April 27, 1926. 1,582,482

A. MRAULA

FLYING MACHINE

Filed June 2, 1925 6 Sheets-Sheet 1

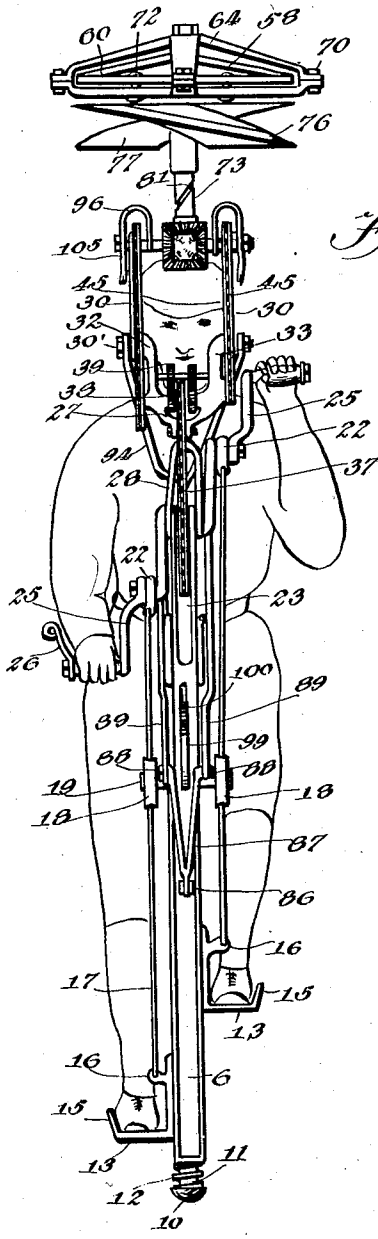


Fig. 1.

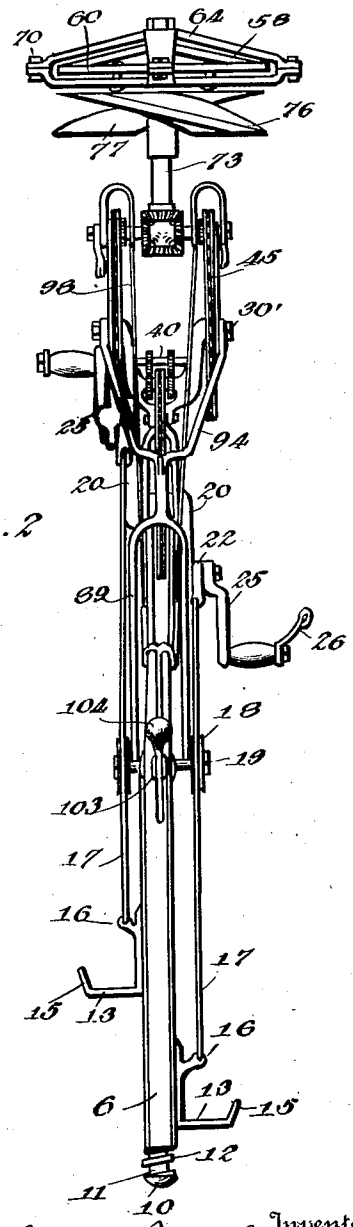


Fig. 2.

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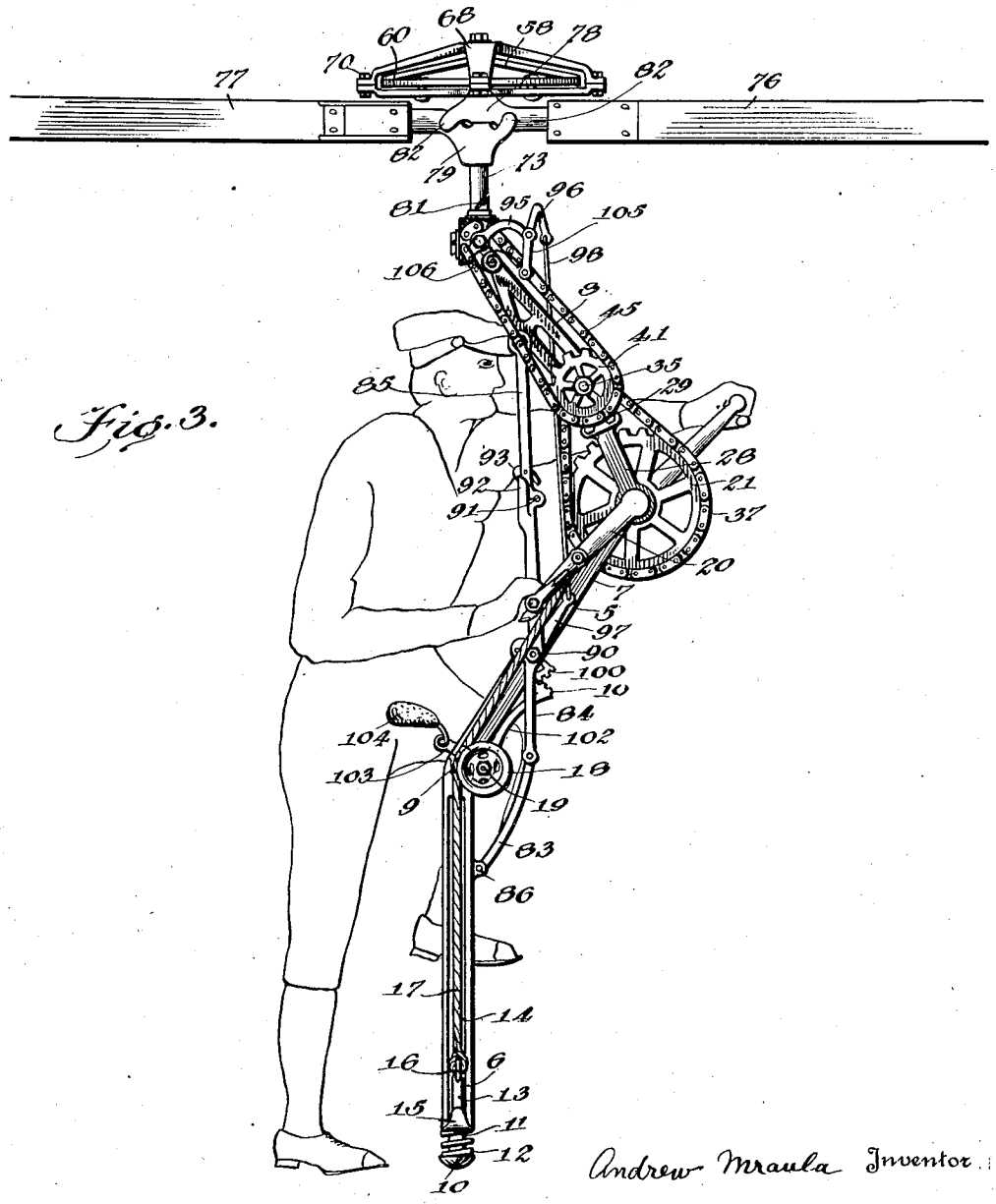


Fig. 3.

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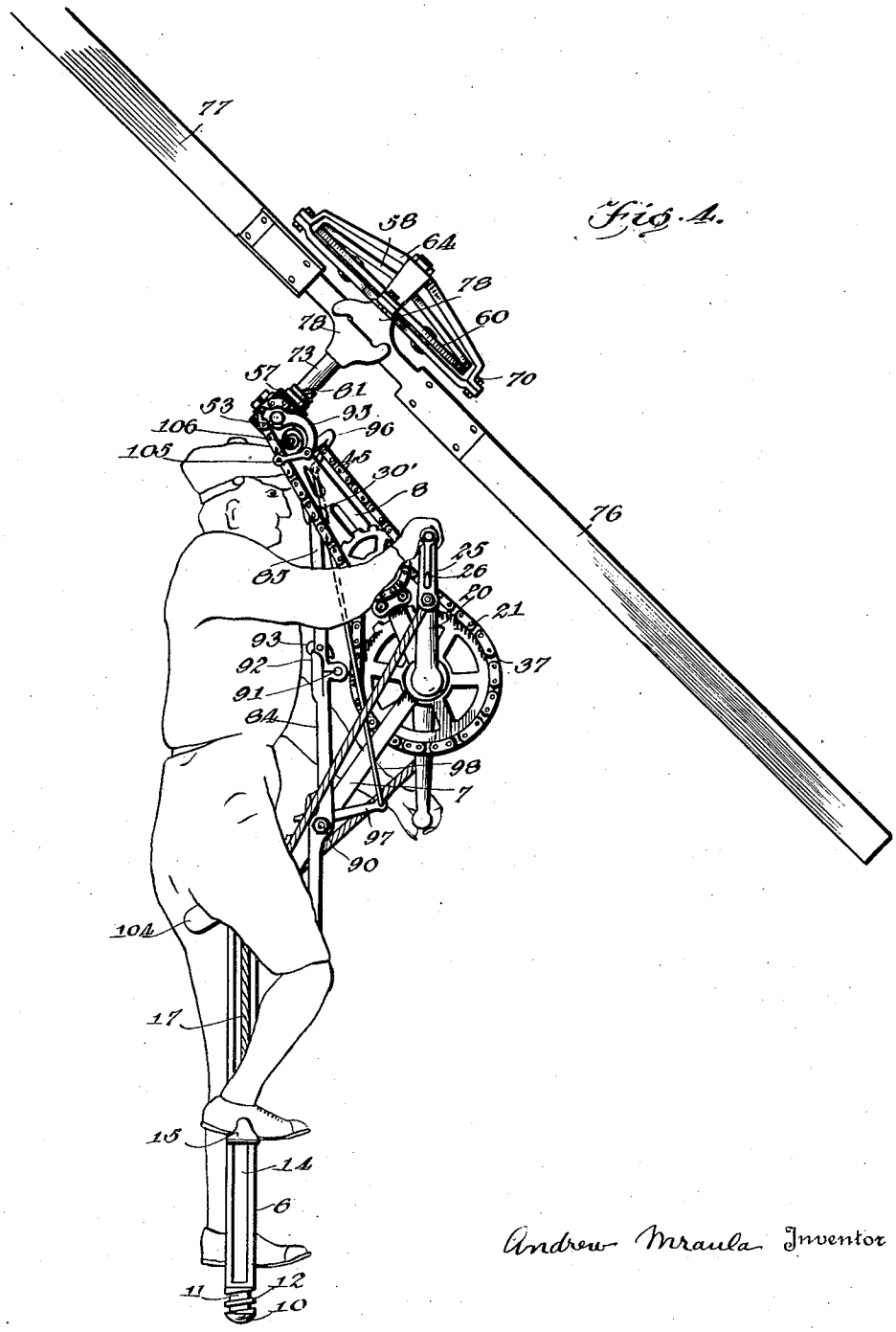


Fig. 4.

Andrew Mraula Inventor

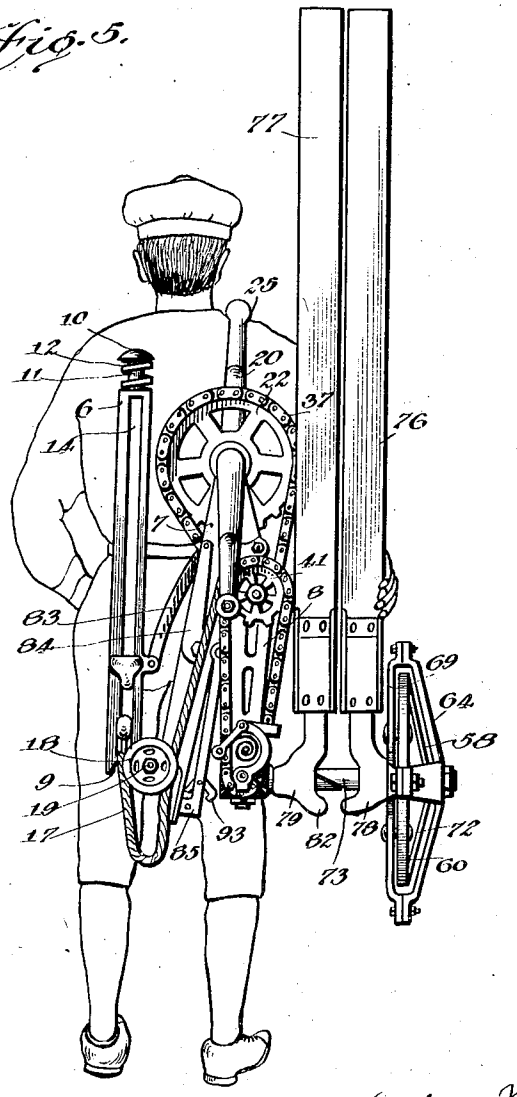
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Fig. 5.



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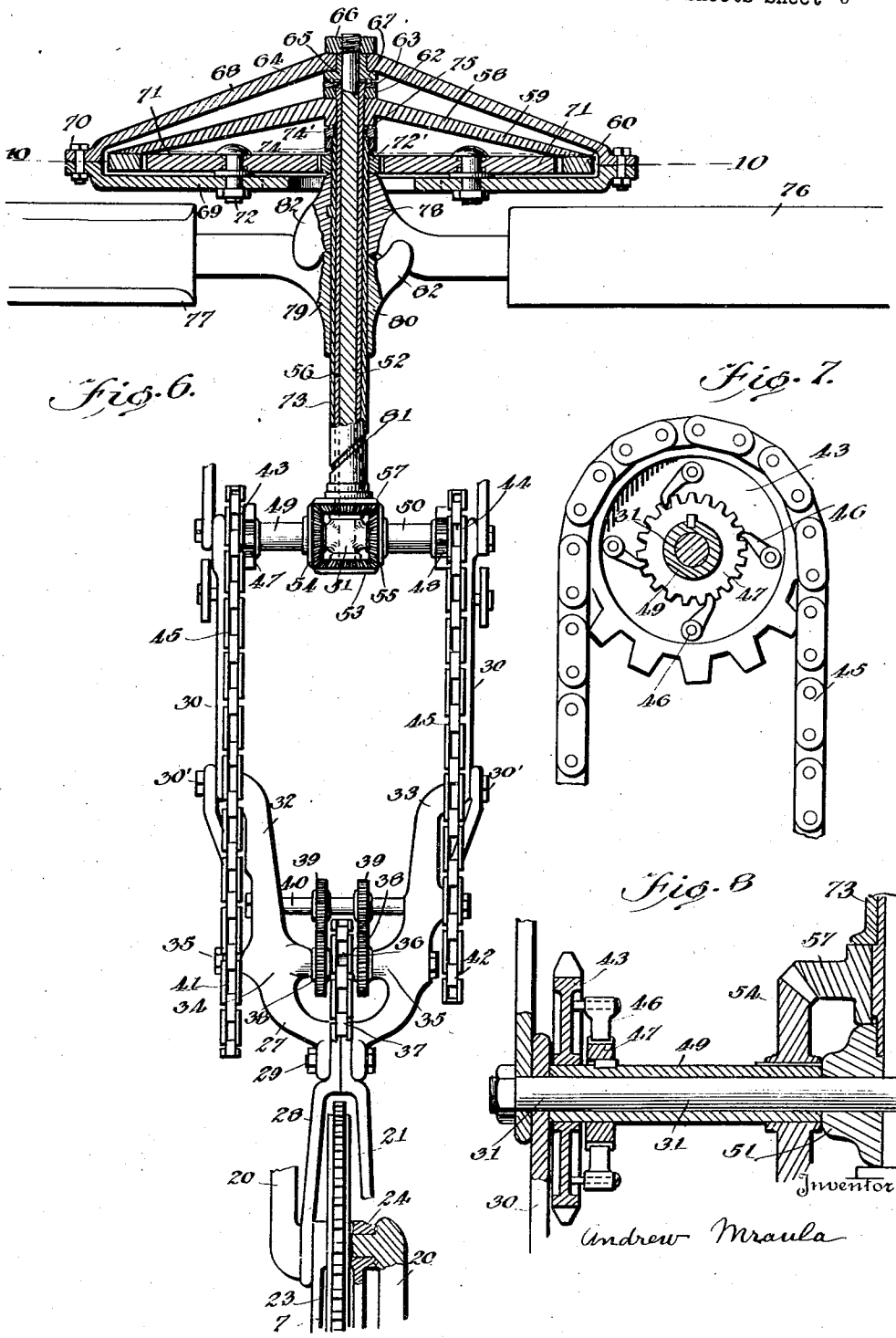


Fig. 6.

Fig. 7.

Fig. 8

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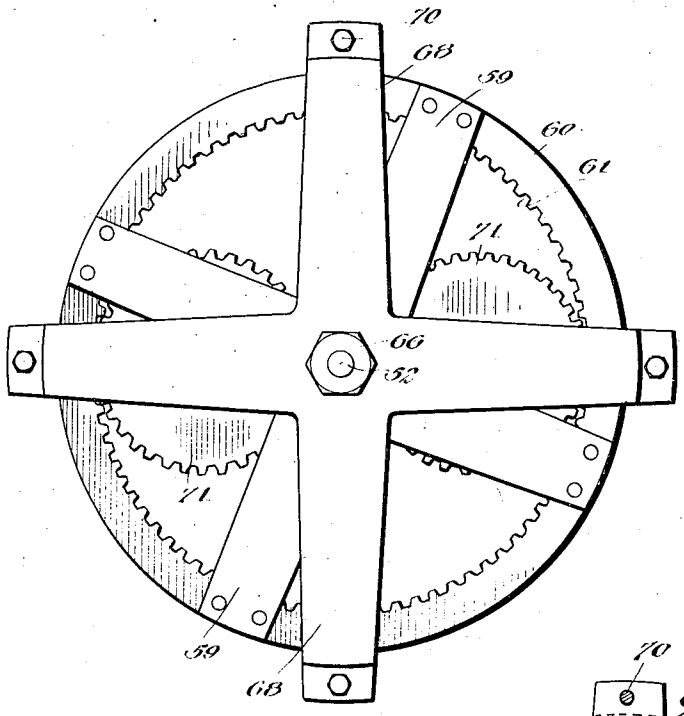


Fig. 9.

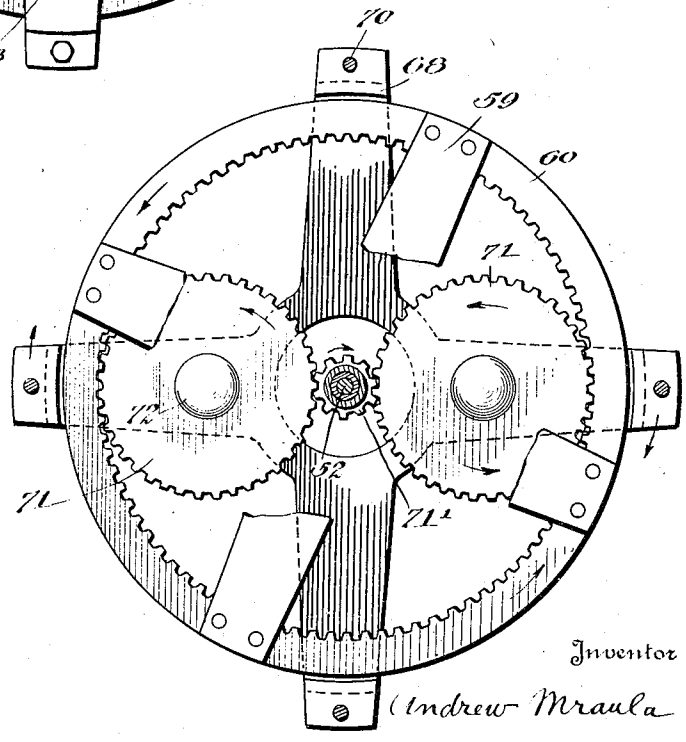


Fig. 10.

Inventor

Andrew Mraula

Patented Apr. 27, 1926. 1,582,482

UNITED STATES PATENT OFFICE.

ANDREW MRAULA, OF CAMAS, WASHINGTON.

FLYING MACHINE.

Application filed June 2, 1925. Serial No. 34,324.

To all whom it may concern:

Be it known that I, ANDREW MRAULA, citizen of the United States, residing at Camas, in the county of Clarke and State of Washington, have invented certain new and useful Improvements in Flying Machines, of which the following is a specification.

My invention relates to manually operated flying machines adapted to be used to navigate the air.

It is an object of the invention to provide a portable machine of the above character having manually actuated mechanism whereby a person through the use of his own strength may fly through the air.

A further object of the invention is to provide mechanism for operating the propeller at a high rate of speed, and so designed that through its operation it will balance the machine while in flight.

A further object of the invention is to provide a portable machine which when not in use may be compactly folded and easily carried on the back of a person.

Another object of the invention is to provide a machine of the above-mentioned character which is simple and durable in construction, efficient in operation and inexpensive to manufacture.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this specification and in which like numerals are employed to designate like parts throughout the same,

Fig. 1, is a front elevation of my machine,

Fig. 2, is a rear elevation of the same,

Fig. 3, is a side elevation of the machine ready to ascend,

Fig. 4, is a side elevation of the machine, showing the position of the propeller when moving forwardly,

Fig. 5, is a side view of the machine collapsed, showing how it is carried on the back,

Fig. 6, is a fragmentary front view of the gearing mechanism, partly in section,

Fig. 7, is a detail side view of the ratchet gear,

Fig. 8, is a longitudinal sectional view, of a part of the differential shaft,

Fig. 9, is a top plan view of the propeller gearing, and,

Fig. 10, is a cross sectional view on lines 10—10 of Fig. 6.

In the drawings, wherein for the purpose of illustration I have shown a preferred embodiment of my invention, the numeral 5 denotes in general the frame of the machine which is composed of sections 6, 7 and 8. The intermediate section 7 is hingedly connected, as at 9, to the upper end of the lower section 6 and when in an extended position extends from the lower section at an obtuse angle thereto. A shock absorber is connected to the lower end of the section 6 consisting of a rubber head 10 having a stem 11 slidably mounted in the end of the section and a coil spring 12 interposed between the end of the section and the head whereby the impact of the head with the ground when the machine is landing will be absorbed by the spring. A pair of pedals 13 are slidably mounted in longitudinal grooves 14 on opposite sides of the section 6 being adapted to be reciprocated by the feet of the operator. The pedals are substantially L-shaped having their outer ends turned up, as at 15, to prevent the feet from slipping off the pedals. Lugs 16 are cast integral with the side of the pedals having ropes 17 connected therewith which extend upwardly and are trained over the pulleys 18 journaled on the outer ends of the pintle pin 19 which hinges the sections 6 and 7 together. The upper ends of the ropes are connected to the cranks 20 of the sprocket wheel 21 by means of collars 22. The sprocket wheel is mounted in the bifurcated end 23 of the section 7, being journaled in the bushings 24, and is manually actuated by the arms of the operator through the medium of the cranks 20. Hand grips 25 are connected with the ends of the cranks 20, being substantially L-shaped and having a guard 26 connected to the outer ends to prevent the hands from slipping off the grips.

The upper section 8 consists of two forks 27 and 28 bolted together, as at 29, the upper fork 27 being relatively wider than the lower fork 28. The lower fork is pivotally connected with the bushings 24 and normally extends upwardly and backwardly, at an obtuse angle to the intermediate section 7. Parallel side pieces 30 are connected to the ends of the fork 27, by bolts 30′ and extend longitudinally therefrom, having a

differential shaft 31 rotatably mounted in their free ends. The arms 32 and 33 of the fork 27, near their lower ends are provided with inwardly directed opposed bosses 34 in which the shaft 35 is journaled. A pinion gear 36 is keyed on the center of the shaft 35 and movement is imparted to the pinion gear by the sprocket chain 37 trained over the sprocket wheel and pinion gear. Spur gears 38 are keyed on the shaft 35 on opposite sides of the pinion gear and mesh with the spur gears 39 keyed on the shaft 40 journaled in the arms 32 and 33 of the fork in superposed relation to the shaft 35. Opposite ends of the shafts 35 and 40 extend beyond the sides of the arms 32 and 33 and have gears 41 and 42 keyed on their respective ends. Thus, it is seen that by reason of the gearing between the shafts 35 and 40 the gears 41 and 42 are revolved in opposite directions. The gears 41 and 42 are connected with the gears 43 and 44 rotatably mounted on the shaft 31 adjacent the side pieces 30 in which the shaft 31 is mounted, by the endless chains 45 trained over the gears. A series of spring pressed pawls 46 are pivotally mounted on the inner sides of the gears 43 and 44, adapted to normally engage the teeth of the ratchet gears 47 and 48 keyed to the sleeves 49 and 50 revolvably mounted on the shaft 31, as more clearly shown in Figs. 7 and 8.

The sleeves 49 and 50 terminate short of the center of the shaft 31 and intermediate their ends, the shaft 31 is provided with a bushing 51 in which the lower end of the shaft 52 is journaled. The shaft is normally disposed in a vertical position and has a beveled gear 53 fixedly mounted on its lower end which meshes with the beveled gears 54 and 55 connected with the ends of the sleeves 49 and 50, respectively. A tubular shaft 56 is revolvably mounted on the shaft 52 having a bevel 57 mounted on its lower end which also meshes with the gears 54 and 55. The gears 53, 54, 55 and 57 serve as a differential whereby the shaft 52 and tubular shaft 56 are revolved in opposite directions. The tubular shaft 56 terminates short of the upper end of the shaft 52 and has a spider 58 connected therewith having its arms 59 inclined downwardly and supporting at their outer ends the annular gear 60 having teeth 61 around its inner peripheral edge. The spider is held on the shaft 56 by the nut 62 and a washer 63 placed on the end of the shaft 52 rests on the nut. A second spider 64 is connected on the end of the shaft 52 by the collar 65 and is held thereon by the nut 66. Ball bearings 67 are interposed between the collar 65 and washer 63 whereby the spider is free to revolve with the shaft upon rotation thereof. The arms 68 of the spider 64 are also inclined downwardly, at a slightly greater angle than the inclination of the arms 59 of the spider 58 and extend beyond the ends of the arms 59. Extensions 69 are connected to the free ends of the arms 68 of the spider 64, by bolts 70 and extend inwardly on a horizontal plane towards the shaft 52 and below the annular gear 60, having their inner ends joined by a circular ring 60′. Relative large gears 71 are connected to two of the extensions near their inner ends by the pivot pins 72 and are disposed on a horizontal plane. The gears 71 mesh with the teeth of the annular gear 60 and a small pinion gear 72′ connected to the end of the propeller shaft 73 revolvably mounted on the tubular shaft 56. A nut 74 is mounted on the end of the propeller shaft and supports a washer 74′ carrying ball bearings 75 on which the spider 58 is mounted, so it is freely movable with the shaft on which it is mounted.

The propeller consists of two blades 76 and 77, the blade 76 having a bearing 78 rigidly mounted on the shaft 73, while the bearing 79 of the blade 77 has a longitudinal rib 80 movable in the spiral groove 81 formed in the shaft 73. The bearing 79 of the blade 77 is mounted on the shaft beneath the bearing of the blade 76 and when the shaft is revolved, will be moved upwardly, by centrifugal force, into engagement with the bearing of the blade 76, whereupon the blades will be interconnected together by the oppositely disposed lugs 82, cast integral with the bearings, so that the blades revolve together.

The frame is normally held in an extended position by the toggle links 83, 84 and 85. The lower link 83 is pivotally connected to the lower section of the frame near the top, as at 86, having two branch arms 87 curved upwardly and pivotally connected, as at 88, to the lower ends of the parallel side members 89 of the intermediate link 84. The side members 89 are pivotally connected to opposite sides of the intermediate section of the frame, approximately midway its length, by the pintle pin 90. The upper ends of the side members merge together and are pivotally connected to the lower end of the upper link 85, as at 91. The pivotal movement of the links is limited by the stop member 92 formed integral with the intermediate link and adapted to contact with the upper link when the links are extended. A catch 93 pivoted to the upper link is movable into engagement with said stop member, whereby the links are locked in place. The upper link has diverging arms 94 which are connected to opposite sides of the upper section of the frame, by the bolts 30′ which connect the side pieces 30 with the ends of the fork 27. Thus, it is seen that the frame is rigidly supported in an extended position when the machine is in use and yet may be readily collapsed when not in use.

In order that the machine will move forwardly after ascending it is necessary to tilt the propeller forwardly, as more clearly set forth in Fig. 4. As shown in Fig. 3, a lever 95 is connected to each end of the shaft 31, which are curved forwardly. A U-shaped arm 96 extends at right angles from the lever, being fixedly connected therewith. The free ends of the arms 96 are connected with the arm 97 by ropes 98 which extend downwardly through the upper section of the frame. The arm 97 is pivotally mounted in the slot 99 formed in the intermediate section of the frame by the pintle pin 90. The lower end of the arm 97 has a segment 100 which meshes with the segment 101 formed on one end of the bell crank lever 102 which is pivotally mounted on the pintle pin 19. The opposite end 103 of the bell crank lever extends through the slot 99 and has a conventional type of saddle 104 connected therewith. Thus, it is seen that when the saddle is moved down by the weight of the operator the bell crank lever will be rocked on its pivot which in turn swings the arm 97 downwardly, pulling the ropes which cause the levers 95 to rotate the shaft 31, whereby the propeller and its entire mechanism is moved forward. The levers 95 are provided with a depending extension 105, which is under the tension of the coil springs 106 connected to the sides of the frame, so that upon release of the weight on the saddle the propeller will be automatically moved to a vertical position by the tension of the coil springs.

From the foregoing it is seen that the frame of the machine is collapsible and may be folded compactly so as to be easily carried on the back of a man. To collapse the frame, the catch holding the toggle links is released and by pulling the upper links towards the operator the sections of the frame will be folded upon each other, and the whole is supported on the back by placing one of the cranks over the shoulder, the blades of the propeller being held vertically by the hand, as clearly shown in Fig. 5.

In operation the frame is extended by the toggle links which hold and support the sections of the frame in position, as shown in Fig. 3. The machine is then placed on the ground in an upright position, and the cranks of the sprocket wheel are gripped by the hands, while the left foot is placed on one of the foot pedals, the other foot being left on the ground to balance the machine. The sprocket wheel is then revolved through operation of the cranks, which in turn through the gearing mechanism causes the propellers to revolve rapidly. As the machine starts to ascend the left foot is then placed on the opposite pedal, and through reciprocation of the pedals by the feet, more power is furnished to the sprocket wheel, since the pedals are connected with the cranks. While the machine is rising the operator stands in an upright position, until the desired altitude is reached, whereupon the operator places his weight on the seat rocking the bell crank lever which causes the propeller to be tilted down, so the machine will travel forwardly. If it is desired to turn the machine the operator pushes the machine with his hands in the direction he wishes to turn, at the same time swinging his body in the opposite direction. To descend, the propeller is moved to its original position, and the speed gradually reduced until the machine reaches the ground. As the speed of the propeller ceases the blades are disconnected, by the lower blade sliding down the shaft, so the blades may be disposed in parallel relation.

It is to be understood that the form of my invention herewith shown and described is to be taken as a preferred example of the same and that certain changes in the shape, size and arrangement of the parts may be made without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described my invention, I claim:—

1. A flying machine comprising an upright frame, a propeller mounted at the upper end of said frame, gearing for driving said propeller, a sprocket wheel for driving said gearing, and pedals slidably mounted on said frame for operating said sprocket wheel.

2. A flying machine comprising an upright frame, a propeller mounted at the upper end of said frame, gearing for driving said propeller, a sprocket wheel for driving said gearing, cranks for revolving said sprocket wheel, and pedals slidably mounted on said frame having connection with said cranks.

3. A flying machine comprising an upright frame, a rotatable shaft mounted at the upper end of said frame, a vertical shaft journaled at one end in said first mentioned shaft, a tubular propeller shaft rotatably mounted on said vertical shaft, a drive wheel, a train of gearing connecting said drive wheel with said propeller shaft, mechanism for moving said first mentioned shaft to tilt said propeller shaft, and spring means for normally holding said propeller shaft in a vertical position.

4. A flying machine comprising an upright frame, a rotatable shaft mounted at the upper end of said frame, a vertical shaft journaled at one end in said first mentioned shaft, a tubular propeller shaft rotatably mounted on said vertical shaft, a drive wheel, a train of gearing connecting said drive wheel with said propeller shaft, actuating levers connected with said first mentioned shaft, and a seat pivotally mounted

on said frame having connection with said levers whereby the movement of said seat will actuate said levers to tilt the propeller shaft.

5. A flying machine comprising a frame, a vertical propeller shaft mounted at the upper end of said frame having a spiral groove, a pair of propeller blades mounted on said shaft, one of said blades being rigidly affixed thereto and the other having sliding connection with said spiral groove, means for revolving said propeller shaft, and means for interconnecting said propeller blades together.

6. A flying machine comprising a frame, a vertically driven shaft, a tubular propeller shaft mounted on said driven shaft, a drive wheel, a train of gearing connecting said drive wheel with said shafts and operable to revolve said shafts in opposite directions, a propeller blade mounted on said tubular shaft, and balancing mechanism consisting of a pinion gear mounted on said tubular shaft, a spider mounted on the end of said tubular shaft, a large gear wheel having inside teeth supported by said spider, a second spider mounted on the upper end of said driven shaft having inwardly extending extensions and idle gears supported by said spider connecting said large gear with said pinion gear.

In testimony whereof I affix my signature.

ANDREW MRAULA.