N. R. LAMB.

FLYING MACHINE.

APPLICATION FILED OCT. 8, 1909.

1,002,528.

Patented Sept. 5, 1911.

5 SHEETS—SHEET 1.

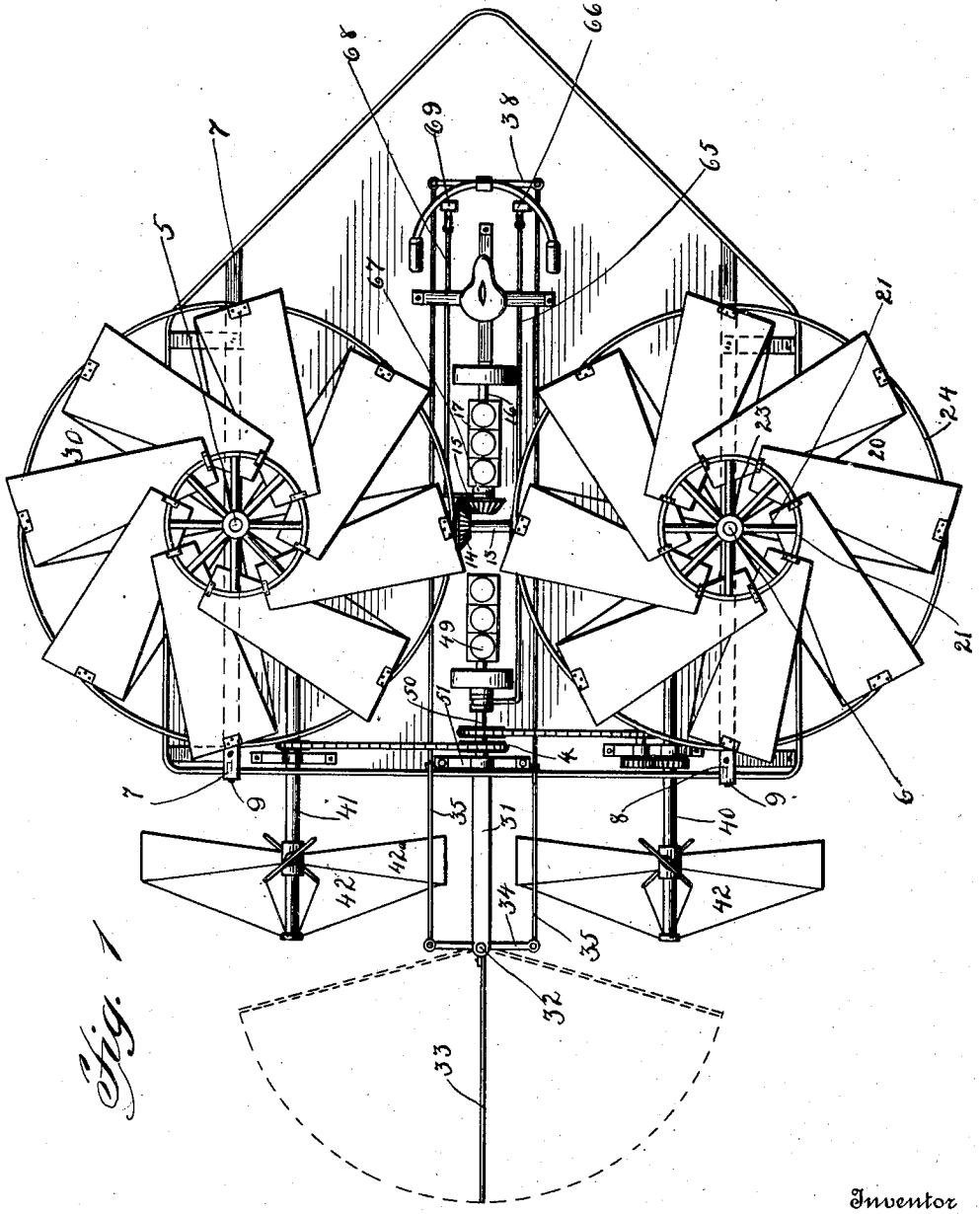

Fig. 1

Witnesses

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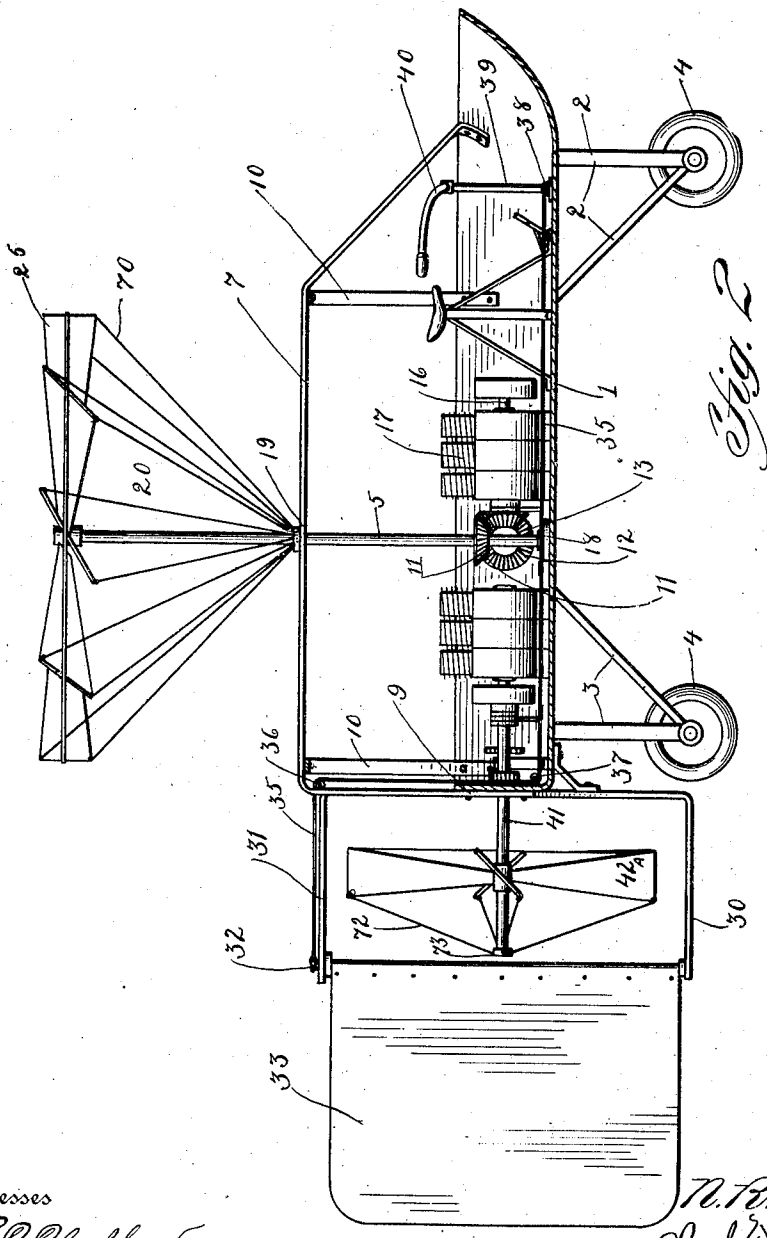

Fig. 2.

Witnesses

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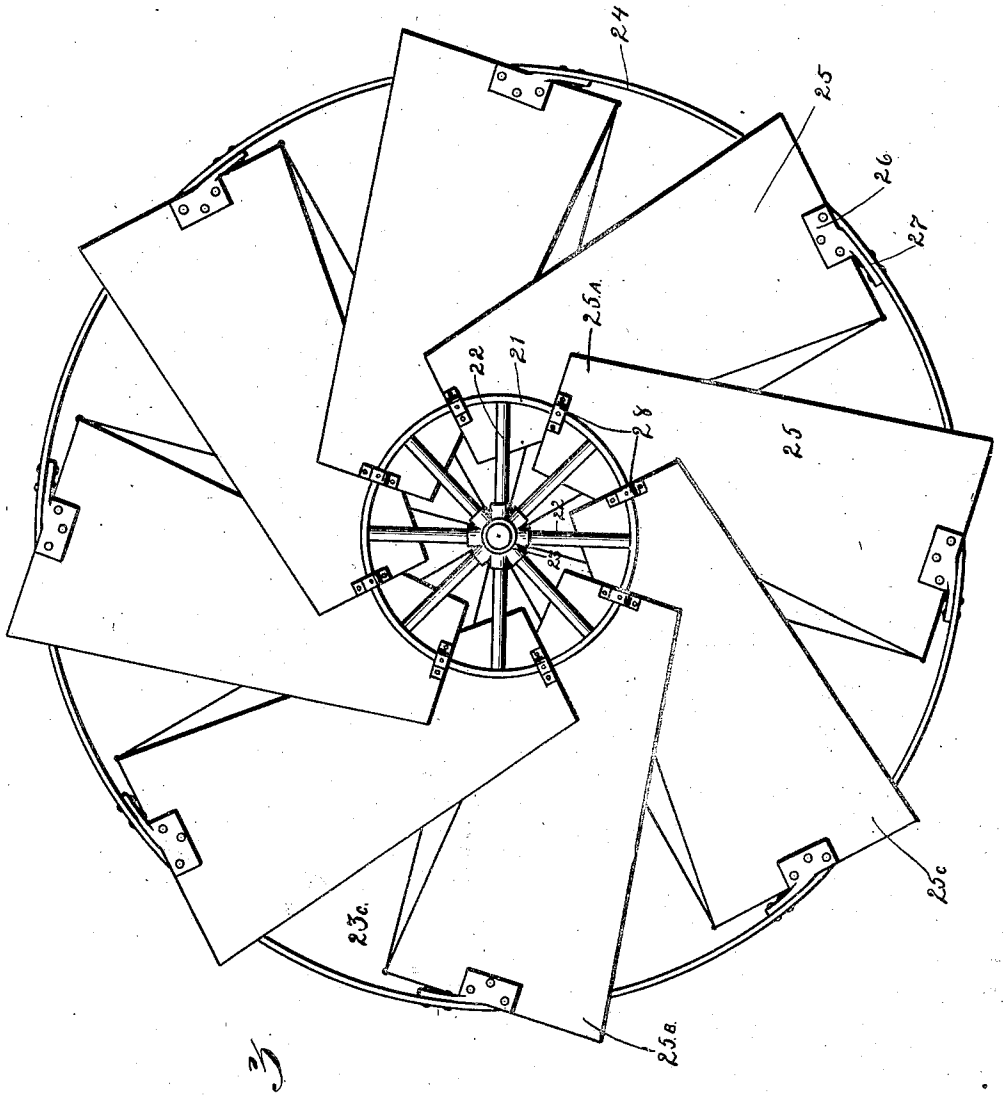

Fig. 3

Witnesses

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6 SHEETS—SHEET 4.

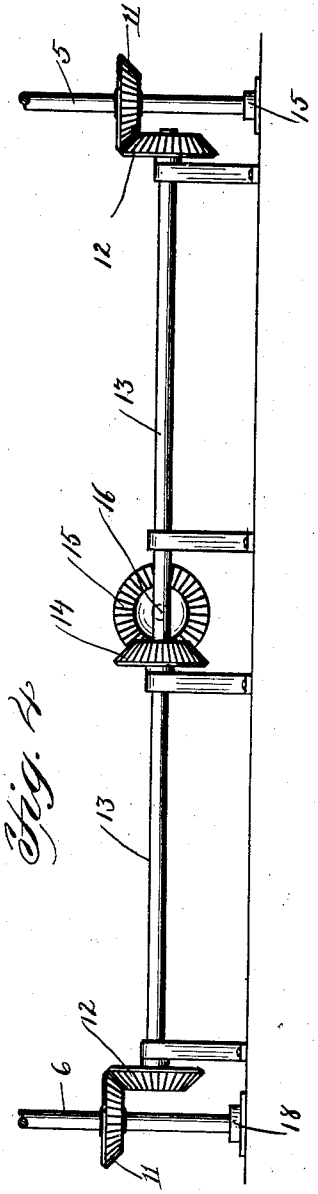

Fig. 4.

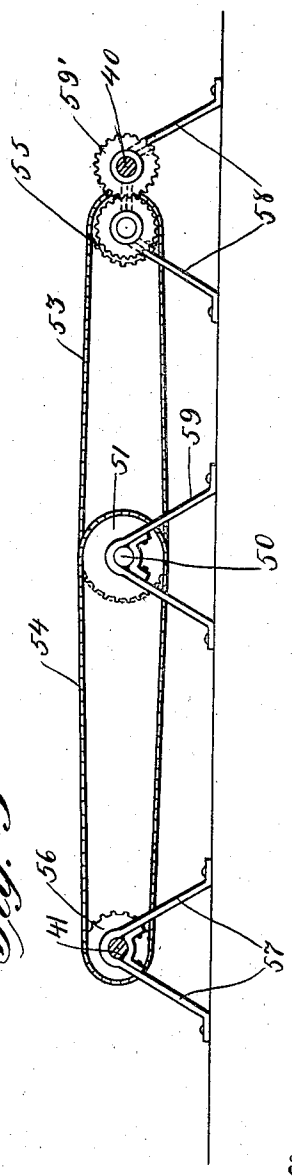

Fig. 5

Witnesses

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5 SHEETS—SHEET 5.

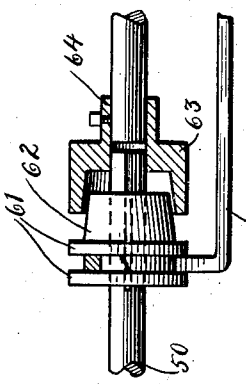

Fig. 7

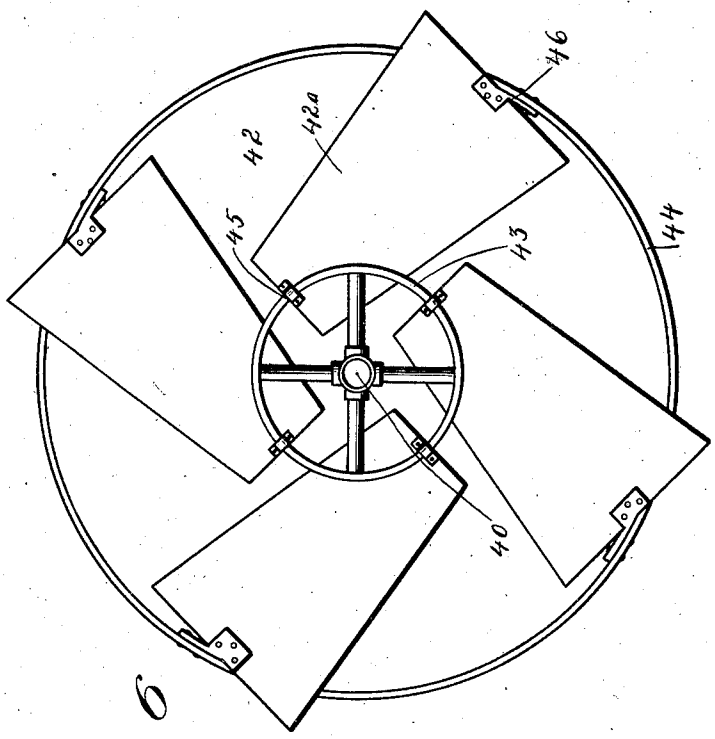

Fig. 6

Witnesses

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UNITED STATES PATENT OFFICE.

NATHAN ROBERT LAMB, OF PITTSBURG, PENNSYLVANIA.

FLYING-MACHINE.

1,002,528. Specification of Letters Patent. Patented Sept. 5, 1911.

Application filed October 8, 1909. Serial No. 521,741.

To all whom it may concern:

Be it known that I, NATHAN ROBERT LAMB, citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Flying-Machines, of which the following is a specification.

The present invention relates to improvements in flying machines and relates particularly to that class of machines having motor driven lifting and propelling fans.

One of the objects of the present invention is the construction of an improved lifting and propelling fan adapted to exert great lifting and propelling power when driven by a motor.

Another object of the invention is the construction of an improved aerial vehicle having a pair of parallel or oppositely arranged lifting fans and a pair of oppositely arranged propelling fans whereby the vehicle can by the application of power be propelled and lifted through the air.

With the above and other objects in view the invention relates to certain improvements consisting in certain combinations, arrangements, and constructions clearly illustrated in the accompanying drawings, in which,

Figure 1 is a plan view of the completed aerial vehicle, Fig. 2 is a side elevation, partly in longitudinal section, Fig. 3 is a detail plan view of one of the fans, Fig. 4 is a detail side elevation showing the operating gearing for the lifting screws, Fig. 5 is a similar view showing the gearing for the propelling screws, Fig. 6 is a view of a modified form of fan construction, and Fig. 7 is a detail view of an operating clutch.

Referring to the accompanying drawings illustrating the invention 1 denotes a car or frame, which is formed somewhat in the shape of a boat, and is provided with supporting legs 2 and 3, which are each provided with a runner wheel 4.

As a support for the vertical operating shafts 5 and 6 longitudinally extending rods 7 and 8 are arranged above the bed of the car or frame 1, the forward ends of said bars or supports being bent downward and connected to the forward sides of the frame or car 1. The rear ends of the supports or rods 7 and 8 are bent downwardly at right angles to the upper portion and connected to the rear end of the car or frame 1 at 9. The rods or supports 7 and 8 are braced on the car or frame 1 by means of braces 10, which connect with said rods or supports and the inner sides of the car or frame 1.

The lower ends of the shafts 5 and 6 are provided with bevel gears 11, which are engaged by gears 12, fixed on horizontally and transversely extending shafts 13, which shafts are provided with gears 14 engaging with gears 15 fixed on motor shafts 16 or motors 17. The lower ends of the shafts 5 and 6 are supported on the car or frame 1 by suitable bearings, 18. The shafts 5 and 6 extend vertically through bearings 19, carried by the rods 7 and 8, and are provided at their upper ends with lifting fans 20. The lifting fans 20 are made like each other and comprise an inner ring or wheel 21, which is provided with a series of radiating spokes 22 secured at their inner ends to hubs 23, which are fixed on the shafts 5 and 6. An outer ring 24 is connected to the inner ring or wheel 21 by a series of vanes or blades 25, which are disposed tangentially relative to the curves of the wheel or ring 21 and the ring 24. The outer ends of the blades or vanes 25 are connected to the outer ring 24 by means of attaching plates 26, which are formed with angular arms 27 riveted to the inner side of the ring 24. The inner ends of the blades are connected to the inner ring 21 by means of attachments or clips 28. The blades 25 broaden from their inner ends to the outer ends and are formed with flat surfaces. The flat surfaces of the blades 25 are disposed at angles of substantially forty five degrees to the axis of the shafts 4 and 5, and the narrower inner ends of said blades are arranged so that a portion 25^a of the inner end of each blade 25 overlaps the adjacent blade, whereby a portion of the inner end of each blade will be held between the inner ends of the two adjacent blades. The attachments or clips 28 are connected to the blades midway of their inner sides so that the axis of each blade will be held at an angle less than a right angle to the shafts, owing to the radius of the inner wheel or ring 21. The outer ends of the blades 25 are spaced apart from each other so that corners 25^b will project over the outer rings 24 and spaces 25^c will be formed between the outer sides of the blades. It will be seen from an examination of the drawings that the inner ends of the blades 25 are held, in plan, at substantially right angles to the adjacent

portion of the inner rings, while the outer ends of the blades cross the rings 24 at angles of about 20 degrees.

By means of the construction of the fans 20 the amount of lifting power and propelling power that can be secured from a given amount of horse power is greatly increased. When the fans 20 are driven at high speed air will be compressed on the side of the fan opposite that facing the direction in which the vehicle is being moved, and a partial vacuum will be created on the reverse side. In practical operation it is found that the air moved by the fan when the same is driven is not thrown outwardly but is drawn toward the fan, thus concentrating the power of the fan and increasing the density of the air on one side thereof while decreasing the density of the air on the other side thereof so that the vehicle will move through the air at the proper speed and with the proper security.

On the end of the car or frame 1 a shelf 30 is formed, and above this shelf another shelf, or arm, 31 projects outwardly. Between these two shelves or arms a rudder shaft 32 is journaled, and on this rudder shaft 32 a rudder 33 is mounted. The upper end of the shaft 32 is provided with a cross arm 34, which is connected to ropes or operating members 35, which extend forwardly of the rudder, being passed over guides 36 and 37, arranged on the frame or car 1, and connected at their forward ends to cross arm 38, which is connected to a post 39, operated by a handle 40. By turning the handle 40 the flexible connecting members or ropes 35 are moved over the guide pulleys and the rudder is moved according to the direction in which the handle is turned or operated. The extreme turning positions of the rudder are indicated in dotted lines in Fig. 1.

In order to propel the vehicle two operating shafts 40 and 41 are arranged on the car or frame 1. The rear ends of these shafts are supported on bearings formed in the rear end of the support 7 and carry propeller fans 42, which are formed like the lifting fans 20.

The propeller fans are preferably provided with four blades 42^a, which are connected to inner rings 43 and outer rings 44. Two of the blades are arranged so that their axes will be disposed substantially parallel to each other, in plan, and the axes of the other blades will be disposed at right angles thereto. In the construction of the propeller blades or fans the blades do not overlap as in the arrangement of the lifting fans. The blades 42^a are fastened to the inner wheels by clips or attachments 45, which are located midway of the sides of the blades, thus holding the adjacent end of the blade at right angles to the adjacent portion of the inner rings 43. The outer ends of the blades 42^a are connected to the outer rings 44 by attaching plates 46, which have angular arms 47, connected to the outer rings 44. The flat surfaces of the blades 42^a are disposed at right angles to the operating shafts 40 and 41, and these blades are formed with tapering bodies, the smaller or narrower ends constituting the inner ends of the same. Spokes 47 connect the inner wheels or rings 43 to the hubs 48, which are mounted on the shafts 40 and 41. The shafts 40 and 41 are driven by means of a motor 49, which is connected therewith through the medium of a clutch and gear mechanism. The outer end of the shaft 50 of the motor 49 is journaled on bearings 51 and is provided with gears or sprocket wheels 52, which wheels connect with sprocket or driven chains 53 and 54, which chains extend outwardly to connect with sprocket or gear wheels 55 and 56, supported by bearing brackets 57, and 58. The center wheels 51 are supported on bearing bracket 59. The bearing bracket 58 supports a follower gear wheel 59, which engages with a wheel 60 mounted against the wheel 55. The wheel 59 is mounted on the shaft 40, and the wheel 56 is mounted on the shaft 41.

The motor shaft 50 is formed in two sections, one section being provided with a double flanged collar 61 having a clutch cone 62 thereon, which cone is adapted to frictionally engage with a second cup-shaped cone 63, having a collar 64 mounted on the portion of the shaft 50 which is directly connected to the motor 49. The collared cone 61 is movable on the outer end of the shaft 50, to which it is keyed, and is operated by means of a spanner rod 65, which extends forwardly and is connected with a pivotally supported foot treadle 66. The motor shaft 16 is also formed in two parts and these two parts are connected together by a frictional clutch similar to the clutch shown in section in Fig. 7 and described in connection with the propeller shafts. The clutch 67 of the motor shaft 16 is operated by a forwardly extending spanner rod 68 which connects with a pivotally supported foot treadle 69. While operating the motors at high speed the lifting and propeller fans can be gradually brought from dead rest to high speed through the medium of the friction clutches, thus preventing an abrupt action of the propeller or lifting fans.

The blades 25 of the fans 20 are braced on the shafts 5 and 6 by means of wires 70, which are connected to the outer corners of the blades 25 and the collars 71, fixed on the shafts 5 and 6. The blades 42^a are braced on the shafts 40 and 41 by means of wires 72 which connect with the outer ends of said blades and with collars 73, fixed on shafts 40 and 41.

Having described my invention I claim and desire to secure by Letters Patent:—

1. In an aerial vehicle, a car having an operating shaft, a fan on the operating shaft, said fan comprising an inner ring mounted on the shaft and a series of blades connected therewith, an outer ring connected with the blades, said blades being disposed tangentially with relation to the curves of said inner ring with the inner end of each blade held between the adjacent blades and each blade disposed at an angle to the shaft, means connecting the outer ends of the blades to the shaft at a point below said outer ends, and means for operating the car.

2. In an aerial propeller, a shaft, a ring mounted on the shaft, an outer ring having a diameter considerably greater than the first ring, and a series of blades connected at their outer ends to the larger ring and at their inner ends to the smaller ring, said blades being disposed tangentially to the said first ring, the blades increasing in area from their inner ends to their outer ends and so arranged that spaces are formed between the adjacent outer ends of the blades, a part of the inner end of each blade overlapping the adjacent blade.

3. An aerial vehicle consisting of a car, fans for propelling said car, shafts connecting said car to said fans, means for operating said shafts, integral flanges on said shafts, said fans consisting of tapering blades, said blades being connected at their narrow ends to the outer ends of said shafts and their axes disposed at right angles to a radius of said shaft, the plane of said blades being inclined to the axis of said shaft, rods connecting the outer ends of said blades to said flanges, a steering means connected to said car and means for operating same.

4. An aerial vehicle consisting of a car, fans for propelling said car, shafts for connecting said car and fans, means for operating said shafts, collars on said shafts, a ring secured to the outer end of each of said shafts, a series of tapered blades secured at their narrow ends to each of said rings and a larger ring secured to the outer ends of the blades of each of series at the middle of said outer ends, braces connecting the corners of the outer ends of said blades to said collars, and means for steering said vehicle.

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

NATHAN ROBERT LAMB.

Witnesses:

ALBERT J. BACHHOFER,

JOHN W. HOLLIS.