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2. SHEETS--SHEET 1.



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Fig. 2.

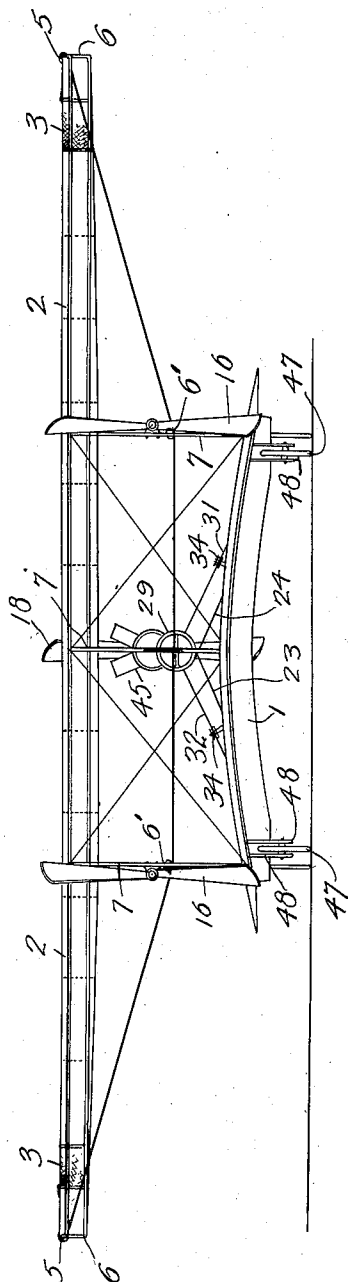
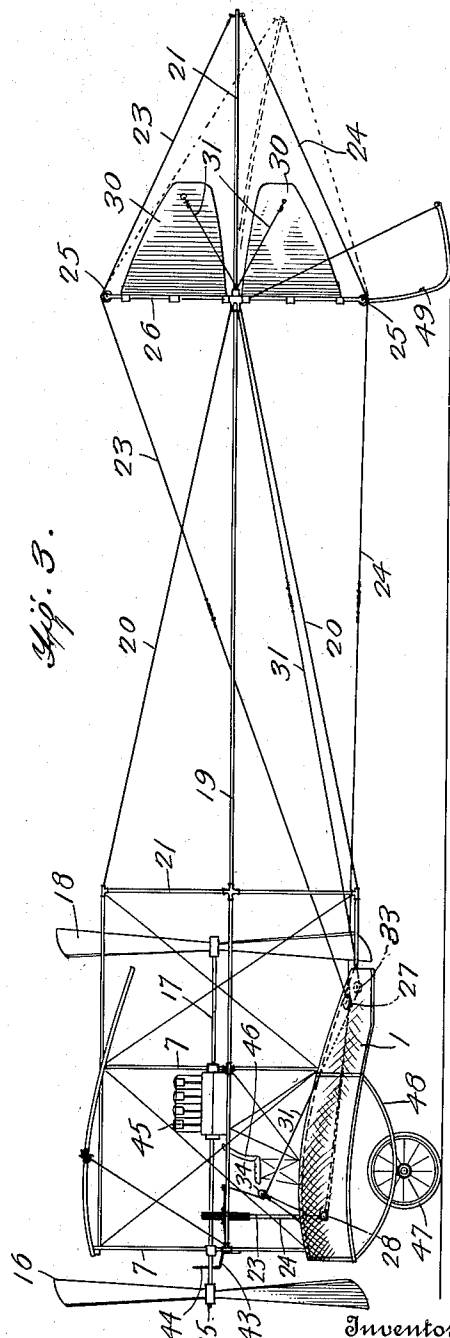


Fig. 3.



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BURT REID, OF THE UNITED STATES NAVY.

FLYING-MACHINE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, BURT REID, of the United States Navy, and a citizen of the United States, have invented new and useful Improvements in Flying-Machines, of which the following is a specification.

The objects, *inter alia*, are: 1. To provide novel, simple, and efficient means for securing lateral balance of the main planes of my airship, by furnishing the upper plane with lateral, expansible wing-tips, whereby either of said tips may be extended, to provide an enlarged surface, and the other tip simultaneously retracted, to provide a diminished surface or area to the air-currents. 2. To provide, at the end of the tail of my airship, a longitudinal balance plane of peculiar and novel structure, in that a portion thereof is flexible; whereby, after said plane shall have been initially manually operated to swing the same up or down on its pivot or hinge, the pressure of the air-current upon the flexible portion of the plane will cause the plane automatically to assume a bowed or curved shape, resulting in increased lift to said plane. 3. To improve the general construction of the tail, which is designed to be very light, but rigid, removable, and thoroughly efficient for the purpose intended. 4. To provide a peculiar and novel disposition of propellers in that, in my airship, there are two propellers in front, which are tractor and pull, and one propeller in the rear, which is thrust, and pushes. 5. To provide a novel and advantageous control of all the planes of my airship, by means of a controlling-wheel reciprocable bodily upon a shaft, upon which it is, also, rotatable, said shaft itself being capable of horizontal swinging movement; and by this controlling-wheel and controlling-shaft all of the planes are governed. This is a very simple, easily-operated, and efficient control. 6. To provide a simple and efficient form of alighting-gear, which is designed to expedite easy landing, with a minimum of jar and like discomfort. 7. To provide means, constituting a range-guide, which are simple and efficient for the purpose intended.

The invention is exemplified in the accompanying drawings, in which:

Figure I is a top plan view of my invention; Fig. II is a front elevation thereof; Fig. III is a side elevation thereof; Fig. IV

is a detail view, in side elevation, partly in section, of the controlling-wheel, of the shaft on which said wheel is rotatable and bodily reciprocable, and of the plane-guys controllable by said wheel and shaft; and Fig. V is a section on the line 5—5, of Fig. IV, looking in the direction of the arrows.

Referring, now, in detail to the drawings: 1 designates a lower, main plane, and 2 an upper, main plane, the length of the former being advantageously one half that of the latter, as clearly shown in Fig. II; which peculiar construction is desirable and efficacious, as, thereby, I secure a greater lift from the top plane, the portions of the upper plane which extend beyond the ends of the lower plane constituting what may be termed wings, 2^a, 2^a, which may be and preferably are demountable or detachable from the remainder of the top plane. Each of these planes, in respect to the rear thereof, preferably droops or curves downward, as clearly shown in Fig. III, for the purpose of increasing the lifting-effect of the air-currents on the planes. Additionally, each plane is advantageously of greatest width in the region of the center thereof, and, thence, of decreasing width to the ends thereof, as shown in Fig. I, thereby giving the greatest lift to the center of the planes, where the heaviest load is and where the greatest lift is, therefore, needed. This construction is advantageous and desirable.

At each end of the top plane 2 is carried an elastic surface, 3, 3, which is capable of being stretched to about twice its natural size, which may be constructed of any suitable elastic material and which may be stretched by lateral-balance guys 4, 4 passing over pulleys 5, 5 on the end bars 6, 6 of the framework of the plane 2; said guys passing, thence, under the plane 2, over pulleys 6', 6', on vertical struts 7, 7, the ends of said guys being secured to an eye 8 on the front end of a controlling-wheel shaft 9 (see more particularly Fig. IV) pivoted, at its rear, as at 10, on a fixed support 11, so as to have a swinging movement, in a horizontal plane, on said pivot. It will thus be seen that, by this construction, lateral balance of the planes 1 and 2 may be maintained: When the airship tilts laterally, the aviator swings the shaft 9 toward the high side of the airship (that is, he swings the shaft 9 to the right or to the left, as the

case may be), thus pulling on the guy 4 attached to the elastic plane-tip 3 on the low side and causing said elastic plane-tip 3 on the low side to stretch and thus increase the area or extent of surface presented to the air at this end of the plane 2; said movement of the shaft simultaneously easing tension on the guy 4 attached to the elastic plane-tip 3 on the high side, and thus allowing the elastic surface, or elastic plane tip 3, on said high side to contract automatically, thus decreasing the area or extent of surface presented to the air on the high side. By this means, the airship will be righted. It will be understood, of course, that, normally, both of the elastic plane- or wing-tips 3 are stretched somewhat, so that, when the guy 4 attached to either one is slackened, the wing-tip may retract.

Extending longitudinally of the top plane 2, and disposed one at the front edge and one somewhat removed from the rear edge, are two bars 12, 12 constructed of some suitable material presenting a maximum of strength with a minimum of weight, such as spruce. At the outer and inner ends of the wings 2^a, 2^a (the wings being, as before stated, those portions of the upper plane 2 which extend beyond the ends of the lower plane 1) and at the center of the plane 2 are wing-shapers 13 (in this instance, five in number) extending transversely of the plane 2 and of the wings 2^a, 2^a carried thereby, said wing-shapers being desirably constructed of birch or elm, and preferably somewhat bow-shaped. Also disposed transversely of the plane 2, at suitable intervals, are a plurality of wing-ribs 14, preferably of light steel. I have found forty of these ribs to be a desirable number; but, of course, the number necessarily depends upon the length of the plane. The lower plane 1 is similarly constructed, excepting that it does not have elastic wing-tips. The planes are constructed of suitable material, which is secured to the wing-shapers 13, the wing-ribs 14, the longitudinal bars 12, 12, and the end bars 6, 6 in any suitable manner. Connecting the top and bottom planes 1 and 2 are vertical struts 7.

Mounted in suitable bearings carried by two of the struts 7 are two propeller-shafts 15, 15 carrying at the front ends thereof propellers 16, 16, preferably having two blades each. These two front propellers are fast on their shafts, which turn in opposite directions, causing the propellers to turn in opposite directions. By this construction, I eliminate the objectionable gyroscopic effect found in most flying machines.

Mounted in bearings in the rear strut 7 which is medially of the length of the plane 1 is an engine-shaft 17, fast on the end of which is a propeller 18. I find that this arrangement gives a greater amount of effi-

ciency, without materially increasing the motor-power. The two front propellers 16, 16 are tractor and pull, while the rear propeller 18 is thrust, and pushes. I find this a very desirable construction.

The different parts going to make up the tail of my airship will now be described: Extending rearward from two of the rear struts 7, and in a plane transversely thereof, are two horizontal tail-bars 19, 19, constructed of some suitable light, but strong material, for instance spruce, and stayed in an appropriate manner so that they may be rigid, as by braces 20, 20 passing over vertical spreader-bars 21; said tail-bars 19, 19, with their braces 20, 20, being demountable or detachable. At the rear end of the tail-bars 19, 19, fast on a cross-shaft 21, is a longitudinal balance plane 22, peculiarly constructed as follows: Desirably for about one-third of its area, this plane is flexible and resilient, the remaining two-thirds (measuring from the shaft 21) being rigid. Shaft 21 is rotatable in bearings in the tail-bars 19, so as to permit movement of said plane 22, either up or down, on said shaft as a pivot. A guy 23 is secured to the top of said plane 22, and another guy 24 to the bottom thereof, said guys passing over pulleys 25, 25 on the top and bottom of a vertical rod 26, thence to the front of the airship, over pulleys 27, thence to a controlling-wheel 29, to which they are secured on opposite sides thereof, whereby, as said wheel is rotated, either to the right or to the left, one of the guys 23 or 24 is tightened and the other one slackened, and the plane 22 is caused to swing upward or downward, as the case may be, causing the airship to ascend or descend, as desired. When the plane 22 is, as described, manually turned either up or down, the pressure of the air-current on the flexible front of the plane 22 causes said plane to assume a bowed or curved shape, thus insuring that the air-current shall exert considerably more lifting influence or power on the plane in its curved or bowed shape, than if said plane remained a flat, uncurved surface.

Pivoted or hinged on the rod 26 are two lateral-turning planes 30, 30, constructed similarly to the plane 22, and to which are secured, on each side thereof, guys 31, 32, which lead toward the front of the flying-machine, passing over intermediate pulleys 33 and 34 and over pulleys 35, 35 disposed on the shaft 9 at the pivotal end thereof. The end of the guy 32 is secured to one ear 36 of a slide-member 37 reciprocable in a longitudinal groove 38 in the shaft 9. The other guy, 31, passes through another groove 39 running parallel with and forming an extension of the groove 38, and over a pulley 40 on the other end of said shaft 9, the end being secured to the other ear 41 of said

slide-member 37. The wheel 29 has a hub 42, which encircles the shaft 9 and is disposed between the ears 36, 41 of the slide-member 37. It is understood, of course, that the body of the slide-member is entirely seated in the groove 38, whereby the hub 42 of the wheel 29 is free to revolve upon said shaft 9. In operation, when the wheel 29 is pulled toward the aviator, or pushed away from him, one of the guys 31 or 32 is tightened and the other slackened, thus turning the planes 30, 30 to the right or to the left, as the case may be, and causing the airship to turn to the right or to the left, as the case may be.

Secured to the front strut 7 which is disposed medially of the length of the plane 1 is a member 43, which may be formed as an angle-iron, as shown, and which acts as a range-guide. The range-guide is disposed directly in front of the aviator, who selects some landmark or object ahead of the airship, toward which he wishes to fly. The angled end 44 of the range-guide is in a direct line with the strut 7, to which said range-guide is secured; thus, when the airship turns either to the right or left, it is immediately apparent to the aviator, as the bent end 44 of the range-guide will be out of line with the landmark or object in question.

45 represents, diagrammatically, the motor, and 46 the aviator's seat.

The alighting-gear comprises, preferably, the following mechanism: Two wheels 47, 47, are disposed beneath the bottom plane 1, and are carried by bow-shaped somewhat resilient skids 48 secured to the bottom

plane 1, said skids acting as a shock-absorber, when the airship strikes the ground.

A skid 49, which is bent intermediate of its length, so as to extend rearward, is carried beneath the rear end of the tail of the airship, and serves as a support for the tail of the airship when the latter is on the ground and also as a drag when alighting.

Having thus fully described my invention, what I claim as new and desire to secure by Letters-Patent is:

In a flying-machine, a plane having flexible ends, a pivoted member, guys one end thereof being secured to said flexible ends of the plane and the other end to said pivoted member, a slide reciprocable on said pivoted member, a wheel rotatable on said pivoted member and movable lengthwise thereon and operatively associated with said slide so that movement lengthwise of said wheel on said pivoted member will reciprocate said slide, lateral turning-planes, guys one end thereof being secured to said turning planes and the other end to said slide, a longitudinal balance plane, and guys one end thereof being secured to said longitudinal balance plane and the other end to said wheel, whereby rotating thereof controls the movement of said longitudinal balance plane.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

BURT REID.

Witnesses:

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CHARLES H. KOEHNE, Jr.