V. C. DE YBARRONDO.

CAPTIVE AIRSHIP MECHANISM.

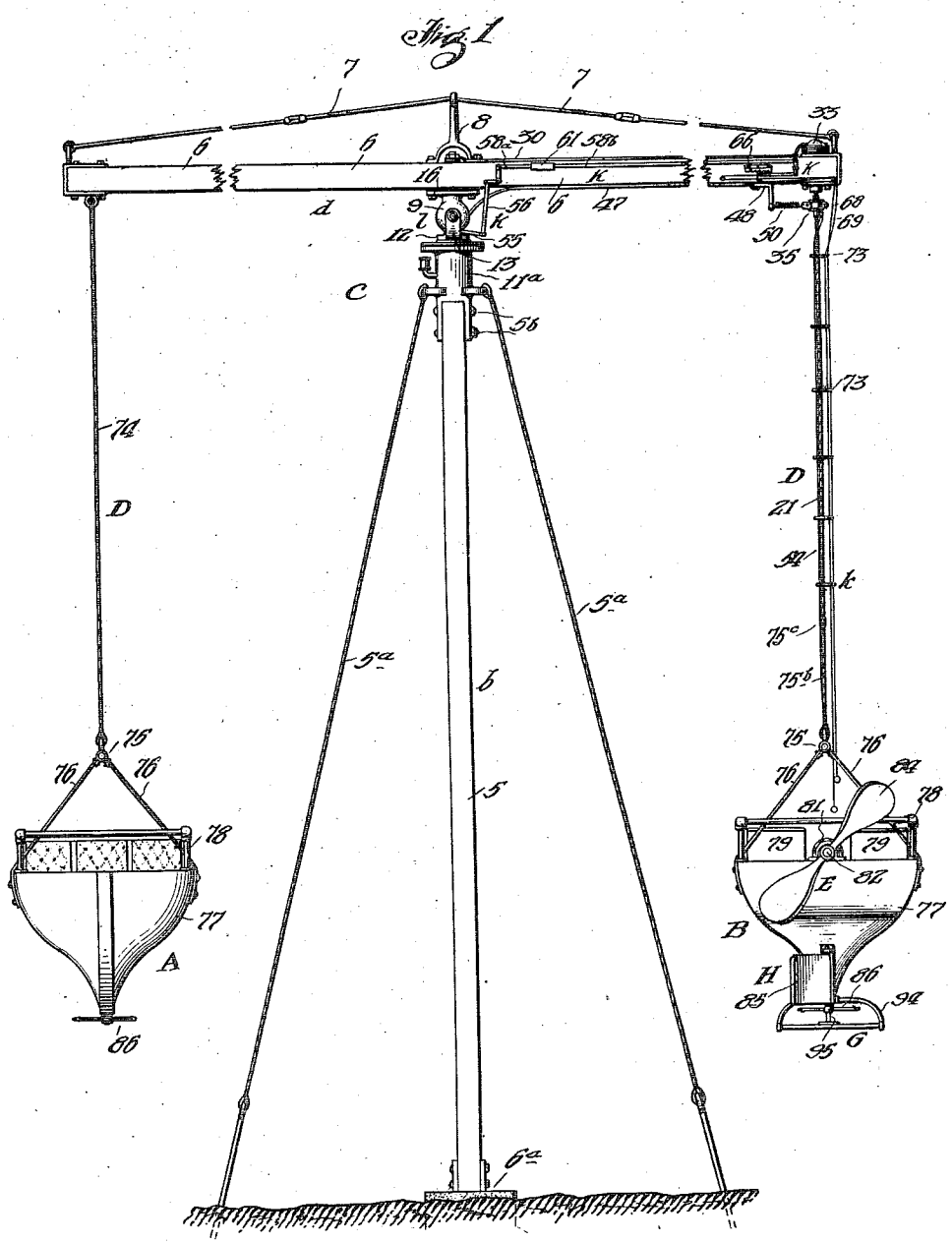
APPLICATION FILED JUNE 14, 1909.

973,398.

Patented Oct. 18, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2

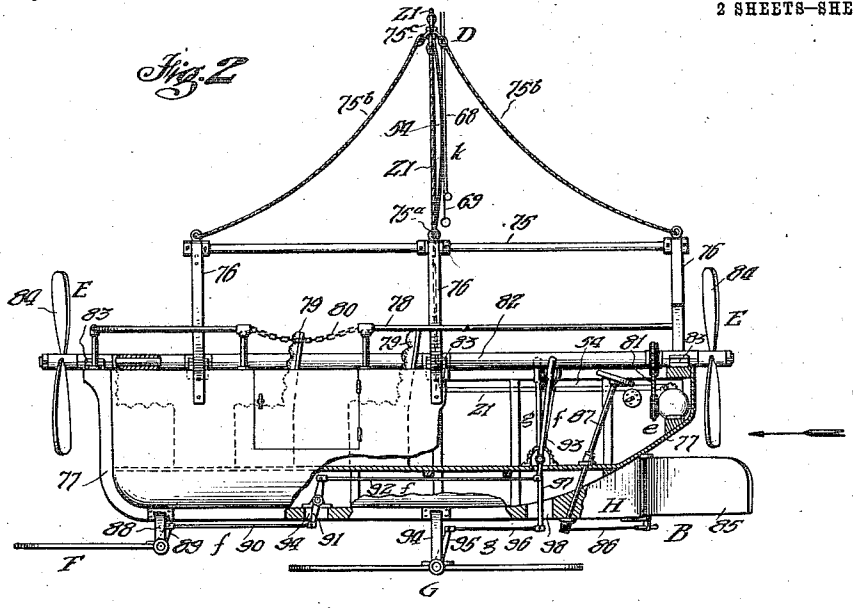


Fig. 3

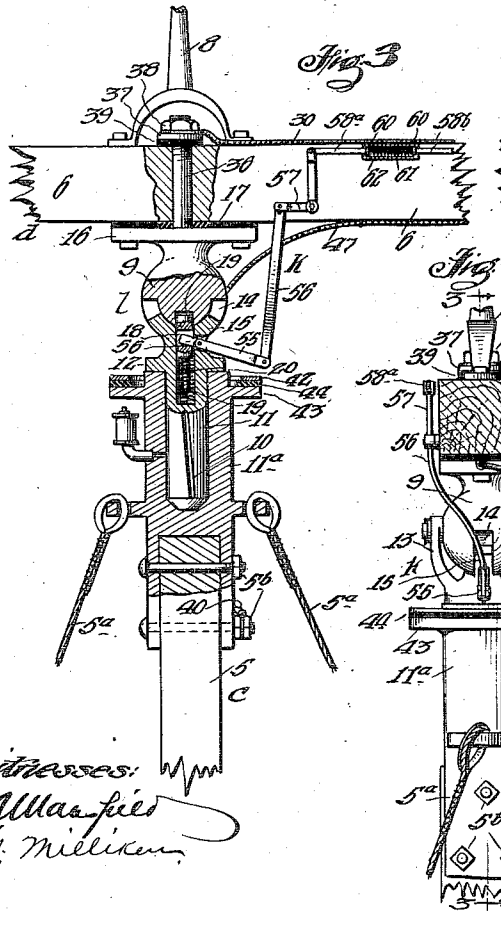
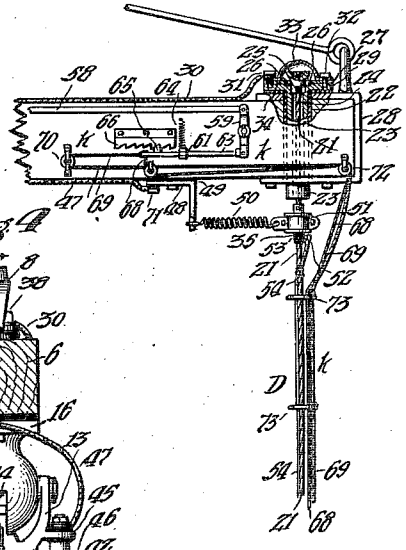


Fig. 4



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CAPTIVE AIRSHIP MECHANISM.

973,398. Specification of Letters Patent. Patented Oct. 18, 1910.

Application filed June 14, 1909. Serial No. 502,166.

To all whom it may concern:

Be it known that I, VINCENT C. DE YBARRONDO, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Captive Airship Mechanism, of which the following is a specification.

This invention relates to air-ships, and more particularly to captive air-ship mechanism comprising one or more air-ships and means for sustaining or suspending the same for movement within the limits of a predetermined course of travel.

The invention has for its object to provide mechanism of the character set forth which will be superior with respect to the useful, entertaining, instructive and pleasurable nature of its operation, which will be positive and safe in operation and convenient in control, and which will be generally superior in point of serviceability and efficiency in carrying out the objects for which it is designed and adapted.

The invention consists in the novel provision, construction, combination, association and relative arrangement of parts, members and features, all as hereinafter described, shown on the drawings, and finally pointed out in claims.

In the drawings:—Figure 1 is an elevation, partly broken away for clearness of illustration, of captive air-ship mechanism embodying the invention; Fig. 2 is an enlarged detail longitudinal side view, partly in section and partly broken away, of one of the air-ships utilized in carrying out the invention; Fig. 3 is an enlarged detail elevation, partly in section and partly broken away, of means for sustaining the air-ships and for controlling the movement thereof; and, Fig. 4 is a view similar to Fig. 3, and taken in a plane of vision at right angles to that of Fig. 3; Fig. 3 is in the main a section taken upon the line 3—3, Fig. 4.

Corresponding parts in all the figures are denoted by the same reference characters.

Referring with particularity to the drawings, A and B designate air-ships organized for operation and control according to the invention, and C designates means for supporting or sustaining the same; said latter means comprising a tower or upright *b* and a transverse member *d* disposed at the upper portion of said tower or upright and from which the air-ships are directly suspended by suspension means D. In the drawings but two of the air-ships are disclosed, one of the same, namely the air-ship B, being shown as provided with operating means or propulsion means E. The said propulsion means serve not only to impel the air-ship provided with the same through the course predetermined by the suspension means D and the transverse member *d;* but both air-ships A and B are impelled jointly by said propulsion means, the transverse member *d* serving as a common support for both air-ships, and being movably mounted upon the tower *b*.

F and G designate respectively aeroplanes carried by the air-ship B, controlling means *f* and *g* respectively being provided for determining and maintaining the positions of said aeroplanes relative to the transverse longitudinal plane of the air-ship; to the end that the flight or normal course of travel of the air-ship may be varied by the production of irregularities of movement which, under certain conditions, will be participated in by the air-ship A, to a certain degree.

H designates steering means for the air-ship B, the same being adapted to act with or independently of the aeroplanes F and G, to cause variations in the course of travel of the air-ship B, with relation to that normally followed. The air-ship A may also be provided with steering means H, if desired.

K designates operative connection between the tower *b* and the transverse member *d*, and *k* designates controlling means therefor, the latter extending to the air-ship B for convenient manipulation by a passenger therein.

Propulsion means E of the air-ship B are shown as comprising an electric motor *e* which is served with energizing current by suitable conductors accommodated by and partly incorporated in the tower or upright *b* and the transverse member *d*, all as hereinafter fully set forth.

A preferred form of construction and inter-relation of parts, members and features embodying the invention, as shown in the drawings is as follows:—The upright or tower *b* may consist of a central wooden support 5 having lateral braces 5^a and firmly seated at its lower end upon a base 6^a, and so located as to permit the transverse member *d* and the air-ships suspended therefrom to be operated without interference by or

with surrounding objects. The transverse member *d* likewise consists of a wooden beam 6. It is manifest that a plurality of such transverse members *d* may be jointly implied, the same being joined together centrally to produce radial arms for the suspension of such sets of air-ships A and B. This plural provision of transverse members would constitute mere duplication of parts and is not illustrated in the drawings.

Tension rods 7 may be provided for the transverse member *d*, the same being connected at their inner ends with an upright or post 8 disposed centrally of the beam 6, and the outer ends of the rod 7 being connected respectively with the outer ends of said beam.

The operative connections K between the tower *b* and the transverse member *d* include means for supporting the latter upon the former, such means comprising a universal joint *l* one member of which, 9, is connected with the beam 6, and the other member of which, 10, is connected with the upright 5. The member 10 consists of a vertical cylindrical bearing received in a suitable chamber 11 formed in a cap piece 11^a secured to the upper portion of the upright 5, as by bolts 5^b, and having an annular flange 12 bearing upon the top of said cap piece 11^a. A yoke consisting of curved arms 13 projects upwardly from the flange 12 and embraces the member 9 of the universal joint 11, said member 9 consisting of a sphere having a lower segmental groove or chamber 14 which receives a similarly formed saddle 15 disposed between the arms 13 in a plane cutting at right angles the plane in which lie said arms 13. The arms 13 have each a pivotal connection with the sphere 9 at diametrically opposed points, as at 16, whereby the sphere 9 is free to swing in the plane of the saddle 15 within limits set by the dimensions of the chamber 14 and of the saddle 15, the relative dimensions of said chamber and saddle being such as to permit the sphere 9 and the beam 6 which rests upon the same to oscillate in opposite directions to a predetermined degree. A plate 16 is formed upon or secured to the sphere 9, midway between the extremities of the chamber 14; and said plate 16 is bolted to the center portion of the beam 6 at the lower surface of the same, an insulating sheet or strip being interposed between the plate and beam. The permitted oscillation of the sphere 9 between the arms 13 and upon the saddle 15, together with the permitted rotation of the bearing 10 which raises the arms 13 and saddle 15, provide for both oscillation of the beam 6 in a vertical plane and rotation of said beam in a horizontal plane together with movement in combination of such oscillation and rotation. The oscillation last referred to is prevented, normally, by locking means comprising a bolt or pin 18 fitting a chamber 19 formed centrally of the saddle 15 and extending within the lower portion of the sphere 9 at a point midway of the ends of the chamber 14. Said locking pin 18 is normally maintained in projection within the chamber 19 by a spring 20 engaging the lower portion of the pin and accommodated within a downward extension of the chamber 19 within the bearing 10, all as shown in Fig. 3. The controlling means *k* of the operative connection K will be hereinafter described in detail.

The suspension means D are utilized as one member of an electrical path to and through the electric motor *e* of the propulsion means E of the air-ship B. To that end, and to insulate the metallic cable 21 which directly supports the air-ship B, from the beam 6 and the other parts connected therewith, I provide a tubular insulator 22 at one end of the beam 6, and extending vertically through the same. Within the insulator 22 fits a sleeve 23 provided with a central orifice 24 and having a flange 27 at its upper portion, immediately above the insulating plate 29. The conical end piece 25 is revolubly mounted among ball bearings 26 mounted in a race-way plate 34 disposed upon the flange 29. A circuit wire 30 which is looped along the top of the beam 6 connects with a binding screw 31 secured to the plate 34 and flange 29; said binding screw 31 and a holding screw 32 serving to secure a protective cap 33 over the conical bearing portion 25 and the balls 26 and race-way plate 34 which confines the ball bearings to their race-way. The metallic supporting cable 21 is connected with the lower end of the conical end piece 25 and extends through the sleeve 23 to beneath the beam 6, and connected within a cylindrical insulator 35. The circuit member 30 extends from the binding screw 31 to a binding post 36 which projects vertically through the center portion of the beam 6, rising from the plate 16. The upper end of the post 36 is threaded and provided with a washer 37 and a nut 38 between which one end of the circuit wire 30 is secured. An insulating ring 39 is passed over the upper end of the binding post 36 beneath the washer 37. Through the binding post 36, the plate 16, the metallic sphere 9, the metallic saddle 15, the metallic flange 12, and the metallic cylindrical bearing 10, the circuit member 30 is electrically connected with the cap piece 11^a. From a suitable source of electrical supply, not shown, another circuit member or wire 40 extends to the cap piece 11^a with which it is connected by one of the bolts 5^b which bind the cap piece to the upright 5. From the same source of electrical supply, another circuit wire 41 extends to an annular contact plate or arma-

ture ring 42 supported upon an annular flange 43 surrounding the upper portion of the cap piece 11^a, said plate or ring 42 being insulated from the flange 43 by a ring 44 of suitable material. One of the arms 13 of the yoke which pivotally supports the sphere 9 is provided with an insulating bracket 45 which supports a contact point or brush 46 which is arranged to traverse the plate or ring 42 in the rotation of the sphere 9 and bearing 10. From the brush 46 extends a circuit wire 47 which is supported beneath the beam 6 and connects at its outer end with a terminal bracket 48 secured to the beam 6 and suitably insulated therefrom by a sheet or strip 49. A coiled circuit wire 50 extends from the bracket 48 to a metallic collar 51 rotatable upon the insulator 35 and suitably electrically connected with a binding screw 52 upon an insulating collar 53 revolubly surrounding the cable 21 beneath the insulator 35 and connected therewith. An insulated circuit wire 54 extends downwardly to the air-ship B, and to the electric motor *e*, with which the cable 21 is also electrically connected, as shown in Fig. 2.

The controlling means *k* for the operative connection K between the tower *b* and the transverse member *d*, comprise an intermediately fulcrumed lever 55 mounted beneath the saddle 15 and projecting at one end into a transverse opening 56 in the pin 18; the other end of said lever 55 being connected by an elongated link 56 with one arm of the bell crank 57, the other arm of which is connected by a link rod 58 with a rocking lever 59; the bell crank 57 being mounted adjacent to the center portion of the beam 6, and the rocking lever 59 being mounted adjacent to the outer end of said beam, and both on one side of the same.

In order to protect the above-described parts against fracture in the oscillation of the beam 6, and to obviate blocking of such oscillation, the link rod 58 is formed in two sections, 58^a and 58^b respectively, having enlarged heads 60 playing within a sleeve 61 within which a coil spring 62 is interposed between the heads 60. For actuating the rocking lever 59, a rod 63 is pivotally connected with one end of the same and extends beneath and normally in parallelism with the link rod 58, being connected therewith by a contractile spring 64 which tends to hold a dog 65 upon the same in contact with a ratchet plate 66 mounted upon the beam 6. The spring 64 is provided with a sleeve 67 loosely fitting the rod 63. The rod 63 is directly actuated by two flexible members or cords 68 and 69 respectively, which are respectively trained about pulleys 71 and 70, the former of which is connected with the beam 6 beneath the ratchet plate 66, and the latter of which is connected with the beam 6 at a point between the ratchet plate 66 and the central portion of the beam 6. From the pulleys 71 and 70 respectively the cords 68 and 69 extend to a common pulley 72 upon the beam 6 outwardly of the rocking lever 59 whence they descend to the air-ship B into position for convenient manipulation by a passenger thereof. A plurality of rings 73 carried by one of the cords 68 and 69 and surrounding the other of said cords as well as the cable 21 and the circuit wire 54 serve to confine all of said devices as against separation of the same, leading them to the air-ship B.

The suspension means D for the air-ship A comprises a single cable 74 connected with the beam 6 at the end thereof opposite to that with which the cable 21 of the air-ship B is connected. The suspension means D for both air-ships comprises also a longitudinal rail or tubular rod 75 extending above the respective air-ship body 77 and connected with the opposite sides of the body 77 thereof by pairs of suspenders 76; the cable 21 of the air-ship B is connected centrally with the rail 75, as at 75^a and loose cords or cables 75^b are looped from the ends of the rail 75 into connection with the cable 21, as at 75^c, at a point some distance above the rail 75. Each body 77 may be provided with a protective side railing or guard rail 78, and may be open at one side to permit entrance and exit of passengers to and from seats 79, such open side portion being closed by a chain 80.

The motor *e* of the propulsion means E is belted, as at 81, in connection with a drive shaft 82, journaled as at 83 in the end portion of the body 77 and provided at its ends with propellers 84.

The steerage means H may comprise a rudder 85 arranged at the rearward end of the body 77 and connected by a flexible cable or cord 86 with an upwardly extending steering post 87 arranged at the rearward end of the body 77.

The aeroplane F is pivotally supported at its rearward end portion at the forward end of the body 77, by a hanger 88, and is provided with an upwardly extending arm 89 from the upper end of which a link rod 90 extends to a rocking lever 91 from which a link rod 92 extends to a controlling lever 93 adjacent to the steering post 87. The aeroplane F lies normally in a plane slightly lower than that of the bottom of the body 77, and the link rod 90 extends rearwardly from the same beneath the bottom of the body 77, the rocking lever 91 playing within an opening 94 in the bottom of said body.

The aeroplane G is substantially centrally pivotally supported by a hanger 94 beneath the body 77 at the center portion thereof, and is provided with an upwardly project-

ing arm 95 connected by a link rod 96 with a controlling lever 97 projecting through an opening 98 in the bottom of the body 77, and arranged adjacent to the controlling lever 93. Both aeroplanes lie normally in horizontal planes or planes parallel with the bottom 77 and may be manipulated by their controlling levers 93 and 97 so as to vary the angle of incidence of the air thereupon, during the flight of the air-ship B to cause the dip and rise of the air-ship and the oscillation of the beam 6, causing resultantly the dip and rise of the air-ship A which is shown as not provided with the aeroplanes nor with the propulsion means E. The air-ship A may, however, be provided with steering means H.

The operation, method of use and advantages of the improvements in captive air-ship mechanism constituting the invention will be readily understood from the foregoing description, taken in connection with the accompanying drawings and the following statement: The air-ships having received their passengers, one or both of the same, the propulsion means E are set in motion through energization of the electric motor *e*, which is supplied with current through the circuit wire 54 and the metallic suspension cable 21, the same being respectively served with current through the circuit wire 47 and the circuit wire 30, and the intermediate electrical connections above described. The circuit wire 47 is connected with the source of supply by the brush 46, ring 42, and circuit wire 41; and the circuit wire 30 is supplied with current through the post 36, the sphere 9, the saddle 15, the bearing 10, the cap piece 11^a and the circuit wire 40. The conical end piece 25 freely turns upon the ball bearings 26 at the end of the beam 6. As the air-ships revolve about the tower *b*, the aeroplanes F and G may be manipulated by the controlling levers 93 and 97 respectively, to cause the air-ship B to dip and rise, the locking pin 18 having been released from the sphere 9 through the instrumentality of the rocking lever 59, and the cord or cable 69. The pin 18 is maintained in depressed position by the dog 65 and ratchet 66. When it is desired to again lock the sphere in fixed position of rotation, so that the transverse member *d* will rotate in a horizontal plane, the cord or cable 68 is manipulated to disengage the dog 65 from its advanced position on the ratchet 66, and the rocking lever 59 is restored to the position clearly shown in Fig. 3 in the drawings, the dog 65 again engaging with the ratchet, and the pin 18 being engaged with the sphere 9 through the intermediate parts, including the lever 55 and bell crank 57. The rudder 85 in each car A and B may be manipulated to supplement the action of the aeroplanes, in deflecting the air-ships from a regular circular course of travel.

I do not desire to be understood as limiting myself to the specific construction and arrangement of parts and features shown and described; but reserve the right to vary the same, in adapting the improvements to varying conditions of use, without departing from the spirit of the invention and the terms of the following claims.

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

1. A plurality of jointly movably mounted air-ship bodies, propulsion means for the same mounted upon one of the same, means confining the air-ship bodies to a normal course of travel, and means acting directly upon one of the air-ship bodies for varying the course of travel of both of the same.

2. A plurality of jointly movably mounted air-ship bodies, propulsion means for the same mounted upon one of the same, means confining the air-ship bodies to a normal course of travel, and means acting directly upon one of the air-ship bodies for varying the course of travel of both of the same; said means comprising an aeroplane, and controlling means for adjusting the same.

3. An upright support, a transverse member rotatably mounted thereupon and capable of oscillation in a plane at an angle with the plane of rotation thereof, means for locking said transverse member against oscillation, an airship body connected with said transverse member, and propulsion means for said air-ship body.

4. An upright support, a transverse member rotatably mounted thereupon and capable of oscillation in a plane at an angle with the plane of rotation thereof, means locking the transverse member against oscillation, an air-ship body connected with the transverse member, means for propelling the air-ship body, and means extending to the air-ship body controlling said means for locking said transverse member against oscillation.

5. An upright support, a transverse member rotatably mounted thereupon and capable of oscillation in a plane at an angle to the plane of rotation thereof, a plurality of air-ship bodies connected with said transverse member, propulsion means for one of said air-ship bodies, means for locking said transverse member against oscillation, and controlling means for said locking means extending to an air-ship body.

6. An upright support, a transverse member rotatably mounted upon said upright support and capable of oscillation in a plane at an angle to the plane of rotation thereof, an air-ship body connected with said transverse member, propulsion means for said air-ship body whereby the same is operated

in a normal course of travel, and means mounted upon said air-ship body for causing the oscillation of said transverse member and the dip and rise of said air-ship body.

7. An upright support, a transverse member rotatably mounted upon said upright support and capable of oscillation in a plane at an angle to the plane of rotation thereof, an air-ship body connected with said transverse member, propulsion means for said air-ship body whereby the same is operated in a normal course of travel, and means mounted upon said air-ship body for causing the oscillation of said transverse member and the dip and rise of said air-ship body; said latter means comprising an aeroplane, and means for adjusting the aeroplane under the control of an occupant of the air-ship body.

8. An upright support, a transverse member rotatably mounted thereupon and capable of oscillation in a plane at an angle with the plane of rotation thereof, an air-ship body connected with said transverse member, and propulsion means for said air-ship body; there being operative connections between said upright support and said transverse member comprising a bearing rotatable upon said upright member and provided with a yoke, a sphere connected with said transverse member and pivotally supported by said yoke, and a guide connected with said bearing and entering a curved channel in said sphere.

9. An upright support, a transverse member rotatably mounted thereupon and capable of oscillation in a plane at an angle to the plane of rotation thereof, an air-ship body connected with said transverse member, propulsion means for said air-ship body, and operative connections between said upright support and said transverse member; said operative connection comprising a bearing mounted upon said upright support and provided with a yoke, a sphere connected with said transverse member and pivotally supported by said yoke, a guide connected with said bearing and entering a curved channel in said sphere, a locking pin mounted in a chamber in said bearing, and means for causing said pin to enter and withdraw from a chamber in said sphere; said latter means extending to said air-ship body for control by an occupant thereof.

10. An upright support, a transverse member rotatably mounted thereupon and capable of oscillation in a plane at an angle to the plane of rotation thereof, an air-ship body connected with said transverse member, propulsion means for said air-ship body, and operative connection between said upright support and said transverse member; said operative connection comprising a bearing mounted upon said upright support and provided with a yoke, a sphere connected with said transverse member and pivotally supported by said yoke, a guide connected with said bearing and entering a curved channel in said sphere, a locking pin mounted in a chamber in said bearing, and means for causing said pin to enter and withdraw from a chamber in said sphere; said latter means extending to said air-ship body for control by an occupant thereof and comprising a rocking lever, a spring controlled rod connected with said rocking lever and provided with a dog, a ratchet plate with which said dog co-acts, operative connection between said locking pin and said rocking lever, and a pair of oppositely acting flexible members extending from said spring controlled rod to said air-ship body.

11. An upright support, a transverse member rotatably mounted thereupon, an airship body, a metallic cable whereby said air-ship body is suspended from said transverse member, operative connection between said upright support and said transverse member, propulsion means for said air-ship body consisting in part of an electric motor, and two independent electrical paths extending to said electric motor; one of said electrical paths including said metallic suspension cable and said operative connection between said upright support and said transverse member.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

VINCENT C. DE YBARRONDO.

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