No. 688,584. Patented Dec. 10, 1901.

R. H. BOTTS.

AIR SHIP.

(Application filed Apr. 16, 1901.)

(No Model.) 5 Sheets—Sheet 1.

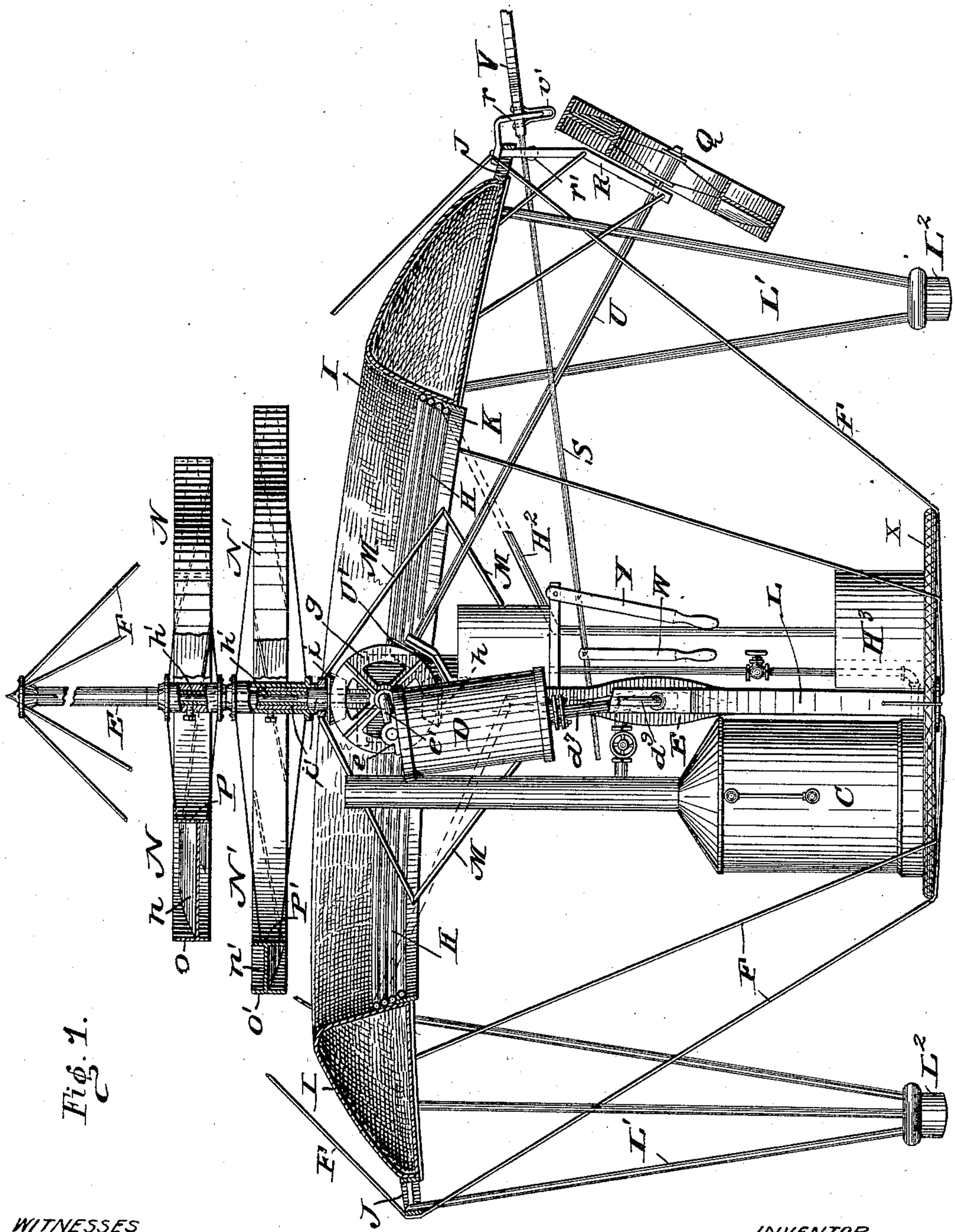

Fig. 1.

WITNESSES
M. S. Blondell
Edw. W. Byrn.

INVENTOR
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BY Munn & Co.
ATTORNEYS

No. 688,584.

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(No Model.)

5 Sheets—Sheet 2.

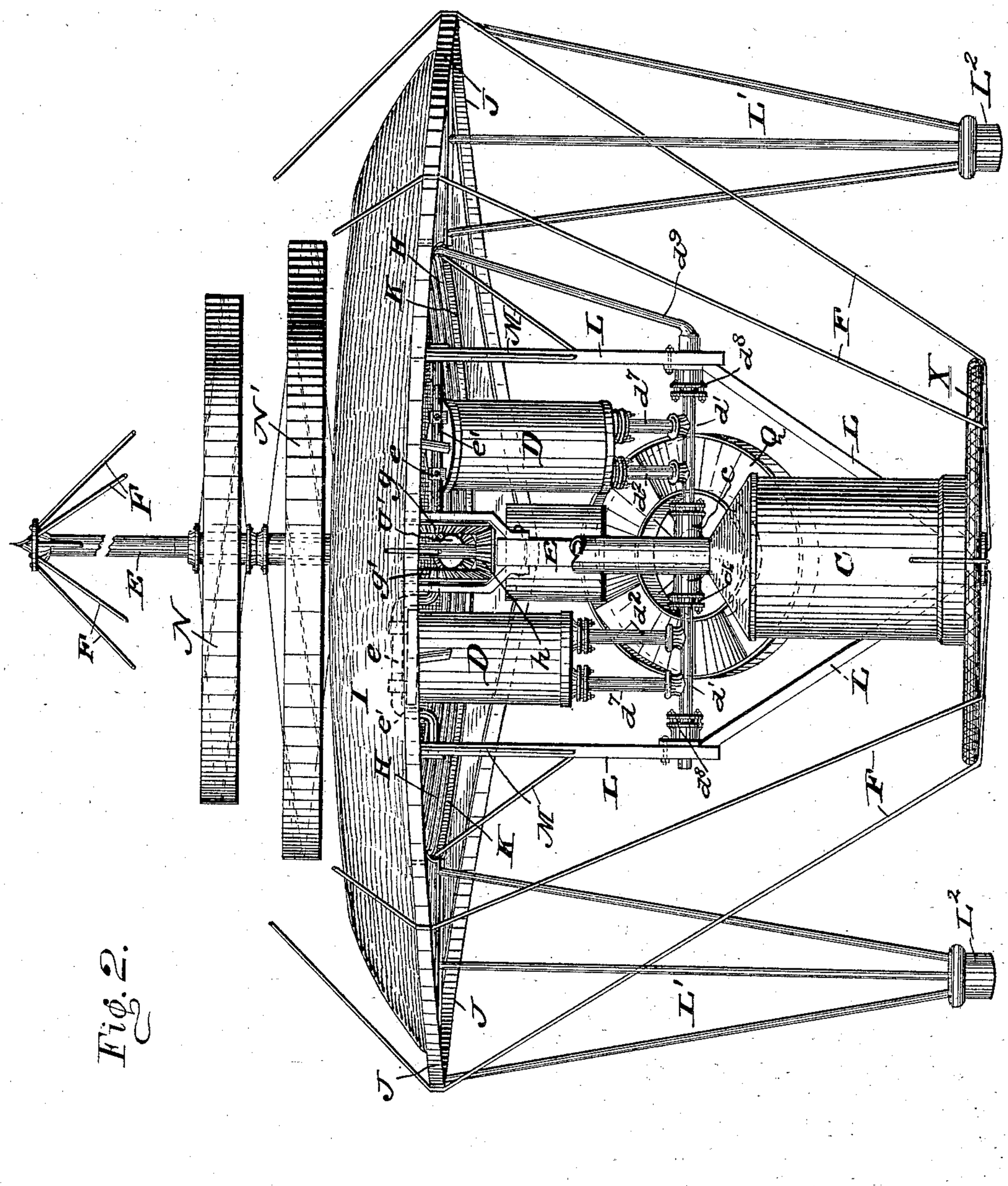

Fig. 2.

WITNESSES
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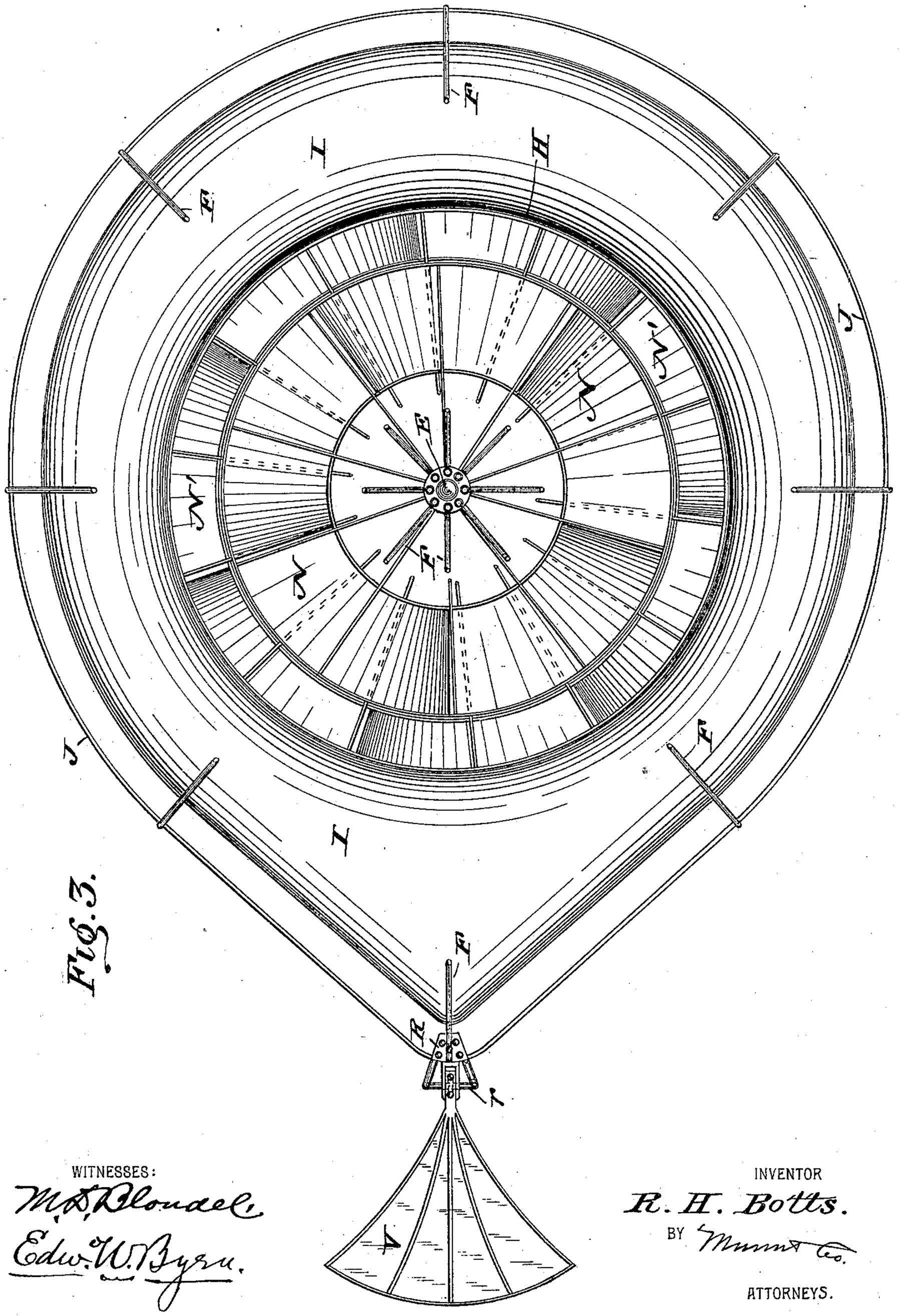

Fig. 3.

WITNESSES:

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Fig. 5.

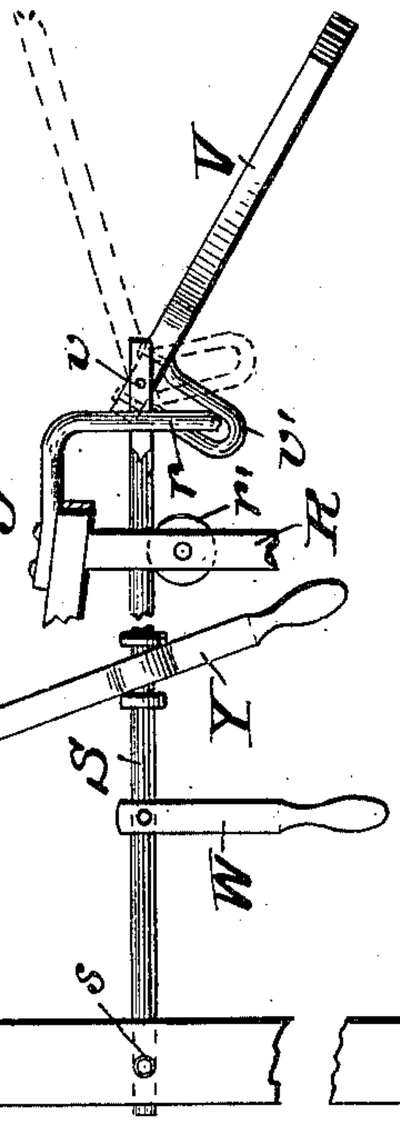


Fig. 6.

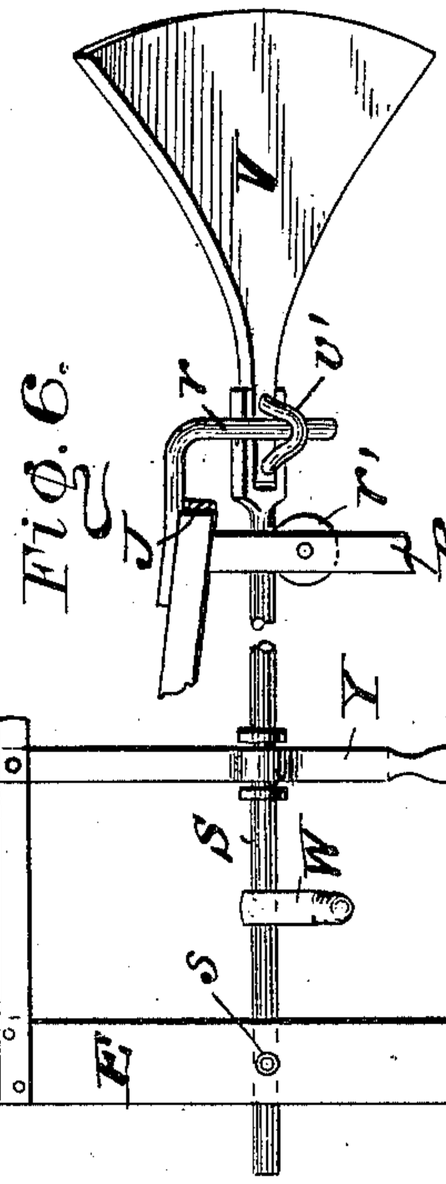
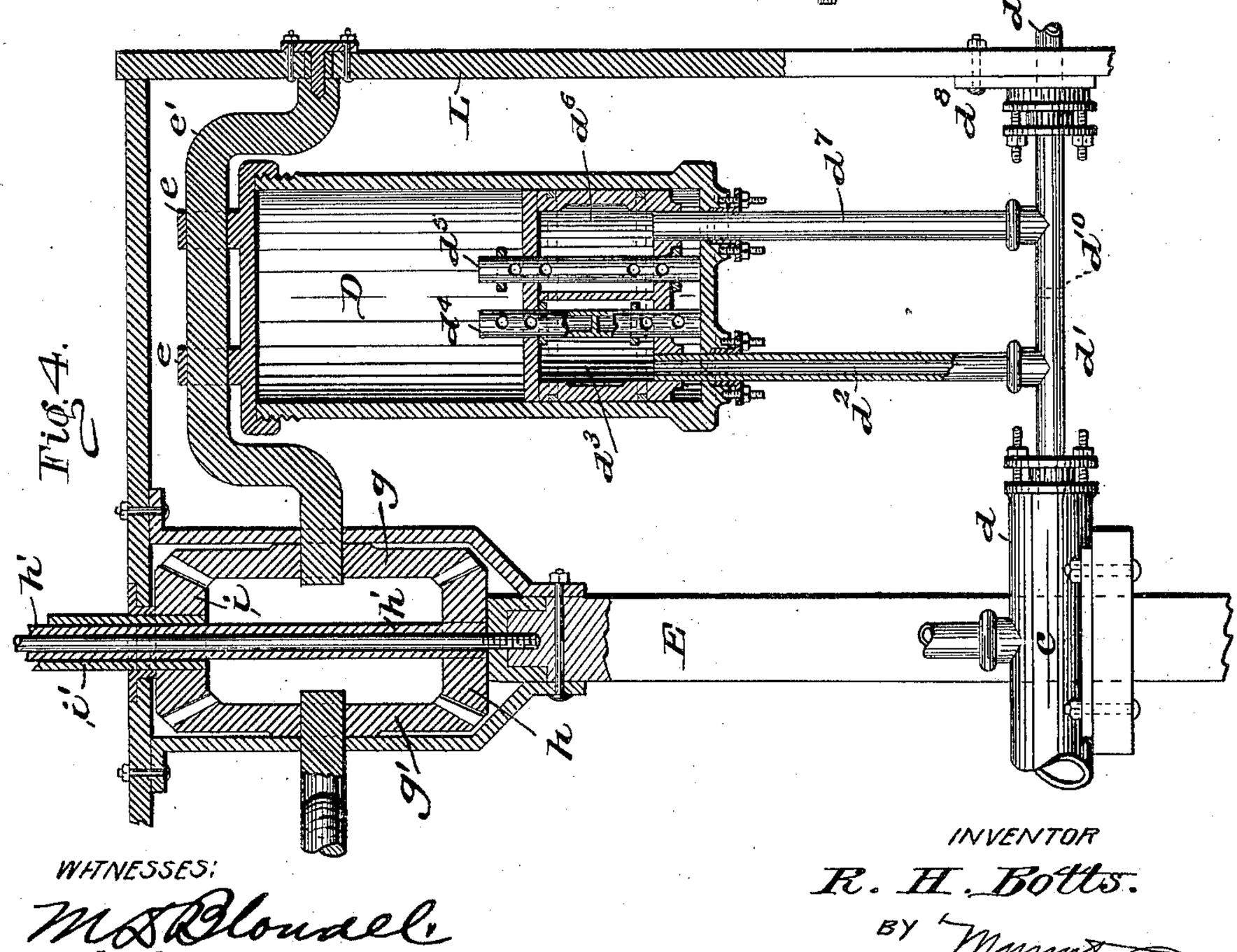


Fig. 4.



INVENTOR

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No. 688,584. Patented Dec. 10, 1901.

R. H. BOTTS.

AIR SHIP.

(Application filed Apr. 16, 1901.)

(No Model.) 5 Sheets—Sheet 5.

Fig. 7.

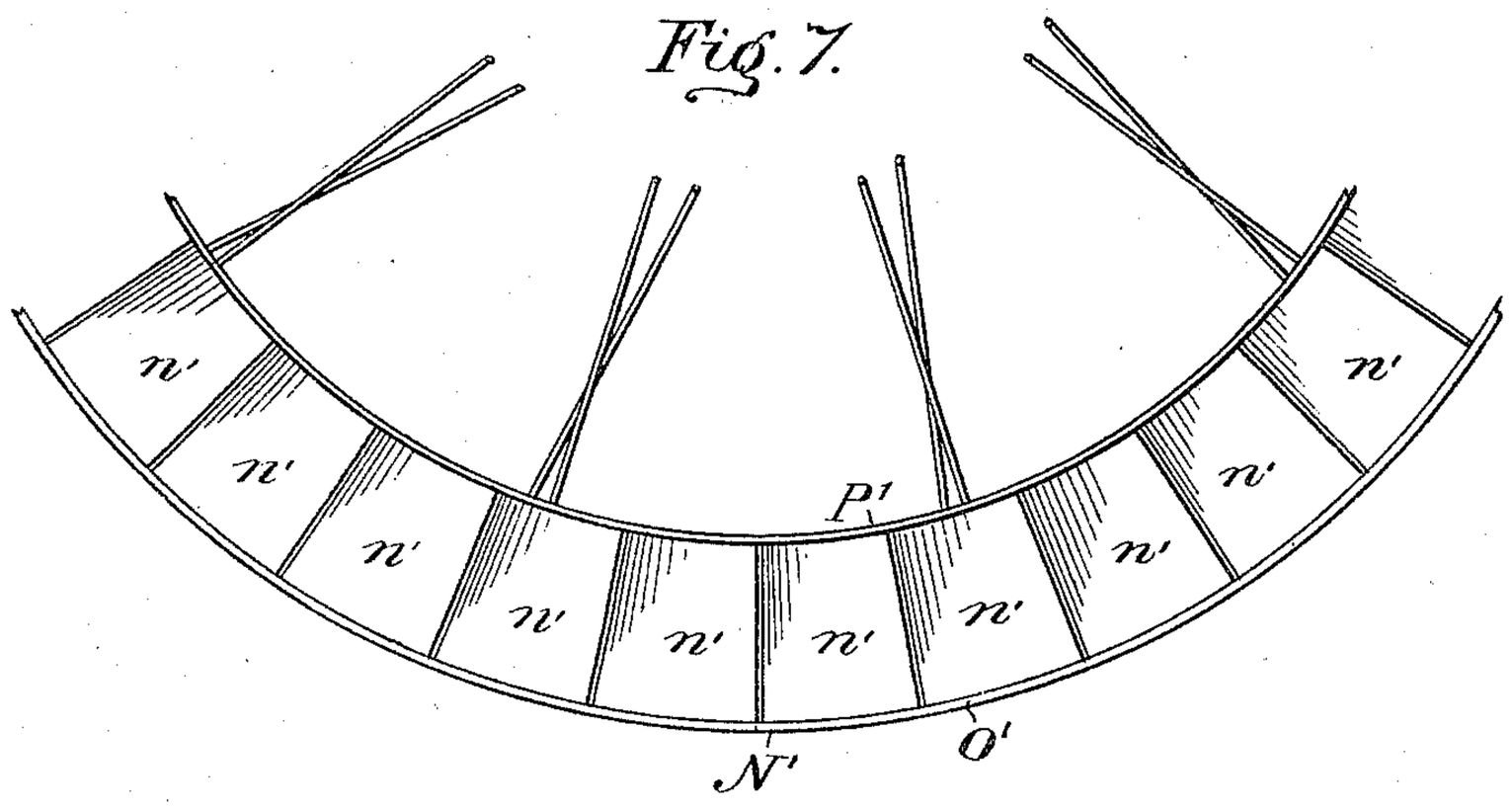
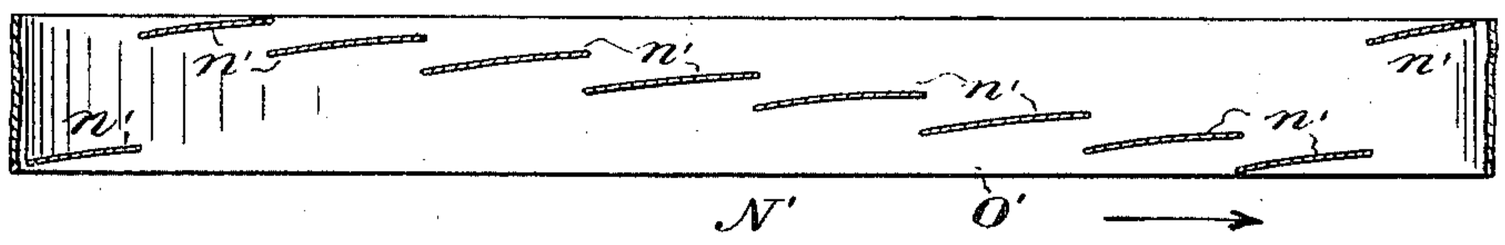


Fig. 8.



WITNESSES:
Jos. a. Ryan
Edw. W. Byrn.

INVENTOR:
R. H. Botts.
BY Munn & Co.

ATTORNEYS

UNITED STATES PATENT OFFICE.

ROBERT HENRY BOTTS, OF ALBUQUERQUE, TERRITORY OF NEW MEXICO.

AIR-SHIP.

SPECIFICATION forming part of Letters Patent No. 688,584, dated December 10, 1901.

Application filed April 16, 1901. Serial No. 56,109. (No model.)

To all whom it may concern:

Be it known that I, ROBERT HENRY BOTTS, of Albuquerque, in the county of Bernalillo, Territory of New Mexico, have invented a new and useful Improvement in Air-Ships, of which the following is a specification.

My invention is designed to provide a practicable, safe, and reliable form of air-ship constructed with the lightest and strongest framework and provided with propellers for raising and lowering and advancing the same, in connection with a gas-bag of peculiar construction which also acts as a parachute in alighting and having also steering devices for controlling the direction of movement of the ship.

It consists in the peculiar construction and arrangement of parts, which I will now proceed to describe with reference to the drawings, in which—

Figure 1 is a vertical longitudinal section of the air-ship. Fig. 2 is a front elevation. Fig. 3 is a top plan view. Fig. 4 is a sectional detail showing the connection of the engines with the lifting propeller-gears, and Figs. 5 and 6 are details of the steering devices. Figs. 7 and 8 are top and sectional detail views of the vanes of the propeller-wheels.

E is a vertical central mast or standard.

I is an annular gas-bag of generally round shape with a large central opening through it and having a prolongation or projection at the rear side, as shown in Fig. 3. The bottom side of this gas-bag is flat, and its plane is set at an incline, with the front end highest to act as an aëroplane.

X is a platform connected to the lower end of the mast and having guy-ropes F extending from its outer edges to the outer marginal rail J of the gas-bag, and thence to the top of the mast, such guy-ropes extending at intervals around the entire device.

C is a steam-boiler mounted on the platform beside the mast, and D represents the engines, arranged in a rectangular frame L, connected to the mast above the boiler and braced to the platform below. The special construction of boiler and engine is not claimed in this application, and only so much of them will be described as is necessary to fully understand the nature of the air-ship.

Referring to Fig. 4, it will be seen that there are two engines, one on each side of the mast. Each consists of a cylinder D, which both reciprocates and oscillates, and a two-compartment piston d^3 d^6, which oscillates about an axis below, but does not reciprocate. This piston has two hollow piston-rods d^2 d^7, opening, respectively, into the two compartments d^3 d^6 of the piston and connecting below to the pipe d', which rocks in stuffing-boxes d and d^8 and has a partition d^{10} between the two hollow piston-rods d^2 d^7. Tubular valves d^4 d^5, with suitable openings in them, slide in the chambers d^3 d^6 of the piston and alternately open these chambers to the cylinder on opposite sides of the piston, the tubular valves being shifted by impact against the heads of the cylinders. Steam comes through the pipes c from the boiler and passes in pipe d' to hollow piston-rod d^2, into chamber d^3, and thence by valve d^4 to one side or the other of the piston, and escapes through valve d^5, chamber d^6, and hollow piston-rod d^7 to exhaust-pipe d^9. This makes a very simple and self-contained engine well adapted to an air-ship. The cylinder D as it reciprocates is connected by straps e e with the crank-shaft e' and turns it with its attached bevel gear-wheel g. This latter is in mesh below with a bevel-gear h, rigidly connected to a hollow shaft h', and at the upper side said gear-wheel g meshes with another bevel-gear i, rigidly connected to a concentric hollow shaft i. These two hollow shafts h' and i' are connected to and made to rotate two concentric propeller-wheels N and N', Fig. 1, arranged horizontally about the mast E and immediately above the opening in the gas-bag, as seen in Fig. 1. These propeller-wheels are constructed lightly, like bicycle-wheels, and have an outer tire O and O', respectively, and an inner tire P and P', with vanes or blades n and n', of any light material, arranged between the two tires, the vanes or blades n of the upper wheel being aranged at a reverse inclination to those n' of the lower wheel, so that when they rotate in opposite directions they will neutralize each other as to any twisting action on the air-ship, but will both coöperate to lift the same. The upper wheel is of the smaller diameter, but has larger vanes than the lower one, the

area of their vanes and their relative speed or pull being so arranged as to be about equal. The vanes of the upper wheel are arranged to come inside the vanes of the lower wheel, so that each set will have a perfect clearance for the air.

On the inner circular edge of the gas-bag there is a marginal circular frame K, connected by braces M to the frame L. Just above this frame K and along the walls of the inner side of the gas-bag there is a coil of pipes H, connected to the exhaust-pipes d^9 from the engines. This coil of pipes acts as a condenser of steam and is placed where the air-blast keeps it cool, it being understood that to get any practical benefit from such air-blast for condensing purposes the surface of the condenser-coils should be kept moist. From this coil the water of condensation passes down pipe H^2 to a tank H^3, from which the boiler is supplied, so that there is no loss of water from the evaporation and escape of steam. This permits a relatively small body of water to be carried and contributes greatly to the lightness of the air-ship.

For propelling the ship horizontally through the air a wheel Q, constructed in the same manner as the wheels N and N', is rigidly fixed to a propeller-shaft U, arranged in bearings in a hanger-frame and extending to the central mast, where it terminates in a bevel gear-wheel U', that engages with the bevel gear-wheels g and g', driven by the engine.

To guide the direction of the ship, a double-acting steering-rudder V is provided. This is arranged to be canted up or down from a horizontal position to cause the ship to rise or descend, or it may be rotated about its longitudinal axis to assume a vertical plane and be then deflected to turn the ship around. This rudder is pivoted at v to the rear end of a shaft S and has a staple or loop v', that incloses the bent end of a stationary arm r, fixed to the framework J. A hanger-bar R from frame J carries a roller r', which supports the shaft S. The inner end of the shaft S slides through a hole in the mast E and is provided with a rigid arm W, by which the shaft is rocked, while a loosely-connected lever Y is arranged to slide the shaft S back and forth. When the shaft S is moved longitudinally by the lever Y, the loose connection of the loop v' to the stationary arm r causes the rudder to be canted up or down, and when the shaft S is rotated by arm W the rudder-blade changes to a vertical plane and by the longitudinal movement of the shaft S may then be thrown to right or left to steer the ship to right or left. To lock the rudder in any desired position, a set-screw s is tapped through the mast and is made to bind against said shaft and lock it rigidly in such position.

The advantage of making the annular gas-bag in the shape shown is to give it the additional function of an aerial plane in flight and also that of a parachute in descending.

Ball-bearings may be used in all the bearings of the running-wheels.

To support the ship when on the ground, legs L', made of three rods each, are connected to the under side of the gas-bag frame and extend below the platform X and have elastic feet L^2, made of inflated rubber cushions, which help to lift the ship in starting and cushion it in alighting.

In arranging the blades of the propeller-wheels they are grouped in sets, and the forward blade of each group (see Fig. 8) is set in a lower plane than the next succeeding one. The next is a little higher, and so on until the group is complete. The second group begins in the same way at the bottom edge of the rim and rises in the same way. This causes each blade of a group to cut the air in a lower plane than the succeeding one, leaving the air above it undisturbed for the next following blade, and by this means I obtain a greater effectiveness of lifting-wheel.

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

1. An air-ship having a generally horizontal annular gas-bag with flat lower side set at an incline, and a horizontal lifting propeller-wheel arranged in line with the central opening and above the plane of the gas-bag substantially as shown and described.

2. An air-ship having a generally horizontal annular gas-bag with flat lower side set at an incline, and two horizontal lifting propeller-wheels arranged concentrically above the central opening of the gas-bag, said wheels having vanes of opposite inclination, and mechanism for driving them in opposite direction.

3. An air-ship having two horizontal lifting propeller-wheels arranged concentrically, the two wheels being of different diameters and having vanes of reversed inclination, and the vanes of the smaller wheel being made larger than those of the larger wheel and arranged in different vertical alinement as set forth.

4. An air-ship having a generally horizontal annular gas-bag with flat lower side set at an incline, a vertically-lifting wheel arranged in a horizontal plane above the central opening in the gas-bag, and a horizontally-driving propeller-wheel arranged at the lower end of the gas-bag substantially as and for the purpose described.

5. An air-ship comprising an annular gas-bag, two reversely-rotating horizontal propeller-wheels arranged above the central opening in the gas-bag and having independent concentric tubular shafts bearing bevel-wheels at their lower ends, two other bevel-gears at right angles thereto, symmetrically-arranged crank-shafts connected thereto, and two engines for rotating said crank-shafts arranged on opposite sides of the gears substantially as described.

6. An air-ship comprising an annular gas-

bag, two reversely-rotating horizontal propeller-wheels arranged above the central opening in the gas-bag and having independent concentric tubular shafts bearing bevel-wheels at their lower ends, two other bevel-gears at right angles thereto, symmetrically-arranged crank-shafts connected thereto on opposite sides of the axial center of the propeller, and means for operating such crank-shafts substantially as shown an described.

7. The combination with an air-ship; of a steering-gear consisting of a slidable and rotatable shaft S having a hinged rudder with loop v', and a stationary arm r passing through the said loop substantially as and for the purpose described.

8. An air-ship having a lifting-wheel whose blades or vanes are arranged in groups, each advance blade of each group being in a lower plane than the next succeeding blade as described.

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

ROBERT HENRY BOTTS.

Witnesses:

JNO. H. NICHOLL,

J. F. PHIFER.