C. E. S. & F. R. BURCH.

FLYING MACHINE.

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968,918.

Patented Aug. 30, 1910.

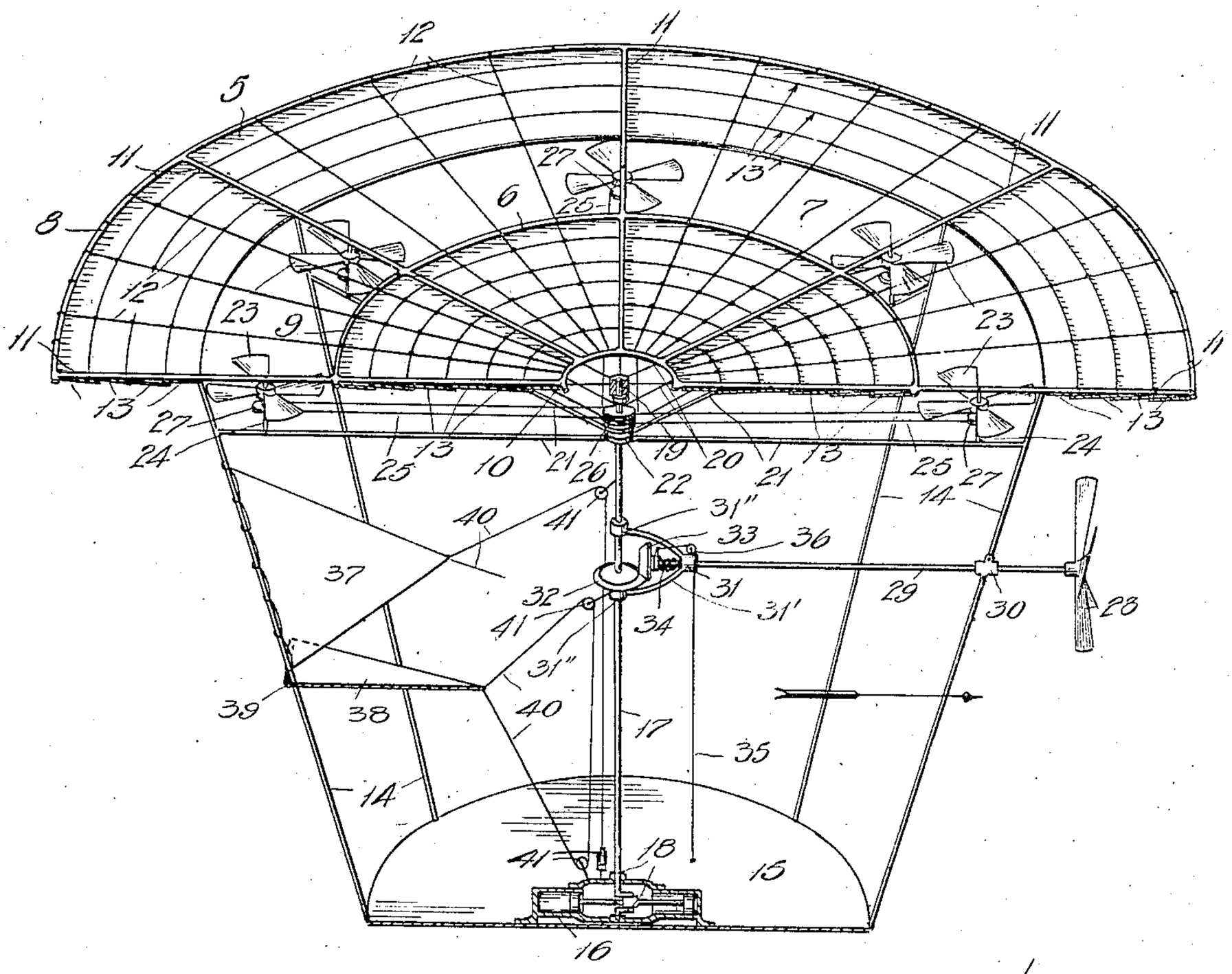

FIG. 1

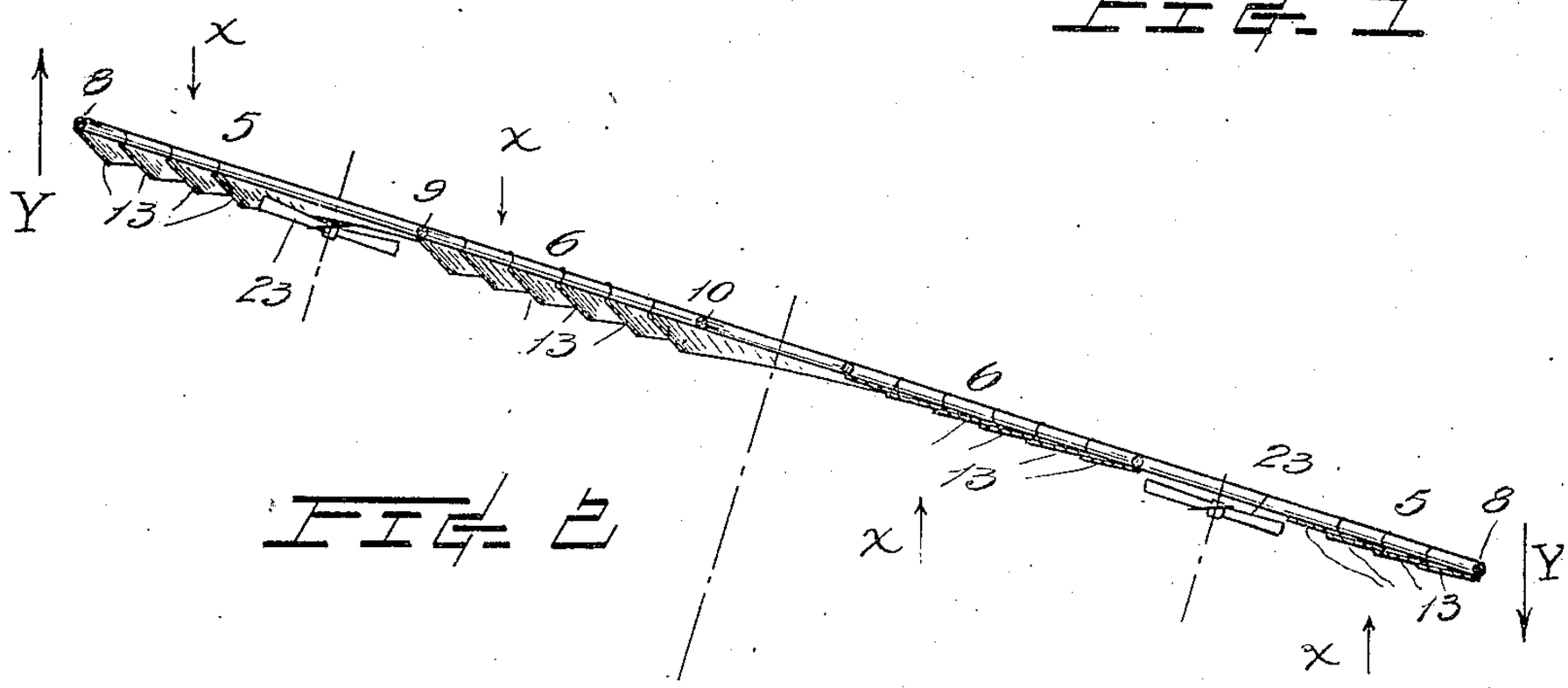

FIG. 2

WITNESSES:

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FLYING-MACHINE.

968,918. Specification of Letters Patent. Patented Aug. 30, 1910.

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To all whom it may concern:

Be it known that we, CHARLES E. S. BURCH and FREDERICK R. BURCH, citizens of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Flying-Machines, of which the following is a specification.

This invention relates to aerial conveyances; and its object is to produce apparatus of this nature which will be effective in ascending or descending in substantially vertical planes; which will be automatic in its maintenance in an upright position subject, however, to deflection through the agency of special steering devices under the control of the operator, and which is capable of locomotion in horizontal, or substantially horizontal directions.

With these ends in view the invention consists in the novel construction and adaptation of devices, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a view partly in perspective and partly in longitudinal vertical section of a flying machine embodying our invention. Fig. 2 is a fragmentary vertical cross sectional view of the same which is represented in a tilted position to evolve a principle employed in the carrying-out of this invention.

The reference numerals 5 and 6 respectively designate two members of a parachute, or annuli, as they will be hereinafter designated, which are disposed concentrically of each other and have such relative diameters as to afford an intervening space 7. For the support of these annuli there is provided a framework comprised of hoops 8 and 9, respectively disposed to be at the outer peripheries of said annuli, and another hoop 10 at the inner periphery of the annulus 6. Rigidly connecting said hoops are radially arranged spokes 11 with correspondingly disposed intermediate wires 12. Each said annulus is comprised of a plurality of rings 13 formed of membranous material which are respectively seized, or otherwise secured at intervals about their outer peripheries either to the hoops or to the aforesaid spokes or radial wires at the intersections therewith, and are disposed at the underside of these frame elements. The widths of the rings are such that the outer seized edges of the same in the outer and inner annuli will overlie the inner unconnected edges when they are in normal condition and bear against the framework, as represented in Fig. 1 and at the right hand side of Fig. 2. Connected with said framework, as by suspending rods 14, is a support 15 to accommodate a suitable motor, indicated by 16, the operator, supplies, etc. The motor drives an upright shaft 17 which is journaled in suitable bearing-boxes, such as 18 at the foot, and 19 at the top end, the latter being secured against lateral movement by stay wires 20 from the hoop 10 while the boxes 18 may be secured to or formed in the motor frame. Subjacent to said framework are radially disposed rods 21 extending from a collar 22, which is loose upon the shaft 17, to the rods 14 and are preferably located in the vertical planes of the respective spokes 11.

Directly below the space 7, which is intermediate the annuli, is a plurality of screw propellers 23, which are mounted upon upright shafts 24 which are journaled in bearings provided in the respective spokes and rods 21. These shafts are rotated in unison from power derived from the shaft 17, as for example by endless belts 25 passing about the driving and driven pulleys 26 and 27, which are fixedly secured to the respective shafts. The function of said propellers is to effect the ascension or to retard the speed of the conveyance in its descent, and it is proposed that they should be continuously actuated, though at a greater or less velocity according to the duty required or to the wish of the operator in the sustaining of the conveyance when the same is making no forward progress and to cooperate with the buoyant power of the planes when in flight or soaring.

To afford means for effecting horizontal advancing movements, a screw-propeller 28 is provided upon a longitudinally arranged shaft 29. This shaft is journaled in suitable bearings such as 30 upon one of the rods 14 and a box 31 which is integral with a frame supported by bracket-arms 31′ from collars 31″ upon the shaft 17. Rotary motion is transmitted between these shafts in any suitable manner, and preferably by friction gear-wheels 32, 33, as illustrated, whereof 32 is fixedly connected to the shaft 17 while the other, 33, is connected to its shaft 29 as by a spline to permit of axial movement of the wheel 33 for its disengagement from the driving element, when the propeller 28 is

to be made inoperative. A spring 34 may advantageously be employed between the bearing 31 and the wheel 33 for normally retaining the latter in engagement with the other wheel, the spring yielding when the wheel 33 is uncoupled by a connected line 35 which passes about a guide sheave 36 to within easy reach of the operator. Steerage is had for the conveyance by any suitable devices such, tentatively, as by sheets 37 and 38 respectively connected along their rear edges to fixed members of the apparatus. One of the rods 14 may serve for the former and a horizontal bar 39, having its ends properly stayed, may serve for the sheet 38. Sheet-lines 40 passing about guide sheaves, designated by 41, may be employed for regulating the angularity of said sheets with respect to a longitudinal vertical plane as to the one, and to a horizontal plane for the other.

In operation, as before alluded to, the propellers 23 are actuated, at a relatively high speed, to elevate the flying machine from the ground and during such upward movement and from the counter-action of the air the inner edges of the parachute-rings are caused to incline downwardly with a corresponding lessening in the resistant force of the air to the uprising of the machine. During such ascension the propeller 28 may, and preferably would be, made inactive by the disengagement of the wheel 33 from its driver 32 through manipulation of the controlling line 35, in opposition to the spring 34. When the machine has surmounted the surrounding objects upon the ground the propeller 28 may be made effective by the operator releasing the line 35 and to cause the forward movement of the machine. When the machine has risen to a determined upon elevation the rotary speed of the propellers 23 may be diminished to allow of the machine dropping sufficiently to flap the rings 13 against the superimposed frame work. By then manipulating the steering sheet 38 the operator can direct the machine so that its forward end will be tilted slightly upward and the parachute-rings will, if the propeller 28 is working, encounter the reactionary flow of the air whereupon said rings will serve to sustain the machine to a greater or less extent according to the speed of flight. Should any cause, as refractive winds, have a tendency to disturb the equilibrium of the machine and cause it to gyrate, as indicated by the arrows Y in Fig. 2, then a resistant air-moment, see darts *x*, will be established which will cause the portions of the rings 13 upon the ascending side of the axis of oscillation to open, while the portions of the descending side will be affected to close against the frame and thereby resist the inclination of the machine. This function which is attainable by our invention we deem to be the desideratum of heavier-than-air flying machines rendering it possible to drive the same even at a slow speed and upon occasion dropping gently to the ground without fear of overturning and as a parachute.

The advantages derived from the construction of a parachute with an intermediate annular space between the members thereof for the accommodation of the screws, is that the power to elevate or sustain the structure is efficiently applied while the spread of surface in the outer member counteracts oscillatory movements tending to disturb the equilibrium of the machine with respect to its stability, and notably so in the descending of the same.

We do not wish to be understood as confining ourselves to the specific structure, form or proportions of any of the parts, nor to the specific arrangement thereof as hereinbefore described and illustrated, as it is evident that in such particulars changes would be made to conform to individual applications and to fulfil the purposes for which the machines are to be employed.

What we claim, is—

1. In a flying machine, the combination with the framework and the sustaining screws rotatably mounted therein, of a parachute comprised of a plurality of rings secured about their outer peripheries to said framework, a propelling screw, and means for driving said screws.

2. In a flying machine, a parachute comprised of a framework and a plurality of membranous members secured about their outer peripheries to the underside of the framework, the inner peripheries of the members being free to swing downwardly from said framework.

3. In a flying machine, in combination with the framework, power devices for effecting the ascension and horizontal propulsion of the machine, and means for steering the latter in vertical and horizontal directions, of means arranged symmetrically of the vertical axis of the machine to resist the tilting of the same in every direction.

4. In a flying machine, in combination with the framework, power devices for effecting the ascension and horizontal propulsion of the machine, and means for steering the latter in vertical and horizontal directions, of means arranged symmetrically of the vertical axis of the machine to resist the tilting of the same in every direction, said means comprising a plurality of annular members secured to the underside of the framework in such a manner that the inner peripheries of the members will be free to swing downwardly from said framework.

5. In a flying machine, the combination with the framework, of a parachute formed of concentrically disposed parts, screws

mounted on upright shafts and located intermediate of said parachute parts, means to rotate said shafts, means to propel the machine in a horizontal direction, and steering means.

6. In a flying machine, the combination of a parachute comprised of members arranged symmetrically in relation to the vertical axis of the machine and a framework whereto said members are secured in such a manner that the tilting of the machine will be opposed through the influence of said members.

7. In a flying machine, the combination with the framework and a parachute comprised of annular shaped members which are secured about corresponding of their edges to said framework, of means for propelling the machine, and steering means.

8. In a flying machine, the combination of the framework, a parachute comprised of a plurality of concentrically arranged elements which are secured to said frame-work, the concentrically arranged sustaining screws, a propelling screw, a motor, mechanical connections between the motor and the screws for rotating the latter, and means under control of an operator whereby the sustaining screws may be rotated independently of the propelling screw.

9. In a flying machine, the combination of the framework, a parachute comprised of concentrically disposed elements, the concentrically arranged sustaining screws, a propelling screw, a motor, mechanical connections between the motor and the screws for rotating the latter, means under control of an operator whereby the sustaining screws may be rotated independently of the propelling screw, and steering means for navigating the machine with respect to horizontal and vertical planes.

10. In a flying machine, a parachute comprised of two members secured to a common framework, one of said members being of an annular shape with its inner diameter greater than the extreme diameter of the other member.

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