C. E. HOLT.

FLYING MACHINE.

APPLICATION FILED AUG. 23, 1918. RENEWED JAN. 24, 1921.

1,370,445. **Patented Mar. 1, 1921.**

3 SHEETS—SHEET 1.

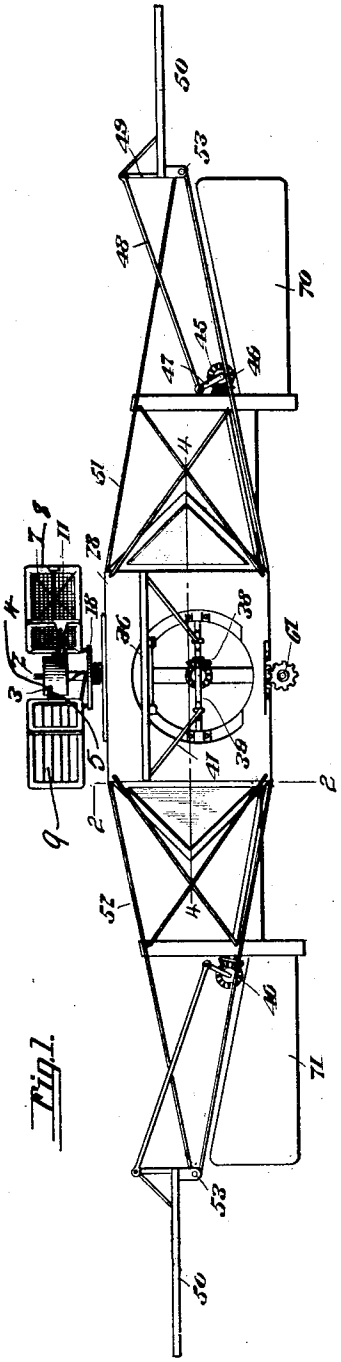

Fig. 1.

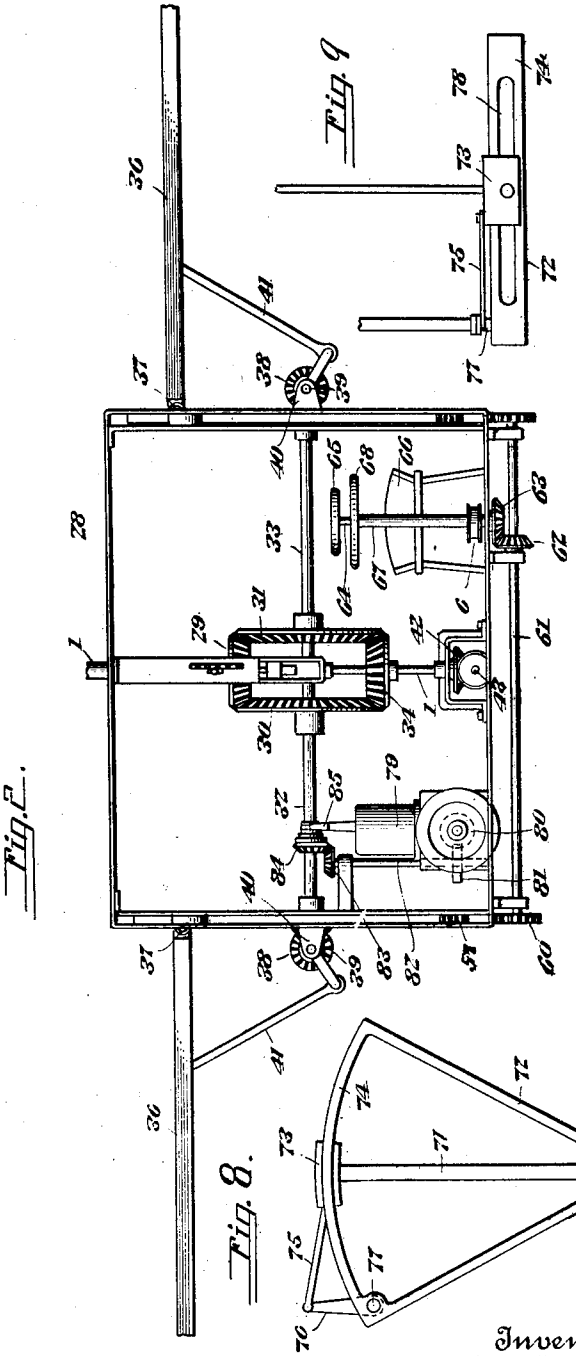

Fig. 2.

Fig. 6.

Fig. 8.

Witnesses.

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3 SHEETS—SHEET 2.

Fig. 3.

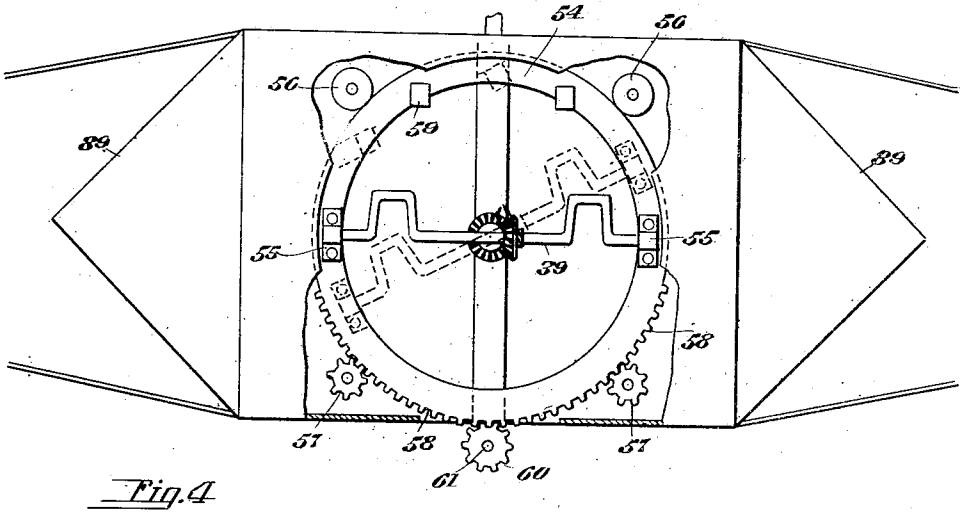
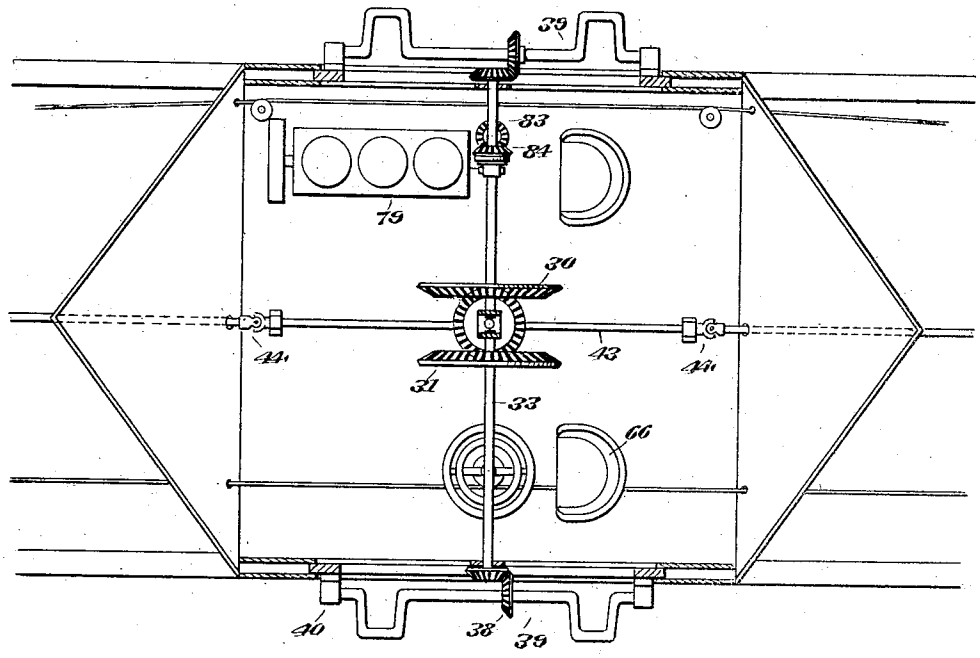


Fig. 4



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3 SHEETS—SHEET 3.

Fig. 5.

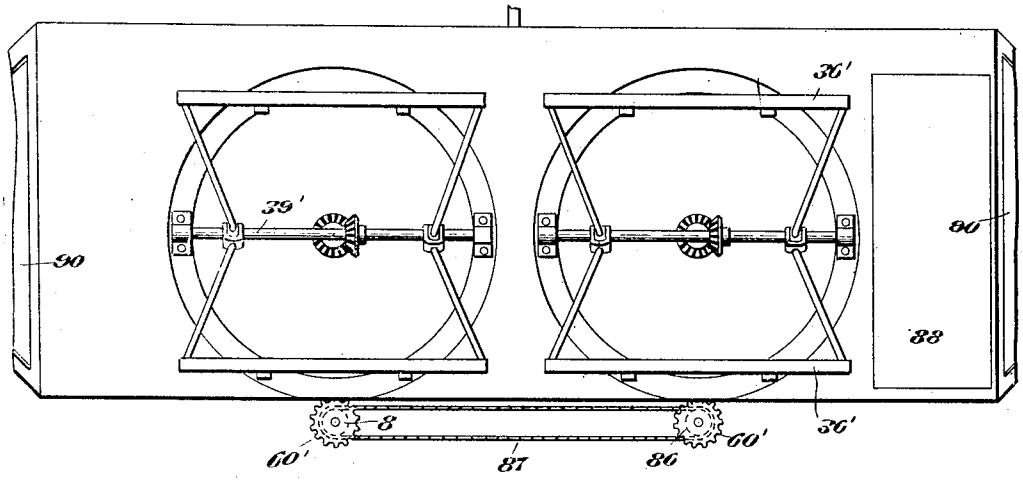

Fig. 6.

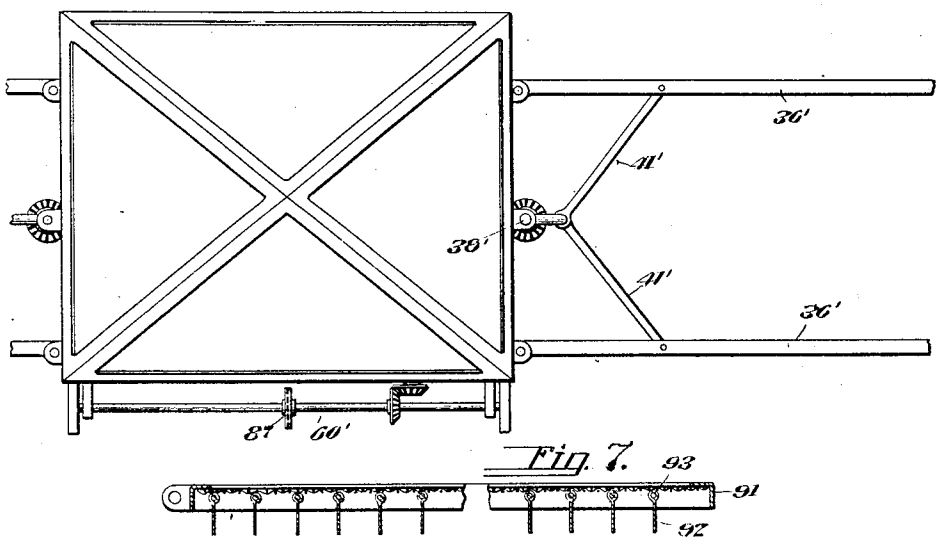

Fig. 7.

Witnesses.

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UNITED STATES PATENT OFFICE.

CLARENCE ERNEST HOLT, OF ADA, OKLAHOMA.

FLYING-MACHINE.

1,370,445. Specification of Letters Patent. Patented Mar. 1, 1921.

Application filed August 23, 1918, Serial No. 251,184. Renewed January 24, 1921. Serial No. 439,710.

To all whom it may concern:

Be it known that I, CLARENCE E. HOLT, a citizen of the United States, residing at Ada, in the county of Pontotoc and State of Oklahoma, have invented new and useful Improvements in Flying-Machines, of which the following is a specification.

This invention relates to flying machines or air craft of heavier than air type. The purpose of the present invention is to provide a machine of the beating wing type, having combined therewith novel and efficient means for imparting motion to the wings for sustentation and propelling purposes; also means for varying the angles of thrust of such wings for the purpose of increasing or diminishing the support of the machine and for the additional purpose of maintaining the stability and correcting the equilibrium of the craft.

With the above and other objects in view, the invention consists in the construction, combination and arrangement of parts, as herein described, illustrated and claimed.

In the accompanying drawings:

Figure 1 is a side elevation of an air-craft illustrating the engine in its applied relation thereto.

Fig. 2 is an enlarged end view of the frame or body of the machine showing the mechanism for operating the beating wings.

Fig. 3 is an enlarged fragmentary side elevation of the machine.

Fig. 4 is a plan view of the same partly in section.

Fig. 5 is a side elevation of the body of the machine showing the use of groups of beating wings.

Fig. 6 is a fragmentary end elevation of the same.

Fig. 7 is a sectional view of one of the beating wings.

Fig. 8 is a detail plan view of one of the vertical rudders and a part of the operating means therefor.

Fig. 9 is a fragmentary end view of the same.

Referring to the drawings, 1 designates a normally vertical rotary engine shaft having a spirally threaded upper end portion 2 around which is disposed the engine hub 3. The hub 3 is formed with a plurality of guideways 4 extending therethrough and slidably mounted in said bearings are blade carrying arms 5, each adapted to engage the spiral teeth or threads of the portion 2 of the rotary shaft 1.

Each of the arms 5 carries at its outer end a blade 7 shown as comprising a substantially rectangular frame 8 having mounted therein normally horizontal and pivotally mounted shutters 9. The wind acting upon the blades of the engine imparts rotary motion to the engine shaft. The frame of each blade is strengthened by means of diagonal stay wires 11, all as clearly shown and described in my contemporary application filed Dec. 30, 1918, Serial No. 269,003 which constitutes a division of the present application.

Referring now to Figs. 1 and 2, the shaft 1 of the air engine extends downwardly into the body 28 of the aircraft, where it has mounted thereon a bevel gear 29 which normally meshes with bevel gears 30 and 31 on horizontal shaft sections 32 and 33 journaled in the frame or body 28 as shown in Fig. 2. The shaft 1 also has fast thereon another bevel gear 34, which also meshes with the gears 30 and 31. The gear 29 is adapted to be thrown into and out of mesh with the gears 30 and 31 by means disclosed in my aforesaid contemporary application so that the air engine may be disconnected from the mechanism illustrated in Fig. 2 and used for the purpose of operating a pair of beating wings 36 extending from opposite sides of the body of the machine and connected thereto by pivots 37. The shaft sections 32 and 33 drive, by means of bevel gears 38, a pair of crank shafts 39 journaled in hangers 40 projecting from opposite sides of the body 28 and the crank shafts 39 are connected to the beating wings 37 by links 41. Thus oscillatory movement is imparted to the wings 36. The shaft 1 is connected by bevel gears 42 to a normally horizontal shaft 43 extending in a fore and aft direction as shown in Figs. 2 and 4, said shaft having universal joints 44 therein. The front and rear portions of the shaft 43 are connected by bevel gears 45 to front and rear crank shafts 46 having cranks 47 from which rods 48 extend to arms 49 projecting from front and rear oscillatory or beating wings or planes 50 as shown in Fig. 1, the body or frame 28 having forwardly and rearwardly extending outriggers 51 and 52 upon which the planes or wings 50 are pivotally mounted at 53. Thus the laterally extending wings

and forwardly and rearwardly extending wings or planes are simultaneously and automatically oscillated for sustaining the machine in the air and as will hereinafter appear for propelling the machine in either a forward or backward direction.

The laterally extending oscillatory wings 36 are capable of being inclined forwardly or rearwardly by the means illustrated in Fig. 3. Each wing or plane 36 is pivotally connected at its inner end to a supporting ring or annulus 54, (see Fig. 3), and the outrigger crank shaft 39 therefor is journaled in bearings 55 located at diametrically opposite points on said annulus. The annulus or supporting ring 54 bears at a plurality of points against sustaining rollers 56 and is supported at other points by pinions 57, which mesh with a toothed arcuate face 58 of said supporting ring. The ring 54 is held in place by suitable keepers or retaining means 59 and is actuated by a pinion 60 on a transverse shaft 61 extending under the body 28 and connected by bevel gears 62 and 63 to a vertical controlling shaft 64 having at the upper end thereof a hand wheel 65. The wheel 65 is located adjacent to the operator's seat 66 who may thereby change the angles of the oscillatory wings 36 so as to propel the machine ahead or backwardly at the desired speed. For hovering purposes, the wings or planes 36 may be operated more slowly by throttling the propelling engine. Surrounding the shaft 64 is a tubular shaft 67 having a hand wheel 68 at the upper end thereof and having on the lower end thereof a pulley 69 from which suitable belts or connections, (not shown), extend to front and rear vertical rudders 70 and 71, (see Fig. 1). Each vertical rudder 70 or 71 is mounted in a triangular shaped supporting and guiding frame 72, (see Figs. 8 and 9), and has a grooved arcuate runner 73 which engages the arcuate end bar 74 of such supporting frame. A link 75 such as a rod connects the runner 73 with the crank arm 76 of a vertical rock shaft 77 to which one of the connections from the pulley 69 is connected. The operator may thus turn the vertical rudders 70 and 71 to steer the machine to one side or the other. The runner 73 is adapted to traverse a longitudinal slot 78 in the arcuate cross bar 74 of the supporting frame 72 as shown in Fig. 4. Thus each vertical rudder is firmly supported and braced, and the lateral swinging movements thereof steadied.

In the initial portion of a flight or in making a safe landing, I use a small engine shown at 79 which is connected by spiral gears 80 and 81 to a vertical shaft 82, connected by bevel gears 83 and 84 to the shaft 32 above referred to, the gear 84 being shiftable into and out of engagement with the gear 83 by means of a shifting fork or lever 85, (see Fig. 2). After the desired altitude and speed are obtained by the use of the engine 79, the latter may be disconnected from the shaft 32 and stopped, and the machine may be thereafter propelled by the air driven engine previously described.

For large machines, groups of oscillatory wings or planes 36 may be used as illustrated in Figs. 5 and 6, said planes may be illustrated at 36′ and arranged in pairs, the wings of each pair being located in superposed relation to each other. A single crank shaft 39′ may be used for operating the planes 36′ of each group as shown in Fig. 6, a rod 41′ extending from each wing 36′ to the crank of each crank shaft 39′. To simultaneously adjust the angles or pitch of the oscillatory wings 36′ where they are arranged in groups as shown in Figs. 5 and 6, the pinions 60′ which actuate the supporting wings 64 may be connected for simultaneous operation by means of sprocket wheels 86 and a sprocket chain 87 as shown in Fig. 5. One or more doors 88 may be provided to permit occupants to enter and leave the main body 28 of the machine, one of such doors being shown in Fig. 5. The front and rear portions of the body are pointed as shown at 89 to reduce head resistance when the machine is traveling either in a forward or backward direction, such pointed bow and stern portions of the body being preferably closed as shown at 90 for observation purposes.

Each of the oscillatory or beating wings is constructed as shown in Fig. 7, the same embodying in connection with a marginal frame 91 a series of shutters 92 which are pivotally connected at 93 to the frame 91. The arrangement just referred to is such that in the upward movement of the wing or plane, the shutters 92 open and offer little or no resistance, while in the downward movement of the wing, said shutters 92 automatically close and exert a downward push on the air resulting in a lifting effect on the machine.

I claim:—

1. A flying machine comprising a body having outriggers at its forward and rear ends, forward and rear vertically swinging wings pivotally connected to said outriggers, upright supporting rings mounted to revolve in the sides of the body, manual means to adjust said rings in concert about a common center, lateral wings pivotally connected at their inner ends to said rings, wing-actuating means carried by the body, driving connections between said means and the forward and rear wings, driving connections between said means and the lateral wings, front and rear vertical rudders con-

nected with the body, and manual means carried by the body to enable the operator to turn said rudders.

2. In a flying machine, the combination of a body, upright revoluble rings mounted in the sides of the body, lateral wings pivotally connected to said rings, crank shafts, carried by said rings and having miter gears, connections between said crank shafts and the wings, transverse shafts occupying the center of movement of said rings and having miter gears intermeshed with those of the crank shafts, wing-actuating means carried by the body and connected with said transverse shafts, and manual means carried by the body to adjust said rings about a common axis; said means connected with the peripheries of the rings.

3. In a flying machine, the combination of a body upright revoluble rings mounted in the sides of the body, lateral wings pivotally connected to said rings, crank shafts, carried by said rings and having miter gears, connections between said crank shafts and the wings, transverse shafts occupying the center of movement of said rings and having miter gears intermeshed with those of the crank shafts, wing-actuating means carried by the body and connected with said transverse shafts, manual means carried by the body to adjust said rings about a common axis, and pivoted shutters carried by the wings and arranged to open on upward movement of the wings and to close on downward movement thereof.

In testimony whereof I affix my signature.

CLARENCE ERNEST HOLT.