as low as possible below the two sets of biplanes, and as close as possible to the center of gravity of the entire structure, the same is properly balanced and steadied in all directions, so that the machine is prevented from being upset by sudden gusts of wind. When it is desired to lift the machine from the ground into the air, the driving and lifting propellers are started; the former driving the aeroplane in an upwardly-inclined direction through the air, while the latter, by their tilted wings or blades, assist the lifting of the machine, which latter can thereby be accomplished without special starting devices.

The descent to the ground is accomplished as easily as the ascent, and without any shocks, the height of flight and direction being controlled by the operator independently of the direction of the wind. The aeroplane can move against the wind, and cut its way through the same, leave the ground by its own motive power at any desired point, can be housed readily in a hangar similar to an automobile in a garage, and can be built at a comparatively low cost, all the motions being controlled by the operator from the seat at the center of the machine and in the center of gravity of the same.

I claim:

1. In an aeroplane, the combination of a supporting frame, two transversely pivoted biplanes supported at the upper portion of the same, rotary driving propellers on the rear-portion thereof vertically below the rear biplane, steering means, and a plurality of rotary lifting propellers at the

lower corners of the supporting frame, two of said lifting-propellers being arranged vertically below the driving propellers, and vertically below the rear biplane, and two of said lifting-propellers being arranged vertically below the forward biplane.

2. In an aeroplane, the combination of a rectangular supporting frame, two transversely pivoted biplanes at the upper portion of the same, means for setting said biplanes into an inclined position, a pair of rotary propellers at the rear-part of the supporting frame vertically below the rear biplane, a steering device at the front-part of said frame, and a plurality of rotary horizontal lifting propellers at the lower corners of the supporting frame, two of said lifting-propellers being arranged vertically below the driving propellers, and vertically below the rear biplane, and two of said lifting-propellers being arranged vertically below the forward biplane.

3. In an aeroplane, the combination of a supporting frame, two transversely pivoted tilting aeroplanes at the upper portion of said supporting frame, a pair of rotary driving propellers at the rear-part of the supporting frame vertically below the rear biplane, a steering device at the front-part of the same, a plurality of horizontal lifting propellers at the lower corners of the supporting frame, and means for imparting rotary motion to said lifting propellers, two of said lifting-propellers being arranged vertically below the driving propellers, and vertically below the rear biplane, and two of said lifting-propellers being arranged vertically below the forward biplane.

4. In an aeroplane, the combination of a supporting frame, two transversely pivoted biplanes supported at the upper portion of the same, means for setting the said biplanes into an inclined position, a pair of rotary driving propellers at the rear-part of the supporting frame vertically below the rear biplane, a steering device at the front-part of the frame, a plurality of horizontal lifting propellers located at the lower corners of the supporting frame, and means for imparting rotary motion to said lifting propellers, two of said lifting-propellers being arranged vertically below the driving propellers, and vertically below the rear biplane, and two of said lifting-propellers being arranged vertically below the forward biplane.

5. In an aeroplane, the combination of a rectangular supporting frame, two transversely pivoted lifting biplanes at the upper part of the supporting frame, driving propellers at the rear-part of the same vertically below the rear biplane, one at each side of the longitudinal center-plane of the machine, a steering device located in said

vertical center-plane, and two pairs of rotary lifting propellers located at the lower corners of the supporting frame, one pair of lifting propellers being located at one side and the other pair at the other side of the vertical longitudinal center-plane, two of said lifting-propellers being arranged vertically below the driving propellers, and vertically below the rear biplane, and two of said lifting-propellers being arranged vertically below the forward biplane.

6. In an aeroplane, the combination of a rectangular supporting frame provided with a platform at its lower portion and a seat thereon, two transversely pivoted biplanes at the upper portion of the supporting frame, means for setting said biplanes into a forward or backward angle of inclination, rotary driving propellers at the rear-part of the supporting frame vertically below the rear biplane, a steering device at the front-part thereof, a plurality of rotary lifting propellers located below the platform at the lower corners of the supporting frame, and means for setting all the movable parts into operative position from points near the seat of the operator, two of said lifting-propellers being arranged vertically below the driving propellers, and vertically below the rear biplane, and two of said lifting-propellers being arranged vertically below the forward biplane.

7. In an aeroplane, the combination of a supporting frame, two transversely pivoted biplanes at the upper portion of said frame, driving propellers at the rear-portion thereof vertically below the rear biplane, a steering device at the front-portion, a plurality of horizontal lifting propellers at the lower corners of the supporting frame, said lifting propellers being provided with overlapping wings or blades, means for imparting rotary motion to said lifting propellers, and means for tilting the wings or blades into an inclined position to the plane of said lifting propellers, two of said lifting-propellers being arranged vertically below the driving propellers, and vertically below the rear biplane, and two of said lifting-propellers being arranged vertically below the forward biplane.

8. In an aeroplane, the combination of a rectangular supporting frame, driving propellers, two transversely pivoted biplanes at the upper ends of said frame, means for setting the same into an inclined position, a plurality of horizontal lifting propellers at the lower corners of the supporting frame vertically below the rear biplane, said lifting propellers being provided with oscillating wings or blades, means for imparting rotary motion to said lifting propellers, and means for setting the wings or blades of the lifting propellers into inclined position to

the plane of the same, two of said lifting-propellers being arranged vertically below the driving propellers, and vertically below the rear biplane, and two of said lifting-
5 propellers being arranged vertically below the forward biplane.

In testimony, that I claim the foregoing

as my invention, I have signed my name in presence of two subscribing witnesses.

BRUNO VON BÜLTZINGSLÖWEN.

Witnesses:

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JOHN MURTAGH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."