

1,297,795.

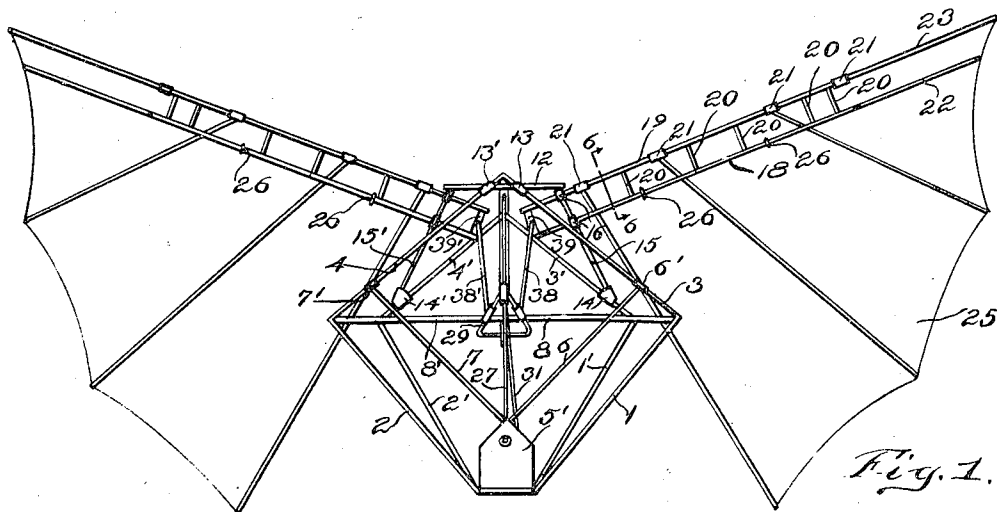


Fig. 1.

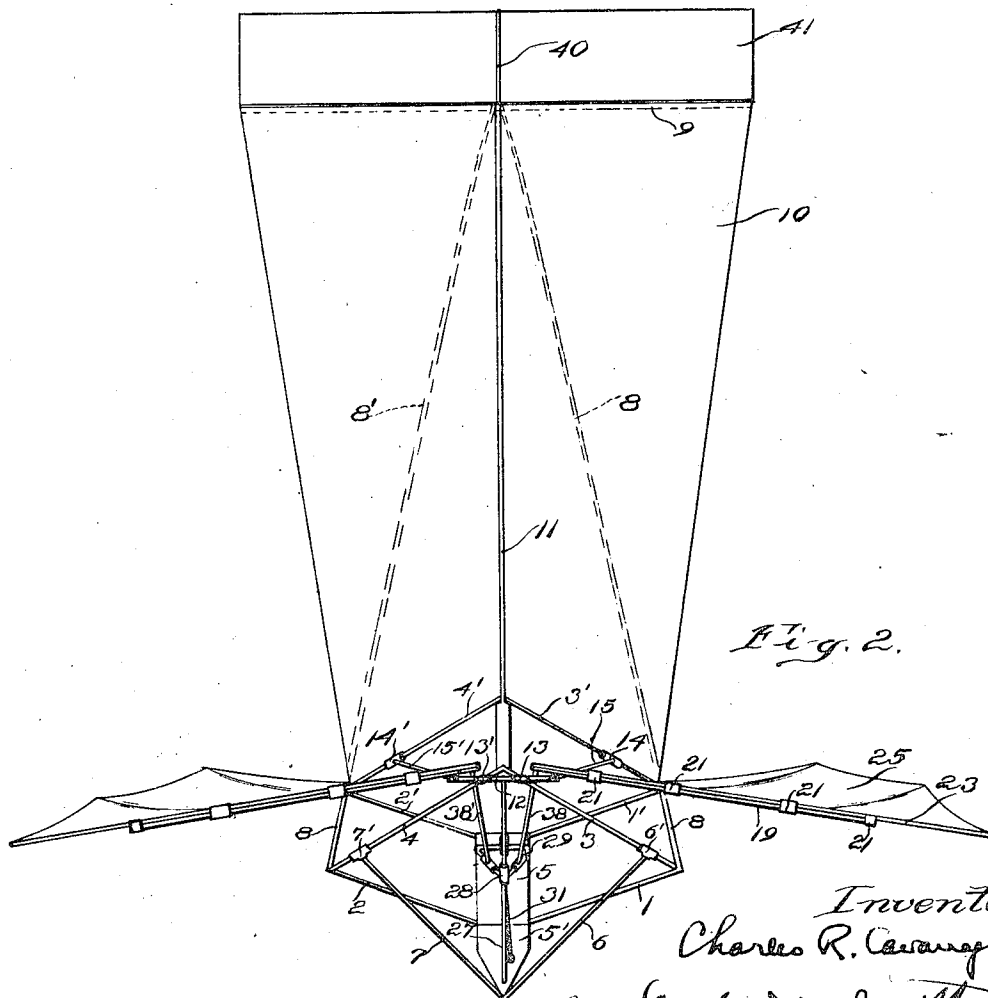
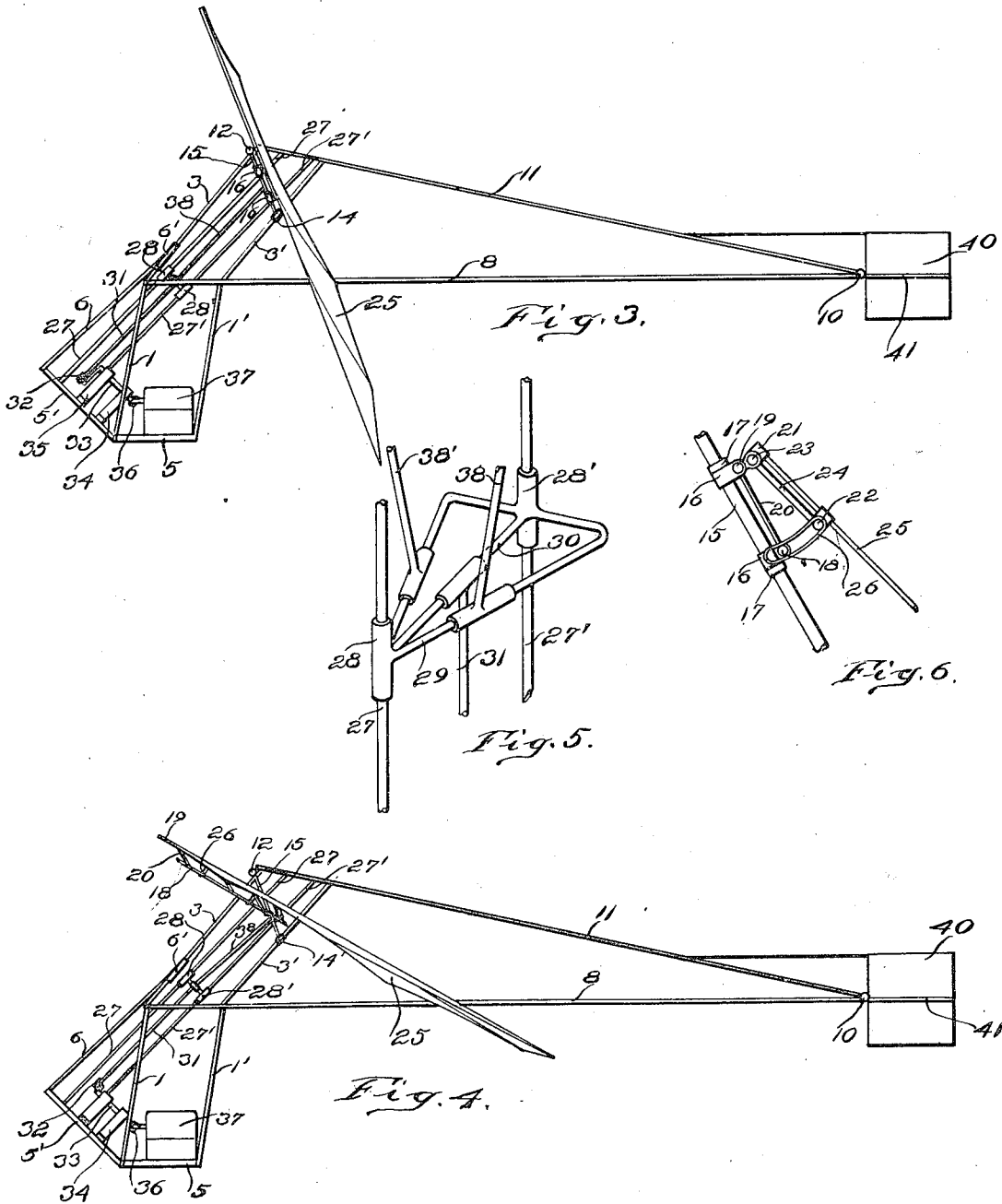


Fig. 2.

Inventor:
Charles R. Cavanagh
by Gustav Woodworth
att'y.

1,297,795.

Patented Mar. 18, 1919.
2 SHEETS—SHEET 2.



Inventor:
Charles R. Cavanagh
by Geo. K. Woodworth.
att'y.

UNITED STATES PATENT OFFICE.

CHARLES B. CAVANAGH, OF BOSTON, MASSACHUSETTS.

FLYING-MACHINE.

1,297,795.

Specification of Letters Patent.

Patented Mar. 18, 1919.

Application filed December 20, 1917. Serial No. 207,997.

To all whom it may concern:

Be it known that I, CHARLES R. CAVANAGH, a citizen of the United States, and a resident of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Flying-Machines, of which the following is a specification.

My invention relates to flying machines of the moving-wing type and its object is to simplify and improve the construction of such machines in the manner hereinafter set forth.

The drawings which accompany and form part of this specification illustrate a simple embodiment of my invention, various elements such as the operator's car, the wheels on which the same is mounted, the steering devices, etc., which constitute no part of my invention being omitted for the sake of clearness.

In the drawings,—

Figure 1 is a front view of my improved flying machine. Fig. 2 is a plan view. Fig. 3 is a side elevation, the wings being shown in their extreme rearward position. Fig. 4 is a similar elevation showing the wings in the position which they assume during the middle of the forward stroke. Fig. 5 is a perspective view of the cross head and the members associated therewith. Fig. 6 is a transverse section taken on the line 6—6 of Fig. 1, looking in the direction of the arrow, and showing the relative position of the wing frame and the wing-supporting frame during the forward stroke of the wings.

In the particular drawings selected for more fully disclosing the principle of my invention, I have shown a frame work consisting of the rods or hollow tubes 1, 2, 3, 4 forming substantially a parallelogram, said rods or tubes being preferably of aluminum or other suitable material, and located in the rear of said frame work are the rods 1', 2', 3', 4' each of which is substantially parallel with the corresponding member of the forward frame work. The lower ends of the rods 1, 2, 1', 2' are connected to the corners of the platform 5 which terminates in a forwardly extending upwardly inclined portion 5'. To the forward end of said portion 5' are connected rearwardly extending braces 6, 7 which by means of the couplings 6', 7' are connected respectively to the rods 3, 4. Horizontal rods 8, 8' are connected at their forward ends to the junctures of the

rods 1, 3, 1', 3' and 2, 4, 2', 4', respectively, and their rear ends are connected together and joined to the transverse rod 9, the frame formed by the rods 8, 8', 9 serving as a support for the sustaining plane 10. A diagonal stay rod 11 is connected between the juncture of the rods 8, 8' and the junctures of the rods 3, 4 and 3', 4'. Across the front of the frame work extends a short rod 12, said rod being connected by the couplings 13, 13' to the frame rods 3, 4. Joined to the frame rods 3', 4' by means of couplings 14, 14' are the rods 15, 15', the upper ends of which are connected to the ends of said rod 12.

To either side frame work above described are connected movable wings which by means of a suitable motor are oscillated for elevating and propelling the machine. In the present instance collars 16 held in position by the thrust collars 17, 17', serve to pivotally connect to the rod 15 (and similarly to the rod 15') a wing supporting frame consisting of the rods 18, 19 connected together at suitable intervals by several cross pieces 20. Pivoted to each wing supporting frame by the hinges 21 is a wing frame consisting of the rods 22, 23 connected together by cross pieces 24 (see Fig. 6), and to each wing frame is attached a wing 25 of any suitable shape and material, said wing being suitably braced by ribs. In order to limit the movement of each wing with respect to its supporting member I provide one or more guides 26 which as shown are wire loops passed around the rod 18 of the wing supporting frame and the rod 22 of the wing frame.

It will be obvious that the wing supporting frames are arranged to be oscillated around the rods 15, 15' which rods are inclined forwardly, upwardly and inwardly and that each wing-frame has a limited rotational movement about the upper rod of said wing supporting frames.

Various means may be employed to impart the necessary motion to the wing supporting frames. In the present instance I provide two guide rods 27, 27' connected between the forward extension 5' of the platform and the forward end of the rib 11. By means of collars 28, 28' the cross head 29 is guided along said rods. Pivotaly connected to the middle rod 30 of said cross head is a pitman 31, connected in the present instance to the crank 32 of the shaft 33, the latter

being journaled in the standards 34, 35 and connected by the universal joint 36 to the gas engine 37 or other suitable motor. Connecting rods 38, 38' pivotally connected with the side members of the cross head are articulated to the cross pieces 39, 39' of the wing supporting members respectively and, as will be obvious the rotation of the crank 32 will cause the said frames to be oscillated about the inclined rods 15, 15'.

The usual steering rudder 40 and elevating and depressing rudder 41 are employed and are operated by the usual controls.

In operation the down stroke of the pitman 31 will draw the inner ends of the wing-supporting frames to which the connecting rods 38, 38' are pivoted downwardly and forwardly thereby throwing the outer ends thereof upwardly and rearwardly, the axes about which said frames are pivoted being inclined forwardly and inwardly, until, at the end of the down stroke of said pitman, the wings assume the positions shown in Figs. 1, 2 and 3. The backward stroke of the wings will therefore propel the machine forward with a slight tendency to force it downward which tendency, however, is overcome by the sustaining plane and by the forward stroke of the wings. On the upward stroke of the pitman, the inner ends of the wing-supporting frames are forced upwardly and rearwardly thereby throwing the outer ends thereof downwardly and forwardly. As soon as the pitman begins its upward stroke, the resistance of the air causes the wings to move about the hinges 21 which connect the wing frames to the wing-supporting frames (see Fig. 6) so that during the forward stroke of the wings, the latter are made to assume a more acute angle with respect to the sustaining plane than on the backward stroke, as shown in Fig. 4 which represents the wings in the middle of the forward stroke. In this way the wings meet with greatly lessened air resistance on the forward stroke and do not appreciably retard the forward impulse given the machine by backward stroke. Owing to the slant of the axes 15, 15' the wings move downwardly as well as forwardly on the forward stroke thereby giving the machine an upward impulse which more than overcomes the slight downward impulse given by the backward stroke because of the more acute angle at which the wings strike the air on the forward stroke.

It will be understood, of course, that various modifications may be made in the apparatus herein particularly described without departing from the principle of my invention.

Having thus described an illustrative embodiment of my invention, what I claim and desire to secure by Letters Patent is:—

1. A flying machine, comprising in combi-

nation a frame, a sustaining plane secured thereto, a pair of wing supporting members pivoted to either side of said frame, a pair of wings each having its upper edge pivotally connected to the upper edge of one of said members respectively, means for limiting the movement of each wing with respect to its supporting member, and a motor for oscillating said wing supporting members with respect to said sustaining plane.

2. A flying machine, comprising in combination, a frame, a rearwardly-extending sustaining plane secured thereto, rods extending forwardly and upwardly with respect to said plane, one on either side of the longitudinal axis of said frame, wing supporting members, each pivoted to one of said rods and each having its inner end extending inwardly therefrom, a pair of wings each carried by one of said members, and means associated with the inner ends of each said member for oscillating the same about one of said rods.

3. A flying machine, comprising in combination, a frame, a rearwardly-extending sustaining plane secured thereto, rods extending forwardly and upwardly with respect to said plane, one on either side of the longitudinal axis of said frame, wing supporting members, each pivoted to one of said rods and each having its inner end extending inwardly therefrom, a pair of wings, means attaching each wing near one edge thereof to one of said wing supporting members, and means associated with the inner ends of each said member for oscillating the same about one of said rods.

4. A flying machine comprising in combination a frame, a rearwardly-extending sustaining or balancing plane secured to the frame, forwardly and upwardly extending rods with respect to the tail plane one on either side of a longitudinal axis, wing supporting parts so constructed as to hold the wing on its down-stroke so that its under surface makes an angle greater than a right angle with an imaginary plane defined or fixed by every point in the arc made by any point on the front edge of the wing during its oscillation, a wing constructed so that its longitudinal frame supports connected to the wing supporting part run the length of the wing well in front of the middle line of the wing so that on the downward and forward stroke the angle between under surface of the wing and an imaginary plane fixed or defined by the arc made by any point on the front edge of wing during its oscillation, tends to increase and on its upward and backward stroke the same angle tends to diminish.

5. A flying machine, comprising in combination, a frame, a rearwardly-extending sustaining plane secured thereto, rods extending forwardly and upwardly with re-

spect to said plane, one on either side of the longitudinal axis of said frame, wing supporting members, each pivoted to one of said rods, a pair of wings and means attaching
5 said wings to said supporting members, respectively, said supporting members being so constructed and arranged that the under surface of each wing on its downward and forward

stroke will make an acute angle with a plane intersecting the rear of the wing and 10 normal to the axis of oscillation of its supporting member.

In testimony whereof, I have hereunto subscribed my name this 12th day of December, 1917.

CHARLES R. CAVANAGH.