C. E. WINTERROS.

AEROPLANE FLYING MACHINE.

APPLICATION FILED JAN. 29, 1909.

1,039,345.

Patented Sept. 24, 1912.

3 SHEETS—SHEET 1.

Fig. 1.

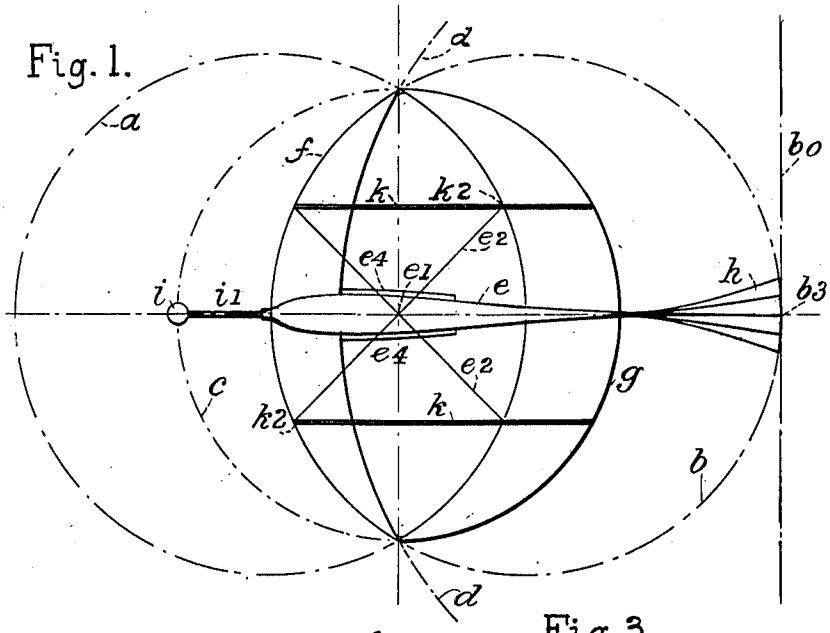


Fig. 3.

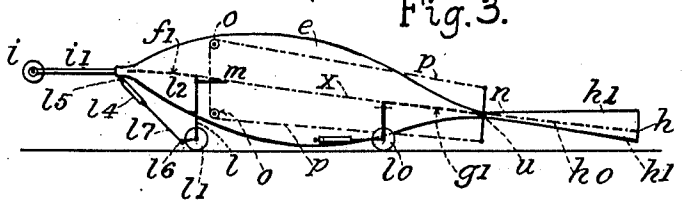


Fig. 4.

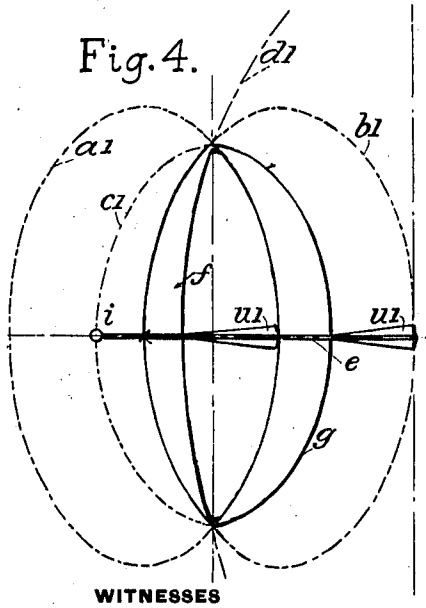
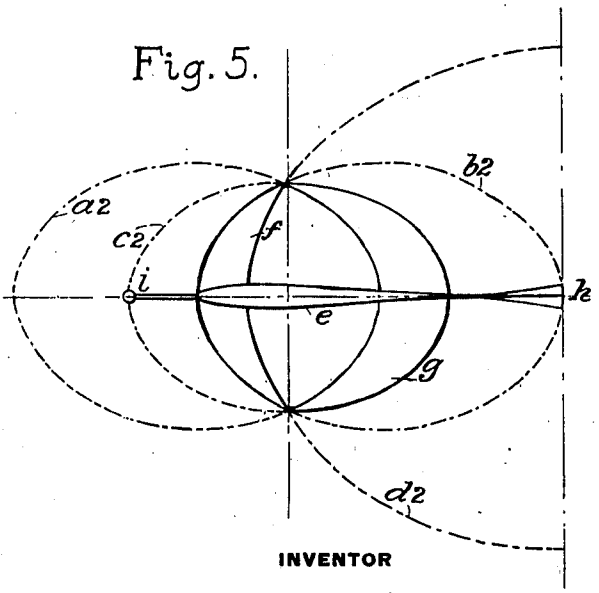


Fig. 5.



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3 SHEETS—SHEET 2.

Fig. 15.

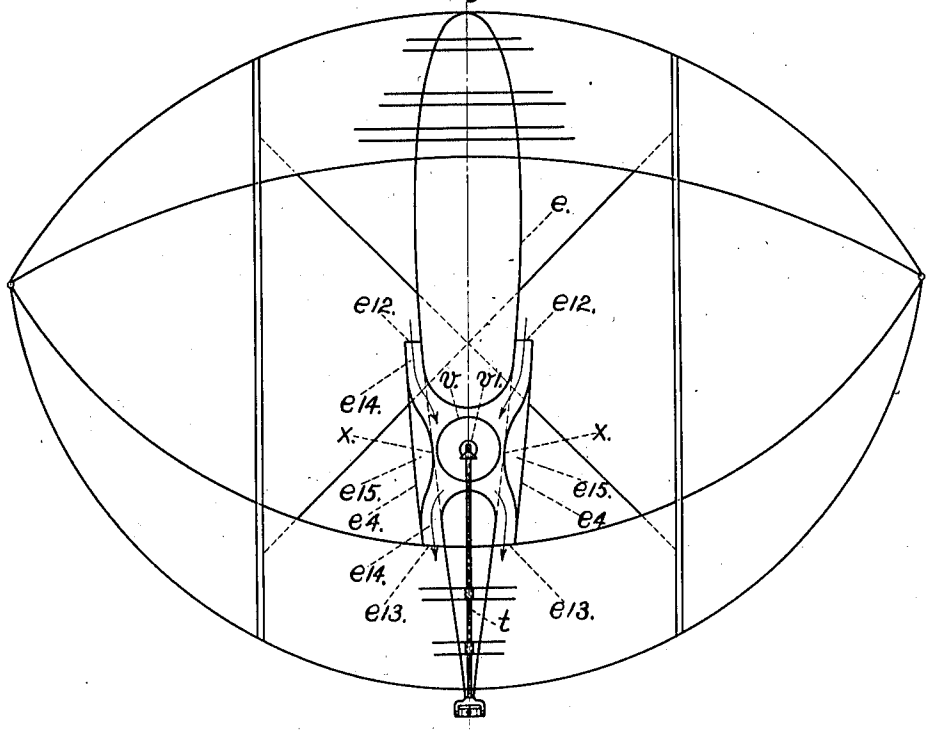
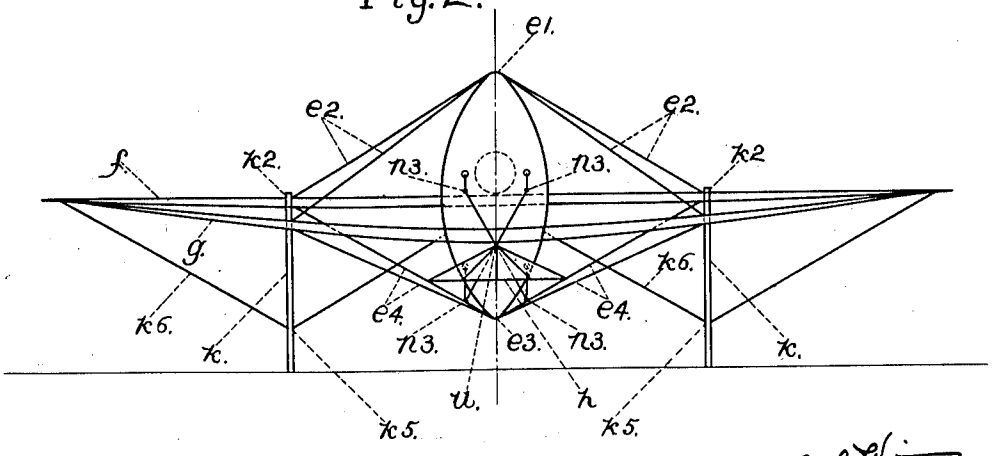


Fig. 2.



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3 SHEETS—SHEET 3.

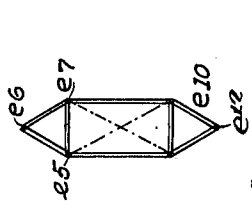

Fig. 7.

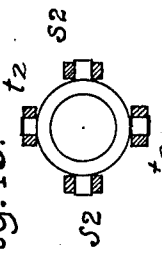

Fig. 10.

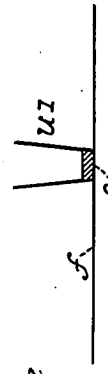

Fig. 14.

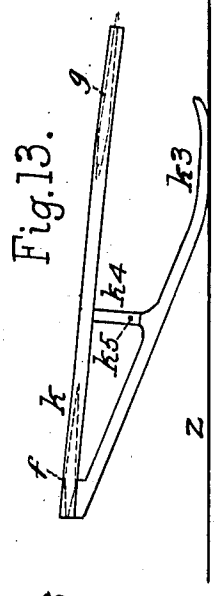

Fig. 13.

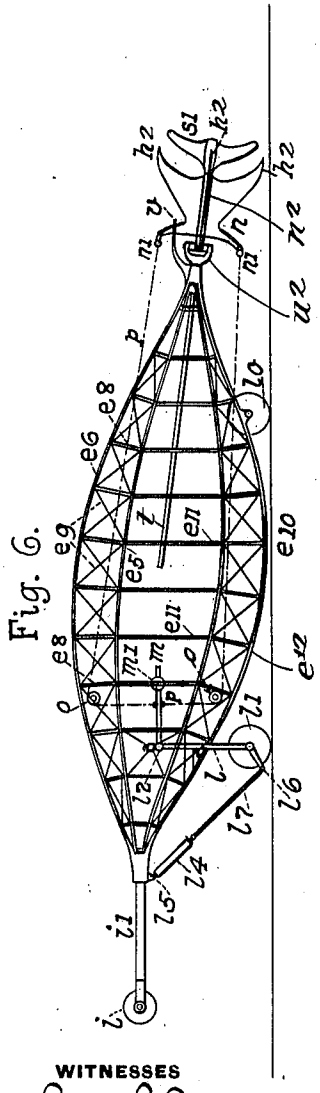

Fig. 6.

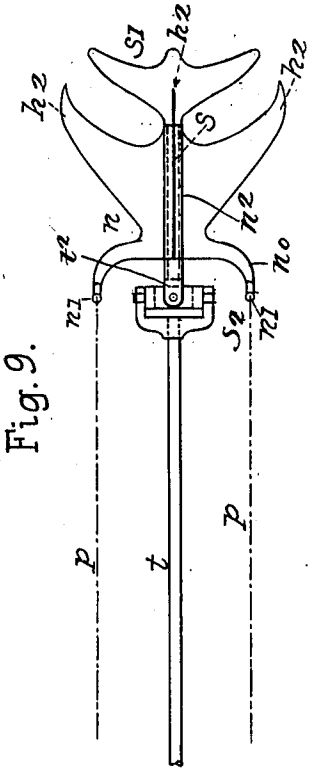

Fig. 9.

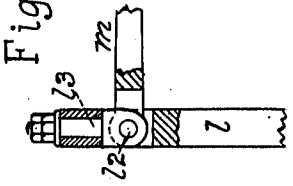

Fig. 12.

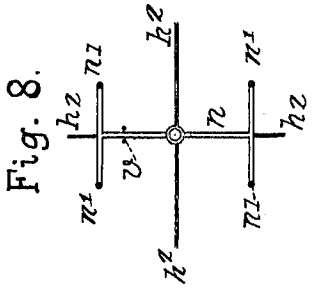

Fig. 8.

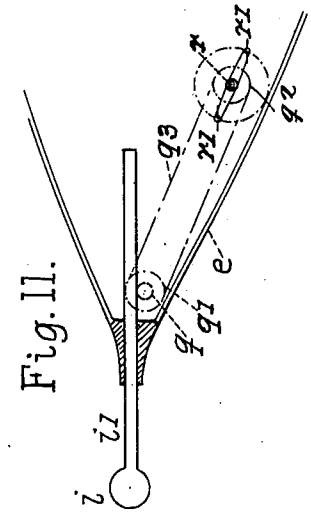

Fig. 11.

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AEROPLANE FLYING-MACHINE.

1,039,345. Specification of Letters Patent. Patented Sept. 24, 1912.

Application filed January 29, 1909. Serial No. 475,017.

To all whom it may concern:

Be it known that I, CLAES ERIC WINTERROS, a citizen of the United States, residing at Oak and Tulip avenues, Takoma Park, Washington, District of Columbia, have invented certain new and useful Improvements in Aeroplane Flying-Machines, of which the following is a specification.

My invention has relation to an aeroplane, which consists of two wings, one in front of the other—projecting from a backbone longitudinal main frame, and adjoined by their tips at each side.

The object of my invention is: 1. To obtain an aeroplane flying apparatus, which balances itself completely in the air, both sidewise and lengthwise, only through its correct form, without any mechanical help. 2. To apply a universal steering arrangement to such an apparatus, consisting of a steering bar universally jointed in front and connected by means of ropes or their substitutes with a similarly jointed cross rudder in the rear of the machine. 3. To combine such mechanical help with wheels for steering and balancing on the ground. 4. To provide a universally jointed propeller shaft in the center of the elongated hub of the rudder. 5. To provide an inclosed inhabitable framework with such correct form that it will give the least friction against the air. 6. To provide a triangular lattice frame at the top and another at the bottom in such a framework. 7. To apply a counterbalancing bar in front of the main frame, moved back and forth by a mechanical arrangement. 8. To apply on each side of the main frame an elongated hollow body, which forms an air-intake in front and an air-outlet in the rear through the speed of the apparatus or the suction of the propeller, in order to create a cold air circulation in a chamber, surrounding the propulsion motor. 9. To apply a wing-supporting bar at each side, with a rigging above from a point at the top of the main frame, and with a rigging below from a point at the bottom of the same. 10. To apply vertically attached runners at each side under the wings, as a support, when the apparatus is resting or moving on the ground.

The nature and scope of my invention will be more fully understood from the following description and the acompanying drawings, forming part thereof, and in which:

Figure 1 is a plan view of an aeroplane arrangement, constructed according to fixed rules on four interlaced circles as a constructional basis for the form of the wings. Fig. 2 is an end view of the same. Fig. 3 is a side view of the same apparatus. Fig. 4 is a plan view of an aeroplane constructed upon four interlaced ellipses analogical with the circles in Fig. 1, but with their short axis in a longitudinal position with the aeroplane. Fig. 5 is an aeroplane constructed upon four similarly arranged ellipses, but with their long axis longitudinally with the apparatus. Fig. 6 shows a side view of an apparatus with a specially constructed lattice framework. Fig. 7 is a section of the same framework. Fig. 8 is a cross rudder to be placed in the rear as a main feature in a universal steering arrangement. Fig. 9 is a side view of the same cross-rudder forming a housing for the universally jointed rear end of the main shaft, which carries the propeller. Fig. 10 is an end view of such a universal joint. Fig. 11 is a side view of a counterbalancing arrangement in front of the frame. Fig. 12 shows the front steering fork joint at its upper united end. Fig. 13 shows an inclined runner at each side. Fig. 14 is a cross-section of a bent-up side fin arrangement for the apparatus as a toy. Fig. 15 is a plan sectional view, showing arrangement of motor-cooling-chamber and canals.

Referring to the drawings: In Fig. 1 *a* is a circle having its center in the middle part of the front border of the front wing, or in the periphery of a second circle *b*, which similarly has its center in the middle part of the front border of the rear wing or in the periphery of circle *a*. *c* is a circle having its center half way between the centers or circles *a* and *b*; and said circle *c* having such a radius that all three circles will intersect each other in the same points, at which points the tips of the wings are joined together. A fourth circle or arc of a circle *d* is again laid out with its center in the point farthest aft of the rear circle *b*, or at the point b^3 where the middle line intersects the periphery of same; and the radius is such that this circle also intersects the other circles at the points where the tips of the wings are joined.

e is a backbone or main frame which may have any suitable form or shape for any special purpose of the apparatus. In Fig. 1 it is represented in the shape of a flat fish.

In this shape it is supposed to be hollow so as to furnish a closed gondola or car for passengers, producing as little friction against the air as possible. And, at the same time, it takes up as little as possible of the wing surface, because of its flat surfaces being placed sidewise, as well as serving as a keel against side motion, and admitting of a comfortable place in its middle portion for passengers in upright position, because of its ample height in proportion to its width. From this frame projects now the front wing *f* and the rear wing *g*, as well as its rear part being shaped into a tail *h*. The front border of the front wing follows the intersected periphery of the circle *b*, and the front border of the rear wing follows the intersected periphery of circle *a*. The aft border of the front wing follows further the intersected periphery of circle *d*, and the aft border of the rear wing one-half of the periphery of circle *c*, making it a half circle.

i' is a balancing bar with a counterweight *i* in its front end and *k*, *k*, are two longitudinal bars or beams attached to the wings, and shaped according to the longitudinal curvature of same in the perpendicular direction. From a point *e'* on the top of frame *e* (Figs. 1 and 2) are rigged four ropes or the like e^2 down to four corresponding points k^2 on the wings. And from a point e^3 in the bottom are rigged four ropes e^4 up to the same points k^2 underneath the wings.

In Fig. 3 the heavy dotted curved lines *f'* and *g'* indicate the longitudinal perpendicular curvature of the wings *f* and *g* respectively in their middle line. And line *h*—*o* represents the horizontal fin of the tail *h*. *h'* (Fig. 3) are vertical fins in the said tail *h* for steering in side direction. The fine dotted line *x* between the wings (Fig. 3) indicates the resultant aerial wave line through action of the front wing, and *h*—*o* is the resultant wave line through the combined action of both wings, when the apparatus is moving in a straight direction; and in such a case said line *h*—*o* is also closely followed by the horizontal fins or fin *h*. Same line *h*—*o* represents therefore also an elongated hub or backbone of the tail, from which the horizontal and vertical fins are protruding. In this shape, with the backbone main frame, thought of as a thin bar of a suitable light material, provided with a necessary vertical fin surface, to act against side motion, the apparatus may be applied as a toy to balance itself and soar in the air in an inclined course downward by the power of gravitation. Such a fin and tail *u'* is seen in transverse section in Fig. 14 and indicated in Fig. 4, provided through the bending upward of the two sides of a horizontal fin. A single vertical fin in the middle line of the frame may however be substituted. The balancing in up and down direction in this case being provided for by the correct shape of the wings themselves, as before mentioned.

In Fig. 4 the circles *a*, *b*, *c* and *d* are transformed to four ellipses *a'*, *b'*, *c'* and *d'*, said ellipses having their longitudinal axis sidewise, so as to make the general form of the wings project farther out in side direction than in Fig. 1; thus increasing the carrying capacity of the apparatus; and it can therefore be made to fly at a lower speed by making the apparatus shorter for the same carrying capacity.

In Fig. 5 the circles *a*, *b*, *c*, *d* are again transformed into four ellipses a^2, b^2, c^2 and d^2. Said ellipses in this case having their longitudinal axis lengthwise of the apparatus, thus making the general form of the wings project less sidewise than in Fig. 1. The result will now be to decrease the carrying capacity of the apparatus, or the velocity can thus be increased by making the apparatus longer for the the same lift. Thus Fig. 4 represents the form of a slow flying apparatus, Fig. 1 an apparatus traveling with a mean velocity, and Fig. 5 one with a high speed. In Fig. 5 it is seen that the ellipse d^2 has its minor axis tangential to the point farthest aft in the periphery of the ellipse b^2 similarly to the transverse axis *b*—*o* of the circle *d* in Fig. 1. It is readily seen that the construction is otherwise the same, as is represented by Figs. 1, 2 and 3, its proportions only changing according to the different proportions of the four ellipses as constructional guide lines.

In Figs. 3 and 6 *l* is a fork, similar to the front fork in a bicycle, turning upon a pivot l^3 at its upper end inside the frame *e*. (Fig. 12 shows this pivot in large size.) To this same pivot is also hinged by a forked joint the steering bar *m*, in such a way, that the hinge l^2 in combination with l^3 causes the steering bar to be universally jointed in its front end; and the steering fork, having also a forked joint, preferably fitted inside the joint of the steering bar, is in like manner hinged to the same pivot, so as to turn or pivot horizontally with the bar, as well as being able to oscillate somewhat vertically on the eye or joint l^2 in longitudinal direction with the apparatus. *n* is a vertically and horizontally acting rudder, having an elongated hub n^2 in its center, a suitably constructed cross-bar *n o* in front, which extends rearward so as to produce vertical and horizontal fins h^2 (Figs. 8 and 9). This rudder can be attached direct by its front end to a universal joint at the point *u* in Figs. 2 and 3 for steering and balancing only, or it may be attached, also, indirectly with a universally jointed propeller shaft through its hub n^2, acting as a sleeve around said shaft; and the universal joint u^2 (Fig. 6) between the front part *t*

and the rear part s of the propeller shaft serves thus as a substitute for the universal joint at the point u, as before described. The universal joint, in larger scale in Fig. 10, may thus represent either of two universal joints, one at the point u, as in Fig. 3, or another u^2, as in Fig. 6. In this latter case the rudder n is prevented from turning by a fork v suitably fastened to the rear end of the main frame e (Figs. 6 and 8). It is clear also without further drawing that of two universal joints, as represented in Fig. 10, one can be placed inside the other in the same transversal plane (the outer stationary and the inner turning), by making the ring y in the outer one large enough to admit the action of the inner joint turning and swinging in the same plane. Thus, by jointing the outer one to the main frame e and the rudder n and the inner one to shafts s and t, as before described, the rudder n will in this case also become the means of steering or guiding the shaft s. The cross bar in front of the rudder n may project either in two arms from the hub n^2, as in Fig. 8, dividing itself further so as to form four eyes n' in rectangular position to each other; or, four arms may project directly from the hub n^2 so as to form four similar eyes n^3 in rectangular position to each other as is represented in Fig. 2. o, o, Figs. 3 and 6, are preferably four pulleys (may also be bell cranks) placed inside the main frame in rectangular position to each other corresponding suitably to the rectangular position of the eyes n' or n^3, when seen in end direction of the apparatus (Figs. 2 and 6). The steering bar m in front and the cross bar n—o of the rudder n are joined together as follows:—Four ropes p or their substitutes are radially fastened or joined together by one end to the steering bar m. Each one is further bent and stretched over pulleys o or their substitutes from which they run about parallel, and by the other end they are suitably fastened to the eyes n' or n^3 of the rudder n. The fastening is arranged in such a way that, when the steering bar points parallel with the axis of the front end of the apparatus, the rudder n should point parallel with its rear end, or with the resultant aerial wave h—o, as before mentioned (Figs. 3 and 6). On the end of the steering bar m is placed a counterweight m' (Fig. 6) of such a size that it will perfectly counterbalance the tail or rudder with its fins h^2, h^2, etc., (Figs. 8 and 9). A substitute for this counterweight may consist of a spiral spring or the like attached from the bottom of the gondola up to the steering bar m. If, as is mentioned above, the steering bar m is adjusted to a direction parallel to a straight course followed by the apparatus in the air, it is readily seen that in turning the bar in any direction, horizontally or vertically, or at any angle between, the cross rudder n will always turn the opposite way, or which is the same: The apparatus will always tend to adjust its course according to the direction pointed out by the steering bar m and it must be pointed out that it is only by arranging the ropes p or substitutes angularly at about 90° over pulleys o or substitutes and then radially attaching the ends to the end of the steering bar that the above pre-eminent advantage of having the bar pointing in the direction desired is attained. When traveling in the air by an aeroplane, situations will arrive when there is not much time for reflection; and it is therefore most important to have only one manipulation to think about: that of putting the steering bar in the direction desired. If now a wheel l' is placed in the fork l in front and another wheel l—o in the rear of the gondola frame, it is seen that the apparatus can also be steered and balanced by the same steering arm m even on the ground, after the same principle as a bicycle.

In Fig. 13 a longitudinal cross-section of the wings at k (Fig. 1) is indicated by the dotted lines f and g. In this figure line z represents the ground. k is further the longitudinal supporting bar of the wings, as shown in Fig. 1, and indicated in Fig. 2. k^3 is an inclined runner, fastened or hinged at its front end to bar k. Said runner is again connected to a strut bar, or its substitute, k^4 between it and the bar k. The rear end of the runner k^3 is curved and made of such a size that it will produce a springy resistance against the ground. One such runner being provided at each side, the apparatus will thus be prevented from turning over. And at the same time (if made of suitable flexible material) they will admit of a certain swinging sidewise of the apparatus, which may be necessary for the steering. Further: at point k^5 by its middle part is fastened a wire, or its substitute, k^6 (Fig. 2), and, after being stretched, the same wire is fastened by one end to the main frame, and by the other end to the joined tips of the wings, thus serving as a rigging also for the part of the wings outside of the supporting bars k. In this condition the apparatus can be used as a coaster on wheels to slide down a hill and eventually rise in the air. Or by substituting runners for the wheels it can be used for the same purpose on ground covered by snow.

In Fig. 11, e represents part of the gondola frame, i the counterweight in front, and i' the counterweight bar to be moved back and forth according to possible changes of center of gravity of the apparatus, or differences in the lifting pressure on the wings by different speed. Said bar is further provided with teeth, or their substitutes, to which the wheel q, or its substitute,

is engaged. Concentrically with the wheel q on the same shaft is placed a sprocket wheel, or its substitute, q'. Farther back on a double crank shaft r is placed another sprocket wheel q^2, or its substitute. On and between both wheels q' and q^2 is now placed an endless chain, or its substitute, q^3. On each of the two cranks on the shaft r is further placed a pedal r'. (r can also be placed so as to be reached by the hands, and pedals r' changed to handles.) The helmsman or the person who steers or guides the apparatus may be seated on a bicycle seat, or the like, having the steering bar m in front of him and his feet on the pedals. He is thus placed in a similar manner as on a bicycle, manipulating, in this position, by the arms, the steering and balancing mechanism by swinging the steering bar m in the direction desired, and by the feet, the counterbalancing, by turning the shaft r in opposite directions, thereby moving the bar i' back and forth as before mentioned. As a substitute for the chain a suitable conical gearing may be used. (The main shaft t, running in suitable bearings, may be driven by any suitable motor, either directly by cranks or by any suitable gearing).

In Fig. 1 (on each side of the gondola frame) e^4 represents an elongated hollow body forming an air-intake in its front end and an air-outlet in the rear, through the speed of the apparatus or by the suction of the propeller, in order to create a cold air circulation in a chamber, surrounding the propulsion motor as a cooler; said chamber communicating with said inlets and outlets by suitable canals, according to different kind of motors. In Fig. 15 one way of arranging such a cooling chamber is shown in which the circle v represents a horizontally revolving motor, and v' a gearing between motor shaft and propeller shaft t. e^{12}, e^{12} are the two inlet canals started by the front end of e^4 on each side of the main hollow body e of the apparatus. Said canals communicate further with a chamber w around the motor, and said chamber in its turn branches out into two canals e^{13} which form the air outlets at the rear end of e^4. The direction of the current is shown by arrows e^{14}. Chambers e^{15} between the outside walls of canals e^{12} and e^{13} and the walls of e^4 may preferably be used as oil tanks to provide fuel for the motor or motors. This chamber is not shown in the drawings, because any kind of suitable motor, as before said, may be used, which in different ways may be surrounded by such a chamber. The hollow bodies e^4 will readily serve as cold air conductors for any kind of such motors only by joining its inlet and outlet with the said chamber.

In Figs. 6 and 7 e^5, e^6 and e^7 are three longitudinal bent bars at the top of the gondola placed in a triangular position to each other, as in Fig. 7. At certain distances there are placed suitably attached strut bars e^8 between the said longitudinal bars, and diagonally between the joints are stretched, by suitable means, wires or their substitutes, e^9. A similar frame e^{10} is also provided at the bottom of the gondola, the two thus forming two strongly constructed lattice frames. And the two ends are suitably attached to each other and accommodated to form the ends of the main or gondola frame. Between the said frames are placed perpendicular bars e^{11} or their substitutes; and all may be covered by a suitable, light and thin, material, thus forming walls of the gondola, which may be shaped similarly to the frame body represented in Figs. 1, 2 and 3. Windows may also be provided for at suitable places in the frame, as well as other conveniences, as doors etc. In this state, (with motor connected for action), the apparatus is now equipped for elevating itself from the ground or an especially prepared starting place, by being put in forward motion at the necessary speed by the action of the propeller. And, by traveling thus in bicycle fashion as before mentioned the starting will be rendered easy because shocks from the ground against the wheels, placed in the center of the apparatus, act as centrally as possible against the frame.

To protect the front wheel from shocks when the apparatus is alighting on the ground the fork l is provided with a diagonal l^7 fastened by one end in the downwardly extended steering fork at l^6, and by the other end to a spiral spring l^4; and this again stretched and fastened to a point l^5 in the front end of the main frame (such spiral spring arrangement also for the hind wheel is indicated in Fig. 3). The fork l descends on both sides of the bar e^{12} in the lower main frame (Figs. 6 and 7) and is of such width between the branches that a suitable clearance is left between the bar and the inner side of said branches of the fork. In the main frame is further provided a lateral surface on each outer side of the fork, so as to become a guide longitudinally against the outside of the fork. And because of the sufficient lateral space between the insides of the fork and the bar e^{12} the fork may turn sufficiently; and it may also swing somewhat backward. A shock will thereby be reduced to a minimum by the counteraction of the spring l^5.

It is thus seen, that Fig. 1 represents in its broadest meaning the apparatus, balancing itself only through the form of its wings projecting from a hollow inhabitable main frame e; and Figs. 2 and 3 the same developed to a glider or coaster with steering and balancing mechanism applied for traveling on the ground and in the air. And in Fig. 6 the

same developed to a motor driven flying apparatus, with steering and balancing arrangement as before mentioned; as well as Figs. 4 and 5 the same developed to a toy soarer, balancing itself through the form of its wings, as before described. In this last case the hindmost fin u', as in Fig. 4 and indicated in cross-section in Fig. 14, may be done away with, for special purposes, the front fin u' between the wings giving the necessary side thrust against the air, if made large enough, for guiding and steering when the apparatus is in motion.

Having thus described the nature and scope of my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an aeroplane flying machine, a backbone longitudinal main frame, two supporting wings, one in front of the other, branching out laterally from the front and rear parts of the main frame, with the front border of the forward wing laid out on a curve bending backward, and the front border of the rear wing laid out on an equal curve bending forward, and the connections of the two wings with each other in a tip at each side being produced, respectively, by the rear border curves gradually approaching and uniting at the said tips, as and for the purpose described.

2. In an aeroplane flying machine, a backbone longitudinal main frame, two supporting wings, one in front of the other, branching out laterally from the front and rear parts of the main frame, with the front border of the forward wing laid out on an elliptical arc bending backward and the front border of the rear wing laid out on an equal elliptical arc bending forward, and the connections of the two wings with each other in a tip at each side being produced, respectively, by the rear border curves gradually approaching and uniting at the said tips, as and for the purpose described.

3. In an aeroplane flying machine, a backbone longitudinal main frame, two supporting wings, one in front of the other branching out laterally from the front and rear parts of the main frame and joined at their lateral tips on each side, an extension rearward of said frame formed into an elongated central body, and vertical and horizontal steering fins projecting from said body, as and for the purpose described.

4. In an aeroplane flying machine, a backbone longitudinal main frame shaped into a hollow body so as to form a living compartment for passengers and crew, and two supporting wings, one in front of the other, branching out laterally from the front and rear parts of the main frame, with the front border of the forward wing laid out on a curve bending backward and the front border of the rear wing laid out on a curve bending forward, so as to connect with each other and with the gradually approaching rear borders of the said wings in one tip at each side, as and for the purpose described.

5. In an aeroplane flying machine, a backbone longitudinal main frame formed into a hollow body in shape of a flat fish, and two supporting wings, one in front of the other branching out laterally from the front and rear parts of the main frame, with the front border of the forward wing laid out on a curve bending backward and the front border of the rear wing laid out on a curve bending forward, so as to connect with each other and with the gradually approaching rear borders of the said wings in one tip at each side, as and for the purpose described.

6. In an aeroplane flying machine, a backbone longitudinal main frame shaped into a hollow body so as to form a living compartment, two supporting wings one in front of the other branching out laterally from the front and rear part of the main frame, with the front border of the forward wing laid out on a curve bending backward and the front border of the rear wing laid out on a curve bending forward so as to connect with each other and with the gradually approaching rear borders of the said wings in a tip at each side, one supporting wheel with bearings in the rear central part of the said main frame, and a supporting steering fork serving as bearing for a supporting steering wheel and pivoting in the forward central part of the said main frame, so as to be able to steer the aeroplane on the ground by said steering fork in bicycle fashion, as and for the purpose described.

7. In an aeroplane flying machine, a backbone longitudinal main frame shaped into a hollow body so as to form a living compartment, two supporting wings one in front of the other branching out laterally from the front and rear parts of the main frame, with the front border of the forward wing laid out on a curve bending backward and the front border of the rear wing laid out on a curve bending forward so as to connect with each other and with the gradually approaching rear borders of the said wings in a joint at each side, a number of rigging wires or substitutes attached by one end in the highest middle part of the main-frame and by the other end in suitable points of the wings, and another number of rigging wires or substitutes attached by one end to the lowest middle part of the main frame and by the other end in suitable points of the wings, as and for the purpose described.

8. In an aeroplane flying machine, a backbone longitudinal main frame shaped into a hollow body so as to form a living compartment, two supporting wings one in front of the other branching out laterally from the front and rear parts of the main frame,

with the front border of the forward wing laid out on a curve bending backward and the front border of the rear wing laid out on a curve bending forward so as to connect with each other and with the gradually approaching rear borders of the said wings in a joint at each side, a number of longitudinally supporting beams at each side extending from the front border of the front wing to the rear border of the rear wing and attached in suitable points to said wings, as and for the purpose described.

9. In an aeroplane flying machine, a backbone longitudinal main frame shaped into a hollow body so as to form a living compartment, two supporting wings one in front of the other branching out laterally from the front and rear parts of the main frame, with the front border of the forward wing laid out on a curve bending backward and the front border of the rear wing laid out on a curve bending forward so as to connect with each other and with the gradually approaching rear borders of the said wings in a joint at each side, one supporting runner at each side attached to said wings and suitably rigged by wires or substitutes attached by their middle part to the runner, by one end to the main frame and by the other end to suitable points of the wings, as and for the purpose described.

10. In an aeroplane flying machine a backbone longitudinal main frame shaped into a hollow body so as to form a living compartment, two supporting wings one in front of the other branching out laterally from the front and rear parts of the main frame, with the front border of the forward wing laid out on a curve bending backward and the front border of the rear wing laid out on a curve bending forward so as to connect with each other and with the gradually approaching rear borders of the said wings in a joint at each side, a horizontal steering bar vertically jointed by its front end to a supporting steering fork in the front middle part of the main frame, four block pulleys or substitutes situated in a vertical transverse plane with the rear end of the steering bar, a vertically and horizontally finned steering rudder universally jointed by its front end to the rear end of the main frame, four transverse rudder arms with ends situated in a vertical transverse plane with said universal joint and longitudinally opposite to the said block pulleys, and four chains or substitutes with their rear end fastened to each end of said transverse rudder arms, the forward part stretched and bent over the said blocks, and their front ends further joined to the rear end of said steering bar, so as to produce a universal steering of the aeroplane when traveling in the air, by the motion of said steering bar, as and for the purpose described.

11. In an aeroplane flying machine, a backbone longitudinal main frame shaped into a hollow body so as to form a living compartment, two supporting wings one in front of the other branching out laterally from the front and rear parts of the main frame, with the front border of the forward wing laid out on a curve bending backward and the front border of the rear wing laid out on a curve bending forward so as to connect with each other and with the gradually approaching rear borders of the said wings in a joint at each side, a gasolene motor driving a propeller shaft and placed in the hollow part of the main frame, an air cooling chamber around said motor, a front air inlet to said chamber and a rear air outlet from the same chamber, for cooling the motor by circulation of air through said chamber by the speed of the aeroplane or by the suction of the propeller, as and for the purpose described.

CLAES ERIC WINTERROS.

Witnesses:
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J. CECIL PROUTY.