A. J. LOCKWOOD.

AIRSHIP PROPELLER.

APPLICATION FILED JULY 28, 1910.

1,000,528.

Patented Aug. 15, 1911.

2 SHEETS—SHEET 1.

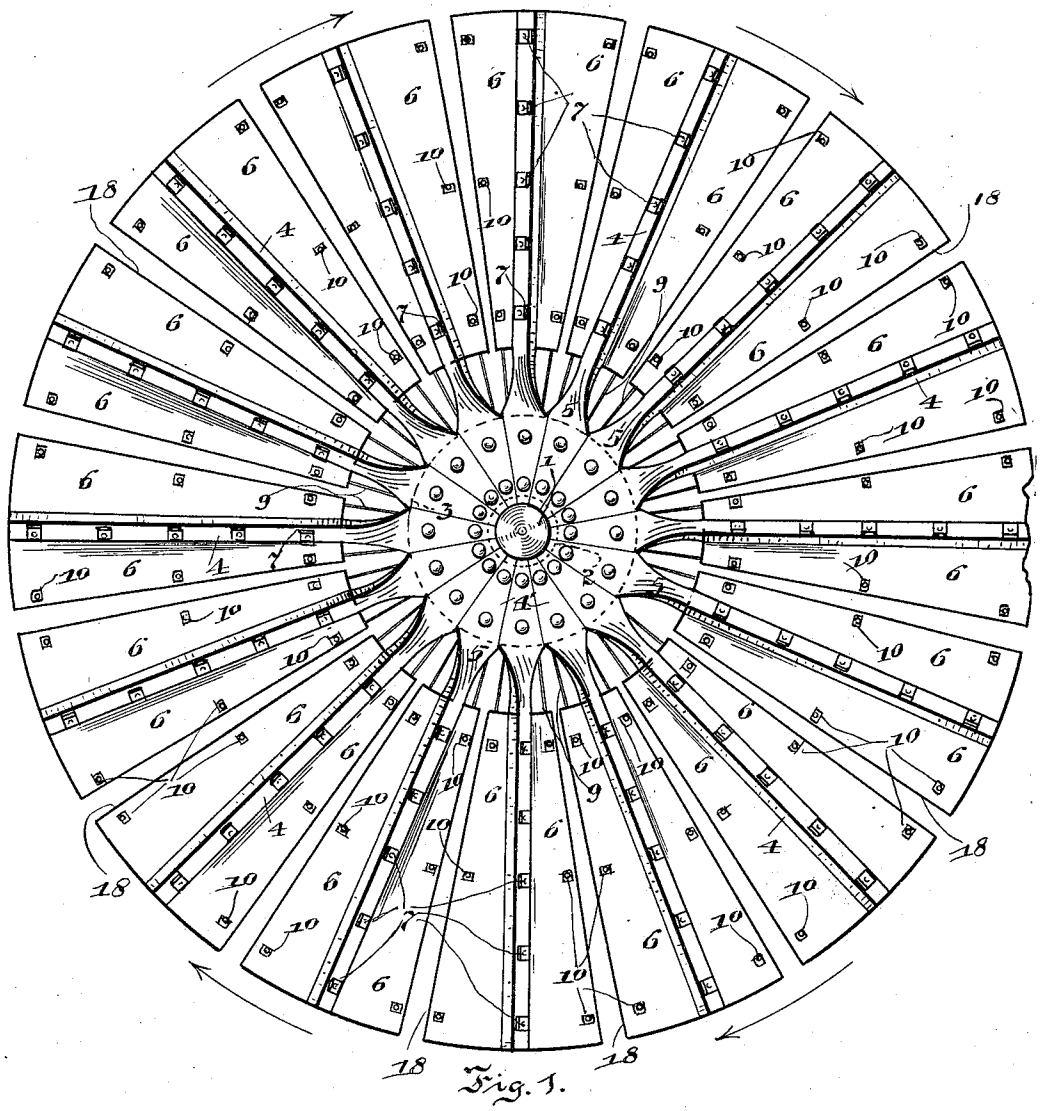

Fig. 1.

Witnesses

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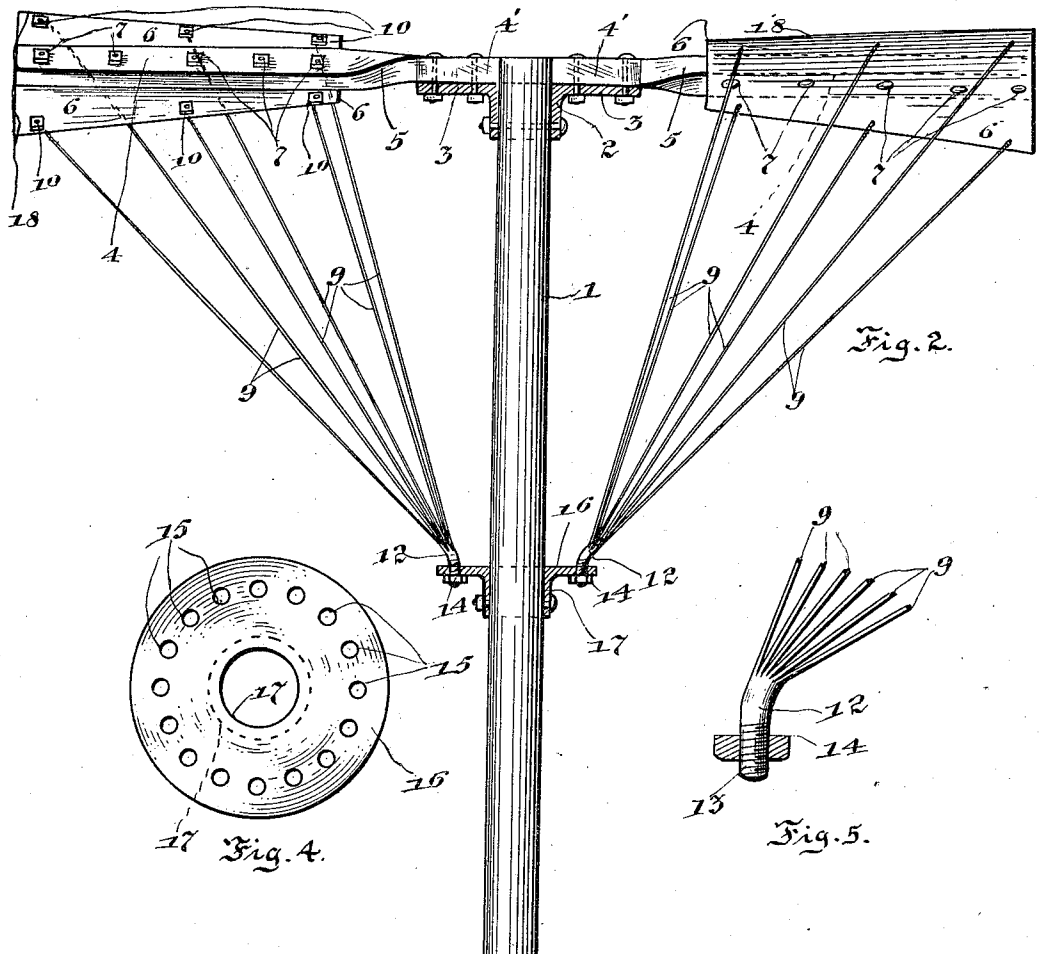

Fig. 2.

Fig. 4.

Fig. 5.

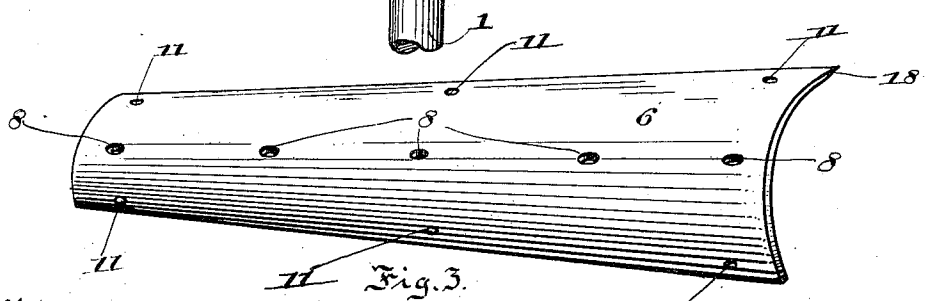

Fig. 3.

Witnesses

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UNITED STATES PATENT OFFICE.

ALBERT J. LOCKWOOD, OF CHICAGO, ILLINOIS.

AIRSHIP-PROPELLER.

1,000,528. Specification of Letters Patent. **Patented Aug. 15, 1911.**

Application filed July 28, 1910. Serial No. 574,363.

To all whom it may concern:

Be it known that I, ALBERT J. LOCKWOOD, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Airship-Propellers, of which the following is a specification.

My invention relates to improvements in propellers for air ships and more particularly to that class of air ships known as helicopters, the object of the invention being the production of a propeller which shall be so designed and constructed as to be capable of withstanding all ordinary strains to which the parts thereof may be subjected.

A further object of my invention is to provide a propeller which shall be simple of construction, inexpensive to manufacture, and efficient in operation.

Other objects will appear hereinafter.

With these objects in view my invention consists in the novel construction and arrangement of parts as will be hereinafter fully described and more particularly pointed out in the appended claims.

My invention will be more readily understood by reference to the accompanying drawings forming a part of this specification, and in which,

Figure 1 is a top plan view of my improved propeller in its preferred form, Fig. 2 is substantially a vertical central section, Fig. 3 is a detail perspective view showing a propeller blade, Fig. 4 is a detail top plan view, and Fig. 5 is a detail view showing the construction of braces employed in the propeller.

The preferred form of my invention as illustrated in the accompanying drawings comprises a vertically disposed power shaft 1 to the upper end of which is secured a hub 2, the latter being provided with a circular radially extending flange 3. Radial spokes 4 which are rectangular in cross section are provided with wedge-shaped inner ends 4′ which are arranged contiguously on the flange 3 and bolted thereto, the divisions between said wedge-shaped ends being co-incident with radii of said flange. The spokes 4 are twisted as at 5 in order that the body or main portions thereof may be disposed at an angle to the plane of the flange 3, thus acquiring the proper inclination for the propeller blades 6 which are bolted along their centers to said spokes, bolts 7 being provided for this purpose. Each propeller blade 6 is provided with a series of bolt holes 8 through which bolts 7 are adapted to pass for securing said blade to the spokes 4. Inclined brace rods 9 are threaded at their upper extremities and provided with nuts 10, said threaded portions passing through perforations 11 provided adjacent the longitudinal edges of each blade 6, by means of which construction said blades are rigidly reinforced. The lower ends of the brace rods 9 are arranged in groups formed as by welding into short rods 12, the latter being provided with threaded extremities 13. Nuts 14 are provided for said threaded extremities 13 of the brace rods 9. The rods 12 are adapted to fit into the perforations 15 of the circular flange 16 and be held rigidly in such position by means of the nuts 14, said flange being formed integral with a hub 17. Hub 17 is located below the hub 2 and bolted rigidly to the shaft 1, as clearly shown in Fig. 2.

In order that a minimum of resistance may be created, when the propeller is in operation, one longitudinal edge 18 of each propeller is made very thin, as clearly shown in Fig. 3.

A propeller of the construction set forth, due to the rigid mounting and reinforcing of the blades thereof, will produce a minimum of vibration and be efficient in operation.

While I have shown what I deem to be the preferable form of my improved helicopter, I do not wish to be limited thereto as there might be various changes made in the details of construction and arrangement of parts described without departing from the spirit of my invention, and hence I desire to avail myself of such changes and alterations as fairly fall within the scope of the appended claims.

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

1. In a propeller, a power shaft, a hub bolted to one end of said shaft, a radially extending flange on said hub, a series of spokes rectangular in cross section and having wedge-shaped contiguous ends which are bolted to said flange, twisted portions in said spokes adjacent the wedge-shaped ends thereof by means of which the body portions of said spokes are formed at an angle to the plane of said hub, transversely curved blades bolted to the angular body portions of said

spokes, and means for reinforcing the edges of said blades, substantially as described.

2. A helicopter propeller comprising a vertical power shaft, a hub having a radial flange bolted to the top end of said power shaft, a series of closely arranged spokes bolted to said flange, the divisions between said spokes being in co-incidence with radii of said hub, said spokes being rectangular in transverse section and having their main portions disposed at an angle to the plane of said hub, transversely curved propeller blades bolted to the angular portions of said spokes and having a plurality of perforations adjacent the edges thereof, a perforated flange located on said top shaft below said hub, and a series of brace rods connecting the perforations of said blades with said perforated flange, substantially as described.

3. In a helicopter propeller, the combination with a vertical power shaft, of a hub having a radially disposed horizontal flange bolted to the top end of said power shaft, a series of closely arranged spokes bolted to said flange, said spokes being rectangular in cross section and having their main portions disposed at an angle to the plane of said hub, transversely curved propeller blades bolted to the angular portions of said spokes and having a plurality of perforations adjacent the edges thereof, a perforated flange located on said power shaft below said hub, and a series of brace rods connecting the perforations of said blades with said perforated flange, the upper end of said brace rods being connected independently with said blades and the lower ends thereof being arranged in groups and formed into short threaded rods which are secured in said perforated flange, substantially as described.

4. A helicopter propeller comprising a vertical power shaft, a hub having a radial flange bolted to the top end of said power shaft, a series of spokes having contiguous inner ends bolted to said flange, the divisions between said spokes being in coincidence with radii of said hub, said spokes being rectangular in cross section and having their main portions disposed at an angle to the plane of said hub, transversely curved propeller blades each having one sharp longitudinal edge, said blades being bolted to the angular portions of said spokes and having a plurality of perforations adjacent the edges thereof, a perforated circular flange located on said power shaft below said hub, and a series of brace rods connecting the perforations of said blades with said perforated flange, substantially as described.

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

ALBERT J. LOCKWOOD.

Witnesses:
HELEN F. LILLIS,
JOSHUA R. H. POTTS.