E. E. STEINHAUS.

DIRIGIBLE FLYING MACHINE.

APPLICATION FILED APR. 20, 1907.

899,350.

Patented Sept. 22, 1908.

3 SHEETS—SHEET 1.

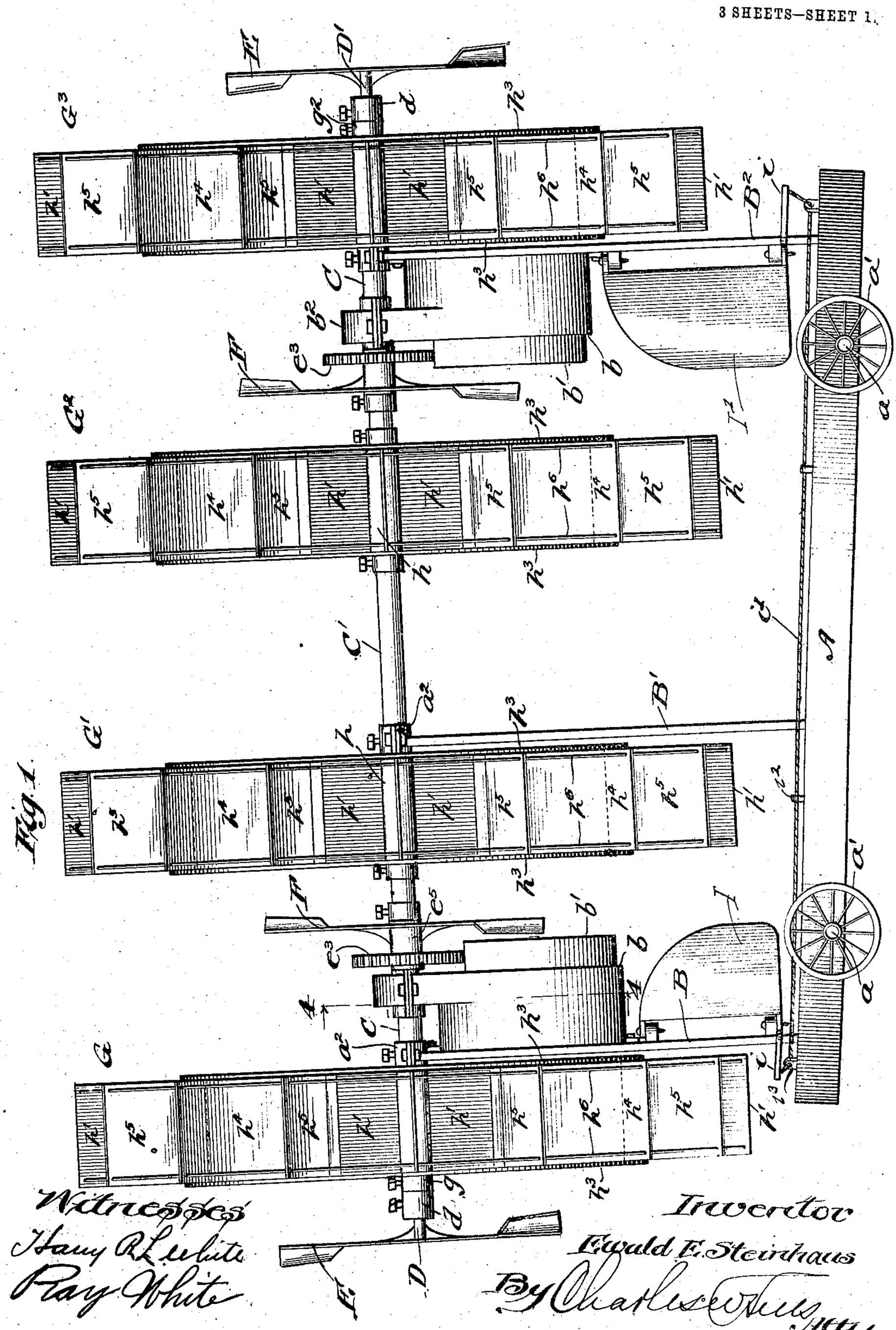

Fig. 1.

Witnesses
Harry R. Lubitz
Ray White

Inventor
Ewald E. Steinhaus
By Charles E. Mills Atty

E. E. STEINHAUS.

DIRIGIBLE FLYING MACHINE.

APPLICATION FILED APR. 20, 1907.

899,350.

Patented Sept. 22, 1908.

3 SHEETS—SHEET 2.

Fig. 2.

Witnesses

Harry R. Lubbite

Ray White

Inventor

Ewald E. Steinhaus

By Charles E. Wills

Atty

E. E. STEINHAUS.

DIRIGIBLE FLYING MACHINE.

APPLICATION FILED APR. 20, 1907.

899,350.

Patented Sept. 22, 1908.

3 SHEETS—SHEET 3.

Fig. 3.

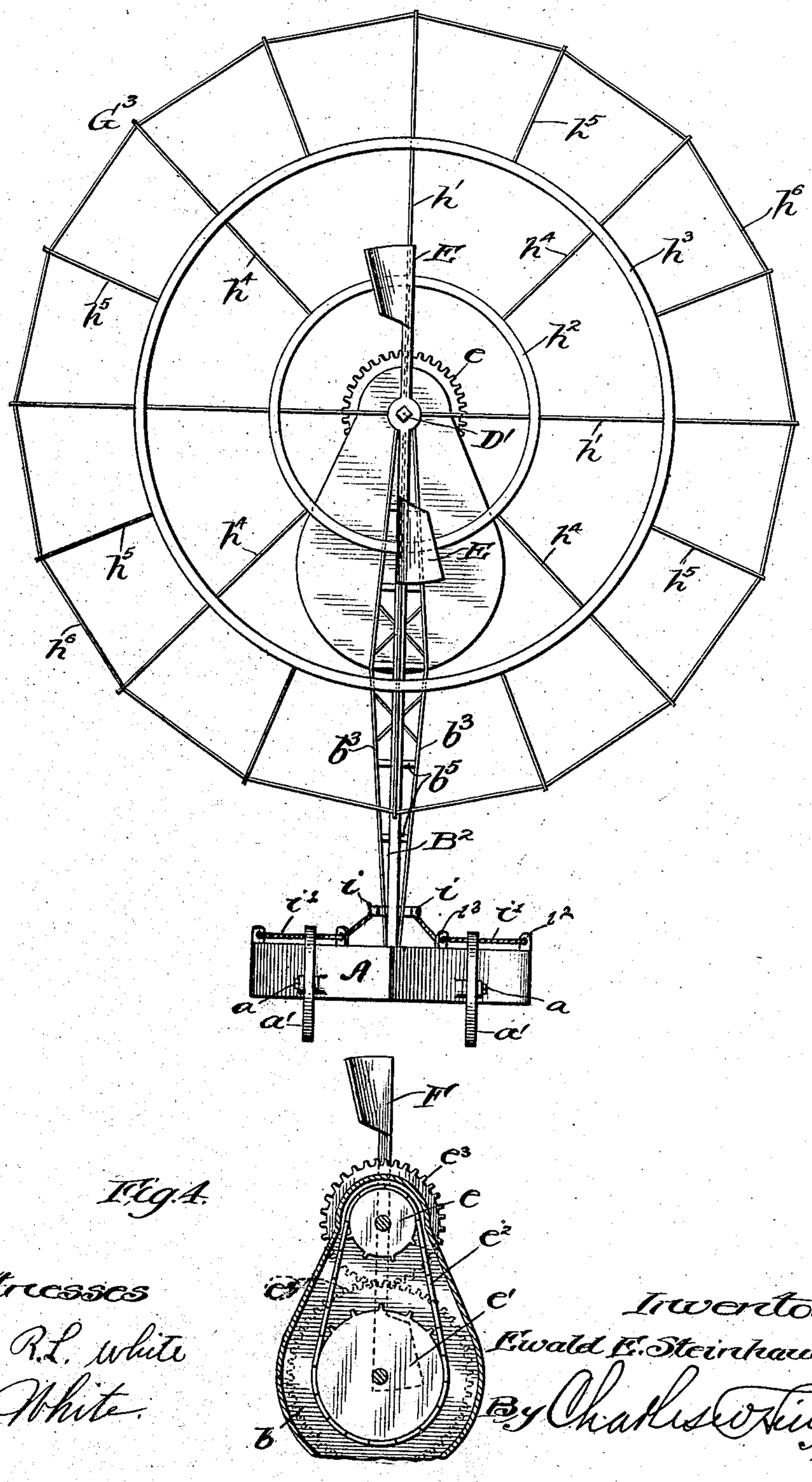

Fig. 4.

Witnesses

Harry R.L. White

Ray White.

Inventor

Ewald E. Steinhaus.

By Charles O. Tits

Atty

UNITED STATES PATENT OFFICE.

EWALD E. STEINHAUS, OF CHICAGO, ILLINOIS.

DIRIGIBLE FLYING-MACHINE.

No. 899,350. Specification of Letters Patent. Patented Sept. 22, 1908.

Application filed April 20, 1907. Serial No. 369,215.

To all whom it may concern:

Be it known that I, EWALD E. STEINHAUS, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Dirigible Flying-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in dirigible flying machines and particularly to that class in which gas bags are not required, but which receive an initial velocity before rising from the ground.

It is an important object of my invention to provide a machine in which both aeroplanes and adequate power are utilized in lifting and propelling the machine and its load and in which when raised to the desired height the aeroplanes alone are adapted to support the weight of the machine when traveling approximately horizontally, the power being then applied directly to propulsion.

It is further an object of this invention to provide an efficient machine of great strength and light weight having few parts, and those easily assembled, and which can be cheaply built and maintained.

The invention consists in the matters hereinafter described and more fully pointed out and defined in the appended claims.

In the drawings: Figure 1 is a side elevation of a device embodying my invention. Fig. 2 is a view in side elevation, showing parts in longitudinal vertical section. Fig. 3 is an end elevation of the same. Fig. 4 is a section on line 4—4 of Fig. 1 with parts removed.

As shown in the drawings: A represents a body or car of considerable length, as compared with its width, and which tapers from its middle toward its pointed ends. Said body may be of any suitable material to afford great strength with light weight. Engaged transversely to said body near each end are axles a, provided with wheels a'—a' which support said car when in contact with the ground. Rigidly engaged to said car A, near each end and the middle, are standards or uprights B—B′ and B² provided with adjustable mutually alined bearings a^2, at their upper ends in which a tubular shaft, comprising sections C—C—C′, is rigidly engaged. As shown, said standard B is the shortest and the standards B′ and B² are of sufficient length to afford a desired inclination of said shaft. Motors B³ and B⁴ of any suitable kind, are firmly engaged on the standards B—B² and inclosing the same are the motor casings b, provided with integral upwardly opening gear casings b'. Integral with the top of said motor casing b is a housing b^2 in which the ends of the sections C—C′ are rigidly engaged, as shown in Fig. 2. For the purpose of affording access to said motors, ladders are provided leading from the car to the top of the standards and, as shown, for this purpose strips b^3 of thin metal or other suitable material are bolted or otherwise secured to the upper and lower ends of the end standards and transverse cleats b^5, are fastened thereto in any suitable manner. Journaled in said sections C—C are shafts D—D′ the inner ends of which project through the housings b^2 and are journaled in suitable bearings in the ends of the section C′. A ball bearing d of any suitable kind is provided for each of said shafts at their outer ends. A propeller wheel E of two or any number of buckets is secured to the outer end of each of said shafts D—D′. On the inner end of each shaft is provided a sprocket wheel e, which is driven from a sprocket wheel e', on the motor shaft, by means of a sprocket chain e^2. Journaled on each end of said shaft section C′ is a gear e^3, adapted to intermesh with a gear e^4 on the motor shaft, in said gear casing b', and which serves as the balance wheel for the motor. Said gear e^3, is provided with a hub e^5, on the outer end of which is engaged a propeller wheel F, similar to the propellers E, and a collar f, bears against the end of the hub e^5 and firmly secures the same from longitudinal movement.

Journaled on each sectional shaft C—C′ are aeroplanes G, G′, G² and G³ which are free to rotate but are firmly held from movement longitudinally of the shaft. For this purpose the hubs of said aeroplanes G, G′ and G³ abut against the bearings on said standards and are firmly held in said position by means of collars g, g' and g^2 and the aeroplane G², is secured from longitudinal movement by means of collars g^3 and g^4 all of which are provided with set screws to firmly hold the same in adjusted position. Said aeroplanes, as shown, comprise a hub h, to which are se-

cured in any suitable manner radial blades h', at right angles to each other. Rigidly bracing said blades are concentric rings or bands h^2—h^3 which are secured to the side thereof in any preferred manner to form a rigid construction and, as shown, one is positioned near the hub and the other is of greater diameter and fastened a corresponding distance from the outer ends of said blades. Securely fastened to said ring h^2 and positioned centrally between said blades h' are shorter blades h^4 which extend to the outer circumference coincident with the ends of said blades h', and are securely fastened at their sides to the ring or band h^3. A plurality of short outer blades h^5, are positioned between the blades h' and h^4 and are secured at one end to the rings h^3 and their outer ends extend the the same radial distance from the hub as the blades h' and h^4. The outer ends of all of said blades h'—h^4 and h^5 are rigidly braced and held in unvarying relation by means of wires or cords h^6, which may be of any desired number and extend around the periphery of said aeroplane. Any suitable steering mechanism may be provided but, as shown, rudders I—I′ are pivoted to said standards B and B² and are each provided with two tillers i—i, adapted to be operated simultaneously by tiller ropes i', which extend along each side of the car and through suitable eyes i^2—i^3 and at their ends are secured to the corresponding tillers of the rudders.

The operation is as follows: When starting and while the machine is obtaining its initial velocity, said device travels on the ground on the wheels a'—a'. As the velocity increases the aeroplanes gradually lift the machine from the ground and the rate of ascension depends upon velocity and the inclination of said aeroplanes. The height from the ground at which said machine travels in a horizontal position depends upon the acquired velocity, as a certain speed is necessary before the aeroplanes are self supporting. As long as the machine travels at the required speed it continues to travel in this horizontal position. It is now obvious that if the velocity is decreased the machine gradually descends and that at any point in the descent we may again cause the machine to travel in a horizontal position by increasing the velocity sufficiently or may ascend by increasing the velocity above the speed required for soaring. If however, it is desired to ascend without changing the power necessary for the aeroplanes to sustain the machine in a horizontal plane, it may be accomplished by shifting the center of gravity or the ballast to the rear end of the car. At any point in the ascent the machine may be made to again assume a horizontal position by shifting the center of gravity or ballast to normal. The direction of travel is readily controlled by actuating the tillers which simultaneously shifts both rudders to act in either direction.

Easy access is had to the motors by means of the ladders at each end of the car for starting and stopping the same or if preferred the motors may be controlled by mechanism operated from the car.

If preferred the standards may be adjustable and provided with mechanism for simultaneously adjusting the same thereby varying the angle of inclination and consequently the rate of ascent and descent.

By my form of aeroplanes it will be seen that the greatest possible sustaining effects are provided owing to the relatively great length and narrow width and that the resultant area of all the blades is the greatest possible to obtain in such a compact form and with light weight.

Different forms of rudders may be used or only one may be used and various forms of aeroplanes may be provided and different means may be employed for transmitting power from the motors to the propellers and various other details may be varied without departing from the principles of my invention, and I therefore do not desire to limit myself as to details as obviously they may be varied.

I claim as my invention:

1. A car mounted on wheels, a shaft supported on the car so that its axis is inclined to the body of the car, propellers arranged on the shaft, and aeroplanes mounted to freely rotate on the shaft, each of said aeroplanes comprising a hub and blades radially arranged relative to said hub and rigidly connected together.

2. A car mounted on wheels, a shaft supported on the car and inclined thereto, propellers arranged on the shaft, propellers journaled in the ends of the shaft and aeroplanes mounted to rotate on the shaft, each comprising a hub, and radially arranged blades rigidly connected together at their ends.

3. A car mounted on wheels, a hollow shaft supported with its axis inclined to the body of the car, propellers journaled on the shaft, a shaft extending from each end of said hollow shaft, a propeller secured on the outer end of each shaft, motors, each adapted to drive one of the propellers on the hollow shaft and one of the shafts journaled in said hollow shaft and aeroplanes mounted on the hollow shaft.

4. In a device of the class described the combination with a car of road wheels thereon, standards engaged on said car, a tubular non-rotative shaft carried thereby, a propeller journaled thereon, a shaft journaled in each end of said tubular shaft, a propeller rigidly engaged on each, motors acting to drive all said propellers, aeroplanes comprising radial blades journaled on said tubular

shaft and means preventing longitudinal movement thereof.

5. A flying machine embracing in combination with a car adapted to travel on the ground of standards or uprights engaged thereto, adjustable bearings at the outer end of each, a non-rotatable shaft engaged in said bearings, one or more propellers journaled on said shaft, motors supported by the end standards, adapted to drive said propellers, means for controlling the direction of travel of said car and aeroplanes inclined relatively to the car and supported to swing on said non-rotatable shaft.

6. In a device of the class described the combination with a car, of standards engaged thereto, a shaft supported thereby at an angle with the car, a motor carried by one of the standards, a propeller driven thereby, aeroplanes on said shaft each comprising a hub, radially directed blades engaged thereto of different lengths and strengthening cords connecting the ends of said blades in rigid relation.

7. An aeroplane for a device of the class described embracing a hub, radial blades of different lengths and cords connecting the ends of said blades in operative relation.

8. An aeroplane for the purposes specified embracing a hub, blades rigidly secured thereto, rings or bands rigidly connecting said blades, shorter blades rigidly connected to said bands or rings having their outer ends approximately the same distance from the hub and bracing means rigidly connecting the blades at the outer extremities.

9. An aeroplane for the purposes specified embracing a hub, blades secured thereto, means connecting said blades and bracing the sides thereof and bracing means connecting the ends of the blades.

10. A car mounted on wheels, standards of different heights secured thereto, a shaft secured to the upper ends of the standards having its axis directed at an angle with the car, propellers journaled on said shaft intermediate the ends and at the ends, motors connected to operate the propellers and aeroplanes mounted on the shaft, each comprising blades of different lengths, means rigidly connecting the same at the outer ends and a hub connecting the longest blades.

11. In a device of the class described the combination with a car of standards secured thereto, a shaft secured on the standards, a propeller journaled thereon, a propeller journaled at the end of said shaft, a motor operatively connected to drive both propellers and aeroplanes secured on the shaft.

12. In a device of the class described the combination with a support of standards secured to the support, motors secured on part of said standards, ladders leading from the support to the motors, a shaft secured to the standards above the motors, propellers journaled on the shaft intermediate its ends, propellers at the ends of said shaft, operative connections between the motors and propellers to actuate the same and ball bearing for the propellers at the ends of the shaft.

13. In a device of the class described the combination with a support of standards secured to the support, motors secured on part of said standards, a shaft secured to the standards above the motors, propellers journaled on the shaft intermediate its ends, propellers at the ends of said shaft, operative connections between the motors and propellers to actuate the same, a ball bearing for some of said propellers, aeroplanes adapted to support the machine and rudders for guiding the same.

In testimony whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

EWALD E. STEINHAUS.

Witnesses:
C. W. HILLS,
C. K. E. HANNAH.