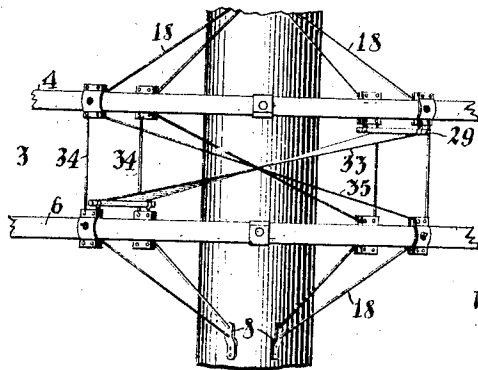
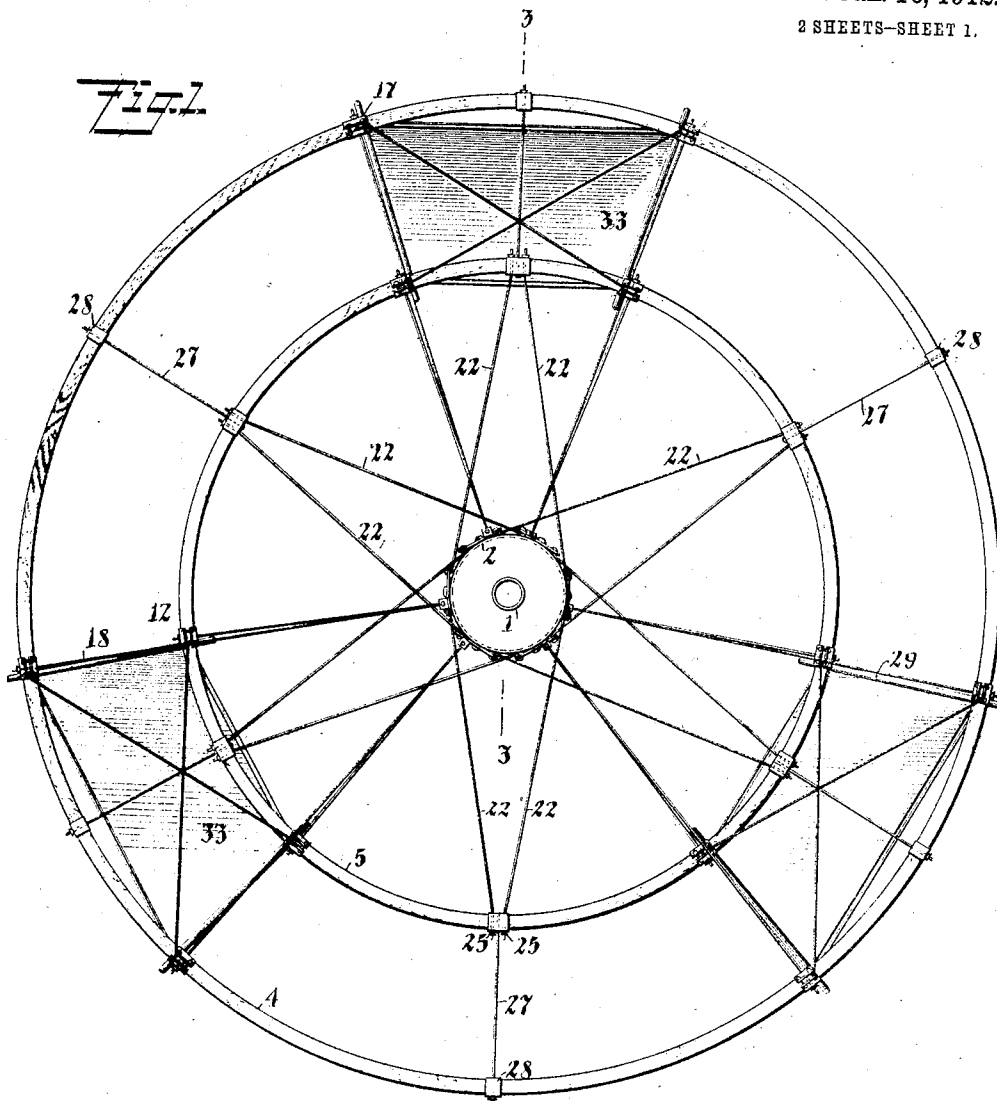


W. H. LAWRENCE.
FLYING MACHINE PROPELLER.
APPLICATION FILED NOV. 26, 1910.

1,015,197.

Patented Jan. 16, 1912.

2 SHEETS—SHEET 1.



WITNESSES

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Munroe & Co.

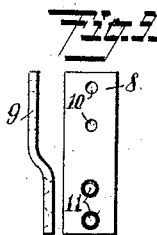
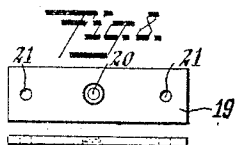
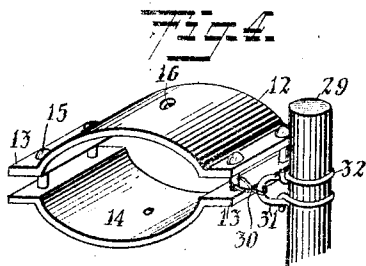
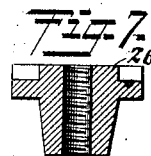
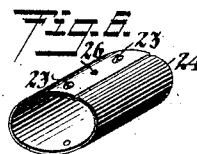
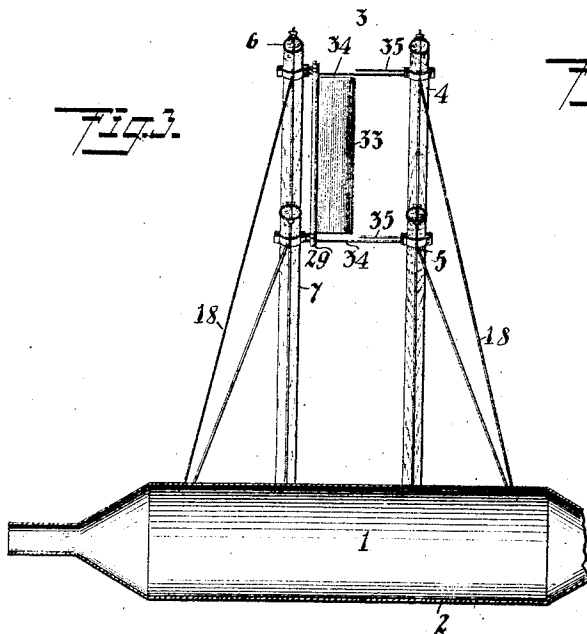
ATTORNEYS

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2 SHEETS-SHEET 2.



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UNITED STATES PATENT OFFICE.

WALTER HULBERT LAWRENCE, OF HARWICH PORT, MASSACHUSETTS.

FLYING-MACHINE PROPELLER.

1,015,197.

Specification of Letters Patent.

Patented Jan. 16, 1912.

Application filed November 26, 1910. Serial No. 594,297.

To all whom it may concern:

Be it known that I, WALTER H. LAWRENCE, a citizen of the United States, and a resident of Harwich Port, in the county of Barnstable and State of Massachusetts, have invented a new and Improved Flying-Machine Propeller, of which the following is a full, clear, and exact description.

My invention relates to improvements in rotary fans or propellers adapted to act upon the air, and more particularly to such air propellers as are used for propelling airships or flying machines and which are actuated either by hand or by a suitable mechanical device.

In describing the invention, I shall make reference only to air propellers in which the improvements have proved particularly useful. It is to be understood, however, that I do not limit my invention to the particular use described, and that the same may be advantageously applied to fans or other apparatus of this character.

In the construction of fans or propellers, it is of importance that the propeller be as light as possible and yet sufficiently strong to resist the strains exerted thereon by the pressure of the air. Furthermore, the blades and connections must be so constructed that the friction of the air on the blades or vanes is reduced to a minimum.

One object of the present invention is to provide a vane or propeller which is in accordance with these requirements, and a further object is to provide a means whereby a light, rigid construction is obtained, and in which I have reinforced the different parts at places where the greatest amounts of strain are received. I attain these objects by forming a framework comprising concentric rings in two planes, attached to the driving shafts and having vanes or propeller blades of flexible material connecting the rings in opposite planes.

With the above and other objects in view, as will more fully hereinafter appear, the present invention consists in certain novel details of construction and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar characters of ref-

erence indicate corresponding parts in all the figures, and in which—

Figure 1 is a plan view looking down on my improved propeller in the direction of the driving shaft; Fig. 2 is a side elevation showing the means for connecting the vanes with the frame, parts being broken away; Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 1; Figs. 4 to 9, inclusive, are details of various parts of the device; Fig. 4 being a perspective view of the clamps used on the frame; Fig. 5, a perspective view of the reinforcing sleeve used on the outer ring; Fig. 6, a similar view showing a sleeve used on the inner ring; Fig. 7, a preferred form of spoke; and Figs. 8 and 9, two forms of attachment plates, by means of which the spokes are attached to the shaft.

In the preferred embodiment of my invention, I have shown a shaft 1 of any suitable material, as, for instance, sheet iron tubing, aluminum or any other light metal, and having means whereby it is connected to the driving mechanism in any suitable or approved manner and having an enlarged portion 2, to which portion is affixed my framework 3. This framework comprises an upper pair of concentric wooden rings, the outer ring 4 being concentric with the inner ring 5. Disposed below the concentric rings in the upper plane and positioned in a plane parallel with an at some suitable distance below the upper plane, is a pair of lower rings, comprising an outer ring 6 and an inner ring 7. In describing the particular construction of these rings, but one pair will be described, it being understood that the description pertains to both sets of rings.

Positioned about the outer circumference of the enlarged portion 2 of the shaft 1 and at some distance above and below the plane of the rings, is a series of spaced-apart plates 8, having one end offset as shown at 9. This offset portion contains a pair of apertures 10, and the plates are riveted to the shaft by means of rivet connections 11. Positioned on the outer rings and substantially in the plane passing through the axis of the shaft and the plates 8, is a two-part clamp 12 having parallel opposite flanges 13 on each end and having its central portion curved outwardly as shown at 14, in order to fit about the ring. The two parts of the clamp 12 are held together, by means

of the bolt connection 15. Centrally disposed through each of the halves of the clamp 12, is an aperture 16 in line with an aperture 17 in the ring. A wire or spoke 18 passes through the openings 16, 17, is looped through the apertures 10 of the plate 8, and is brought back on itself and fastened to a similar clasp 12 on the inner ring, substantially in the same line with the clamp on the outer ring.

Located longitudinally between the plates 8 on the shaft member 2 but in the plane of the rings, is a series of plates 19 fastened to the shaft by means of a bolt 20, and having oppositely-disposed apertures 21. Fastened through the apertures 21 and the plates 19, and extending outwardly in a direction in a line tangent to the shaft and all in the same plane, is a series of tangent braces 22. The tangent braces from one of these plates converge and intersect at the inner ring and are passed through apertures 23 in a reinforcing sleeve 24 and through apertures in the inner ring 5, and held in position by a bolt 25. This ring or sleeve 24 has a central aperture 26, and through this aperture and through an aperture in the inner ring, is passed a ring-connecting brace 27, the outer end of which is passed through a reinforcing ring 28 on the outer ring 4. These outer ring braces are disposed in the radii of the planes of the rings. The clamps 12 of each of the vanes 33 are braced by horizontal brace rods 34 connecting the clamps on the upper rings 4 and 5 with the clamps on the lower rings 6 and 7, respectively. Further, these clamps are braced by the diagonal braces 35 connecting the clamps on the upper rings 4 and 5 with the diagonally-disposed clamps on the lower rings 6 and 7, respectively.

Positioned below the clamp 12 on the upper pair of rings and positioned above the clamps 12 on the lower pair of rings, are vane pins 29 connecting the adjacent clamps and held thereto by a wire connection 30 engaging the bolts 15 and engaging the loop member 31 of the tie member 32 which passes about the vane pins 29. Stretched between the offset vane pins 29 is a series of upwardly-inclined vanes 33, preferably of some flexible material, as canvas or silk, and each plane inclines in the same direction and preferably at about an angle of thirty degrees to the plane of the rings. In the embodiment of my invention herewith disclosed, I have shown three of these planes, but it is to be understood that any number may be used as preferred. A framework constructed as described possesses considerable rigidity, so that it provides a reliable support for the blades of the propeller.

As many changes could be made in the above construction and many apparently widely different embodiments of this inven-

tion could be made without departing from the scope thereof, it is intended that all matters contained herein in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense. It is also to be understood that the language used in the following claims is merely intended to cover all the generic and specific features of the invention herein described and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween and that materials, sizes and relativities of parts are non-essential, except as called for in the claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In a flying machine propeller, a frame comprising two pairs of concentric rings arranged in parallel planes, clamps attached to the rings of each pair, rods connecting the clamps of rings in the same plane, and a vane stretched from the rod of one pair in one plane to the rod of a pair in the other plane.

2. In a flying machine propeller, a cylindrical shaft, concentric rings about said shaft, a leaf on said shaft, connections fastened to said leaf and extending at a tangent to the shaft, sleeves encircling said rings, and means on said sleeves uniting said connections with said rings.

3. In a propeller, a shaft, concentric inner and outer rings about said shaft, reinforcements on said inner and outer rings, and a connection between said inner and outer rings passing through said reinforcements.

4. In a flying machine propeller, a frame comprising rings disposed in parallel planes, reinforcing sleeves surrounding said rings, and vertical and horizontal connections between said reinforcements on adjacent rings.

5. In a flying machine propeller, a frame comprising rings disposed in parallel planes, reinforcing sleeves surrounding said rings, vertical and horizontal connections between said reinforcements on adjacent rings, and inclined vanes extending from the rings in one plane to the rings in the other plane.

6. In a flying machine propeller, a framework comprising concentric rings in parallel planes, clamps on said rings, and horizontal and inclined braces connecting adjacent clamps.

7. In a flying machine propeller, a shaft having an enlarged portion, a pair of concentric rings surrounding said enlarged portion, a second pair of concentric rings in a plane parallel with said first-mentioned pair, and vanes inclining from one pair of rings to the other pair.

8. In a flying machine propeller, a shaft having an enlarged portion, a pair of con-

centric rings surrounding said enlarged portion, a second pair of concentric rings in a plane parallel with said first-mentioned pair, vanes inclining from one pair of rings to the other pair, and rigid connections between said rings and said shaft.

9. In a flying machine, a shaft, a pair of concentric rings spaced apart in a plane at right angles to the axis of said shaft, a pair of concentric rings in a plane parallel to said first-mentioned plane, diametrically

aligned clamps about each of said rings, one set of clamps offset from the other set, a rod connecting the clamps of each set, and a flexible vane attached to the offset rods. 15

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WALTER HULBERT LAWRENCE.

Witnesses:

BENJAMIN C. KELLEY,
ERNEST S. NICKERSON.