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APPLICATION FILED SEPT. 9, 1908.

996,815.

Patented July 4, 1911.

5 SHEETS—SHEET 1.

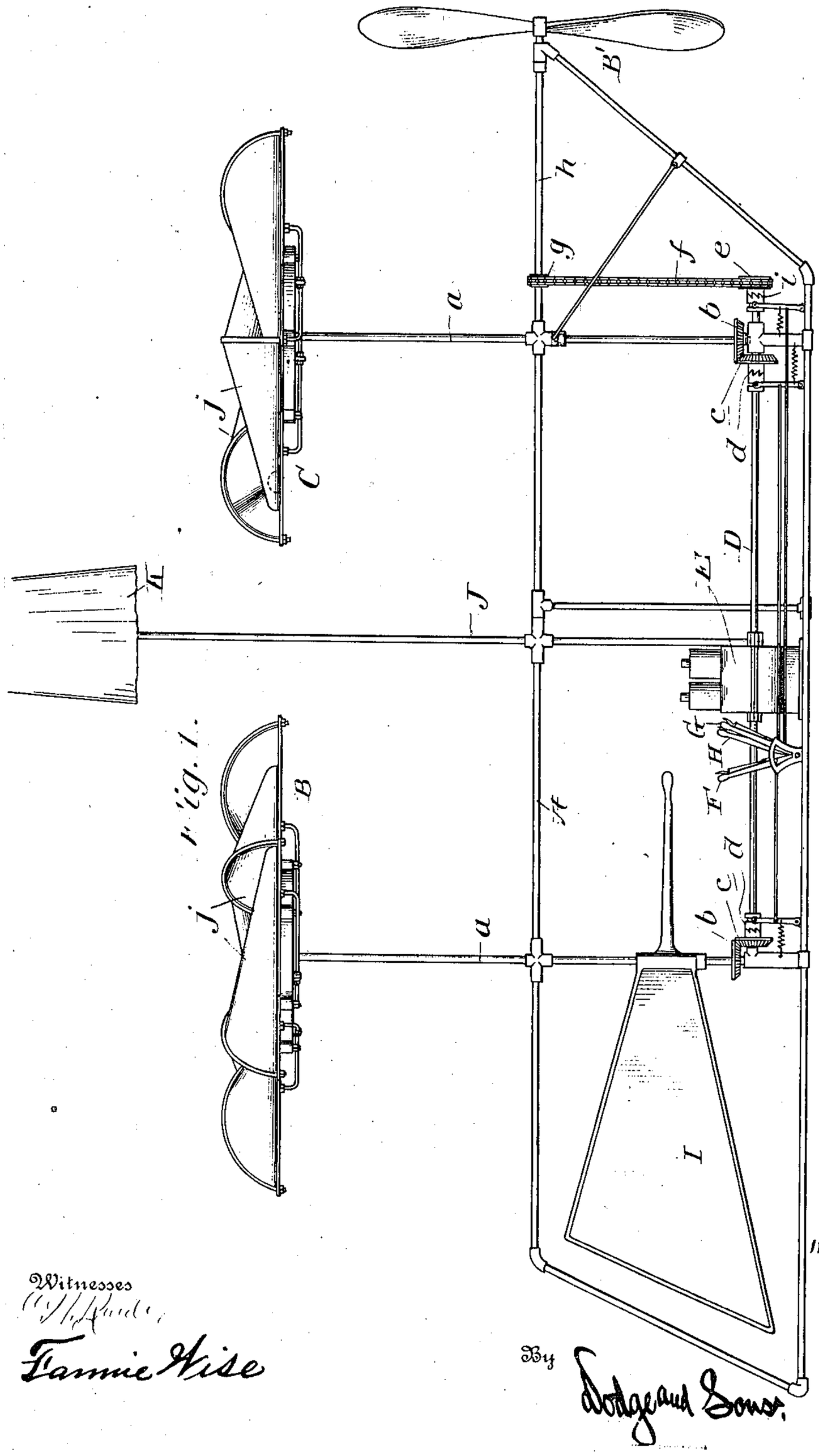

Fig. 1.

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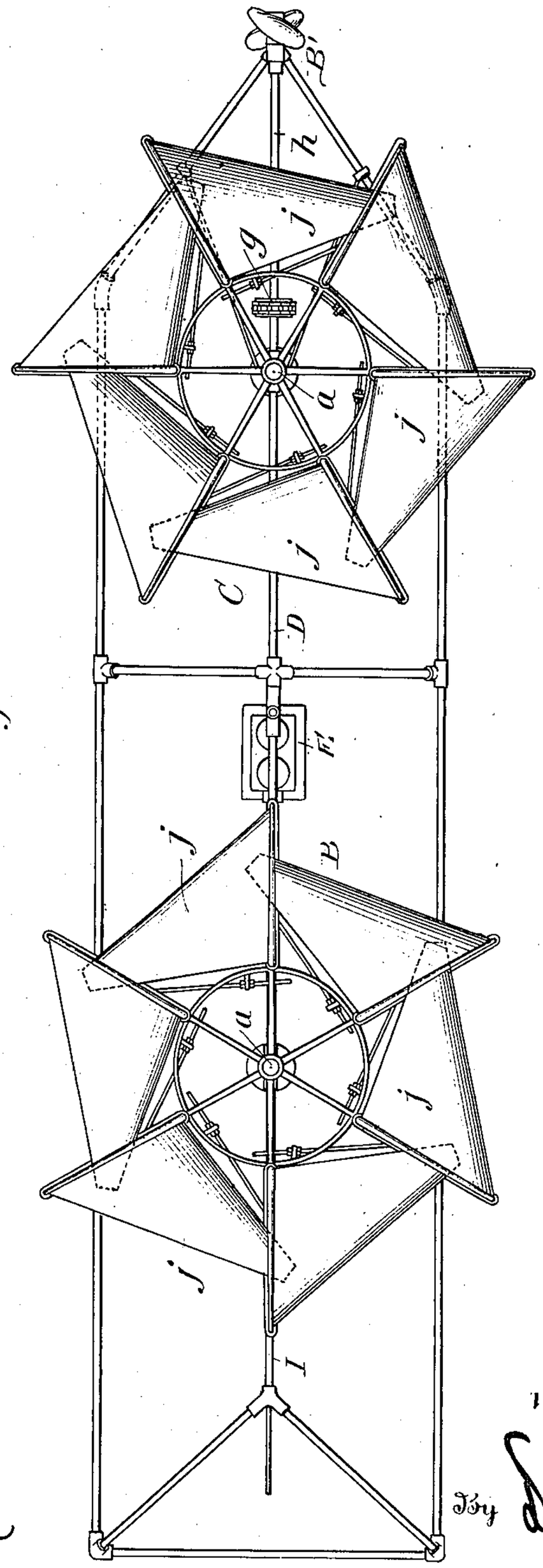

Fig. 2.

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5 SHEETS—SHEET 3.

Fig. 3.

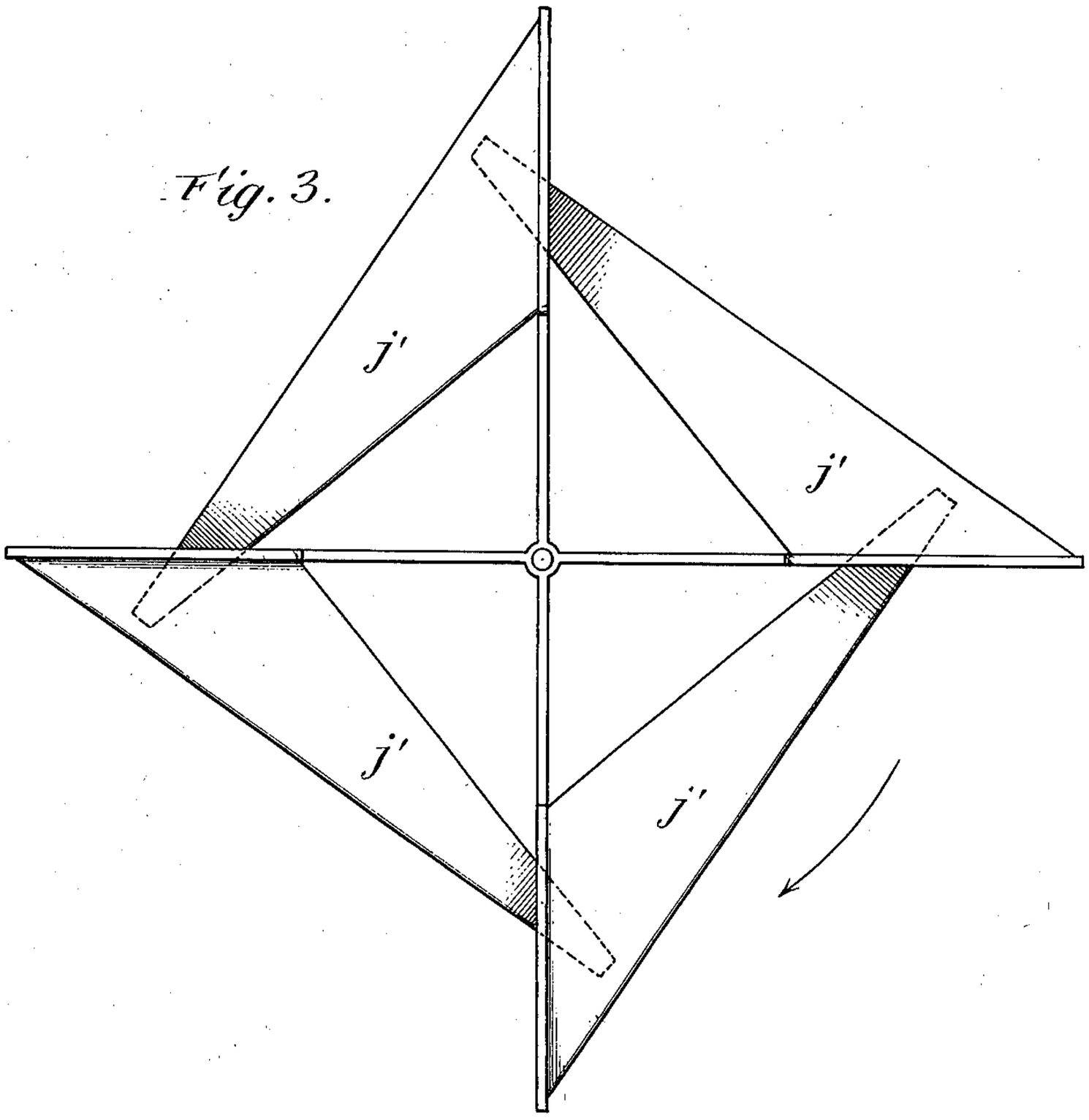
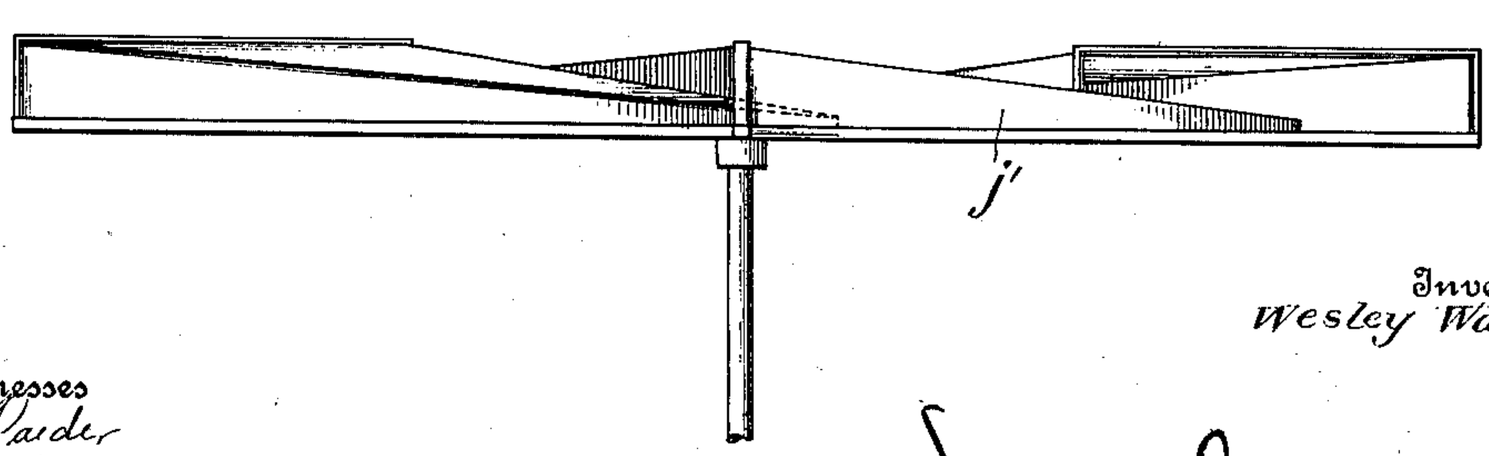


Fig. 4.



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5 SHEETS—SHEET 4.

Fig. 5.

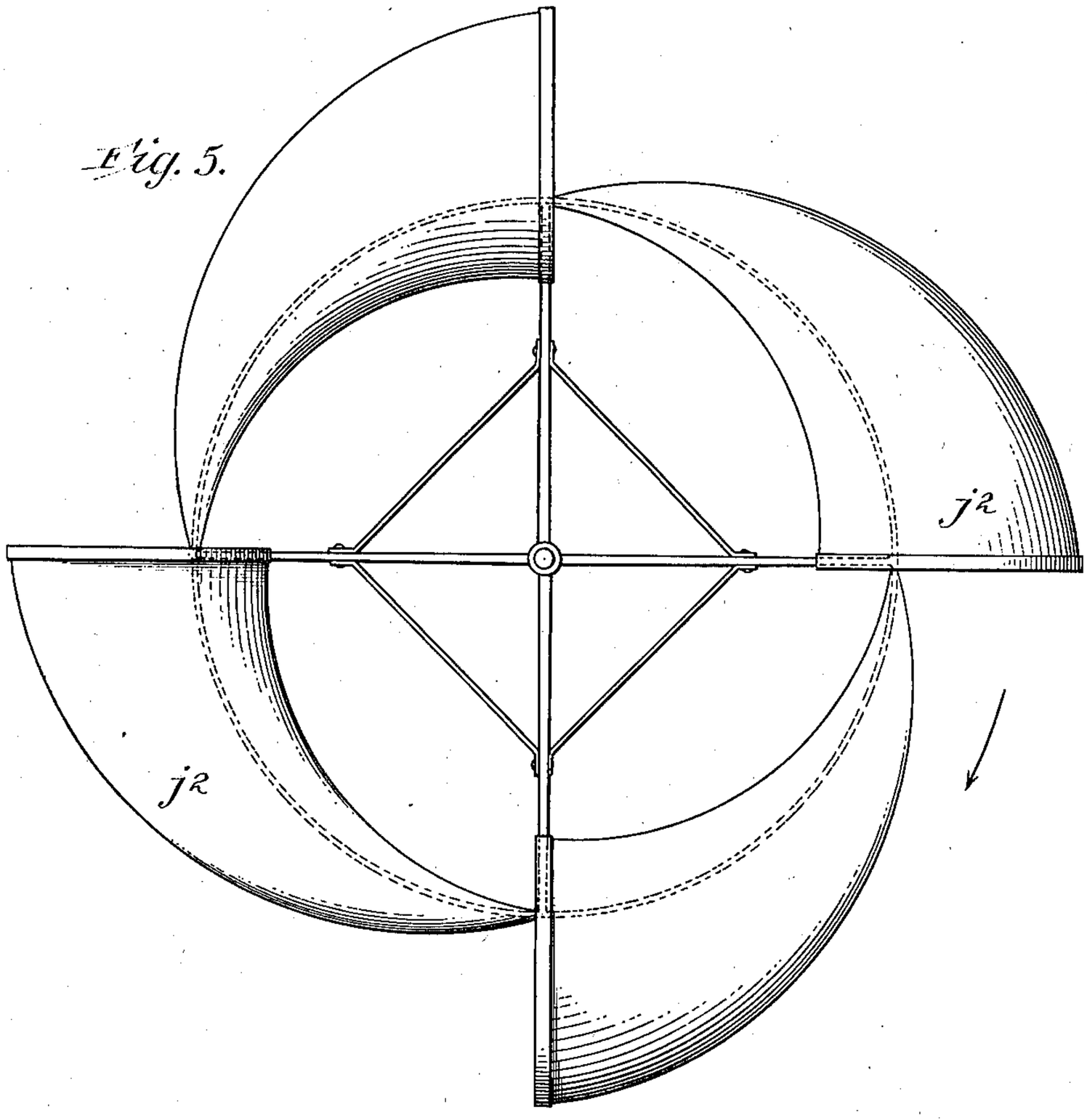
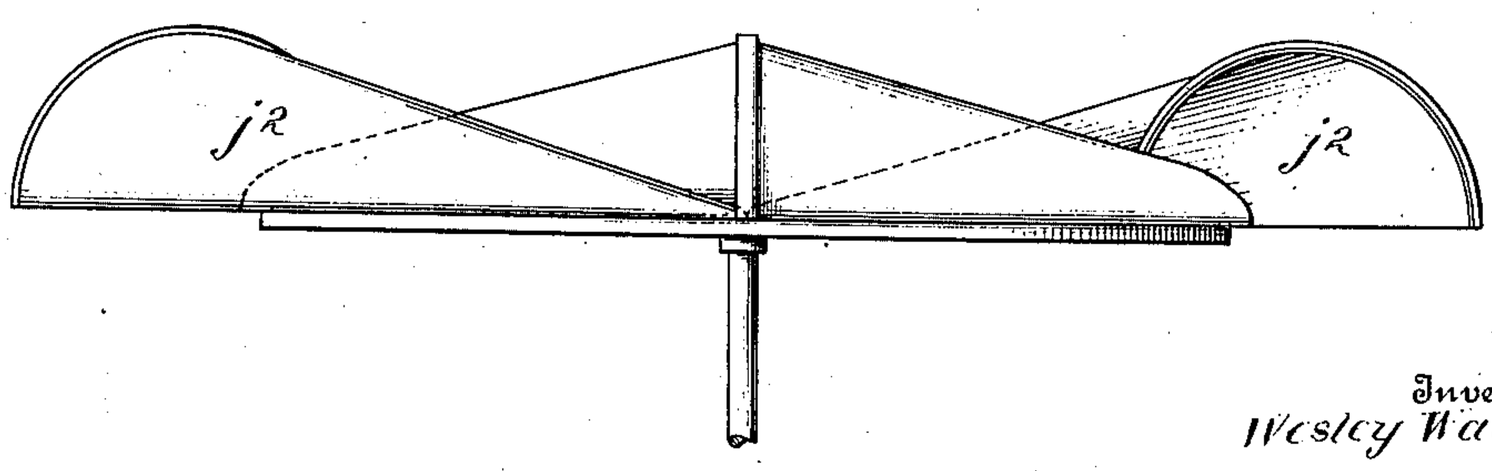


Fig. 6.



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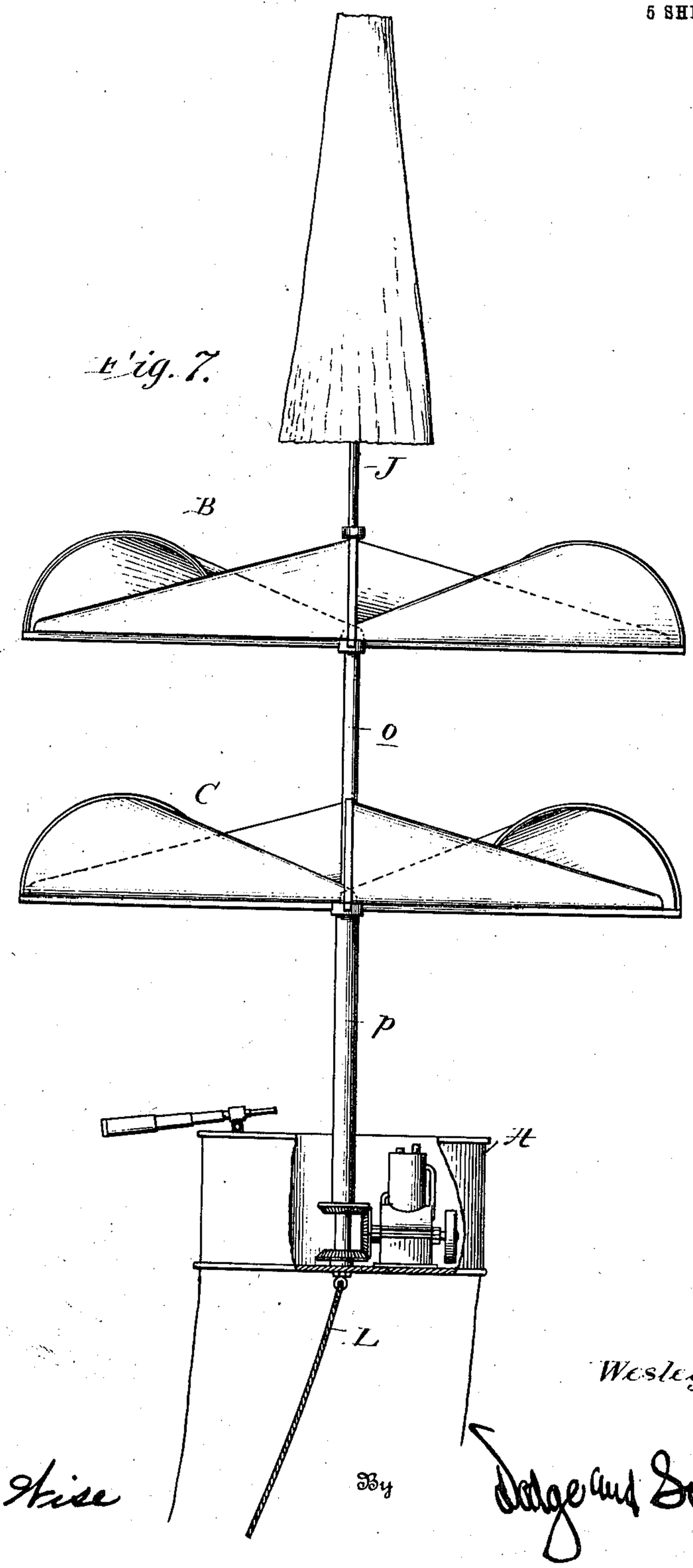
5 SHEETS—SHEET 5.

Fig. 7.



Witnesses

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UNITED STATES PATENT OFFICE.

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Application filed September 9, 1908. Serial No. 452,289.

To all whom it may concern:

Be it known that I, WESLEY WAIT, a citizen of the United States, residing at Newburgh, in the county of Orange and State of New York, have invented certain new and useful Improvements in Aerial Vessels, of which the following is a specification.

My invention pertains to aerial navigation, and more particularly to the form and construction of the bladed wheels in the nature of screw propellers, designed to lift the structure, and maintain it at any desired elevation. Similar wheels or propellers may be employed for causing the ship or structure to move in any desired direction.

The prominent feature of the invention is such a construction or formation of the blades of the wheel or propeller as shall cause the air in which the wheel is rotating to be compressed beneath the blades and discharged downward therefrom, each blade discharging air beneath the leading edge of the next succeeding blade, and preferably directing the same in greater or less degree toward the center or axis of rotation.

Other features will be explained in the following description.

In the drawings I have represented a simple form of the structure and various forms of the wheel or propeller, all, however, embodying the same essential principle.

Figure 1 is a side elevation of a car or ship embodying my invention; Fig. 2, a top plan view thereof; Figs. 3 and 4, edge views of a propeller made in accordance with my invention; Figs. 5 and 6, similar views of a slightly varying form thereof; Fig. 7, an elevation of a captive car provided with superposed propellers of the character described, and designed merely for making ascensions but not to go from place to place.

Though the wheels or propellers about to be described may be used in connection with balloons or like buoyant bodies, they are primarily intended for use in connection with cars or vessels of the heavier-than-air type, and the purpose is to effect the lifting and the maintenance of the vessel or car in the air by means of such wheels or propellers, and to effect a horizontal movement or travel of the structure by another propeller (one or more) of the same or other suitable type. The framing of the structure and the arrangement of the lifting and propelling wheels and like details may be varied within wide limits, and the structure here represented is suggested merely and may be varied as circumstances require, the matters of design, weight, and strength of parts, etc., belonging rather to the field of engineering than to that of invention.

Referring first to Figs. 1 and 2, which show a simple and conventional form of the car or vessel, A indicates a framing advisably constructed of metallic tubing with suitable couplings or connections, and braced or trussed in such manner as to give the requisite strength and stiffness. B and C are lifting wheels or propellers, each carried by a vertical shaft *a* suitably journaled in the framework of the machine, and carrying at their lower ends bevel pinions *b* arranged to mesh with like pinions *c* on a driving shaft D to which rotary motion will be imparted by an engine or motor E, preferably of the internal combustion or explosive type. The pinions *c* are preferably placed loosely upon the shaft D but are connected therewith, when desired, by clutches *d*, each controlled by a separate lever F or G. The shaft D carries also a sprocket wheel *e* to receive a driving chain or band *f*, which also passes about a sprocket wheel or band-wheel *g* on the shaft *h* of the propeller B′. A clutch *i* is interposed between the sprocket wheel *e* and shaft D, whereby the propeller may be at any time disconnected from the shaft D by withdrawal of one of the clutch members from engagement with the other. A lever H, suitably connected with the sliding member, serves to throw it into or out of engagement with the companion member on the sprocket wheel *e*. In each case the sliding member of the clutch is splined upon the driving shaft so that though free to move longitudinally upon or relatively to the shaft, it can turn only with the shaft. A rudder I applied to the structure at the end opposite the propeller B′ serves to direct the same horizontally.

It will be observed upon referring to Fig. 1, that the gearing *b*, *c*, is so arranged as to cause the wheels B, C, to rotate in reverse directions, this being necessary in order that there may be no tendency of the structure as a whole to revolve about an axis intermediate the wheels B, C, any tendency of either wheel to turn or whirl the structure about such axis being counteracted and neutralized by the tendency of the other wheel to turn it about the same axis but in the reverse direction.

As shown in Figs. 1 and 2, the wheels B, C, are each provided with a series of blades *j*, of semi-circular form in cross section and tapering from the forward or leading end toward the trailing end, speaking with reference to the direction of rotation. The lower edges of the blades keep normally a horizontal position, or lie in common horizontal plane. As a consequence, the leading edge or mouth of each blade is raised considerably above the trailing or discharge end of the blade. As the wheel or propeller rotates, the broad arching mouth of each blade gathers in the air, which being forced backward into the narrower and shallower part of the blade, or speaking more precisely, the blade riding over the air and causing it to occupy the portion of the blade of progressively less cross section, the air is condensed or compressed. Owing to the slant or downward inclination of each blade from its receiving to its discharge end, and to the narrowing space within or under the blade, the air is caused to be discharged downward at or near the rear end of each blade, escaping within or directly beneath the mouth of the succeeding blade. As the air becomes compressed beneath the blades they act with greater efficiency to effect a lifting of the structure, and this upward movement is facilitated by reason of the rounding shape of the upper face of each blade offering relatively little resistance to the ascent of the wheels and structure. Owing to the rapid rotation of the wheels, the gathering of the air within the broad mouths of the blades, and its being forced into the narrower portions thereof, the air is not only more or less compressed but is thrown downward. The action is, therefore, analogous to that of the reaction wheel or Barker's mill. In other words, the air gathered and compressed within the blades presses in all directions alike, but having contact only with the under faces of the blades, can exert its influence upon the wheels, and therefore on the entire structure, only in an upward direction. Rising centrally from the structure is a staff J, carrying at its top a parachute K for use in case of injury to or failure of the mechanical appliances, or in descending. It will be observed, too, that the wheels B, C, by reason of the arching form of their blades and the consequent gathering and holding of the air beneath them as the structure descends, will themselves act in a considerable degree as parachutes.

In Figs. 3 and 4 the wheels are represented as of the same general construction as in Figs. 1 and 2, except that instead of being semi-circular in cross section, or rounded on the upper face, the blades *j'* are flat, though tapering from the receiving toward the discharge end as before. This construction has the same advantages substantially as that shown in Figs. 1 and 2 except that it offers greater resistance to the rise of the wheel and the structure owing to the broad flat face presented to the air. In Figs. 5 and 6 is shown the same general form as in Figs. 1 and 2, but with the blades *j²* curved longitudinally as well as transversely, the effect of which is to cause the discharge to take place nearer to the center of rotation or axis of the wheel.

It will be noted that under all the forms above described the air is compressed and then discharged at a point within the radius of rotation of the wheel, and this may be nearer to or farther from the center or axis of rotation, as deemed advisable. The purpose of this is to maintain directly beneath each lifting wheel or propeller a body of relatively dense air upon which the wheels may act with greater efficiency or lifting effect than upon the relatively rarefied air through which the structure moves.

In Fig. 7 the wheels B, C, are superposed and carried by tubular shafts *o* and *p*, arranged one within the other, and both encircling the parachute shaft J which thus forms a central support for the tubular shafts. In this figure the car A is represented as having attached to it a rope or cable L, designed to be anchored to the ground or otherwise held, to limit the rise and prevent the escape of the structure, thus answering to the uses of the ordinary captive balloon but substituting mechanical means of elevation for the buoyant gas-bag of the balloon.

It will be observed also that under the construction set forth in Figs. 1 and 2, either or both wheels B, C, may be put in rotation or disconnected from the power shaft at will, and thus the movement may be caused to be directly vertical or angling as desired. In Fig. 1 the several clutches are represented as of toothed construction for the purpose of more clearly indicating the fact that they are clutches, but in practice it will probably be better to employ friction clutches which admit of varying transmission of power from the main driving shaft to the shafts of the lifting wheels B and C, thereby enabling the operator to vary the inclination of the frame of the car or vessel to cause it to travel at an angle to the horizon under the propelling force of the wheel B'. Said wheel B' may be at the forward or the rear end of the structure as preferred, the rudder in either case being at the end opposite to that which the propelling wheel B' is located.

As seen in the various figures, a skeleton frame is in each case provided to carry the blades making up the wheel or propeller. No specific construction of this skeleton frame is described or deemed important, but the same may be varied according to

form and size of the blades and like constructions.

It is of course understood that the wheel or propeller has a rotary motion about its axis in a plane perpendicular thereto, but that the wheel as a whole advances facewise in the direction of said axis. The term "leading edge" designates the forward edge of the blade with reference to such rotary motion or travel about the axis of rotation, and the term "forward or advancing side" has reference to the front face of the wheel, or of a blade of the wheel, with regard to the bodily translation incident to the rotation of said wheel, and its screw-like advance through the air. The term "trailing edge" designates the rear edge of the blade with reference to the rotary motion of the wheel.

Having thus described my invention what I claim is:

1. In an aerial vessel, the combination of a suitable frame; a motor; and two upright shafts connected with said motor, each carrying a wheel rotatable with the shaft, and having a series of blades each with an unobstructed leading edge and with downwardly turned sides, each blade inclining downward from the forward toward the trailing edge, and decreasing in width toward said trailing edge.

2. In a wheel or propeller, the combination with a suitable skeleton frame, of a series of blades with depending sides or edges and decreasing in width and height from the leading toward the trailing edge or end of the blade.

3. A wheel or propeller provided with blades each having a closed face on the forward or advancing side with reference to the direction of bodily translation or advance of the wheel, said blades having free and unobstructed leading edges, and backwardly turned edges connecting the leading and the trailing edges, the leading edges being in a plane forward of the trailing edges with reference to the direction of bodily advance of the wheel, and the blades decreasing in width from their leading toward their trailing edges.

4. In a lifting wheel or propeller, the combination with a suitable skeleton frame, of a series of blades concavo-convex in section radial to the axis of rotation of the wheel, and tapering from their leading edges toward their trailing edges.

5. In a lifting wheel or propeller, the combination with a rotatable shaft, of a blade carried by said shaft and movable about the axis thereof in a plane perpendicular to such axis, the leading edge of said blade being of greater width than the trailing edge, said blade being bounded between the leading and trailing edges by flanges turned rearwardly with reference to the direction of bodily advance of the wheel, the forward or advancing face of the blade being oblique to the plane of rotation.

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

WESLEY WAIT.

Witnesses:

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TILLIE P. GIBSON.