

W. D. & E. S. LE FEVRE.

AIR SHIP.

APPLICATION FILED FEB. 20, 1908.

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3 SHEETS—SHEET 1.

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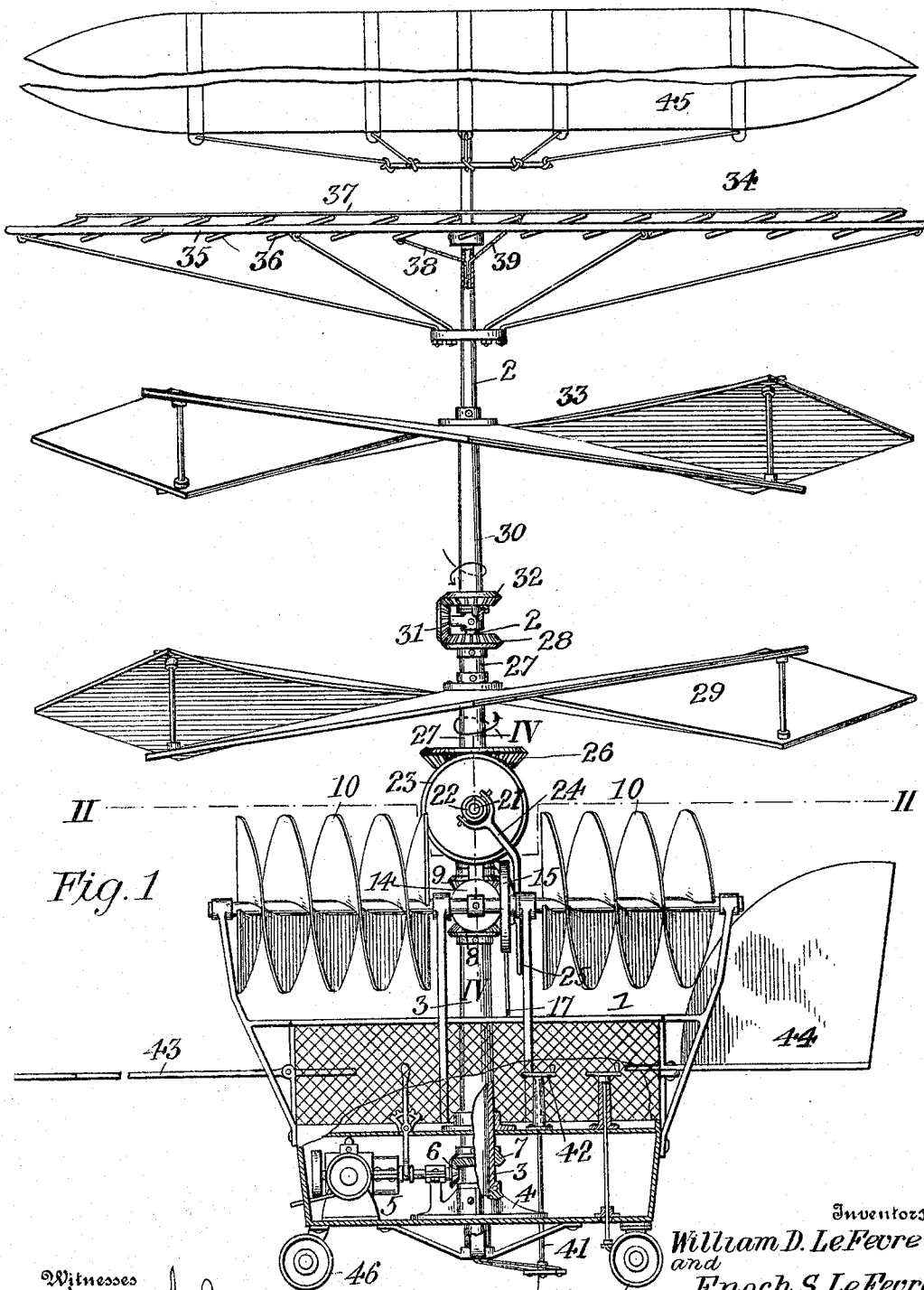


Fig. 1

Witnesses

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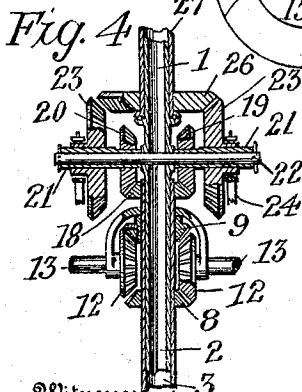
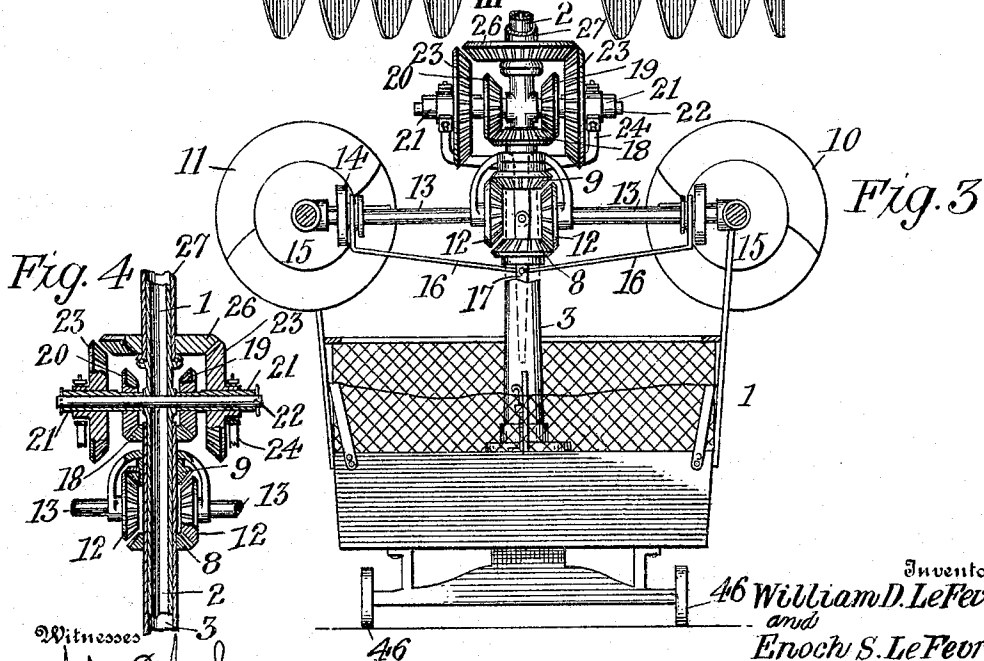
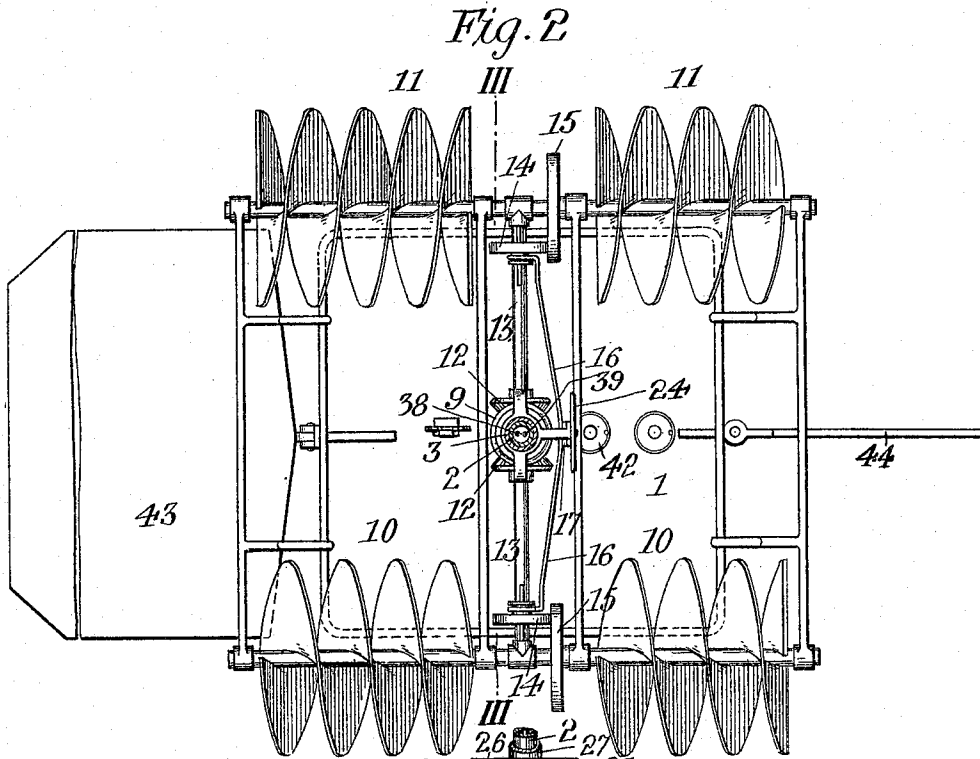
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3 SHEETS—SHEET 2.

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3 SHEETS—SHEET 3.

Fig. 5

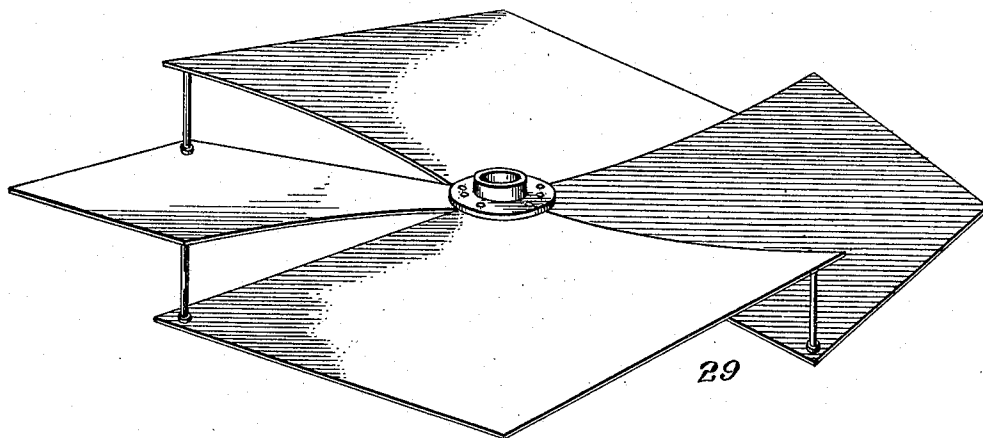
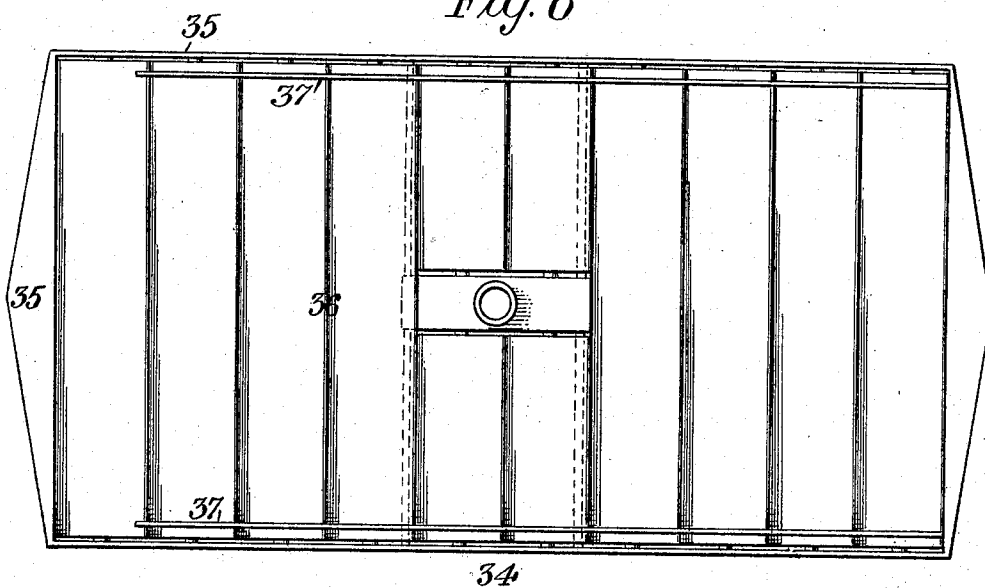


Fig. 6



Witnesses

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AIR-SHIP.

932,712.

Specification of Letters Patent. Patented Aug. 31, 1909.

Application filed February 20, 1908. Serial No. 416,847.

To all whom it may concern:

Be it known that we, ENOCH S. LE FEVRE and WILLIAM D. LE FEVRE, citizens of the United States, the former residing at Littlestown, in the county of Adams and State of Pennsylvania, and the latter residing at Smyrna, in the county of Kent and State of Delaware, have invented certain new and useful Improvements in Air-Ships, of which the following is a specification.

Our invention relates to improvements in air-ships.

The principal objects of our invention are to provide improved means for propelling the air-ship vertically: to provide improved means for propelling the air-ship longitudinally or forward and backward: to provide improved steering mechanism: and to provide improved aeroplane surface.

The propellers for driving the air-ship vertically are arranged in pairs, one or more as desired, the blades of one propeller of a pair are inclined oppositely to the blades of the other propeller; and the propellers composing a pair are actuated in opposing directions. The propellers for driving the air-ship longitudinally or forward and backward, are disposed at opposite sides of the air-ship. These propellers are constructed with the blades of one inclining in a direction opposite to the blades of the other; and one propeller is actuated in a direction opposite to that of the other.

The principal objects of the stated opposite movement of the opposed propelling elements are to maintain the air-ship in a well balanced state, to prevent the air-ship from whirling around, and to prevent it from being subjected to undue vibration.

We have indicated in the following description, and in the accompanying drawings, a preferred embodiment of our invention for accomplishing the foregoing and hereinafter indicated objects. We are aware however that modifications in some of the details may be made without departing from the spirit and scope of our invention, and we therefore reserve the right to make such modifications.

Referring to the drawings—Figure 1 is a side elevation. Fig. 2 is a horizontal section on the line II—II of Fig. 1. Fig. 3 is a vertical section on the line III—III of Fig. 2. Fig. 4 is a detail vertical section on the line IV—IV of Fig. 1. Fig. 5 is a detail per-

spective view of one of the propellers for driving the air-ship vertically. Fig. 6 is a plan view of the aeroplane.

1 indicates the basket or car of the air-ship, and 2 a mast, preferably hollow, which is suitably secured to the car to be immovable in reference thereto. Surrounding the lower portion of the mast 2, is a rotatable sleeve 3 which may be supported as shown by an anti-friction foot-step bearing 4. The rotatable sleeve 3 is driven by a suitable motor 5, preferably by means of intermeshing bevel gears 6 and 7. The gear 6 is secured to the driving shaft of the motor, and is controlled by a hand-operated clutch of ordinary construction: and the gear 7 is fixed to the rotatable sleeve 3. Near its upper end, the rotatable sleeve 3 has secured thereto oppositely facing bevel gears 8 and 9 each of which, through suitable intermediate mechanism hereinafter described, drives a horizontal or longitudinal-flight propeller, these propellers being arranged at opposite sides of the center of the air-ship, as indicated at 10 and 11. The mechanism intermediate a gear 8 or 9 and the corresponding longitudinal-flight propeller comprises a bevel gear 12, a shaft 13 rigidly secured to the bevel gear 12 and rotatably mounted on the car 1 in a suitable manner, and a friction wheel 14 feathered to the shaft 12 to rotate therewith and be slidable thereon. One gear 12 is in mesh with gear 9, and the other gear 12 is in mesh with the gear 8. Each longitudinal-flight propeller has secured to its shaft a friction-disk 15 a plane face of which is engaged by the rim of a friction-wheel 14. The two friction-wheels 14 are connected together by means of a yoke 16 adapted to be operated by means of a hand-lever 17 to simultaneously change the positions of the friction-wheels upon their respective friction-disks.

The horizontal propellers 10 and 11 are disposed at opposite sides of the car 1, have their wings or blades oppositely inclined, and are simultaneously rotated in opposing directions by means of the bevel gears 8 and 9, and the coaxing intermediate mechanisms. This opposing rotation of the longitudinal-flight propellers counterbalances their individual tendency to rotate the air-ship, which is thus prevented from being whirled around, or from being subjected to undue vibration. The propellers 10 and 11

have their respective shafts rotatably supported in a suitable manner by the car 1; and each propeller is preferably comprised, as shown, of a front and rear section.

5 Above the bevel gear 9, the rotatable sleeve 3 has secured thereto a bevel gear 18, which is in mesh with oppositely facing bevel gears 19 and 20, each fixed to a rotatable sleeve 21, mounted on a non-rotatable shaft 22
10 fixed to the stationary mast 2. Each sleeve 21 has feathered thereto a bevel gear 23; and the two gears 23 are connected by a yoke 24, adapted to be operated by a hand-lever 25 to throw either of the gears 23 into mesh with
15 a bevel gear 26 fixed to a second rotatable sleeve 27 suitably mounted on the mast 2. The second rotatable sleeve 27 has secured to its upper end a bevel gear 28; and intermediate the bevel gears 26 and 28, a propeller 29 is fixed to the sleeve 27. A third
20 rotatable sleeve 30 is suitably supported by the mast 2 to be rotatable thereon. The sleeve 30 is positioned above the sleeve 27, and is geared thereto by means of an intermediate bevel gear 31 mounted on the mast
25 2, and meshing with the gear 28 from which power is transmitted by the gear 31 to a bevel gear 32 secured to the lower end of the rotatable sleeve 30.
30 The sleeve 30 has secured thereto a propeller 33, similar to the propeller 29, the wings or blades of one propeller being oppositely inclined to those of the other propeller. The propellers 33 and 29, are adapted
35 to drive the air-ship vertically; and these propellers, through their driving gearing, are adapted to be simultaneously driven in opposing directions. This contra-rotation of the vertical-flight propellers counterbal-
40 ances their individual tendency to rotate the air-ship, which is thus prevented from being whirled around, or from being subjected to undue vibration; and this opposing inclination of the propellers' blades, and contra-rotation of the propellers results in their keep-
45 ing each other supplied with great quantities of air.

Above the propeller 33, an aeroplane 34 is secured to the stationary mast 2. The
50 aeroplane is formed preferably of a hollow frame 35 in which are pivoted slats 36 connected together by bars 37 which cause the slats to turn in unison. Cables 38 and 39 for opening and closing the slats are suitably
55 connected thereto, and are led down the interior of the hollow mast 2, and are attached at their lower ends to a cross-bar 40 carried by a shaft 41 having an operating hand-wheel 42. The aeroplane may be in duplicate and, if desired, such duplicate may be
60 of an unbroken surface instead of being slatted.

If desired, the air-ship may be provided with a horizontally disposed rudder 43, and
65 also with a vertically disposed rudder or

sail 44. If desired, the air-ship may be provided with a gas-bag 45. To facilitate the movements of the air-ship upon the ground when starting and ending its flight, we have provided the car with wheels 46 and 47, and
70 with a suitable guiding-stem for controlling the latter. While the various wings employed in the invention are shown in the drawings as flat it is to be understood that they can be employed with equal if not
75 greater facility by having them either concave or convex, or both.

In the operation of my device, the longitudinal-flight propellers, 10 and 11, when their respective friction-disks 15 are con-
80 tacted at equal distances from their centers by the friction-wheels 14, travel at equal speed, hence of themselves would carry the air-ship along in an unchanging, straight
85 line: if however the friction-wheels 14 be shifted to unequal distances from the centers of their respective friction-disks, the propellers 10 and 11 will be then rotated at different rates of speed which will result in
90 changing the horizontal course of the air-ship. It will be therefore seen that the longitudinal-flight propellers, through the medium of their friction mechanism may be used as a steering means for the air-ship.
95 The pair of vertical-flight propellers, 29 and 33, may be duplicated, as will be readily understood, if an air-ship of greater carrying capacity be desired. The direction of rotation of the longitudinal-flight propellers can
100 be controlled by the reversing lever of the motor, or by equivalent mechanism: and the direction of rotation of the vertical propellers can be reversed by the movement of the hand-lever 25. The aeroplane may be
105 positioned at the desired angle for flight. The slats 36 of the aeroplane are opened when the air-ship is ascending, and the slats are usually closed when the air-ship is in flight or is descending, unless it be desired
110 to influence the course of the vertical flight of the air-ship by opening the slats 36 to a suitable angle.

Having thus described our invention, what we claim is—

1. In an air-ship, the combination with a
115 non-rotatable mast secured thereto, of a rotatable sleeve on the mast means for rotating the sleeve, longitudinal-flight propellers rotatably mounted on the air-ship at the sides thereof and at opposite sides of the mast the
120 propellers having blades the blades of one propeller being inclined in a direction opposite to those of the other propeller, a driving shaft for each propeller, a gear on each driving shaft in mesh with a gear on the
125 rotatable sleeve, a friction-wheel mounted on each driving shaft to rotate therewith but slidable longitudinally thereon, a friction-disk fixed to each propeller shaft and engaged by the corresponding friction-wheel,
130

means for shifting the friction-wheels radially upon their respective friction-disks, and means carried by the air-ship and adapted to sustain it above the ground.

5 2. In an air-ship, the combination with oppositely disposed longitudinal-flight propellers having blades, or vertical-flight propellers having blades the blades of one longitudinal-flight propeller being oppositely inclined to those of the other and the blades of one vertical-flight propeller being oppositely inclined to those of the other, means for simultaneously rotating the longitudinal-flight propellers in opposing directions, 10 means for rotating the vertical-flight propellers simultaneously in mutually opposing directions, an aeroplane, slats pivoted in its frame and forming the body portion of the aeroplane, and means for rotating the slats 20 on their pivots.

3. In an air-ship, the combination with a car, of a mast fixed thereto, a sleeve rotatable on the mast, means for rotating the sleeve, longitudinal-flight propellers disposed at opposite sides of the car and rotatably mounted thereon the blades of one propeller being oppositely inclined to those of the other, gearing connecting the rotatable sleeve to each propeller to simultaneously rotate them in opposite directions, means controlling said 30 gearing and adaptable to change the rela-

tive speed of rotation of said propellers, a second rotatable sleeve supported by the mast, a vertical-flight propeller fixed to said sleeve, a third rotatable sleeve supported 35 by the mast, a vertical-flight propeller secured to this sleeve the blades of one vertical-flight propeller being oppositely inclined to those of the other, gearing connecting the first rotatable sleeve to the second 40 rotatable sleeve, means controlling the gearing and adaptable to determine the direction of rotation of the second sleeve, gearing connecting the third rotatable sleeve to the second rotatable sleeve to rotate the former 45 in a direction opposite to that of the latter, an aeroplane secured to the stationary mast, slats pivotally supported by the frame of the aeroplane and forming the body of the latter, means for rotating the slats on their 50 pivots, and means for reversing the direction of rotation of the longitudinal-flight propellers.

In testimony whereof we affix our signatures in presence of two witnesses.

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WILLIAM D. LE FEVRE.

Witnesses:

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