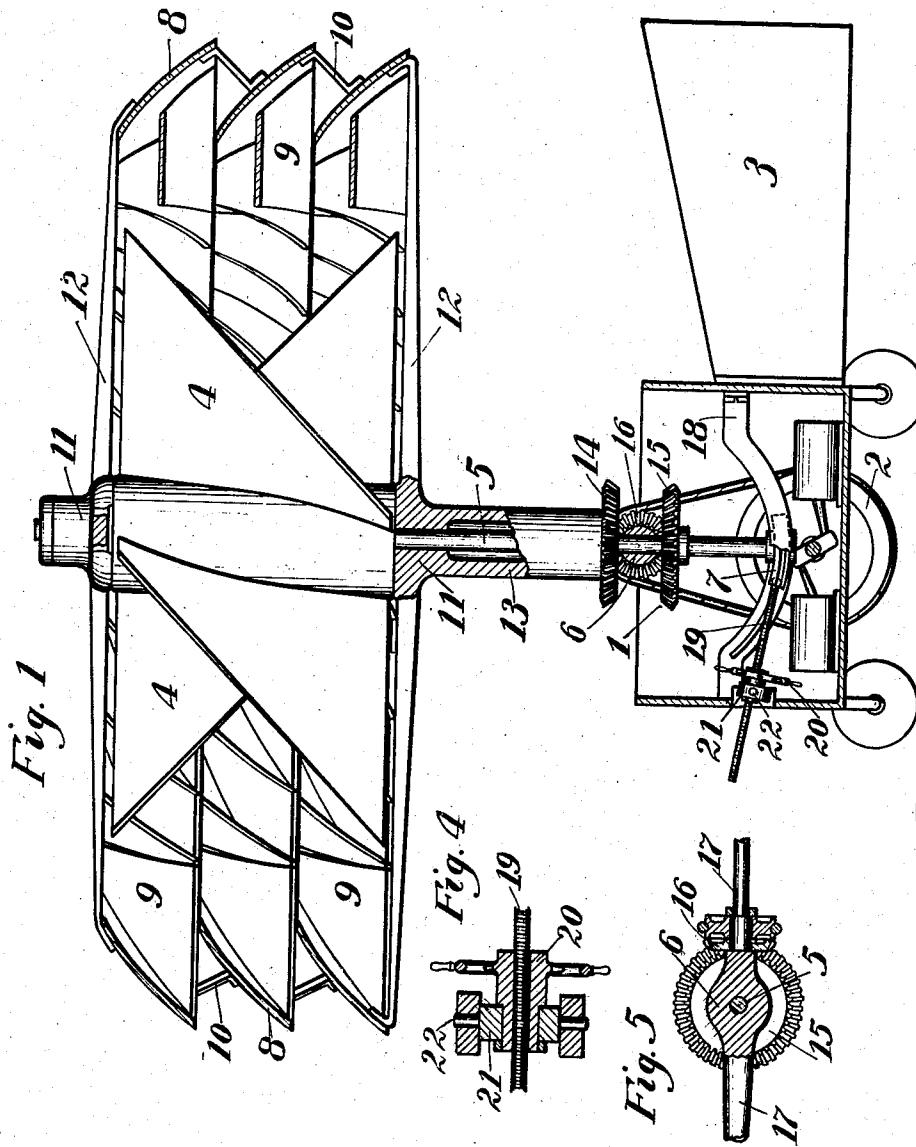


C. M. LEE.
 PROPELLER MECHANISM FOR AIR SHIPS.
 APPLICATION FILED DEC. 14, 1908.

936,916.

Patented Oct. 12, 1909.
 2 SHEETS—SHEET 1.



Witnesses:

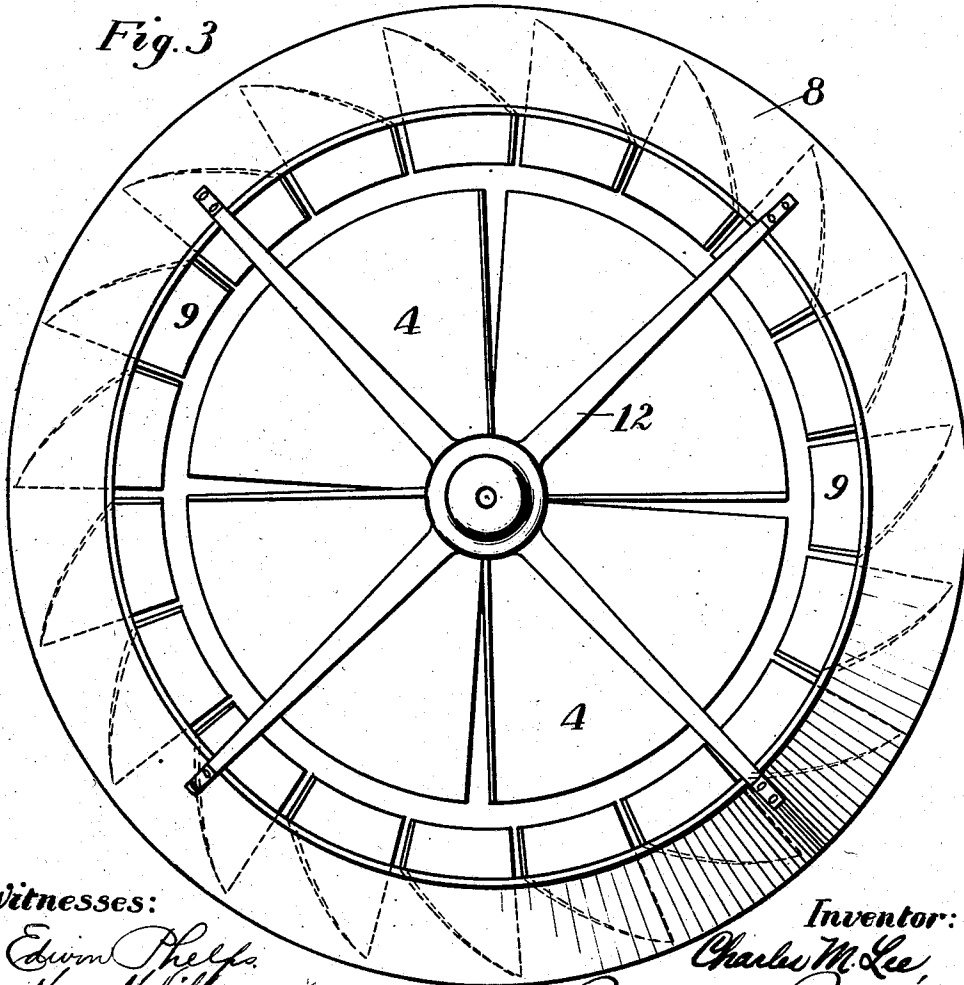
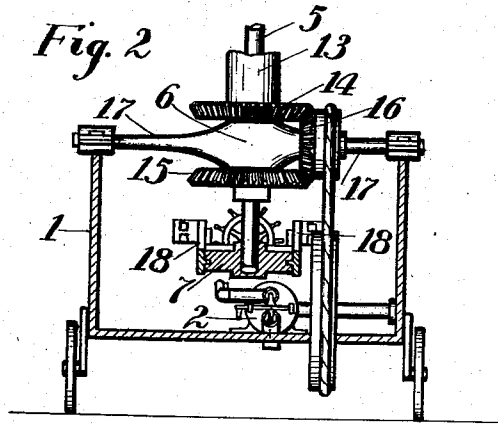
Edwin Phelps.
 Mary M. Sullivan.

Inventor:
 Charles M. Lee.
 By *Rummler & Rummler*
 Attorneys.

C. M. LEE.
PROPELLER MECHANISM FOR AIR SHIPS.
APPLICATION FILED DEC. 14, 1908.

936,916.

Patented Oct. 12, 1909.
2 SHEETS—SHEET 2.



Witnesses:

Edwin Phelps
Mary M. Sullivan

Inventor:

Charles M. Lee,

By *Rummler & Rummler*
Attorneys.

UNITED STATES PATENT OFFICE.

CHARLES M. LEE, OF GIBBON, NEBRASKA.

PROPELLER MECHANISM FOR AIR-SHIPS.

936,916.

Specification of Letters Patent.

Patented Oct. 12, 1909.

Application filed December 14, 1908. Serial No. 467,428.

To all whom it may concern:

Be it known that I, CHARLES M. LEE, a citizen of the United States of America, and a resident of Gibbon, county of Buffalo, State of Nebraska, have invented certain new and useful Improvements in Propeller Mechanism for Air-Ships, of which the following is a specification.

The main objects of this invention are to provide an improved form of propeller mechanism particularly adapted for use on flying machines and related devices; to provide mechanism of this class wherein means are provided for deflecting the air currents which are caused to flow centrifugally outward by a rotating propeller, so as to utilize the energy of said air currents through their reaction upon the deflecting surfaces; and to provide an improved form of propeller of annular form adapted to be mounted concentrically outside of another propeller so as to avoid loss of energy due to air being discharged in tangential or centrifugal directions from the inner propeller. These objects are accomplished by the device shown in the accompanying drawings, which illustrate a specific embodiment of this invention.

Figure 1 is a side elevation, partly sectional and partly broken away, of an air ship provided with propelling mechanism constructed according to this invention, some of the parts being indicated more or less diagrammatically. Fig. 2 is a detail illustrating a method of mounting the propeller shafts so as to permit them to be tilted for causing horizontal propulsion of the car. Fig. 3 is a top plan of the propelling wheels. Fig. 4 is a sectional detail, showing the method of mounting the wheel by means of which the inclination of the propelling mechanism is controlled. Fig. 5 is a detail, partly sectional, of the bearing 6.

In the form shown in the drawings, the air ship is provided with a car 1 within which is located the engine 2 which operates the propelling mechanism. The car is provided with a vertically disposed vane or rudder 3 which is mounted to swing on a vertical axis for the purpose of guiding the car, and which also serves to prevent the car from rotating in case the propelling mechanism is not perfectly balanced.

In the form shown, the propelling mechanism comprises an inner screw propeller 4 carried by a vertical shaft 5 journaled in bearings 6 and 7 in the car. The propeller 4

is surrounded by a series of frusto-conical shells 8 secured in axial alinement with each other and arranged concentrically with respect to the axis of the propeller 4. The larger end of each of these conical shells is downward. Each of the shells 8 has formed on its inner periphery a plurality of spiral vanes 9. These are inclined spirally in a direction opposite to the direction of inclination of the working faces of the vanes of the screw propeller 4, so as to deflect downwardly the air which is driven tangentially from the propeller 4. The shells 8 are rigidly secured against relative rotation with respect to each other by means of connecting braces 10, and they are carried by hubs 11 journaled above and below the screw propeller 4 and provided with spider arms 12 to which the shells 8 are secured. The lower hub 11 is fixed upon a hollow shaft 13 journaled concentrically of the shaft 5. The propellers 4 and 8 are driven in opposite directions by means of bevel gears 14 and 15 which are respectively fixed on the shafts 5 and 13 and which are driven by a bevel gear 16 which meshes with both and is connected by means of suitable power transmission mechanism with the engine 2. As the power is positively applied to the gear 16, the gears 14 and 15 will be driven at equal speeds in opposite directions, regardless of whether the resistance which has to be overcome by each is the same or not.

In the form shown, horizontal propulsion of the air ship is accomplished by tilting the axis of the propellers 4 and 8 so that its thrust will have a horizontal component as well as a vertical one. This result is accomplished by mounting the bearing 6 upon trunnions 17 carried by suitable bearings in the frame of the car, and by mounting the bearing 7 in a cross-head arranged to travel on curved tracks 18 concentric with the trunnions 17. An adjusting screw 19 having swiveled connection with the cross-head of the bearing 7 controls the tilting of the propelling mechanism. The screw 19 has threaded engagement with the hub of an operating wheel 20 which is journaled in a bearing 21 mounted upon transverse trunnions 22 in the supporting frame. A construction suitable for this purpose is shown in Fig. 4.

The operation of the device shown is as follows: The propellers 4 and 8 are always driven in such directions as to cause the lift-

ing of the car. On account of the arrangement of the transmission gears, the direction of rotation of the propellers 8 and 4 is always opposite. If it is desired to cause the car to be propelled horizontally through the air, the axis of the propelling mechanism is tilted as hereinbefore described.

The action of the air currents is as follows: The rotation of the propellers causes air to be drawn downward from above and to leave the propellers in a downward direction. On account of the curvature of the surfaces of the screw propeller, some of the air is forced tangentially or centrifugally outward from the axis of the propeller. The centrifugal air currents which leave the propellers 4 strike against the downwardly inclined inner faces of the cones 8 and vanes 9 and are deflected downward toward an axial direction. The reaction of such downwardly deflected air currents causes an upward thrust on the surfaces 8 which assists in the lifting of the apparatus. On account of the rotation of the cones 8, an additional thrust is obtained from the spiral vanes 9. These vanes, besides deflecting the air which passes centrifugally from the propeller 4, also have the effect of drawing other air downwardly in a manner similar to the action of the vanes on the propeller 4.

While but one specific embodiment of this invention is illustrated in the drawings, it will be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of this invention.

I claim:

1. A propeller, comprising a plurality of truncated conical shells open at both ends and rotatably mounted in axial alinement with each other, means rigidly connecting said shells to each other, and one or more spiral vanes mounted on the inner surface of each of said shells.

2. A propelling mechanism, comprising a

screw propeller, a substantially frusto-conical shell mounted concentrically with respect to said screw propeller, the inner surface of said conical shell diverging in the direction of the air currents produced by the rotation of said screw propeller, and one or more vanes extending spirally around the inner periphery of said shell.

3. A propelling mechanism, comprising a screw propeller, a substantially frusto-conical shell mounted concentrically with respect to said screw propeller, the inner surface of said conical shell diverging in the direction of the air currents produced by the rotation of said screw propeller, and one or more vanes extending spirally around the inner periphery of said shell, said vane or vanes being twisted oppositely from the working surfaces of said propeller, and mechanism for rotating said propeller and shell in opposite directions with respect to each other.

4. A propelling mechanism, comprising an inner rotary propeller, a shell surrounding said propeller and separately journaled concentrically of the axis thereof, the surface of said shell which is adjacent to said inner propeller being spirally inclined and adapted to deflect toward an axial direction centrifugal currents set up by said inner propeller.

5. A propelling mechanism, comprising an inner screw propeller, a shell surrounding said propeller and separately journaled concentrically with the axis thereof, and a spiral surface on the inner face of said shell inclined oppositely to the working surfaces of said propeller.

Signed at Chicago this 9th day of December, 1908.

CHARLES M. LEE.

Witnesses:

EUGENE A. RUMMLER,
MARY M. DILLMAN.