W. G. MADISON.

FLYING MACHINE.

APPLICATION FILED JUNE 8, 1910.

1,047,098.

Patented Dec. 10, 1912.

4 SHEETS—SHEET 1.

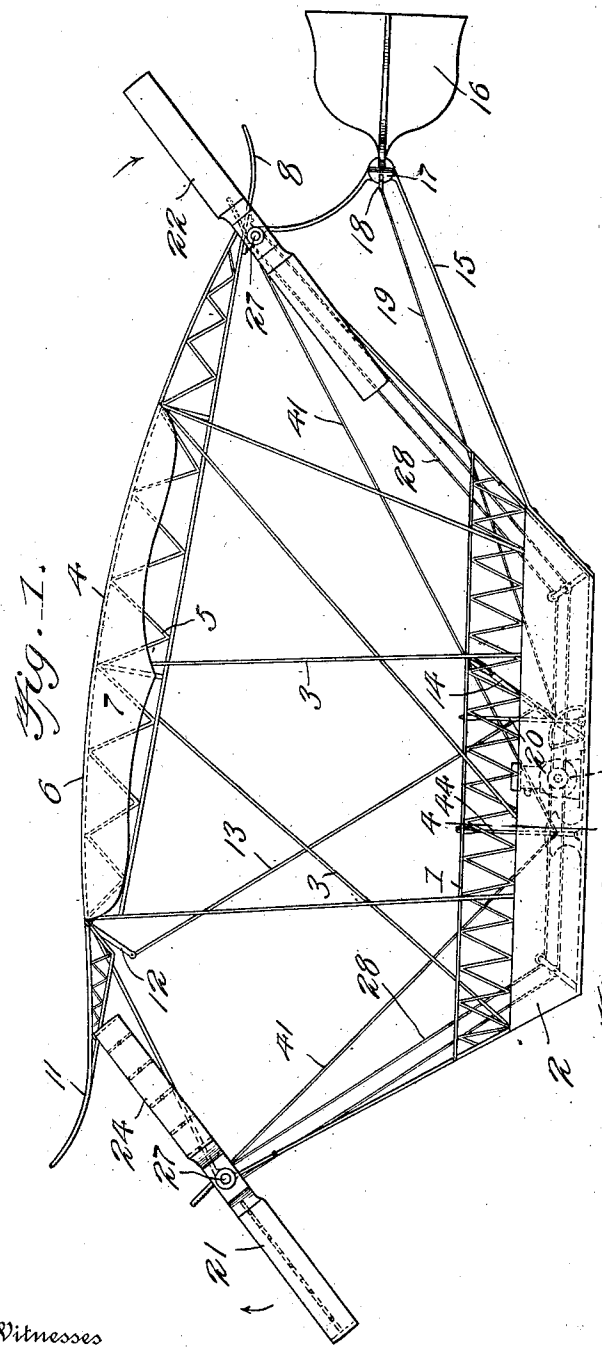

Fig. 7.

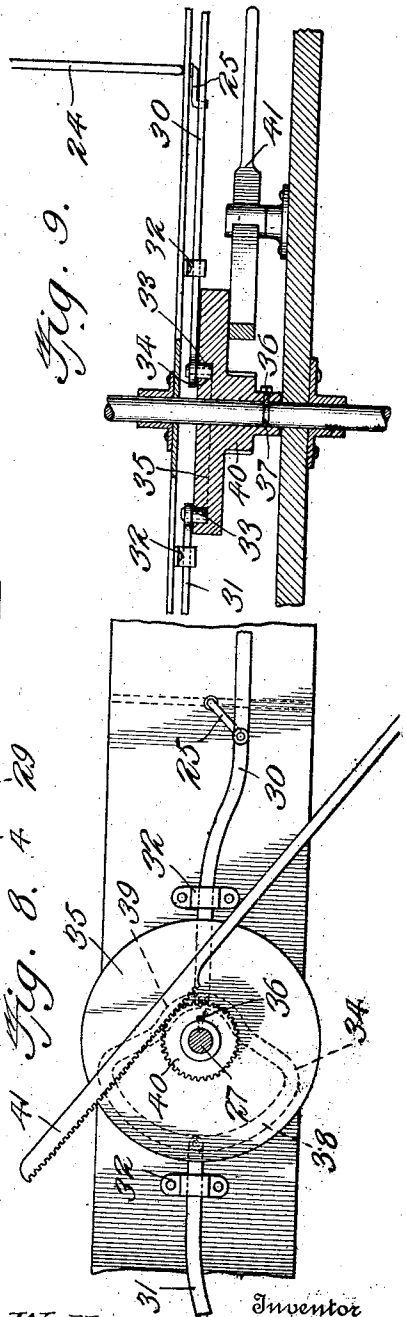

Fig. 9.

Fig. 8.

Witnesses

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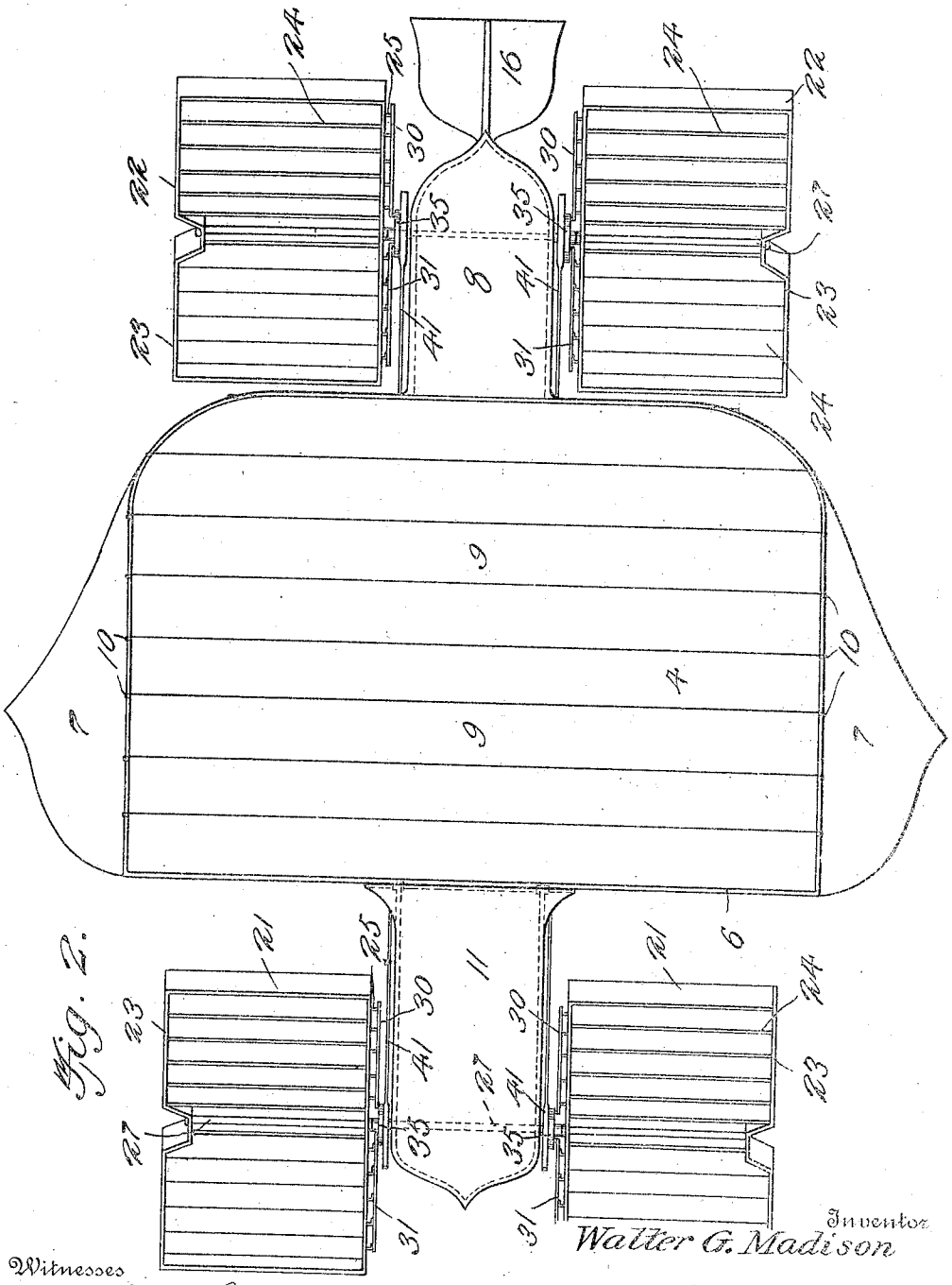

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 3.

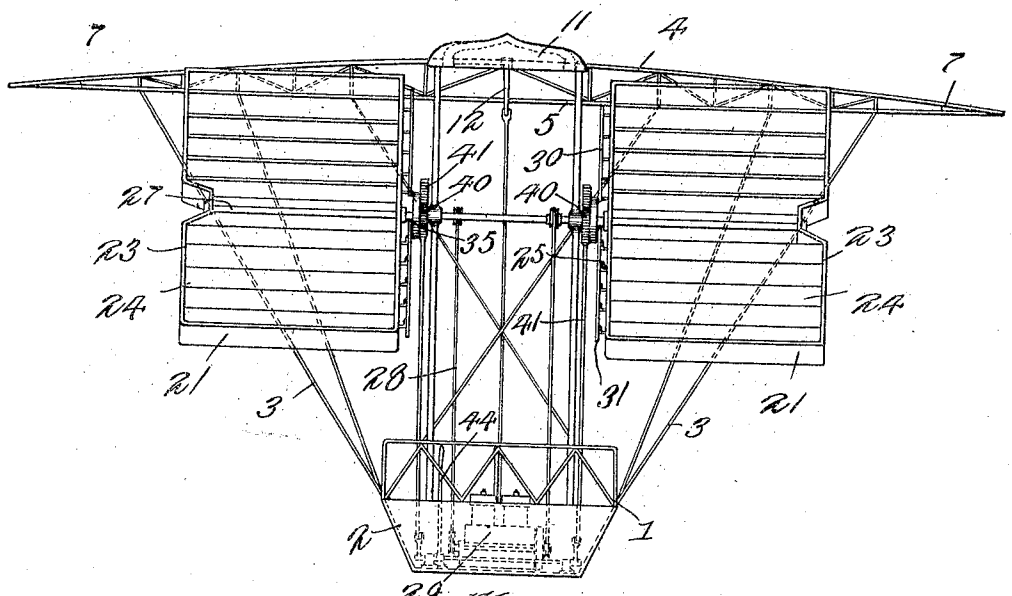


Fig. 4.

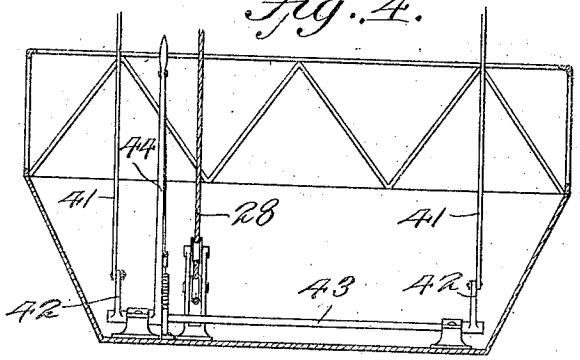
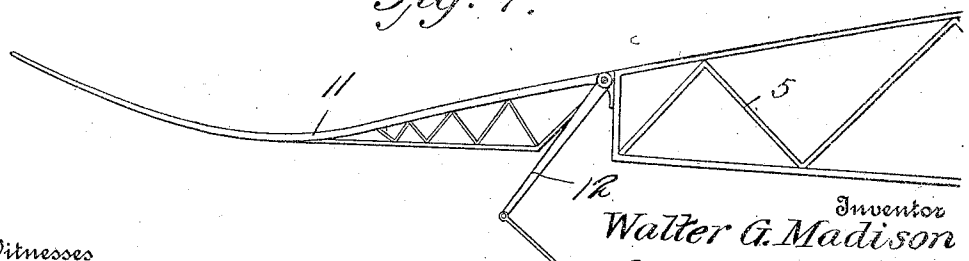


Fig. 7.



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SHEETS—SHEET 4.

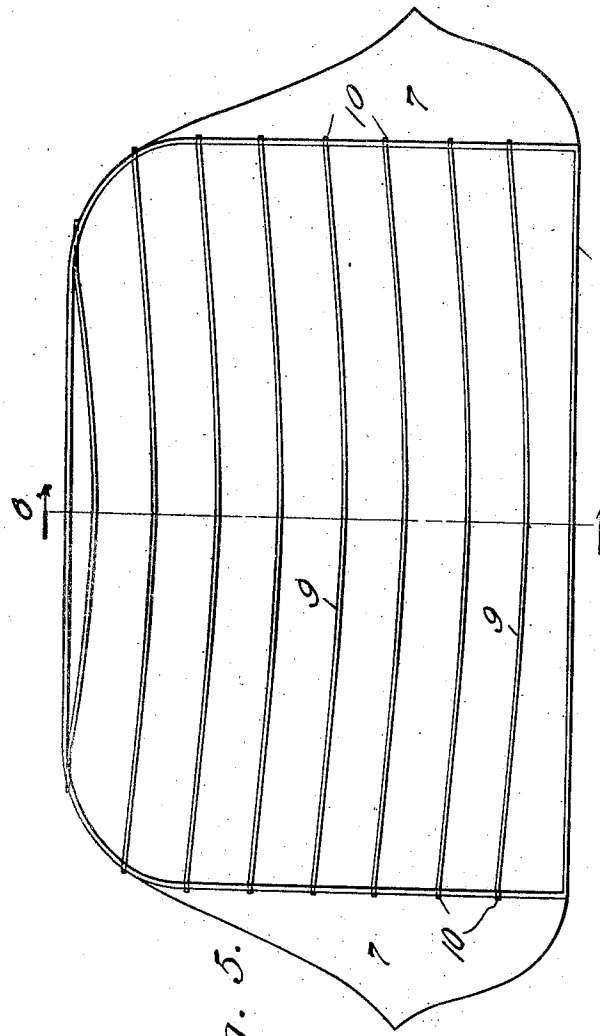

Fig. 5.

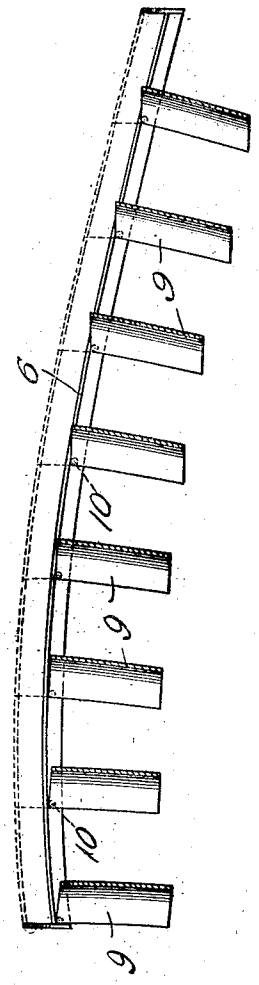

Fig. 6.

Witnesses

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UNITED STATES PATENT OFFICE.

WALTER G. MADISON, OF AMES, IOWA.

FLYING-MACHINE.

1,047,098. Specification of Letters Patent. Patented Dec. 10, 1912.

Application filed June 8, 1910. Serial No. 565,687.

To all whom it may concern:

Be it known that I, WALTER G. MADISON, a citizen of the United States, residing at Ames, in the county of Story and State of Iowa, have invented new and useful Improvements in Flying-Machines, of which the following is a specification.

This invention relates to aeroplane flying machines of the monoplane type, and its objects are, first, to provide an improved construction of supporting plane for increasing the longitudinal and lateral stability and reducing resistance to the ascent of the machine; second, to provide simple and effective means for horizontal and vertical steering; and, third, to provide a construction and arrangement of propellers which will operate both as lifting and driving propellers.

The invention consists of the features of construction, combination and arrangement of devices, hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Figure 1 is a side elevation of a flying machine embodying my invention. Fig. 2 is a top plan view of the same. Fig. 3 is a front elevation. Fig. 4 is a vertical transverse section through the car on the line 4—4 of Fig. 1. Fig. 5 is a top plan view of the supporting plane with its slats or pivoted portions arranged for the ascent of the machine. Fig. 6 is a longitudinal section thereof on the line 6—6 of Fig. 5. Fig. 7 is a side view, showing the horizontal rudder. Fig. 8 is a side view of the feathering and reversing devices of one of the propellers on an enlarged scale. Fig. 9 is a horizontal transverse section of the same.

The main frame 1 of the machine includes a car 2 of suitable construction and has extending therefrom uprights 3 of any desired character which carry the supporting or flotation plane 4, said plane including in its construction a frame structure 5. The body of the plane proper is secured to the frame structure 5 in any preferred manner and consists of an open rectangular frame portion 6 provided with rigid laterally extending fixed tips or ailerons 7 and a rear tip or aileron 8, said tips or ailerons serving to increase the lateral and longitudinal stability of the machine. The central portion of the plane body is composed of a series of transversely extending vanes or slats 9 mounted on eccentric journals 10 to normally drop downward to the substantially vertical position shown in Fig. 6 when not supported by wind pressure. The plane is curved transversely or in a fore and aft direction to secure a desired lift with a minimum drift and may also be concavo-convexly curved transversely to the line of flight. As shown, the vanes are curved to conform to and complete the general curvature of the plane and are adapted when the machine is in straight-away flight or descending to swing upwardly to a substantially horizontal position in the plane of the supporting plane and thus close the open rectangular frame portion 6 to prevent the passage of air therethrough. By this construction, a full supporting surface will be provided when the machine is traveling horizontally or descending, while the area of the supporting surface will be reduced when the machine is ascending in a substantially straight vertical line to reduce the air resistance to its ascent. At the front of the plane is arranged a pivoted, vertically swinging horizontal rudder 11 in the form of a central flexible rear wing tip, which rudder is connected by a crank arm 12 and a link 13 with a controlling lever 14 on the car, whereby said rudder may be adjusted to steer the machine in a vertical plane and held in the desired adjusted position, suitable means being employed for securing the lever at any point in its range of movement. A bracket 15 extends from the rear portion of the main frame and plane frame and supports a vertical rudder 16 mounted to swing laterally on a hinge joint 17 and connected by a crank arm 18 and link 19 with an adjusting lever 20 on the car, by which the rudder may be moved to the right or left to steer the machine laterally.

Rotary propellers 21 and 22 are respectively arranged in pairs at the front and rear of the machine and at what may be called the four corners of the flotation plane, the propellers of each pair being disposed on opposite sides of the longitudinal center of the machine and mounted on horizontal axes for rotation in a vertical plane. Each propeller consists of a substantially open, flat rectangular frame 23 provided with blades on each side of its transverse center, each blade consisting of a transverse series of vanes or slats 24 the ends of which are provided with journals mounted in bearings in the opposite side walls of the frame,

the journals at the inner ends of the slats being provided with cranks 25. The slats or vanes are thus adapted to be adjusted to lie edgewise in line with each other to form a propeller surface closing the portion or side of the frame in which they are arranged against the passage of air, or to be turned to a position at right angles to the frame edgewise to the direction of rotation of the propeller in order to provide open spaces for the free passage of air. The planes of each pair are mounted for rotation at the same speed upon the opposite ends of a transverse shaft 27, the frames 23 being fixed to the shaft, and the shafts of the front and rear propellers being driven by belts or chains 28 from a suitable motor 29 mounted upon the car.

The vanes composing the blades of each propeller are adapted to be feathered for the usual purpose and reversed for upward or forward propulsion, as occasion demands. To this end the cranks 25 of the vanes of the blades of each propeller are connected with sliding rods or motion transmitting members 30 and 31 mounted in suitable guides 32 on the propeller frame and provided at their inner ends with friction rollers 33 mounted to travel within the groove 34 of a cam or eccentric disk 35 loosely mounted on the shaft 27 and which is held from longitudinal movement thereon by a key or screw 36 engaging an annular groove 37 in the shaft. The groove 34 is provided with arcuate portions 38 and 39 concentric with and arranged at different distances from the shaft with suitable connecting portions, whereby during the travel of the friction rollers of each link the links will be, at different points in the path of rotation of the propeller, moved outwardly to close or fold the vanes and inwardly to open them. As illustrated particularly in Figs. 1 and 8 the cam is set to dispose the groove in such position that the vanes upon the descending blade of the propeller will be closed for a working or propulsion action, while the vanes upon the ascending blade of the propeller will be opened for the passage of air to diminish the resistance to the return or non-working movement of said blade. It will be observed that through this arrangement the thrust of the working blade will be in a downward and forward direction, whereby both a lifting and forward propelling action will be secured. By shifting the cam half way around on the shaft this operation may obviously be reversed, so as to secure a lifting motion solely, whereby the propellers may be adapted to operate simply for a helicoptic action in lifting the machine straight from the ground for ascension to the desired height before beginning propulsion in a straight line. In such movement it will be understood that the vanes of the flotation plane will remain open, thus reducing the air resistance to the lifting action.

The hub of each cam disk is provided with a spur gear 40 engaged by the teeth of a rack bar 41, whereby the gear may be adjusted to reverse the feathering action, as described, and also held in either of its operative positions. The rack bars of all the cam disks extend downwardly into the car and are connected with crank arms 42 on a transverse rock shaft 43 adapted to be adjusted in either direction by a controlling lever 44, the construction and arrangement of the parts being such as to adapt the cam disks of the different propellers to be simultaneously turned in the proper direction for action. This lever may be provided with a pawl to engage a rack to secure it in adjusted position or be locked in any other preferred manner.

From the foregoing description, the construction of my improved flying machine will be readily understood, and it will be seen that a type of machine is provided by which a straight ascent may be secured with a minimum of resistance and a propelling mechanism provided by which either a lifting or driving action may be secured at will. By arranging the propellers at or near the corners of the flotation plane and providing the balancing tips described an efficient degree of stability against loss of longitudinal and lateral equilibrium is obtained.

Having thus described the invention, I claim:—

1. In a flying machine, the combination of a body, horizontal transverse shafts mounted at the front and rear of the body on opposite sides of the longitudinal center thereof, propellers mounted on the respective shafts for rotation in a vertical plane and in a fore and aft direction, each of said propellers comprising an open rectangular frame, front and rear series of vanes pivotally mounted in said frame and having projecting cranks, links connecting the series of cranks, a normally stationary disk mounted on each shaft and provided with a cam groove located mainly at one side of its center, friction rollers on the links engaging said groove at diametrically opposite points, devices for shifting the respective disks to vary the positions of the grooves therein relative to the axes of the propellers, and means for operating the shifting devices controlling the cam disks of the series of propellers in unison.

2. In a flying machine, the combination of a body, horizontal transverse shafts mounted at the front and rear of the body on opposite sides of the longitudinal center thereof, propellers mounted on the respective shafts to rotate in a vertical plane and in a fore and aft direction, each propeller

comprising a shallow open rectangular frame, front and rear series of pivoted vanes mounted in said frame and provided with projecting cranks, links connecting the series of cranks, a disk mounted on each shaft and provided with a gear wheel and having a cam groove arranged mainly on one side of its center, friction rollers on the links engaging said groove at diametrically opposite points, rack bars engaging the gears of the respective cam disks for normally holding said disks stationary and shifting said disks to vary the positions of their cam grooves relative to the axes of the propellers, and means for holding the rack bars stationary and adjusting said rack bars in unison.

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

WALTER G. MADISON.

Witnesses:
HENRY WESTERMAN,
HENRY WILSON.