H. C. GAMMETER.

FLYING MACHINE.

APPLICATION FILED FEB. 11, 1910.

1,013,152.

Patented Jan. 2, 1912.

4 SHEETS—SHEET 1.

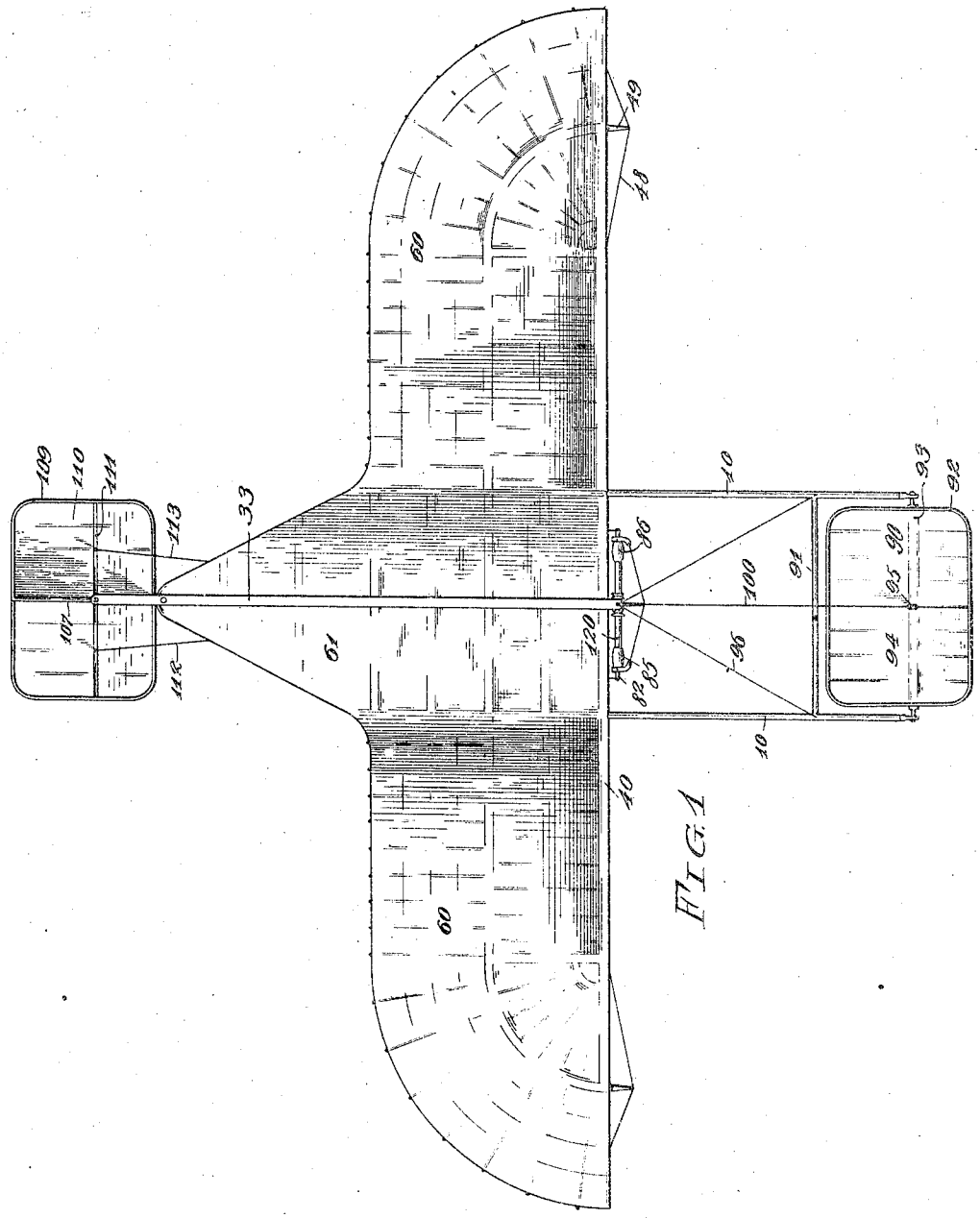

FIG. 1

WITNESSES:

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Harry C. Gammeter,

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4 SHEETS—SHEET 2.

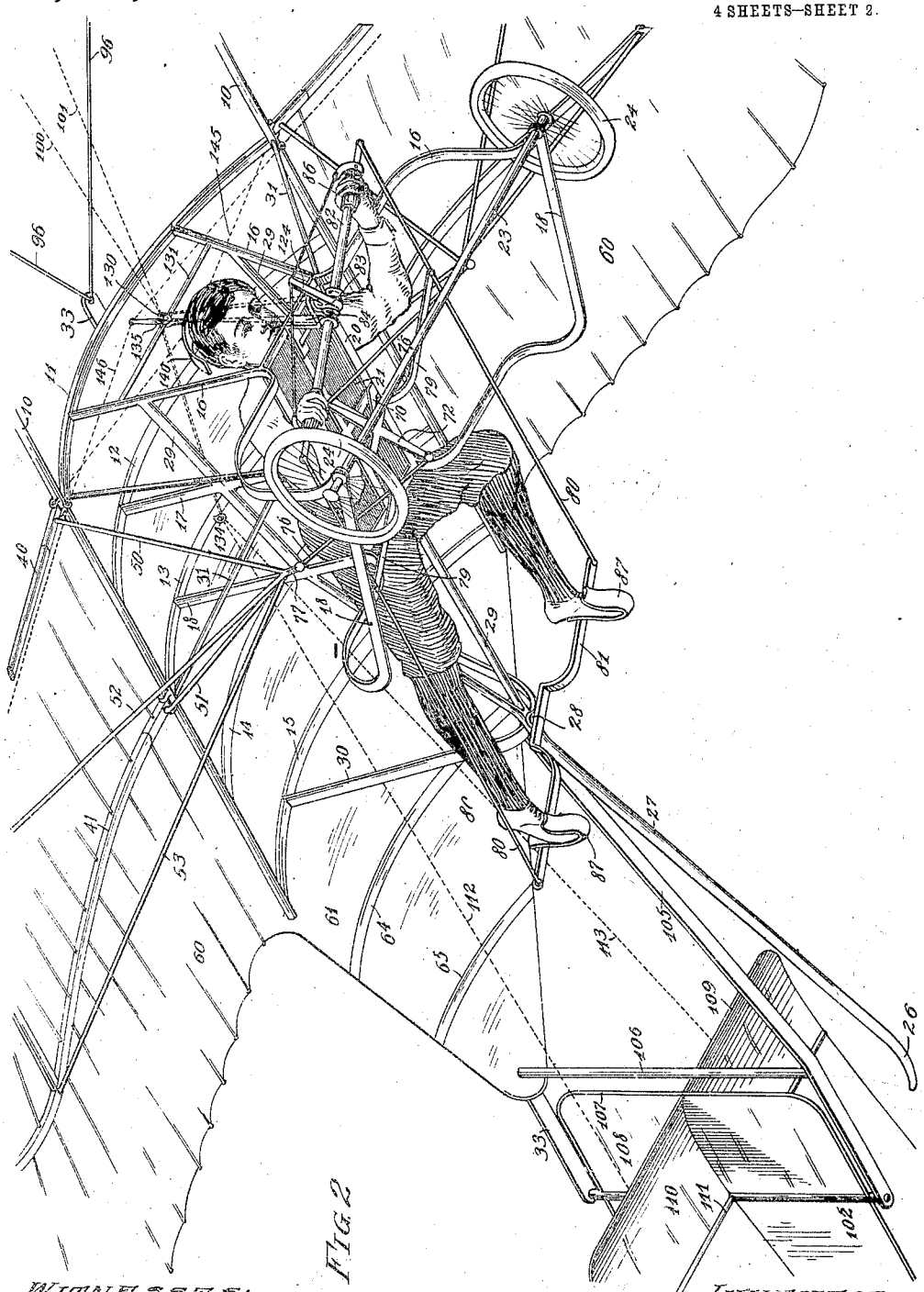

FIG. 2

WITNESSES:

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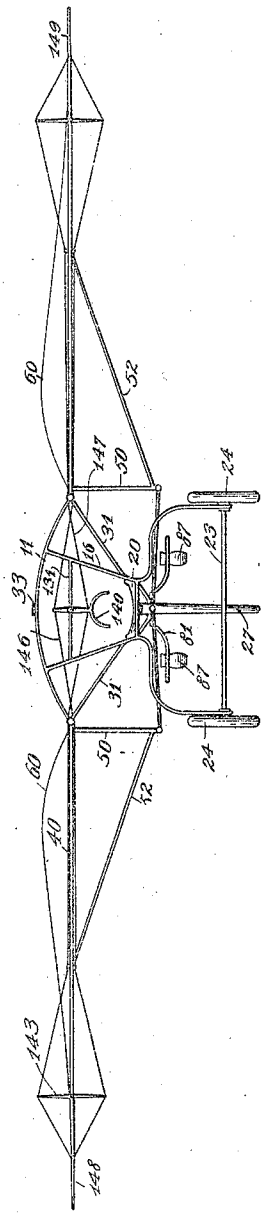

FIG. 3

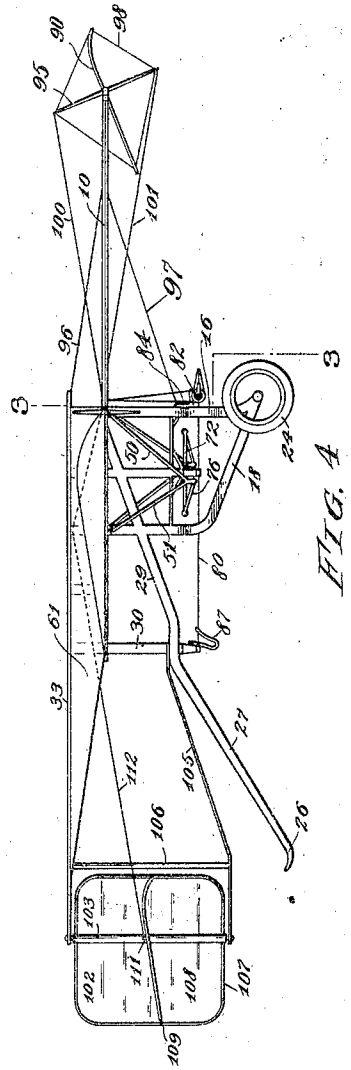

FIG. 4

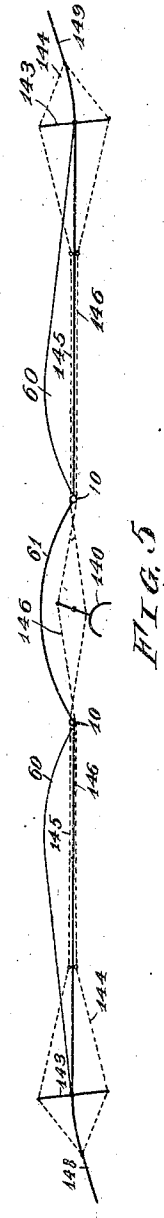

FIG. 5

WITNESSES:

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1,013,152.

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4 SHEETS—SHEET 4.

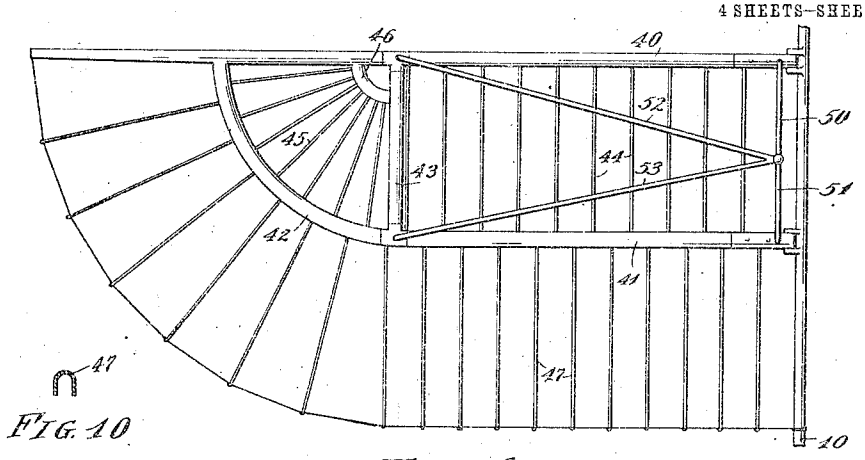

FIG. 10

FIG. 6

FIG. 11

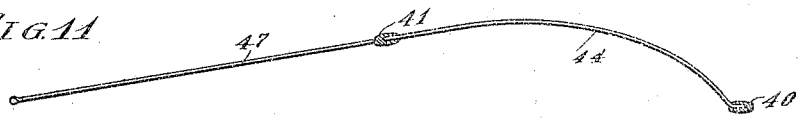

FIG. 7

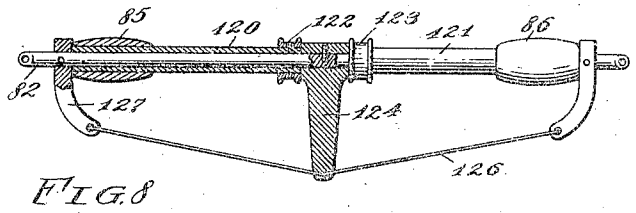

FIG. 8

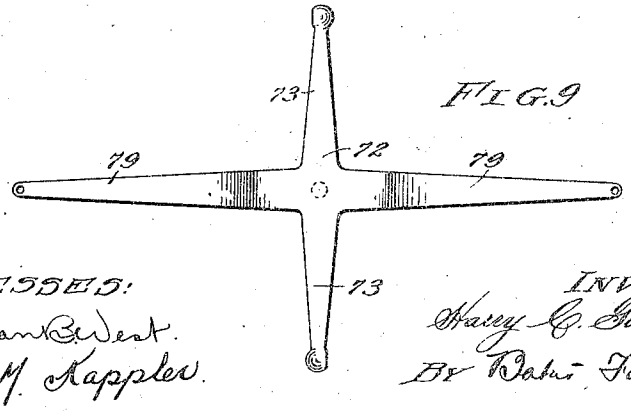

FIG. 9

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UNITED STATES PATENT OFFICE.

HARRY C. GAMMETER, OF BRATENAHL, OHIO.

FLYING-MACHINE.

1,013,152. Specification of Letters Patent. Patented Jan. 2, 1912.

Application filed February 11, 1910. Serial No. 543,291.

To all whom it may concern:

Be it known that I, HARRY C. GAMMETER, a citizen of the United States, residing at Bratenahl, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Flying-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The object of this invention is to provide an effective and cheap machine for flying.

The machine is adapted to be extremely light in construction and the various moving parts may be so arranged and connected that the machine may be conveniently driven by man power.

One of the features of the invention is arranging the mechanism so that the operator may lie substantially horizontally head foremost, so as to present the minimum resistance to the air while he may use the force of both hands and both feet for driving the machine.

Another feature is the arrangement of mechanism so that the operator, while using a backward and forward movement of his hands in driving, may use a twisting or wrist movement in steering.

Another feature is the provision of means for flexing the tips of the wings by the movement of the operator's head.

My machine is illustrated in the drawings herein and is hereinafter more fully described and its essential characteristics are summarized in the claims.

In the drawings, Figure 1 is a plan of my machine; Fig. 2 is a bottom perspective thereof showing the operator in position; Fig. 3 is a front elevation with the parts in front of the line 3—3 of Fig. 4 removed; Fig. 4 is a side elevation; Fig. 5 is a diagrammatic view in the nature of a vertical section parallel with Fig. 3 illustrating the flexing of the wing tips; Fig. 6 is a bottom plan of one of the wings; Fig. 7 is a vertical cross section through one of the wings in the fore and aft direction, illustrating the parabolic curvature of the wing; Fig. 8 is a sectional plan of the driving and steering handle bar; Fig. 9 is a plan of the rocking cross bar which operates the wings; Fig. 10 is a cross section of one of the ribs of the wings; Fig. 11 is a cross section of one of the steel frame bars.

My machine, in the form shown, being adapted to be driven by the power of the operator himself, is designed so as to be very light in construction, being composed of thin steel strips and tubes, light wooden strips, steel U-shaped ribs like umbrella ribs, and light fabric. The machine shown it will be seen, comprises a central frame, two outwardly extending wings hinged to the upward outer edges of the frame, an elevation rudder at the front, a steering rudder at the rear, a support on the central frame for the operator, and driving mechanism which he may actuate when on said support. I will first describe the central frame.

As shown, the central frame has a pair of parallel bars 10, preferably of hollow tubular steel construction and located at the upper outer edges of the frame. These bars 10 are connected by a series of light arched bars as 11, 12, 13, 14 and 15, preferably hollow elliptical or flattened steel tubing, as illustrated in Fig. 11. Extending downwardly from the crown bars 11, 12 and 13 are the bars 16, 17 and 18 preferably of the same flattened tubular form and material, and these depending bars are connected with and carry the rectangular frame 20 which forms the border for a suitable plate 21 which supports the operator. The depending bars 16 and 18, referred to, continue below the supporting plate 21 and connect together at the lower ends where they carry the axle 23 of a pair of wheels 24, by which the machine may rest while on the ground. A third point of support for the machine at rest is provided by the rear end 26 of a diagonal bar 27, which is connected at 28 to a bar 30 depending in a U form from the arch bar 15. In front of the point 28, the bar 27 forks and each branch 29 thereof connects with one set of the bars 16, 17 and 18. The central frame above described is further braced on each side by the diagonal rods 31 and 31 extending downward diagonally from two points of the bars 10 to points on the opposite sides of the frame 20. These diagonal bars 31 and 31 join the frame 20 substantially where the bars 17 join. These diagonal bars are omitted from Fig. 4 for clearness of illustration, and to prevent their confusion with the diagonal operating bars there shown. The various crown bars are braced by the fore and aft strip 33 surmounting them and secured to them preferably over the fabric, as hereinafter described.

The wings are of the construction shown

in Figs. 6 and 7. They comprise the front edge bar 40, preferably of wood, the intermediate parallel bar 41, connecting curve bar 42, the cross bar 43 all of wood preferably, and numerous ribs. As shown, there are one set of ribs 44 connecting the bars 40 and 41, another set of ribs 45 connecting the quadrant bar 42 with the short bar 46 at the angle, and a set of ribs 47 connected at their forward edges to the bars 41, 42 and projecting rearwardly and outwardly. The bars 40 and 41 of the wing are hinged to the frame bar 10. The wing is shown as braced by four diagonally extending bars leading from points near the opposite ends of the two bars 40 and 41 to a common point below the inner end of the wing. These four diagonal bars are designated 50, 51, 52 and 53. The ribs of the wings are preferably U-shaped steel construction with the trough facing downwardly, after the manner of umbrella ribs and as illustrated in Fig. 10. Near the tip the forward edge of the wing may be trussed by the wire 48 and the strut 49, as shown in Fig. 1.

The fabric of my machine preferably extends continuously from wing tip to wing tip over the central frame. The portion over the wings is designated 60 and that over the central frame 61. Over the central frame it extends rearwardly, supported by arch bars 64, 65 which are carried by the fore and aft bar 33, heretofore referred to. It is convenient and effective to put the intermediate fabric 61 over the arch bars and put the fore and aft bar over the fabric and connect it with the arch bars through the fabric. The fabric over the central portion is cut off diagonally or tapered to a point adjacent to the rudder, as shown in Fig. 1. The fabric may be of any light approved material, as is well understood.

To operate the wings effectively by the power of the operator himself, I provide the following mechanism. Pivotally mounted in the central frame, as on a bar 70 secured to the rectangular frame 20, is the oscillating yoke 72. This yoke is of the form shown in Fig. 9. It has two fore and aft arms 73 which are connected respectively by links 76 with the conjoint lower end 77 of the wing-brace bars 50, 51, 52 and 53 referred to. The connection between the arms 53 and the links 76 is by universal or ball and socket joint, as indicated in Fig. 9. The lateral arms 79 of the yoke bend downwardly and are connected at their outer ends respectively to a pair of fore and aft rods 80. These rods are pivotally connected at their rear ends to a cross bar 81, pivoted to the frame at the point 28, and at their forward ends to a handle bar 82 pivoted to the frame at 83; for example, to a bracket 84 depending from the frame 20. The cross bar 82 is provided with hand grips 85, while the cross bar 81 has toe-clips or pockets 87.

The result of the above described construction is that an operator lying on the support 21 and engaging with his hands and feet the bars 82 and 81 may oscillate these bars simultaneously by the power of both arms and both legs—pushing, for example, with the right leg and left arm and pulling with the left leg and right arm, or vice versa. This movement, which, it will be seen, may be made with the whole power of the individual, rocks the yoke 72, and, through the links 76, oscillates the wings up and down. This ability to obtain the maximum human power is one of the important features of my machine.

It will be seen from Fig. 7 that the wings of my machine have a parabolic curve measured fore and aft, the focus of the parabola being at the front. By this construction the direction of the upward force exerted by the downward movement of the wings against the air resistance is not purely vertical but diagonally forward. That is to say, while the larger component of the force is vertical there is a material component extending horizontally in a fore and aft direction. The result is that a major portion of the force is exerted to sustain the machine, while a portion is available to propel it forwardly.

90, in Figs. 1 and 4, designates an elevation rudder, which, in the embodiment, is mounted at the front of the machine between forward extensions of the frame bars 10, these bars being braced near their forward end by a cross bar 91 and also braced by the wires 96 leading to the forward end of the bar 33, and wires 97 leading to the bracket 84. The rudder has a substantially rectangular frame 92, a cross bar 93, by which it is journaled, and a fabric covering 94. Extending upwardly and downwardly from the cross bar 93 is a bar 95 which is suitably braced to the rim 92, by the wires 98, for example, as shown in Fig. 4. Connected to the ends of the bar 95 are wires 100 and 101 by which the rudder may be operated, as hereinafter explained.

The rudder for lateral steering is designated 102. It is mounted on a vertical rod 103 journaled in a rearward extension of the top bar 33 and in a lower bar 105 which is secured to the frame at 28. These two bars are braced by a suitable vertical cross bar 106. The rudder 102 is provided, not only with the vertical rectangular frame 107 and the vertical fabric 108, but has also an approximately horizontal steadying portion comprising the frame 109 and the fabric 110. This rudder is operated by wires 112 and 113 connected to a cross member which

leads from the pivot shaft 103 to the horizontal border 109 as indicated by 111.

To pull on the respective wires, to operate either rudder as desired by the hands of the operator without interfering with his movement of the handle bar, I provide the following mechanism. As heretofore stated, there are hand grips 85 on the handle bar. These grips, however, are not tight on the bar but are mounted on sleeves 120 and 121 on the bar, these sleeves carrying respectively pulleys 122, 123 near their inner ends, which are adjacent to a bracket 124, which is pivoted to the frame bracket 83 referred to. The handle bar is shown as braced by a truss rod 126 bearing intermediately on the bracket 124 and connected at its ends to strips 127 mounted on the rod. The two wires 100 and 101 from the elevation rudder pass over a guide sheave or eye 130 (carried on the cross bar 131 of the central frame) downwardly and wrap from opposite directions around the sheave 123. Similarly the wires 112 and 113 from the steering rudder pass through an eye 134 and thence downwardly over a pulley or eye 135 carried by the bar 131 and wrap from opposite sides around the sheave 122.

From the above construction it will be apparent that, when the operator is in position, the movement of his hands and legs will operate the wings as heretofore described, while by twisting the hand grip 86 by his left hand the elevation rudder is tipped up or down and by twisting the hand grip 85 with his right hand the steering rudder is turned to the right or left. These twisting movements in no manner interfere with the oscillations of the handle bar, nor do these oscillations give any movement to the rudders, as the wires come down substantially in line with the center of oscillation and the slight movement of the sheaves by the rocking of the bar is immaterial.

For the most satisfactory manipulation of the machine it is desirable to be able to flex the tips of the wings, and this I provide for by mounting on the frame bar 131 a yoke piece 140 which is adapted to depend on opposite sides of the operator's head, and I connect this yoke piece by suitable wires with the wing tips, so that the operator, by moving his head to the one side or the other, may flex the wings as desired, one tip being bent down whenever the other tip is bent up. This is illustrated particularly in Fig. 5. The wing tips are provided with up and down bars 143 suitably braced by wires 144, and from the upper ends of these bars lead wires 145 and 146, connected to the yoke lever 140 above and below its pivot. As shown, the wires 145 from the upper end of the bars 143 are connected below the pivot, and the wires 144 are connected above the pivot. When the operator throws his head to his right, for example, (as he is supposed to have done in Fig. 5) the right wing tip 148 is flexed downwardly, while the left wing tip 149 is flexed upwardy. The movement of the head to the left would cause the reverse movement. In operation, when the machine tends to tip downwardly on either side, the operator almost involuntarily throws his head to the opposite side which tips up the lower wing point (making an elevating plane thereof) and tips down the upper wing so that the new position of these points tends to make the machine right itself.

It will be seen from the description given that my machine, while allowing the operator to use his full force for propelling the machine, enables him, without removing his hands or feet from the propelling mechanism, to give all the movements necessary to steer the machine, and control its elevation and its balancing. The operator is so positioned that he presents the minimum of air resistance and is furthermore in convenient position for observation of what is below him and in front of him. The machine is very light in construction, so that the major portion of the operator's work is in lifting and propelling his own weight. The machine may also be very cheaply constructed, which is a decided point in its favor.

Having thus described my invention, what I claim is:—

1. In a flying machine, the combination with a central frame, a pair of wings hinged thereto, a support for the operator carried by the frame, a pair of pivoted driving bars carried by the frame in front of and behind the support respectively and adapted to be engaged by the operator's hands and feet respectively, links connecting said driving bars, and a rocking member carried by the frame and connected with said links and with the wings.

2. In a flying machine, the combination of a central frame, wings hinged thereto, a support for the operator carried by the frame, a pair of pivoted driving bars respectively located in front of and behind the support and adapted to be engaged by the operator's hands and feet, a rocking member operated by said bars, brace bars depending from the wings, and links connecting said brace bars with the said rocking member.

3. In a flying machine, the combination with the wings, of driving mechanism therefor, comprising a pair of pivoted members connected with the wings and having on opposite sides of their pivots hand holds and foot holds, whereby the operator may exert simultaneously the power of both arms and both legs.

4. In a flying machine, the combination

with a central frame and wings hinged thereto, of driving mechanism for the wings mounted on the central frame and comprising connected levers mounted on substantially vertical pivots and adapted to be engaged and operated simultaneously by both feet and both hands of the operator.

5. In a flying machine, the combination with the supporting parts, of a support for the operator's chest, and driving mechanism in front of and behind said support and comprising pivoted levers adapted to be engaged by the operator's hands and feet.

6. In a flying machine, the combination with movable wings, of a support adapted to carry the operator on his chest, and driving mechanism for the wings comprising connected levers adapted to be engaged respectively by hands and feet of the operator when in such position on such support.

7. In a flying machine, the combination with a central frame, wings hinged thereto, a support for the operator carried by the frame, a pivoted bar mounted adjacent to said support, another pivoted bar at the rear of said support, said bars swinging on substantially vertical intermediate pivots and being adapted to be engaged on opposite sides of their pivots by the operator's hands and feet, and connecting mechanism between said bars and the wings.

8. In a flying machine, the combination with means for supporting the operator in a substantially horizontal position, and driving mechanism comprising connected intermediately-pivoted levers adapted to be engaged and moved by both of the operator's hands and both legs simultaneously when on said support.

9. In a flying machine, the combination with a frame, a support for the operator carried thereby, a movable bar located below said support and adapted to be engaged by the operator's hands, and a movable bar at the rear of the support adapted to be engaged by the operator's feet, and movable parts driven by the movement of both of said bars simultaneously.

10. In a flying machine, the combination of a central frame, wings hinged to the opposite edges thereof, members depending from the wings, a substantially horizontal support for the operator, rocking mechanism beneath said support, connections between the same and the members depending from the wings, and movable mechanism adapted to be engaged by the hands and feet of the operator when on said support to operate the rocking mechanism.

11. In a flying machine, the combination with a support for the operator, of a rocking bar pivotally mounted adjacent to the front of the support on an intermediate up and down pivot, a second rocking bar pivotally mounted at the rear of the support, and flying mechanism operated by the conjoint movement of both of said bars.

12. In a flying machine, the combination with a support, a handle bar intermediately pivoted near the forward end of the support, a foot bar intermediately pivoted at the rear of the support, wings, and connections between the same and both of said bars.

13. In a flying machine, the combination of a driving mechanism including a pivoted hand bar having an independently movable hand grip, and guiding mechanism controlled by such independent movement.

14. In a flying machine, the combination of driving mechanism including a pivoted handle bar having two independently movable grips, an elevation rudder and a steering rudder, and connections between the rudders and the grips respectively.

15. In a flying machine, the combination of a pivoted hand-operated driving bar, a hand grip thereon adapted to turn about the axis of the bar, guiding mechanism, and a flexible cord or wire connecting the same with the hand grip.

16. In a flying machine, the combination with a hand-operated pivoted driving bar, a hand grip mounted to turn thereon, guiding mechanism, and a connection between the guiding mechanism and the hand grip connecting with the hand bar adjacent to its pivot.

17. In a flying machine, the combination of a pivoted hand-operated driving bar, a pair of hand grips thereon for moving the bar, sleeves leading inwardly from the hand grips to points adjacent to the pivot, an elevation rudder and a steering rudder, and connections between said rudders and said sleeves respectively.

18. In a flying machine, the combination of a support for the operator, a hand driving bar centrally pivoted adjacent to the front end of the support, driving mechanism operated by the movement of said bar about its pivot, hand grips on said bar adapted to be independently moved thereon, and directing mechanism operated by said hand grips.

19. In a flying machine, the combination with the wings, driving mechanism therefor including a pivotally mounted hand bar, hand grips on said bar, and directing mechanism controlled by the independent movement of said grips.

20. The combination with a central frame a pair of wings hinged thereto, driving mechanism for the wings including a hand-operated pivoted bar, a pair of hand grips on the bar, a pair of rudders, and connections between the rudders and the grips respectively, whereby the movement of the bar about its pivot may operate the wings, and the movement of the grips on the bar may operate the rudders respectively.

21. In a flying machine, the combination with the supporting members having flexible portions, mechanism adapted to be engaged by the operators head, and connecting mechanism between the same and said flexible portions, whereby the operator, by moving his head, may cause the flexure.

22. In a flying machine, the combination with hand-operated driving mechanism, of mechanism actuated by the movement of the operators head for flexing a portion of the supporting member.

23. In a flying machine, the combination with a support for the operator, of a pivoted member adapted to be engaged by the operator's head and moved in either direction, supporting surfaces adapted to be flexed, and connections between such pivoted member and portions of the supporting surface.

24. In a flying machine, the combination with a central frame, wings hinged thereto and having flexible tips, cords or wires for operating the same, and movable mechanism carried by the central frame and adapted to be engaged by the operators head for pulling on said cords or wires.

25. In a flying machine, the combination with a central frame, wings hinged thereto, a support for the operator carried by said frame, hand-operated driving mechanism adjacent to said support, and mechanism for flexing the tips of the wings adapted to be operated by the head of the operator when on the support.

26. In a flying machine, the combination of a central frame, a support for the operator, a yoke adapted to extend on opposite sides of the operator's head, said yoke being pivotally mounted in the frame, wings connected to the frame, and mechanism for flexing the tips of the wings connected with said yoke.

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

HARRY C. GAMMETER.

Witnesses:
ALBERT H. BATES,
BRENNAN B. WEST.