(No Model.)

3 Sheets—Sheet 1.

W. BEESON.

AERIAL NAVIGATION.

No. 361,855. Patented Apr. 26, 1887.

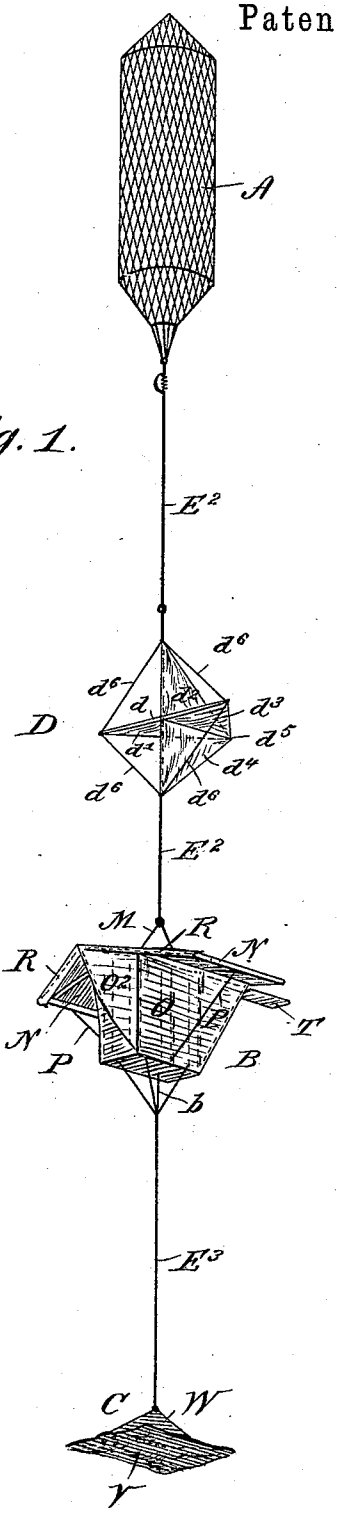

Fig. 1.

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Fig. 2.

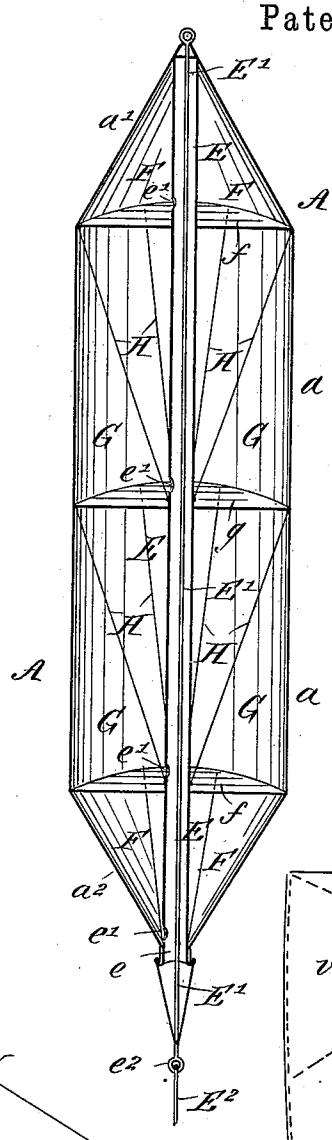

Fig. 5.

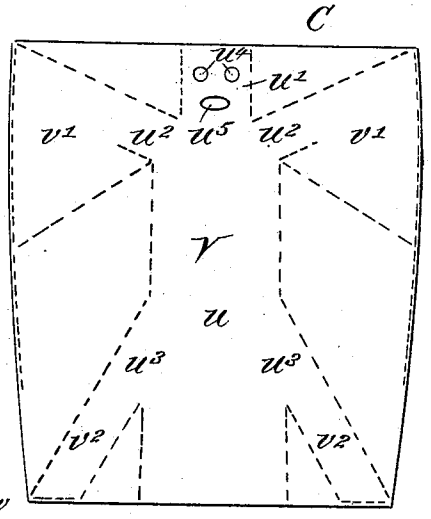

Fig. 4.

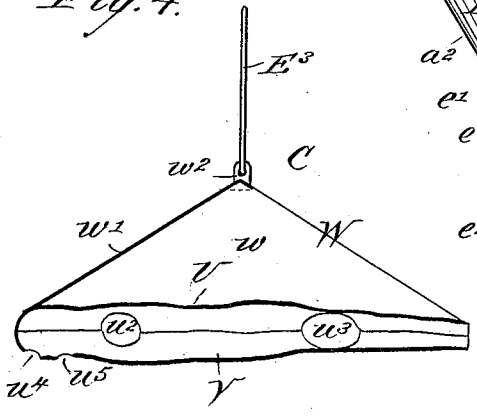

Fig. 3.

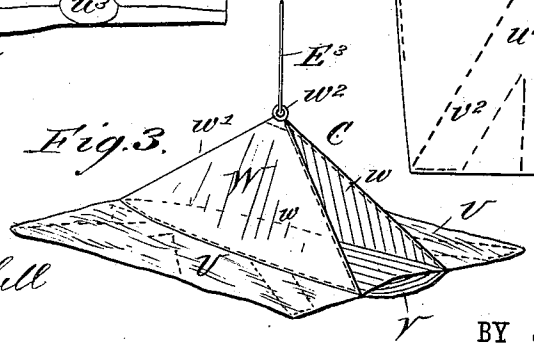

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Fig. 6.

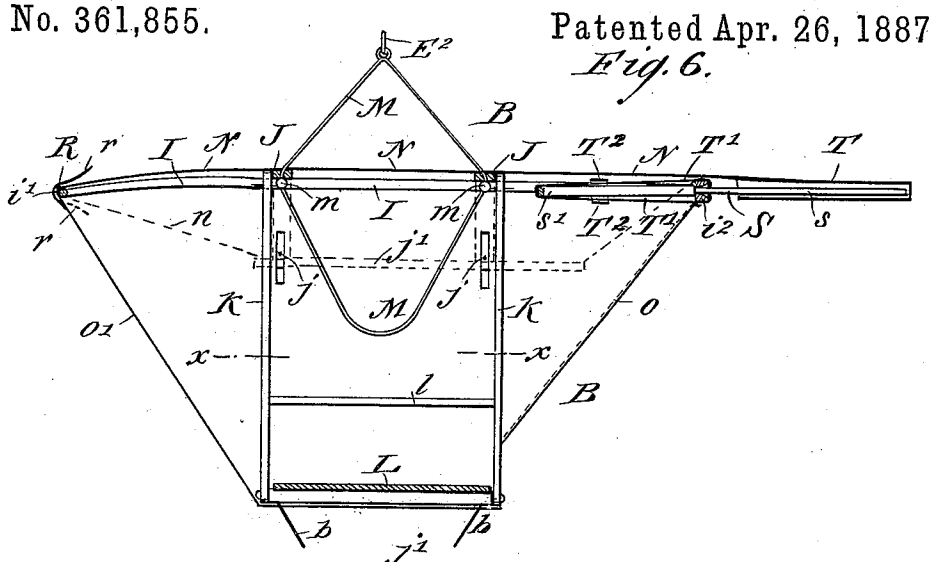


Fig. 7.

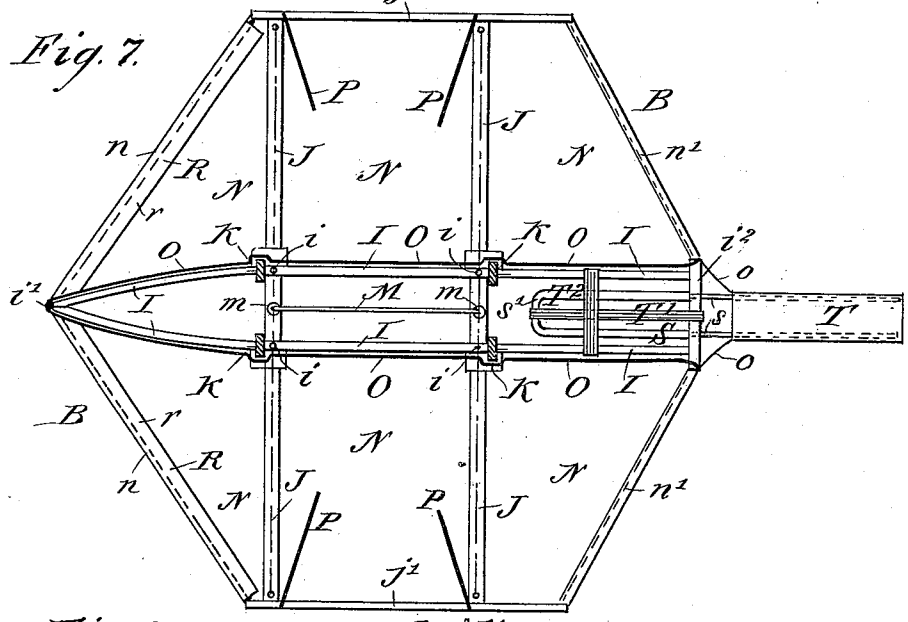
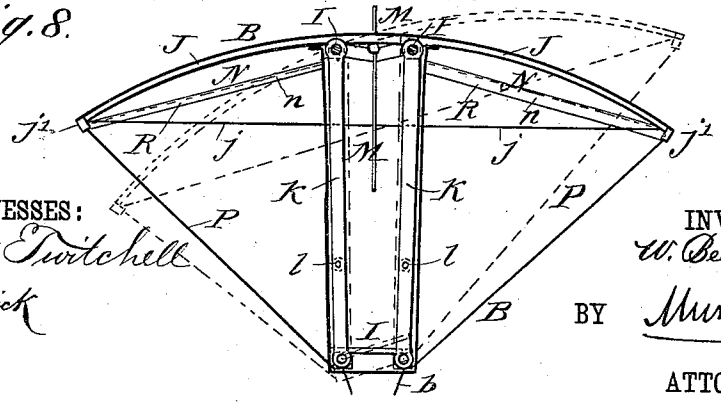


Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLIAM BEESON, OF DILLON, MONTANA TERRITORY.

AERIAL NAVIGATION.

SPECIFICATION forming part of Letters Patent No. 361,855, dated April 26, 1887.

Application filed October 26, 1886. Serial No. 217,235. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BEESON, of Dillon, in the county of Beaver Head and Territory of Montana, have invented a new and Improved System of Aerial Navigation, of which the following is a full, clear, and exact description.

My invention relates to a system of aerial navigation, comprising a balloon and attached propelling or flying sail-suit aerial motors, whereby the influences of wind-currents and gravitation may be utilized to good advantage in navigating the air.

The invention consists in certain novel features of construction and combinations of parts of the aerial-navigation system or structures comprising said system, all as hereinafter fully described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a perspective view of a connected balloon, four-winged sail, winged propeller, and wing-sail suit, arranged for navigating the air in accordance with my system. Fig. 2 is an enlarged longitudinal central sectional elevation of the balloon. Fig. 3 is a perspective view of the wing-sail suit. Fig. 4 is a longitudinal vertical sectional elevation of the sail-suit. Fig. 5 is a bottom plan view of the suit. Fig. 6 is a vertical longitudinal central sectional elevation of the winged propeller. Fig. 7 is an under side view of the top of the propeller, with its floor-supporting bars in section, on the line *x x* of Fig. 6, and with the elastic wing-stays broken away; and Fig. 8 is a transverse vertical sectional view of the propeller.

In carrying out my invention I make use of a balloon or gas-bag, A, a winged propeller, B, a sail-suit, C, and a peculiarly-constructed four-winged sail, D. These structures A B C D are connected by ropes, allowing them limited movement independently of each other, and they all co-operate to give the best results in navigating the air in light winds or calms. In heavy winds the propeller or the sail-suit may alone be used with the balloon, as will be hereinafter more fully explained. I will particularly describe these structures A B C D in the order named and as follows:

The balloon A is a bag having a cylindrical body, *a*, and conical ends a' a^2, the end or head a' being closed at the top and the end a^2 having an opening or throat, into which is fitted the neck *e* of a tube, E, which ranges along the center of the balloon, and is fixed at its upper end to the head a'. This tube E serves as a conduit for the balloon-inflating gas, as presently described. At the points of connection of the ends of the balloon with its body there are fitted interior transverse partitions, *f f*, and these are fitted gas-tight around the tube E, thereby forming gas-chambers F F within the conical ends of the balloon. Between these partitions *f f* there will be fitted one or more like transverse partitions, *g*, depending on the length or height of the balloon. The drawings show but one partition, *g*, thereby forming two gas-receiving chambers, G G, in the body of the balloon. Interior cords, H, attached to the gas-tube E, next the lower partition, *f*, and the partition *g* are diverged upward, and are made fast to the body of the balloon at their upper ends, thereby effectively bracing the entire structure. Holes e' in the tube E, near the partitions *f g f*, allow passage of the gas from the tube E, into the several gas-chambers of the balloon.

It will be understood that the walls of the balloon, its tube E, and the transverse partitions *f g* will be made of silk or any other suitable flexible collapsible fabric, and the balloon-body may be covered by or inclosed in a netting, as shown in Fig. 1 of the drawings; or the netting may be dispensed with, as the aeronaut may desire. To inflate the balloon, a pipe leading from a gas-conduit or source of supply will be introduced into the mouth *e* of the tube E. A rope or cable, E′, held at the top of the balloon by a knot or stop-block of any kind, passes down through the gas-tube E and hangs below the balloon, where it may have a ring, e^2, or other device, to which a rope or cable, E^2, will be attached for connecting other parts of the aerial apparatus to the balloon, as hereinafter described.

The propeller B (shown more clearly in detail in Figs. 6, 7, and 8 of the drawings) is made with a top or roof frame formed, mainly, of two pairs of bars or rods, I I and J J, which are connected strongly where they cross each other at about right angles by pins *i* or other

suitable fastenings. The forward end parts of the rods I I are converged and connected together at their outer ends at i', and to the separated back ends of these rods is fixed a cross-bar, i^2, which supports the rudder of the propeller.

The roof-frame rods J J, which range transversely of the propeller, are bowed downward at both ends from their points of connection with the fore-and-aft rods I I, and their opposite ends are connected by stay-cords j, which hold the rods J to their normal curvature and cause strains on them to be evenly distributed. The ends of the rods J J are strongly braced by fore-and-aft rods j', fixed to them.

On the roof-frame rods I I there are pivoted the upper ends of rods or hangers K, which are preferably arranged in two pairs, one pair outside of each of the rods J J, next the intersection of the rods I J, and to the lower ends or parts of these hangers K is pivotally connected a platform or floor, L, on which the aeronaut will stand. Opposite side rods, l l, connecting the fore-and-aft hangers K K, serve as hand-grasps to the aeronaut in manipulating the propeller. A rope, M, is passed through apertures in or guides on the roof-rods J J and hangs in a loop within reach of the aeronaut. This rope has knots m m, which normally are drawn closely to the under sides of the rods J J and sustain the weight of the propeller, which is suspended from the balloon-rope E^2 by a connection of the upper ends of the propeller-rope M therewith. (See Fig. 6.) A series of cords, b, connected to the platform L of the propeller, afford convenient means of connecting a rope, E^3, to which the sail-suit C may be attached to suspend it from the propeller, as shown in Fig. 1 of the drawings.

Ropes or cords n n are stretched between the forward ends of the frame-rods j' and the point of junction at i' of the two fore-and-aft roof-rods I I, and ropes or cords n' n' are stretched between the rear ends of the frame-rods j' and the opposite ends of the rear cross-bar, i^2, connecting the roof-frame rods I I. Ropes o o are stretched between the ends of the bar i^2 and the platform L, and a rope, o', is stretched between the end joint at i' of the rods I I and the forward end of the platform L. The roof-rod frames I J, together with the ropes n n', constitute a frame, over which the main horizontal wing-sail N of the propeller B is stretched and fastened, and the roof-frame I J, hangers K, and platform L, together with the fore-and-aft ropes o o', constitute a frame, over which is stretched a fabric, O, which not only serves to protect the aeronaut standing on the platform from the wind, but also serves as a sort of center-board sail to the propeller. The open space between the two aft-ropes o o leaves the space between the aft-hangers K K open for entrance or exit of the aeronaut, and the stretch of the sail fabric over the front hangers, K K, and the single centrally-disposed rope o' gives a closed sharp prow shape at o^2 to the front of the center-board sail O, which thus offers little resistance to the forward movement of the propeller through the air.

One or more elastic bands, P, or it may be springs tending to contract, are fixed at one end to each side rod, j', of the roof-frame J, and at the other end are connected to the sides of the platform L. The drawings show two of these elastic bands P at each side of the propeller, said bands being broken away in Fig. 7. These elastic bands assist the aeronaut in giving a wing motion to the propeller by taking up strains and by their contraction at the beginning of each downstroke or pressure of the aeronaut at the opposite sides of the platform.

At the front of the main top-sail N, and over the forward ropes, n n, there are fixed pieces of quite stiff fabric R, which are sufficiently wide to provide fins or wings r r at the upper and lower faces of the top-sail N, and these wings r r catch winds blowing forward and deflect the air currents backward and accelerate the forward movement of the propeller.

The rudder of the propeller is made with a light bent frame, S, the two side arms, s s, of which are fitted loosely into holes made through the aft cross-bar i^2 of the roof-frame rods I I, and pass into a fabric pocket, T, which is preferably a continuation of the top-sail N, or is fixed thereto in any approved way, and projects rearward as a tail behind the wing-sail N of the propeller. The side arms or parts, s s, of the rudder-frame S are made smaller than the inner bowed part, s', of the frame, and whereby shoulders are formed on the rudder-frame, which bear against the inner side or face of the cross-bar i^2 and limit outward movement of the frame. An elastic band, T', is stretched around or over the cross-bar i^2, and also over the end of the bow s' of the rudder-frame, and holds the frame-shoulders in contact with the bar i^2, and thus keeps the fabric T of the rudder in proper tension for effective action. Another elastic band, T^2, is passed over the roof-frame rods I I and incloses the inner part of the rudder-frame S between its opposite side parts, and whereby the rudder is held quite rigidly and prevented from rising or dropping, except when handled by the aeronaut.

It is obvious that the elastic bands T' T^2 will yield to allow the rudder to be raised or lowered by rocking its frame S in the cross-bar i^2 of the roof-frame, and the opposite side arms of the rudder may also be twisted to position the rudder out of the plane of the roof-frame I I i^2. The rudder may thus be raised or lowered or twisted by the aeronaut on the platform L, who may reach the inner bowed part, s', of the rudder-frame to adjust the rudder as a bird adjusts its tail, to steer the propeller as occasion requires.

The general operation of the propeller is as follows: After the propeller is raised by the balloon A, the aeronaut, standing on the platform L, may, by throwing his weight first on one edge of it and then on the other edge,

cause a vertical alternate up-and-down motion of the opposite side parts or wings of the main top-sail N, to help rise to higher altitudes, or to hold either side of the top-sail down or up to take advantage of favorable air-currents and ward off unfavorable ones, and thereby facilitate the movements of the air-ship. This wing movement of the top-sail N as the platform-hangers turn on their upper and lower pivots will be clearly understood from the dotted lines in Fig. 8 of the drawings.

It will be seen that the contraction and expansion of the elastic cords or bands P greatly facilitate the wing movements of the top-sail, and these movements may be accelerated in frequency and force by power applied by the aeronaut's hands grasping the side bars, *l l*, of the platform-frame. To lower the prow or bows of the propeller when steering it, the aeronaut will simply step to the forward end of the platform L, and to raise the bows he will step to the rear end of the platform, and to facilitate these up-and-down adjustments of the propeller the aeronaut may pull upon one side of the loop M. By these means the longitudinal center of gravity of the propeller may be shifted at the will of the aeronaut to facilitate steering in the desired course, to be indicated by the effect of the sail-rudder S T, which will be operated as required in the manner above described. The transversely arched or curved shape of the top or wing sail N reduces the resistance to a rising movement of the propeller, and the large surface of the frame-sail O presented to the wind facilitates taking a lateral or diagonal course of travel through the air.

The sail-suit C (shown more clearly in Figs. 3, 4, and 5 of the drawings) comprises upper and lower thicknesses or layers, U V, of some suitable flexible fabric, which are stitched together, as indicated in dotted lines in Fig. 5, to provide a space at *u* between the fabrics for the body or trunk of the aeronaut, and a space at *u'* for his head, and arm and leg holes u^2 u^3, which open, respectively, into spaces v' v' for the aeronaut's arms and v^2 v^2 for his legs. The arm-spaces v' are made flaring horizontally from the arm-holes to allow free front and rear movement or swing of the arms. Eye-holes u^4 and a mouth-hole, u^5, are provided in the lower fabric, V, to give vision and breath to the aeronaut wearing the suit.

To the back or upper fabric, U, of the sail-suit is connected at its lower edge a fabric support or dorsal-fin structure, W, the bottom edge of which describes two lines separated at the back edge of the sail-suit and converging to a point above the head-opening *u'* of the suit, and from this lower stitched edge of the structure W its two side parts, *w w*, rise and converge at the front, where they together form a sharp prow or front, *w'*, to offer little resistance to the forward movement of the aeronaut in the suit, and the back edges of the side parts, *w w*, are separated from the suit-fabric U to a point, w^2, where they converge to meet the upper end of the prow *w'*. This construction and connection of the dorsal structure W gives a broad area of support to the aeronaut in the suit when the suit is suspended by its rope E^3 from the propeller B or from the balloon A, thereby allowing the aeronaut to rest or lie easily in the suit and move his arms and legs with the greatest freedom to adjust the side parts of the suit as wings for steering in any desired course. The dorsal support W being open at the back end and closed at its prow *w'* thereby forms with the suit fabric a chamber or pocket, into which the wind may enter to give the suit forward impetus through the air.

Experiments have demonstrated that a proportion between surface and weight which plane resistance is best able to carry is about one square foot to a pound, and, as a man in the sail-suit can spread and handle forty square feet of plane surface, the buoyancy of the balloon to which the sail-suit will be connected will be adjusted until the downpull of the aeronaut's weight would be but forty pounds. In a strong wind this sail-suit C would alone be connected to the balloon A, and in a gale the propeller B would alone be used in connection with the balloon; but in light winds or calms the entire train consisting of the balloon A, the propeller B, with one aeronaut, and the flying-sail suit C, with another aeronaut, will be employed, and, if desired, these connected structures may be duplicated any number of times for use by aeronauts traveling together.

The four-winged sail D, which I will next describe, may be used between the balloon and either the propeller B or flying-suit C, or may be used when both the propeller and flying-suit are used. This four-winged sail D is made with a light spar, *d*, to which is connected a stout rope running at right angles to the spar, and which may be the rope E^2, by which either the propeller B or the flying-suit C is connected to the balloon A. To the spar *d* and the cross-rope E^2 are connected the back ends or bases of four triangular sails, d' d^2 d^3 d^4, the longer right-angular sides of which are connected together at the longitudinal center of the sail, and, if desired, a spar running at right angles to the spar *d* may be placed at the point of intersection or joint of the four wings of the sail with each other. The wings of the sail converge to a point at d^5, which faces the wind. Stay ropes or cords d^6 are stretched between the ends of the spar *d* and the corners of the other two sails connected to the cross-rope E^2, to hold the sails well spread out and brace them one to the other.

It is obvious that the wind may act from either side or from below on the several sails of the structure D, thus causing it to have a lifting or lowering effect on the balloon and the attached propeller or flying-suit, or causing movements laterally to either side or in diagonal planes or tacks, according to the direction and force of the wind-currents.

An important feature of my invention is the suspension of an aerial motor or propeller or flying-suit from a balloon by a long rope, whereby the motor or suit may have independent motion from the balloon in its waftage, and whereby whirls or zigzag or inclined courses taken by the motor or suit, by wind-power and gravitation, will, by acquired inertia of the propeller or flying-suit, tow the balloon against the wind, or partly so, or enable the balloon and propeller or suit to rise in altitude, whereby force will be stored up, to be used again at will by gravitation.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. In a system of aerial navigation, the combination, with a balloon and an aerial propeller or motor, of a rope connecting said balloon and propeller and of a length sufficient to admit of the propeller or motor taking an independent motion and varied velocities from the balloon in its waftage, substantially as set forth.

2. In a system of aerial navigation, the combination, with a balloon and a rope depending therefrom, of a propeller connected to the rope and having its top forming a single top-sail and a platform pivotally suspended at the corners from points at opposite sides of the longitudinal center of said propeller, whereby when the platform is depressed at one side the entire top-sail will be inclined, substantially as set forth.

3. In a system of aerial navigation, the combination, with a balloon A, and a rope suspended therefrom, of a flying-suit, C, connected to said rope and made with two fabric layers, U V, having head, arm, and leg pockets, and eye and mouth holes for the aeronaut, substantially as described, for the purposes set forth.

4. An aerial navigating apparatus comprising balloon A and ropes suspended therefrom, a propeller, B, and flying-sail suit C, connected to the ropes to have motion independently of the balloon, and said propeller made with a top-sail, N, and a platform pivotally suspended from the top-sail frame and adapted to give wing motion to the top-sail by alternate pressures at opposite sides of the longitudinal center of the platform, and said flying-suit C, made with two fabric layers, U V, having head, arm, and leg pockets and eye and mouth holes for the aeronaut, substantially as described, for the purposes set forth.

5. In a system of aerial navigation, the combination, with a balloon, A, and a rope suspended therefrom, of a propeller or flying-motor connected to the rope, and a four-winged sail, D, connected to the rope between the balloon and propeller or motor, substantially as described, for the purposes set forth.

6. The balloon A, made with separate gas-chambers, as F G, and a central tube or gas-conduit, E, ranging through the chambers, and provided with holes e', opening thereto, substantially as shown and described.

7. The balloon A, made with separate gas-chambers, as F G, and a tube or gas-conduit, E, provided with holes e', opening to the gas-chambers, and stay-cords H, connecting the tube E to the outer wall or body of the balloon at or near the partitions forming the gas-chambers, substantially as shown and described.

8. The balloon A, made with separate gas-chambers, as F G, a tube provided with holes e', opening to the gas-chambers, and a rope, E', held at the head of the balloon and passed through the tube E, and pendent from the body of the balloon for connection of aerial propellers or motors, substantially as shown and described.

9. The propeller B, adapted for connection to a balloon, and made with a roof-frame at opposite sides of its longitudinal center, a top-sail, N, attached thereto, hangers K, pivoted to the roof-frame, and a platform, L, pivoted to the hangers at its four corners, substantially as shown and described, whereby wing motion may be given the top-sail by alternate pressures at opposite sides of the longitudinal center of the platform, as and for the purposes set forth.

10. The propeller B, adapted for connection to a balloon, and made with a roof-frame, a top-sail, N, attached thereto, hangers K, pivoted to the roof-frame at opposite sides of its longitudinal center, at its four corners, a platform, L, pivoted to the hangers, and elastic connections, as P P, stretched between the sides of the top-sail frame and the platform, substantially as described, for the purposes set forth.

11. The propeller B, having a roof-frame provided with two apertures in line with its longitudinal center, in combination with the rope M, passed down through said apertures into the propeller, and provided with knots or projections below the apertures, the upper converging ends of the rope being adapted for connecting with a balloon, substantially as set forth.

12. The propeller B, adapted for connection to a balloon, and made with a roof-frame having a top-sail, N, attached thereto, hangers K, pivoted to the roof-frame, a platform, L, pivoted to the hangers, and a fabric, O, inclosing the platform-frame and constituting a center-board sail, substantially as shown and described.

13. The propeller B, adapted for connection with a balloon, and having a roof-frame formed of parallel horizontal rods I I, converged at their forward ends, the cross-piece i^2, connecting the rear ends of said rods, the transverse parallel rods J J, rigidly connected to the rods I I, the covering N over said frame, the rudder-frame S, formed of two parallel side arms fitted loosely into holes in the cross-piece i^2 to rock therein, and the fabric T, covering the outer ends of the arms, substantially as set forth.

14. The propeller B, adapted for connection with a balloon and comprising the longitudinal parallel rods I I in the same horizontal

plane, and converged at their forward ends, the cross-piece i^2, connecting the rear ends of said rods, the transverse parallel rods J J, rigidly connected to the rods I I at their point of intersection and bowed downward therefrom, the trusses j j, connecting the ends of the rods J J, the sail N, covering said frame, the rudder, the hangers K, pivoted at their upper ends to the propeller-frame at opposite sides of its longitudinal frame to swing transversely thereto, and the platform L, pivotally connecting the lower ends of said hangers, substantially as set forth.

15. The propeller B, made with a roof-frame comprising crossed and connected pairs of rods I I J J, said rods I I converged and connected at the front at i', and connected by a cross-bar, i^2, at their separated back ends, a top-sail, N, on the roof-frame, hangers K, pivoted to the roof-frame, a platform, L, pivoted on the hangers, and a rudder comprising a frame, S, fitted loosely in the roof-frame bar i^2, a fabric, T, on the frame S, and elastic connections, as T' T², holding the rudder in normal position and within reach of the aeronaut on the platform L, substantially as shown and described.

16. The propeller B, made with a roof-frame comprising crossed and connected pairs of rods I I J J, said rods I I converged and connected in front at i', and connected at their separated rear ends by a cross-bar, i^2, rods j' j', connecting the ends of the transversely-bowed rods J J, truss-cords j j, connecting the ends of the bowed rods J J transversely of the propeller-cords n n', connecting the rods I j', a top-sail, N, stretched over the roof-frame rods and the cords n n', hangers K, pivoted to the roof-frame, a platform, L, pivoted to the hangers, cords o o o', connecting the roof-frame with the platform, a sail fabric, O, stretched over the platform-frame and cords o o o', and a rudder comprising a frame, S, a fabric, T, stretched thereon, and elastic connections T' T², holding the rudder in normal position on the roof-frame and within reach of the aeronaut on the platform L, substantially as shown and described.

17. The propeller B, made with a roof-frame, a top-sail stretched thereover, and fins or wings r, held at the front of the top-sail or its frame to catch the wind, substantially as shown and described.

18. The propeller-rudder comprising a frame, S, having shoulders, and fitted loosely in the roof-frame of the propeller, a fabric, T, on the frame S and projecting beyond the roof-frame sail of the propeller, and longitudinal and transverse elastic bands T' T², connected to the roof-frame and the rudder-frame, the said transverse bands acting on the inner end of the frame S beyond its point of connection with the roof-frame, substantially as shown and described.

19. The flying-sail suit C, comprising fabric layers U V, connected to provide a body space, u, a head-pocket, u', provided with eye and mouth holes u^4 u^5, arm-holes u^2, leg-holes u^3, arm-pockets v', and leg-pockets v^2, and a suspending cord or rope, substantially as shown and described.

20. The flying-sail suit C, comprising connected fabric layers U V, provided with body, head, arm, and leg receiving pockets and eye and mouth holes, substantially as specified, and a suspending-structure comprising a dorsal fabric connected to the fabric U, to give broad area of support to the aeronaut, and a rope connected to the dorsal fabric, substantially as shown and described.

21. The flying-sail suit C, comprising fabric layers U V, connected to provide a body space, u, a head-pocket, u', provided with eye and mouth holes u^4 u^5, arm-holes u^2, leg-holes u^3, arm-spaces v', leg-spaces v^2, and a dorsal fabric, W, comprising sides w w, connected at the back of the fabric U in the line of the aeronaut's body, and comprising sides w w, joined at the front w' and open at the back to catch the wind, substantially as shown and described.

22. The sail structure D, comprising a spar, d, a crossed rope, as E², connected thereto, and four angular sails, d' d^2 d^3 d^4, connected at one edge to the spar and rope and joined at their meeting edges at the center of the sail and converging to a point, d^5, at the center and other end of the sail structure, and stays d^6, connecting the outer corners of the sails, substantially as shown and described.

WILLIAM BEESON.

Witnesses:
B. E. NELSON,
H. K. SELOVER.