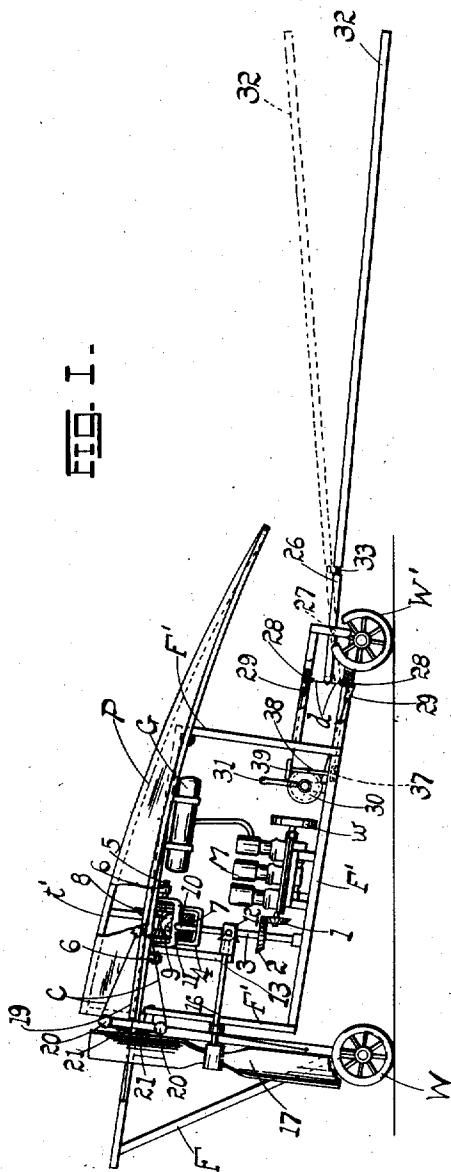


989,616.

Patented Apr. 18, 1911.

3 SHEETS—SHEET 1.

FIG. 1.

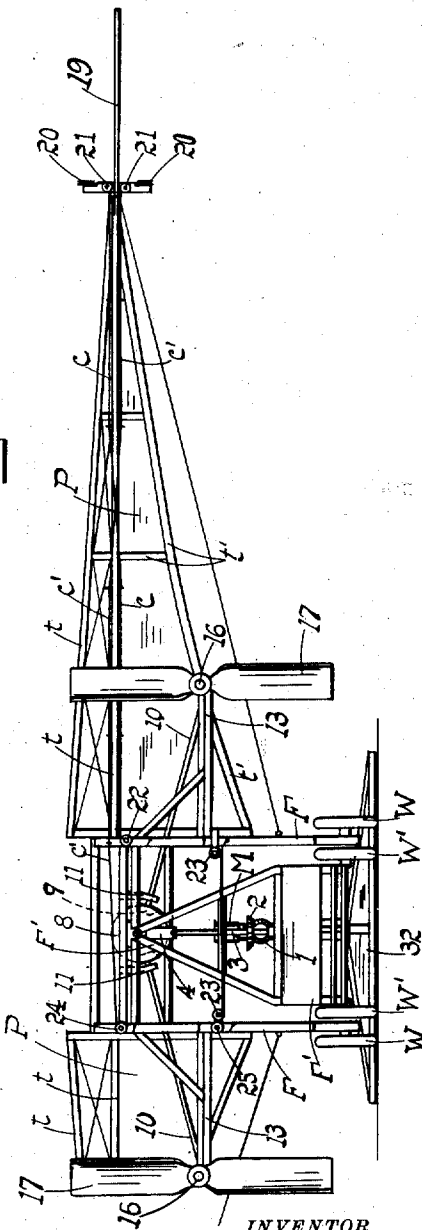


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FIG. 2.



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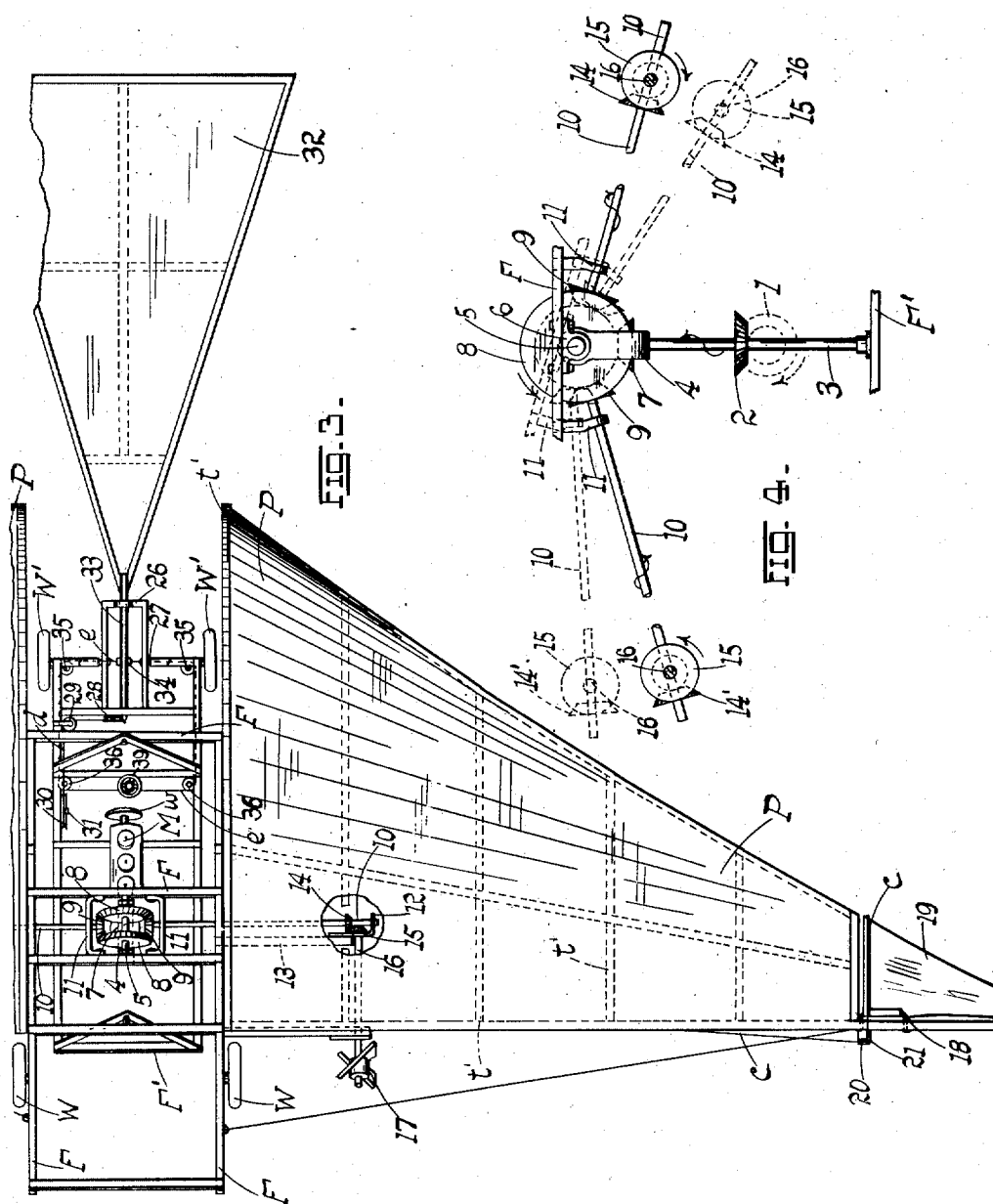
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989.616.

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3 SHEETS—SHEET 2.



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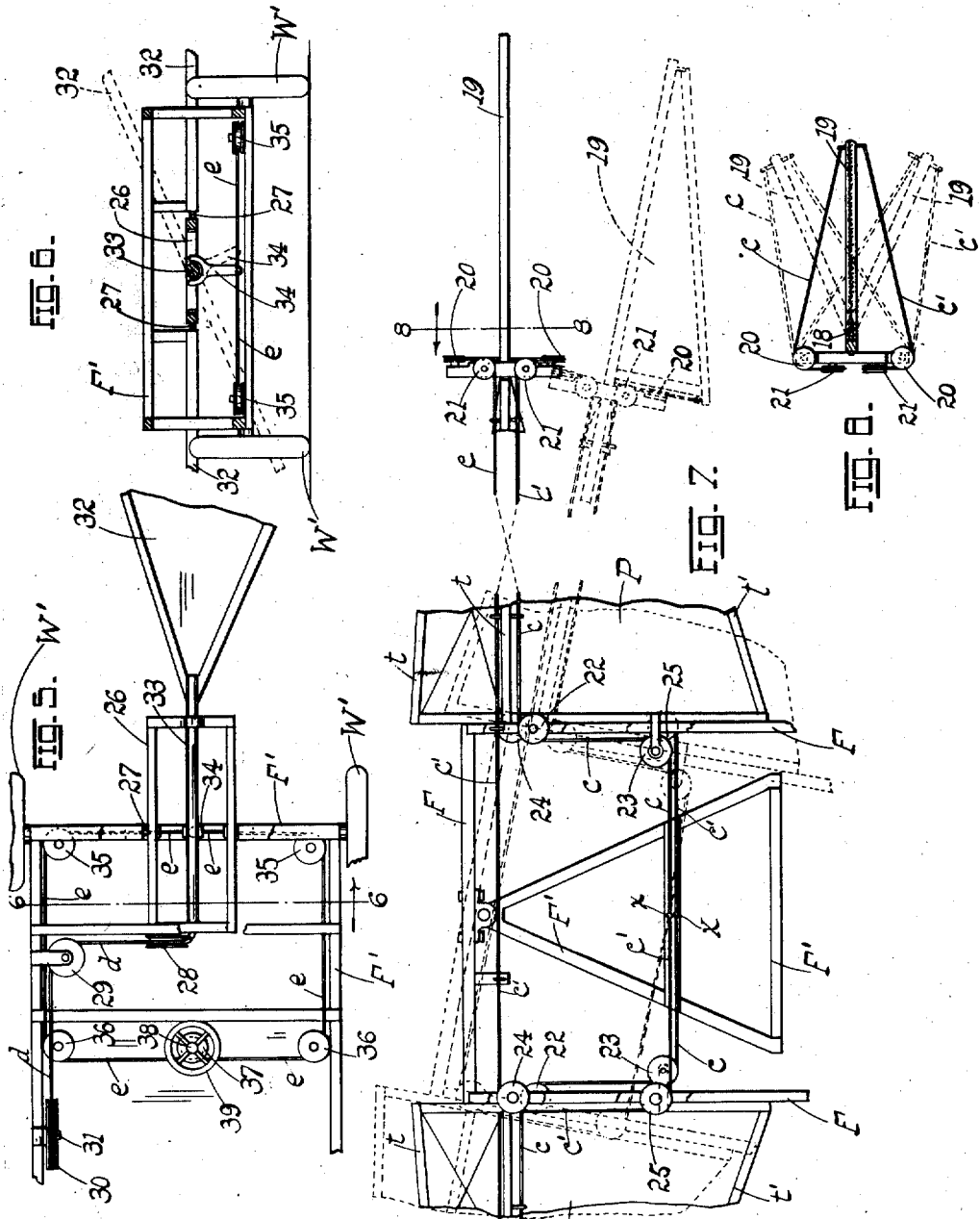
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FLYING MACHINE.
APPLICATION FILED JUNE 25, 1910.

989,616.

Patented Apr. 18, 1911.

3 SHEETS—SHEET 3.



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FLYING-MACHINE.

989,616.

Specification of Letters Patent.

Patented Apr. 18, 1911.

Application filed June 25, 1910. Serial No. 568,880.

To all whom it may concern:

Be it known that I, ELMER E. LESSARD, citizen of the United States, residing at Heber, in the county of Cleburne and State of Arkansas, have invented certain new and useful Improvements in Flying-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in flying-machines of the heavier-than-air type; and it consists in the novel details of construction more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a side elevation of the machine; Fig. 2 is a front elevation thereof; Fig. 3 is a top plan on a larger scale, one section of the supporting plane and gasoline tank being omitted, and part of the rear steering and elevating plane broken; Fig. 4 is a front elevation of the driving gear detached; Fig. 5 is a detail plan of the controlling mechanism for the combined steering and elevating plane; Fig. 6 is a transverse vertical section on the line 6-6 of Fig. 5; Fig. 7 is a front elevation of one-half of the machine-frame and motor-supporting platform (parts being broken) and the balance wing, showing in dotted outline the position assumed by the tilting of the machine-frame; and Fig. 8 is a cross-section through the balance wing or tip on the line 8-8 of Fig. 7.

The object of my invention is to construct a mono-plane flying machine in which the plane shall be so disposed as to insure a rapid rise for the machine after the propelling motor has been started; one in which a specially suspended motor-supporting platform is secured to the machine-frame, permitting the latter to oscillate under the influence of side currents without disturbing the motor from its position; one which is provided with special automatically responsive balance wings or tips; one making special provision for operating the rear combined elevating and steering plane; and one possessing further and other advantages better apparent from a detailed description of the invention, which is as follows:—

Referring to the drawings, F represents the machine-frame composed of light mate-

rial securely tied and braced as best appeals to the skilled mechanic, the lower front extension of said frame being provided with running wheels W. Secured in pivotal or hinged relation to the frame F is the motor-supporting frame F' which, when the machine is in flight hangs vertically from the main frame F, this hinged relation between the frames subserving a special purpose as presently will more fully appear. The axis of suspension of the frame F' corresponds to the central longitudinal axis of the frame F as best seen in Fig. 2. The rear extension of the motor-supporting frame F' is provided with running wheels W', the front extension of the main frame F being of sufficient length to cause the machine to incline forwardly and upwardly when resting on the ground (Fig. 1), so as to facilitate the passage of the air under the supporting plane sections the moment the motor is started. Built outwardly from the upper frame work of the main frame F, are the trusses t, t, and frame-work t' which when covered over with suitable sheet material constitute triangular supporting planes P. The planes P may be considered as mere sections of a single plane, one section on each side of the frame F, the top of which is left uncovered. Or, the frame F with its supporting-plane sections P, P, may be regarded as a single frame, the center of which is left uncovered.

Resting on the platform of the suspended frame F' is a motor M, supplied with fuel from a gasoline tank G, all of which is represented conventionally herein. The motor-shaft terminates at one end in a fly-wheel w and at the opposite end in a bevel pinion 1, the latter meshing with a bevel gear 2 carried by a vertical shaft 3 on the platform, the upper end of the shaft being guided and supported by a U-shaped bracket-strap 4 through the arms of which freely passes a pin or supporting member 5 mounted in bearings 6, 6, which are disposed on the axis of suspension of the frame F', or what is the equivalent on the axis of oscillation of the frame F when the machine is lifted off the ground. The upper end of the shaft 3 projecting above the strap 4 terminates in a bevel pinion 7 which meshes with the bevel gears 8, 8, disposed on opposite sides thereof, said gears being loose on

the pin or axle 5 and confined between the arms of the strap 4 (Figs. 1, 3, 4). In simultaneous mesh with the gears 8, 8, and disposed on opposite sides of the axis of suspension of the frame F' (or the axis of oscillation of the frame F with its plane sections P, P) are bevel pinions 9, 9, the same being carried at the upper ends of the inclined laterally diverging shafts 10, 10, which at the top are supported in straps 11, 11, secured to the main frame F. The outer and lower ends of the shafts 10 are supported in brackets 12 at the outer ends of the members 13 of the main frame F, the shaft terminal on one side being provided with a bevel pinion 14 the teeth of which are presented outwardly (right hand Fig. 4), whereas the shaft terminal on the opposite side is provided with a bevel pinion 14' the teeth of which are presented inwardly (left hand Fig. 4). Each pinion 14, 14', meshes with the terminal pinion 15, 15, at the inner end of a propeller shaft 16 mounted on the frame F, the outer ends of the shafts terminating in propellers 17. It follows from the specific disposition of the pinions 14, 14', (the one being on the inside, and the other on the outside of the bevel pinion 15) that the rotations of the shafts 16 and their propellers will be simultaneously in opposite directions, as will herein-after more fully appear.

Hinged along one edge (front edge) to a U-shaped bar or strap 18 (Fig. 3) at the extremity of the front edge of each supporting plane section P, and forming an extension of the general triangular formation of said section P, is a balance wing or tip 19 to the base of the rear edge of which and on opposite sides whereof are attached the outer ends of cables c, c', (Fig. 8) each cable passing over vertically disposed sheaves or grooved pulleys 20, thence inwardly over secondary pulleys 21, 21, disposed at right angles to the pulleys 20, the cable c thence passing under the plane-sections P, (Fig. 7) over a pulley 22, thence downward over a pulley 23, thence inward to the anchor α on the frame F'; the cable c' after leaving the pulley 21 passes over a pulley 24, thence downward over a pulley 25, thence inward, joining with the cable c at the anchor α . What is true of one side of the machine is true of the other, each cable c, c', passing over pulleys 22, 23 and 24, 25 respectively, and joining at an anchor α at the center of the frame F', (Fig. 7).

At the rear end of the frame F' is mounted a vertically oscillating frame 26, the same being provided with lateral projecting spindles 27 disposed at the ends of the transverse axis of oscillation (or rotation) of said frame, the spindles having bearings in the frame F'. The inner end of said frame 26 has secured thereto, and leading from it in

opposite directions the laps of an endless cable d (Fig. 1), the upper lap passing over, and the bottom lap passing under a grooved pulley or sheave 28, each lap then passing over a guide pulley 29, and thence wrapping about the disk 30, which is provided with an operating lever 31 within easy reach of the aviator. By oscillating the lever 31 first in one direction and then the other, a vertical oscillating movement may be imparted to the frame 26, which frame directly supports the combined elevating and steering plane 32. This plane is triangular as shown, the apex of the triangle terminating in a rock-shaft 33 which is supported by the frame 26, and disposed along the central longitudinal axis thereof (Figs. 5, 6). The center portion of the shaft 33 is gripped between the upper forked end of a depending controlling arm 34, to the lower end of which is secured from opposite sides the endless cable c, the laps of the cable passing over guide pulleys 35, 35, 36, 36, and finally wrapping about the bottom sheave 37 of a staff 38 provided with a hand-wheel 39 within easy reach of the aviator. By turning the wheel 39 (and hence the staff 38 and sheave 37) first in one direction and then the other, a pull will be exerted first one way and then the other on the lower end of the arm 34, and the shaft 33 and its plane 32 be rocked in either direction. Since the plane 32 however, has an independent oscillation in a longitudinal plane as a result of the oscillating movements of the frame 26 as already described, it follows that the plane 32 becomes at once an elevating and steering plane combined. The plane-sections P, by reason of their peculiar construction are elastic, and hence readily respond to any variations of pressure inherent in the supporting air-column.

The manner of oscillating the frame 26 and independently rocking the shaft 33 and plane 32 having just been alluded to, there is no occasion to repeat the operation thereof at this point. Suffice it to say however, that an oscillation of the frame 26 will oscillate the plane 32 with it so as to elevate or depress the machine in flight; and a rocking of the shaft 33 will steer the machine in flight, making the member 32 a combined elevating and steering plane; the plane of oscillation for purposes of steering being at right angles to that for purposes of elevation and depression.

The operation of the propellers 17 and the balance tips or wings 19 is substantially as follows:—As stated above, the moment the machine leaves the ground, the frame F' becomes virtually suspended from the frame F. The motor M being set in motion, a rotation is imparted to the shaft thereof and to the pinion 1 of said shaft. This rotates the shaft 3, and through the gearing

described, the latter imparts rotation to the gear wheels 8, 8, these in turn rotating the shafts 10, 10, and pinions 14, 14' in opposite directions; but as the pinions 14, 14' are
 5 relatively on corresponding sides of their respective cooperating pinions 15, 15, the propeller shafts 16, 16, and their propellers 17, 17, will likewise rotate in opposite directions. As the frame F oscillates
 10 about the axis of suspension of the frame F', in response to disturbing side currents (see dotted position Fig. 4), the gears 9, 9, simply play over the gears 8, 8, no cessation of the driving action resulting from such
 15 oscillation. By having a pair of gears 8, 8, the parts are balanced perfectly and no binding is possible. As the frame F, or the plane-sections P, P, and frame F proper, oscillate, under the disturbing influence of
 20 side currents, the cords *c, c'*, will be so drawn upon as to depress the wing or tip 19 on the depressed side of the machine (Fig. 7), while the wing or tip on the raised side will be raised or oscillated upwardly, thus shed-
 25 ding the air. Thus the frame F with its plane-sections P, P, will tend to right itself, the descending tip 19 on the depressed side of the machine resisting the air against it, and the ascending tip on the elevating
 30 side of the machine shedding the air as explained. The action of the wings 19, 19, is entirely automatic, the endless cables *c, c'*, with which each tip is connected playing over their respective sheaves or pulleys 22, 23
 35 and 24, 25 as previously described. When the machine sails on an even keel, that is to say, when there are no disturbing side currents, the cords *c, c'* are evenly drawn upon and the tips 19, 19, assume a horizontal
 40 position, there being then as much pressure on top as on the bottom of each wing. The sections P, P, may be considered as a single supporting plane for practical purposes. They are here termed as "sections" from the
 45 fact that the top of the center of the frame F' is left uncovered.

Having described my invention, what I claim is:—

1. A flying-machine comprising a main central frame, lateral supporting-plane sections extending therefrom, a motor-supporting frame pivotally suspended from the center of the main frame between the plane sections aforesaid, a vertical shaft propelled by the motor, mounted on the suspended
 55 frame, a bevel pinion at the upper end of said shaft, bevel gears disposed on opposite sides of the pinion aforesaid and mounted loosely on their axles, bevel pinions on opposite sides of the axis of the suspended
 60 frame, laterally diverging downwardly inclined shafts to which said pinions are secured, bevel pinions at the lower ends of said diverging shafts, the teeth of the pinion of one shaft being presented outwardly and
 65 those of the other inwardly, suitable propeller shafts, and pinions on said propeller shafts engaging the lower terminal pinions of the inclined shafts, the parts operating as set forth.

2. In a flying-machine, a main central frame, a motor-carrying frame suspended pivotally from the main frame, lateral supporting triangular plane-sections extending
 75 from the main frame, a balance wing hinged along one edge at the extremity of the front edge of each supporting plane-section and forming an extension of the general triangular formation of said section, cords attached on opposite sides to the base of the
 80 rear edge of each wing, suitable grooved pulleys distributed along each supporting section over which each cable is passed, the ends of the cable being brought and fastened to a fixed anchor on the motor-carry-
 85 ing frame, the parts operating as set forth.

In testimony whereof I affix my signature, in presence of two witnesses.

ELMER E. LESSARD.

Witnesses:

EMIL STAREK,

FANNIE E. WEBER.