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AERIAL SHIP.

No. 356,743. Patented Feb. 1, 1887.

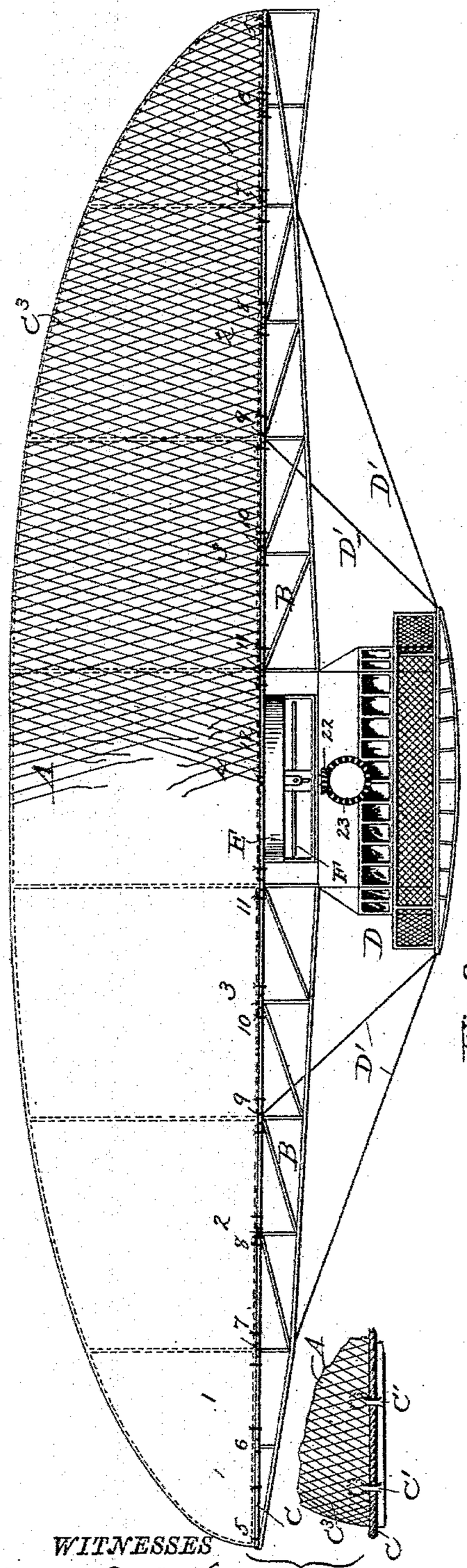

Fig. 1.

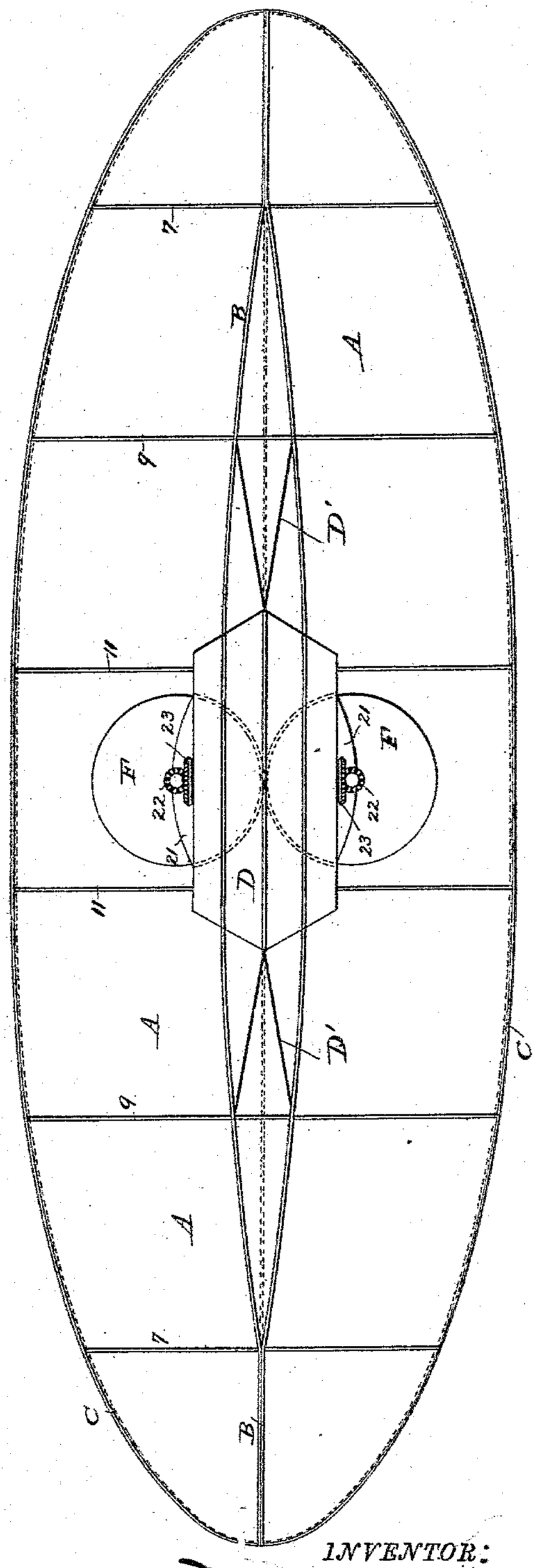

Fig. 2.

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Fig. 3.

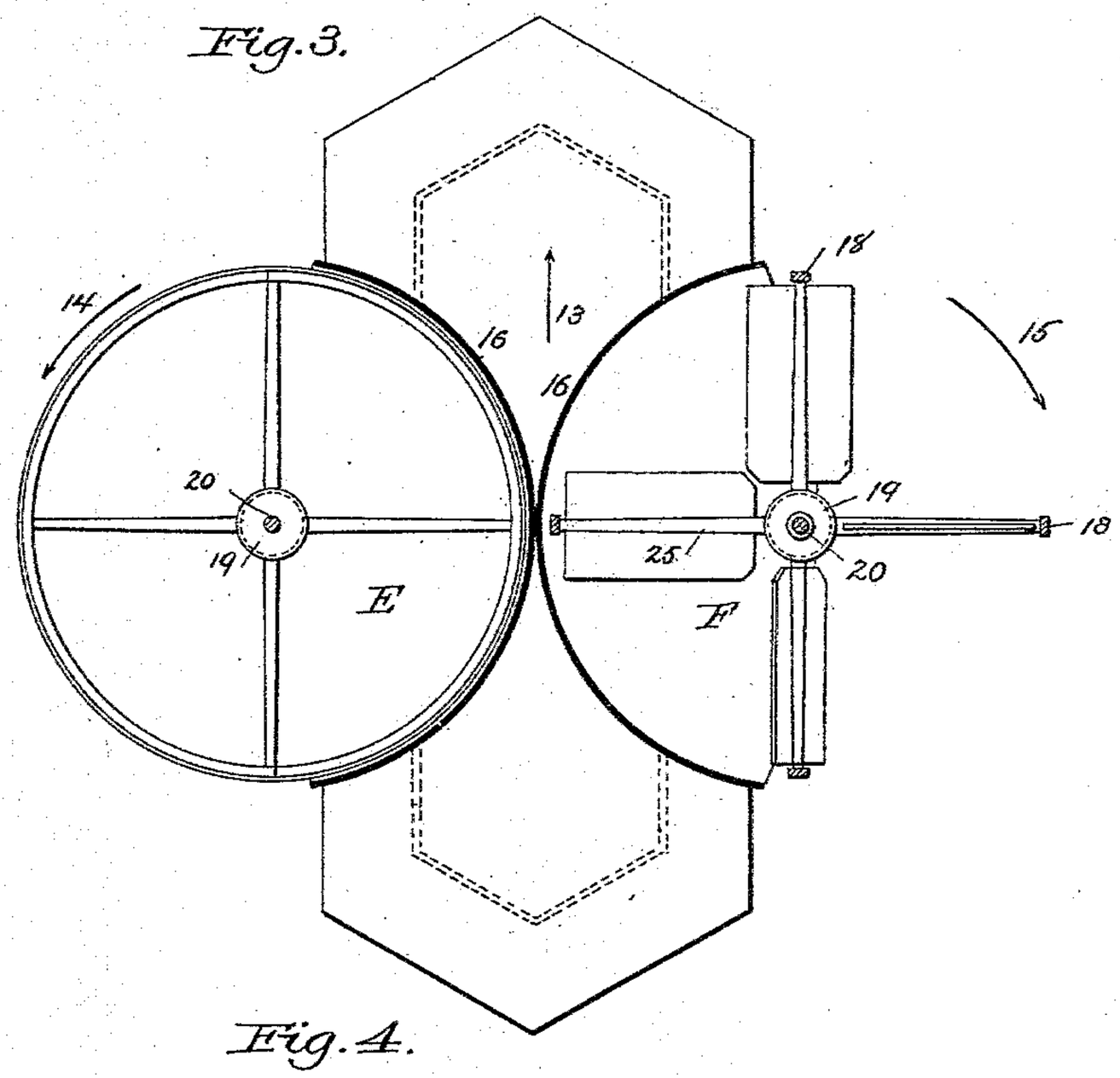
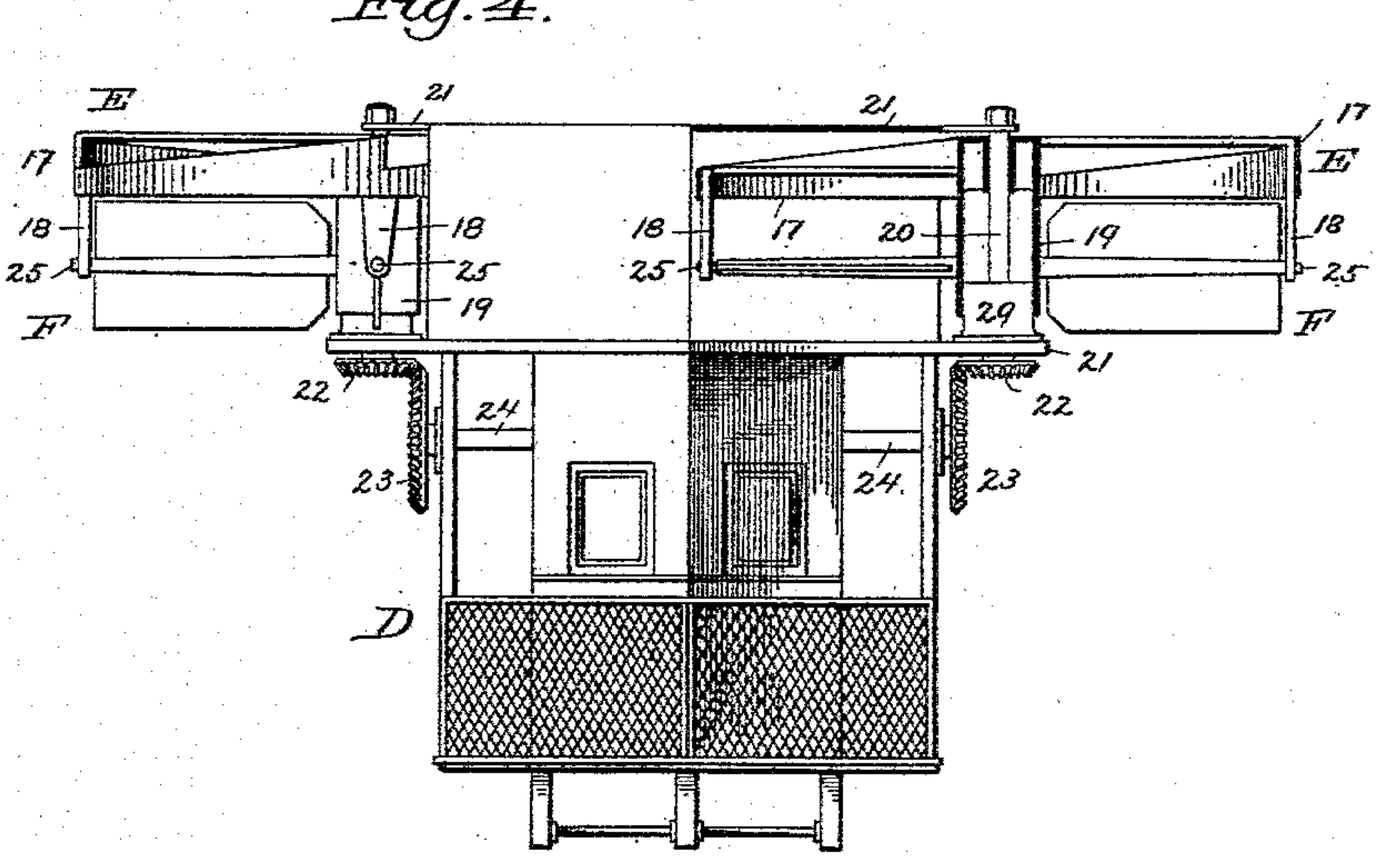


Fig. 4.



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AERIAL SHIP.

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Fig. 5.

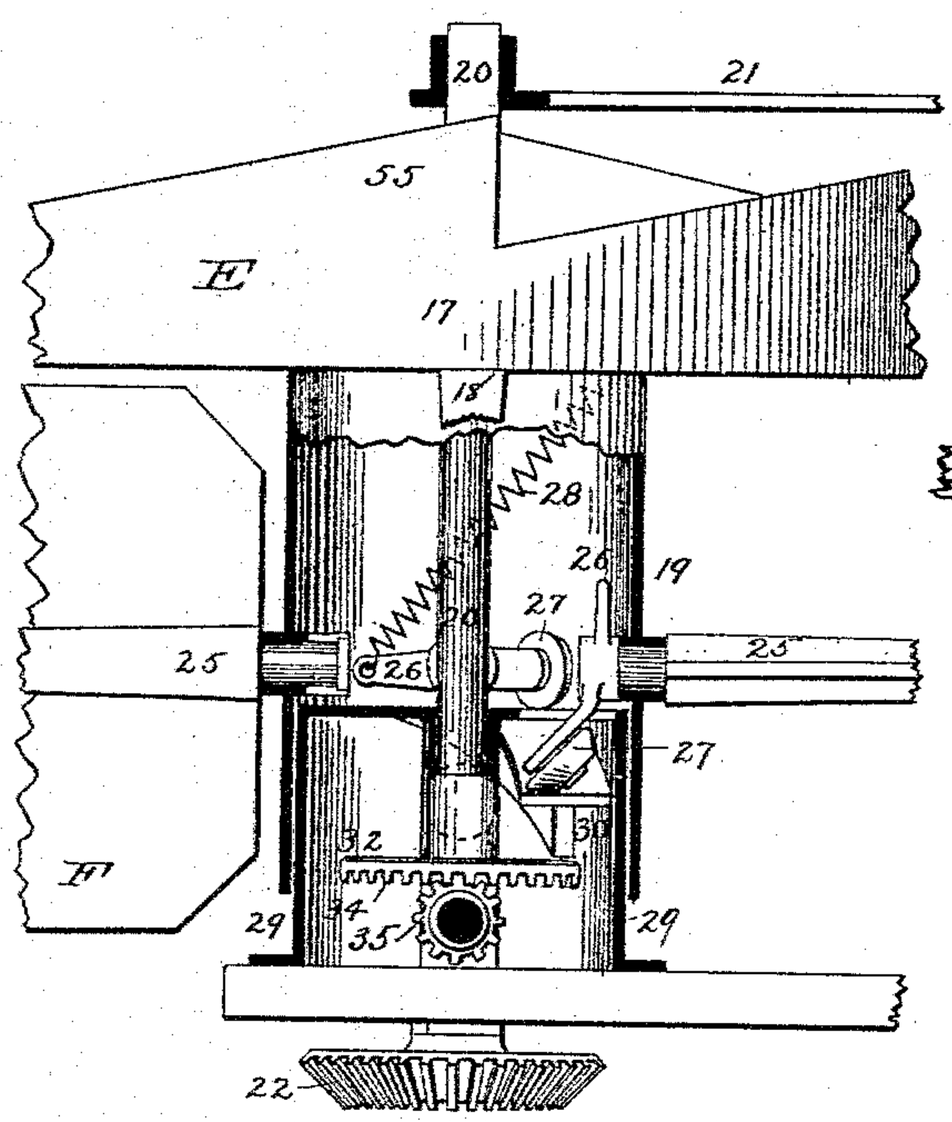

Fig. 6.

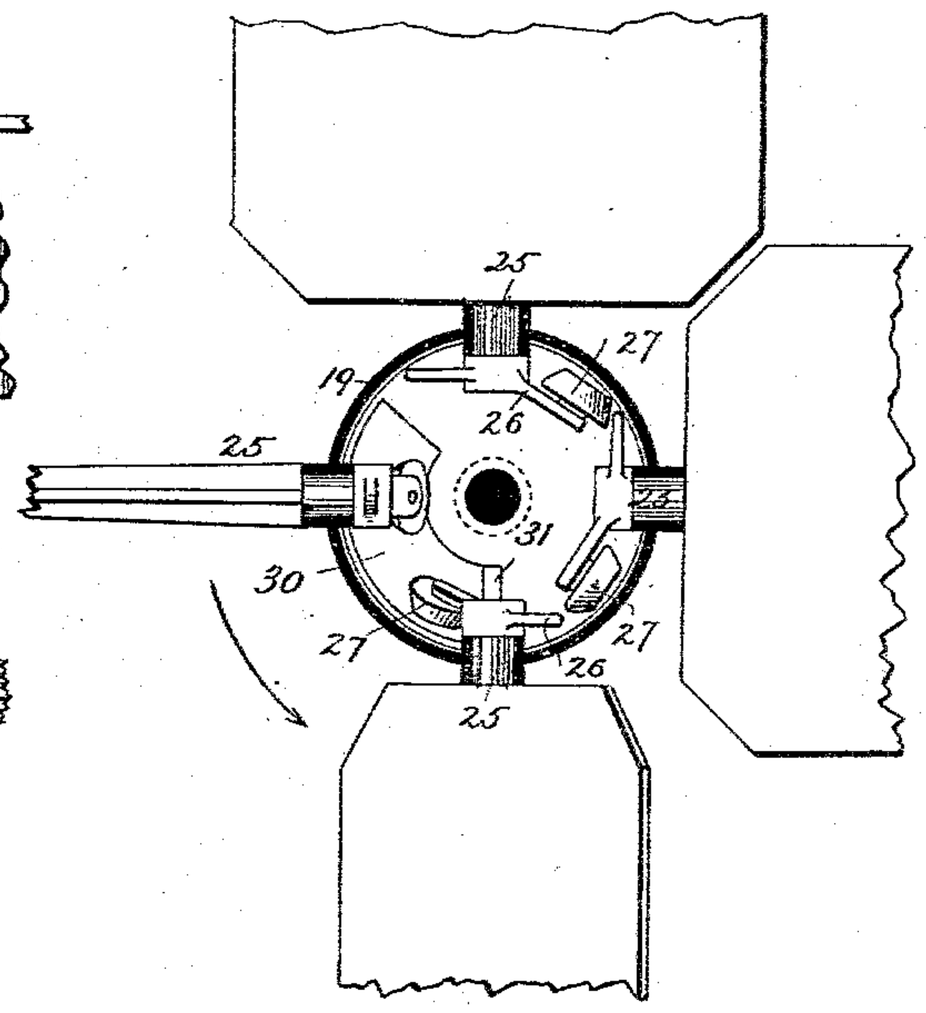

Fig. 13.

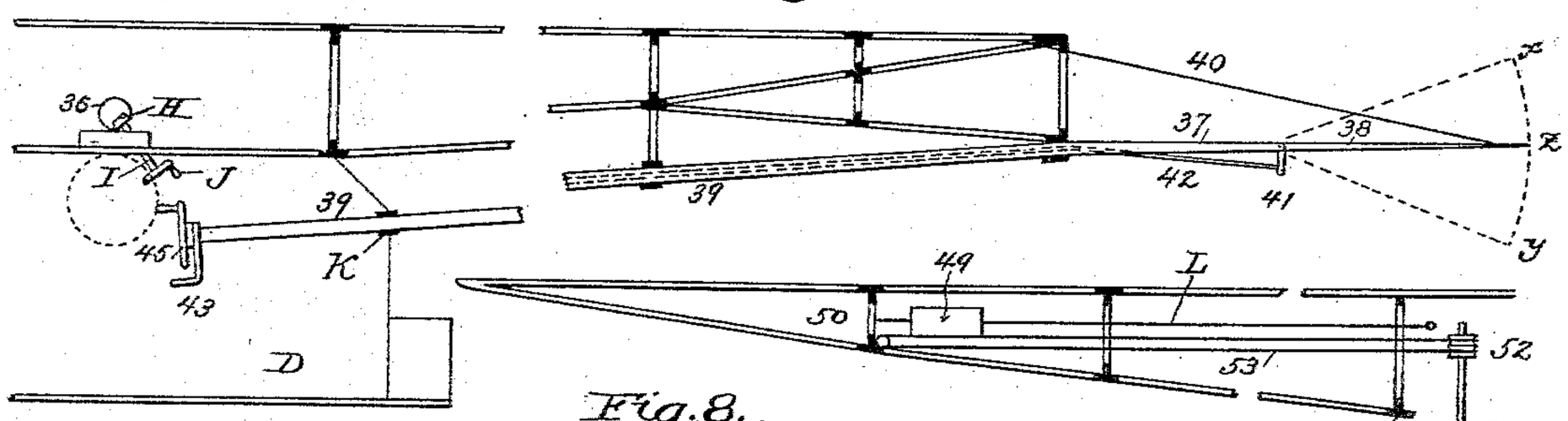

Fig. 8.

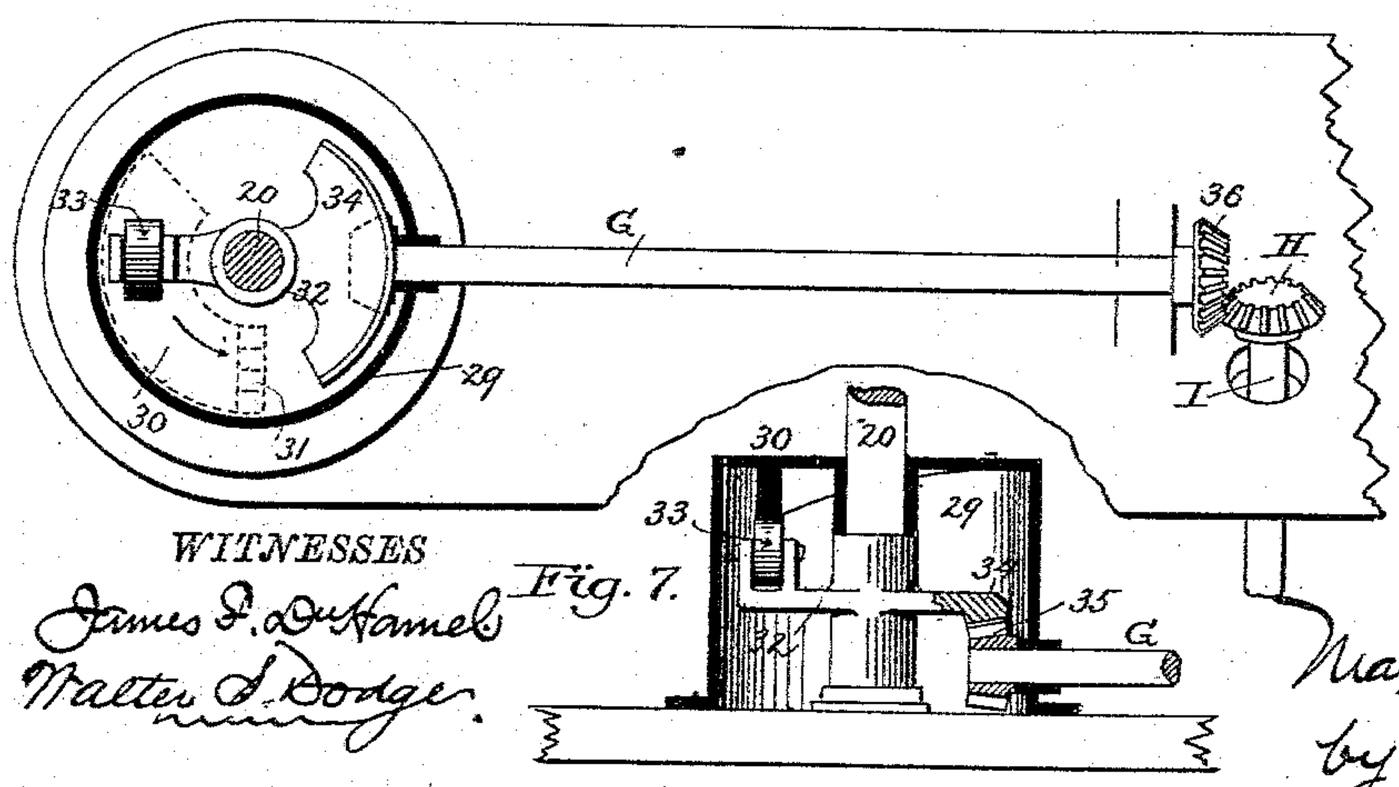

Fig. 7.

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Fig. 11.

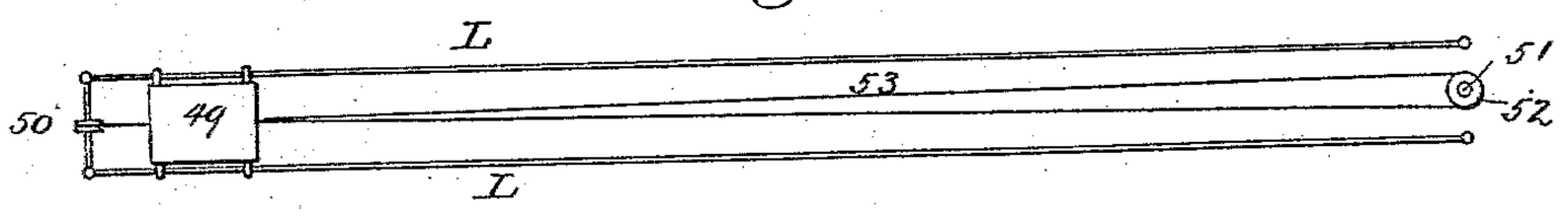

Fig. 12.

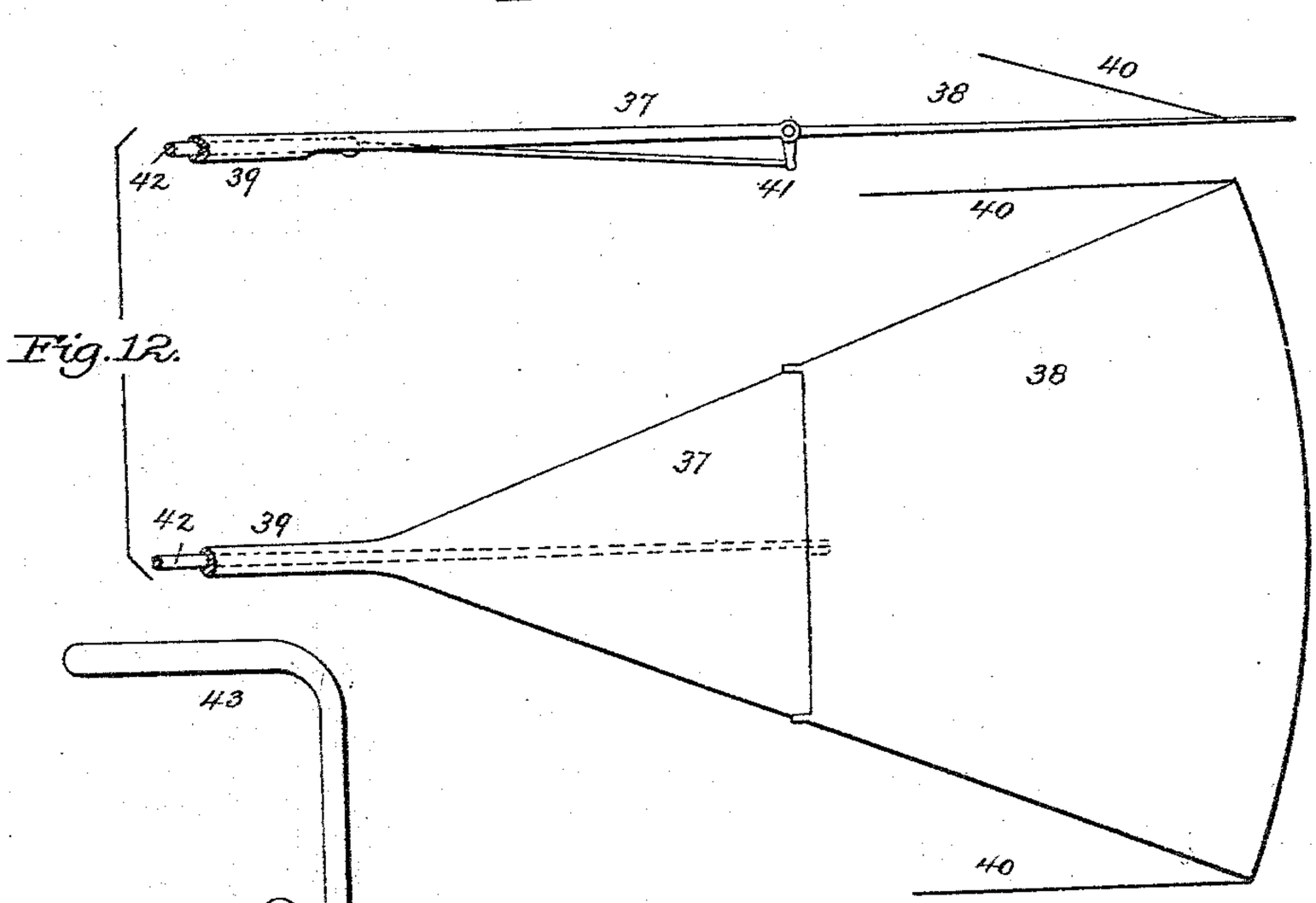

Fig. 9.

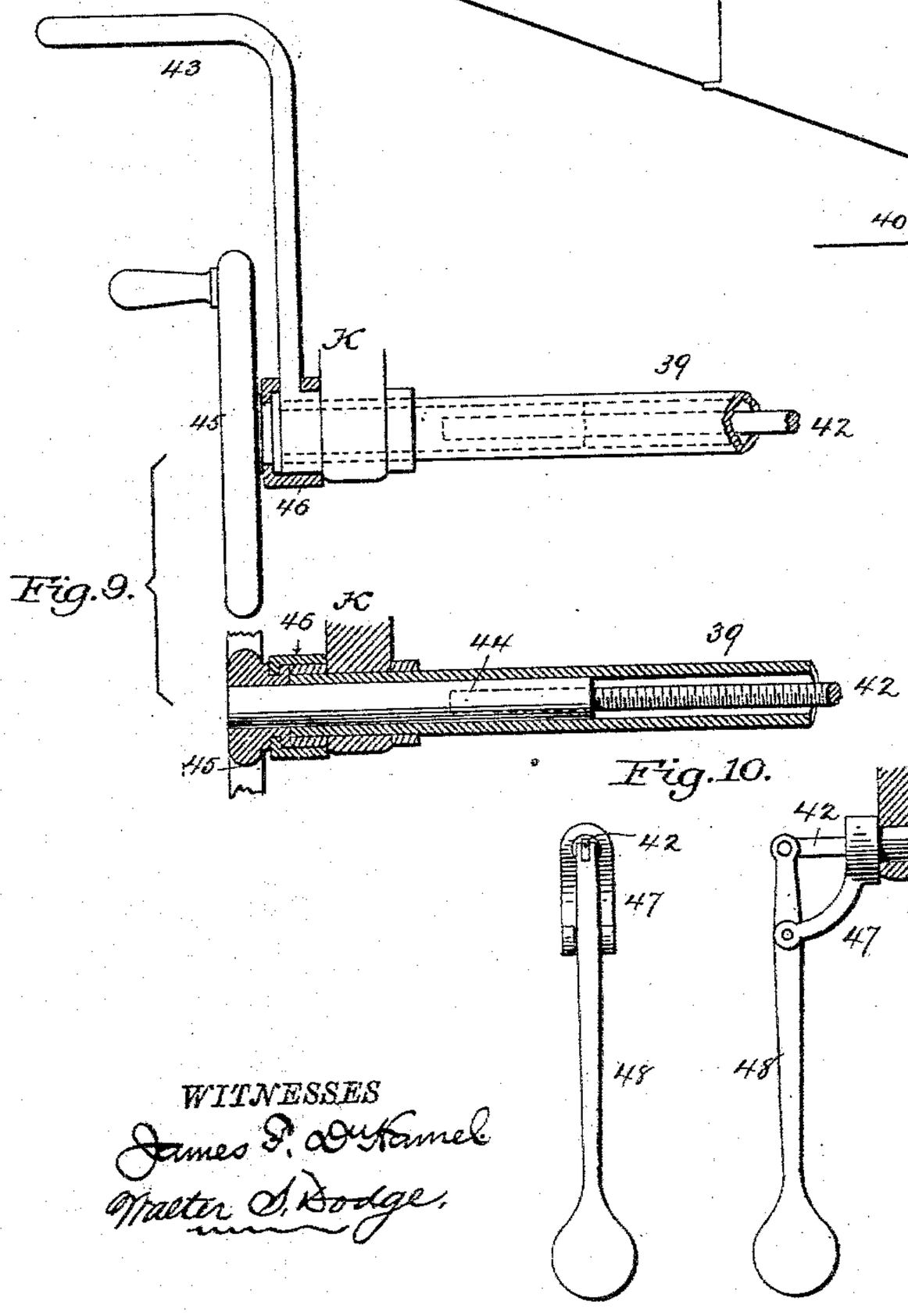

Fig. 10.

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AERIAL SHIP.

No. 356,743. Patented Feb. 1, 1887.

Fig. 14.

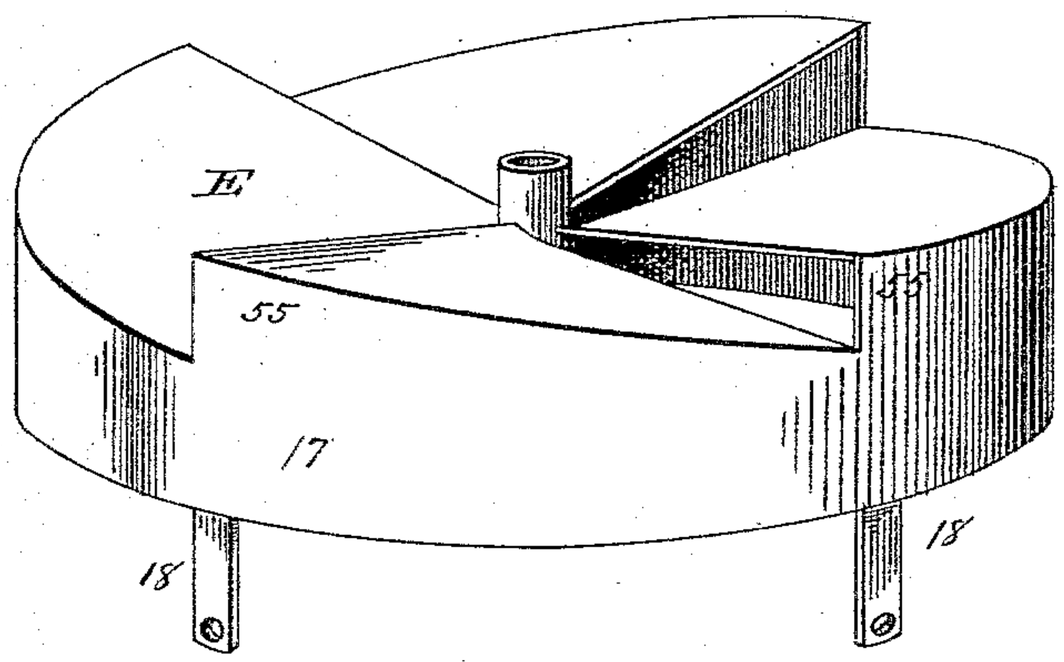
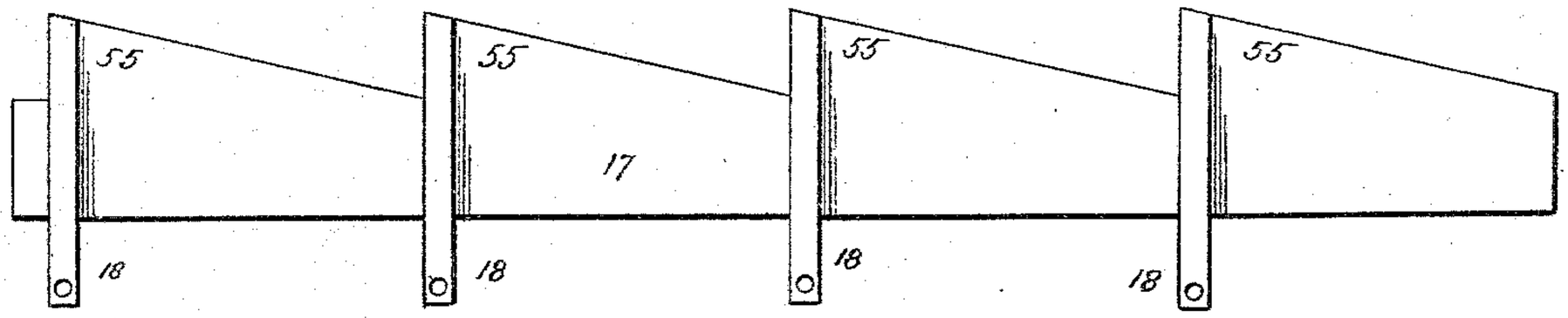


Fig. 15.



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(No Model.) 6 Sheets—Sheet 6.

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AERIAL SHIP.

No. 356,743. Patented Feb. 1, 1887.

Fig. 16.

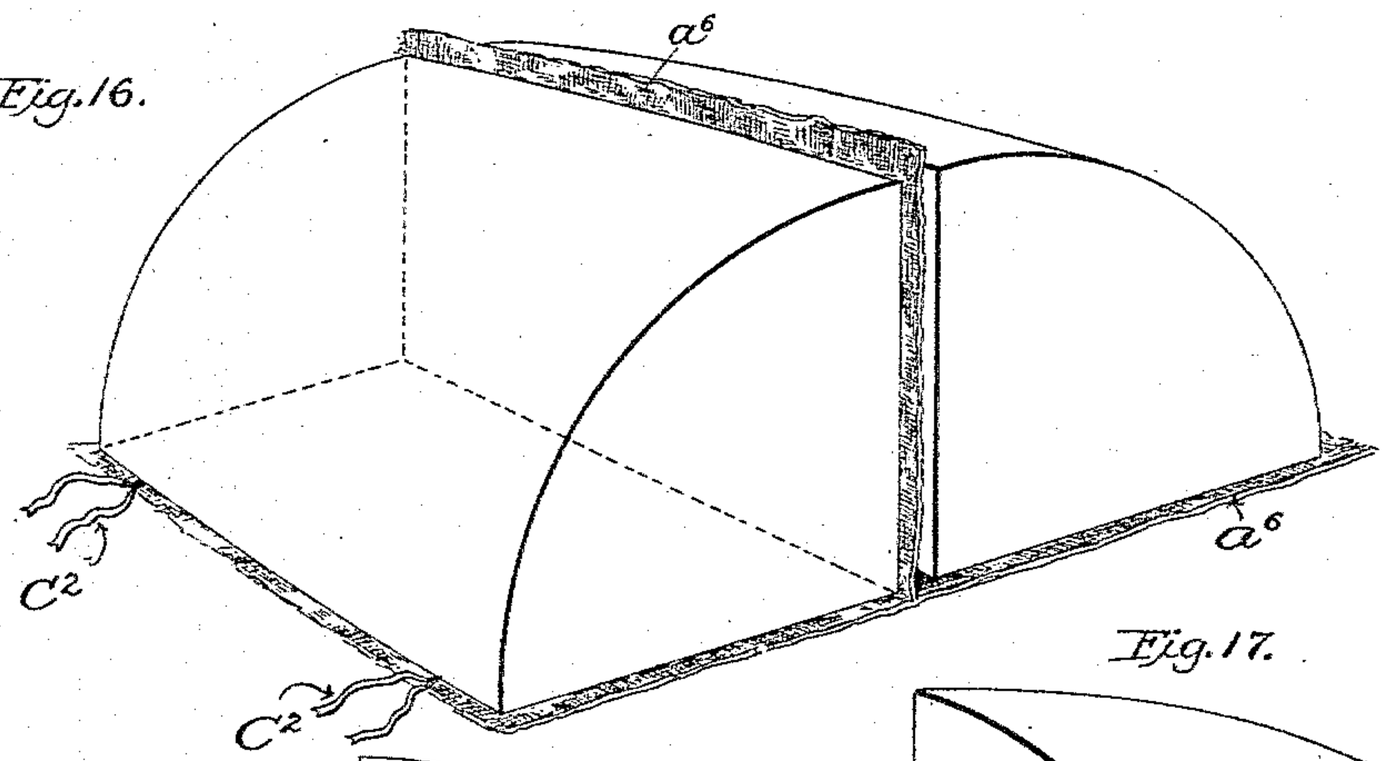


Fig. 17.

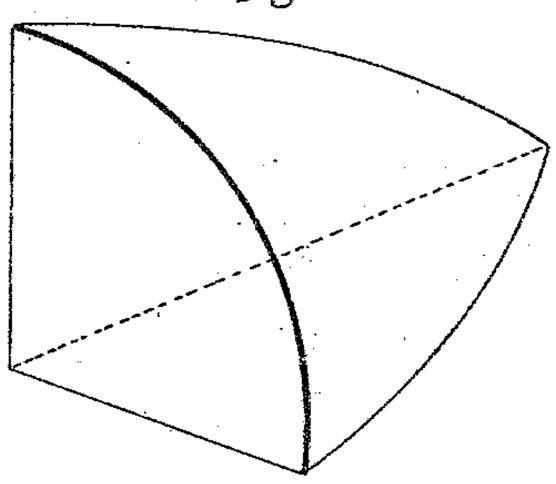
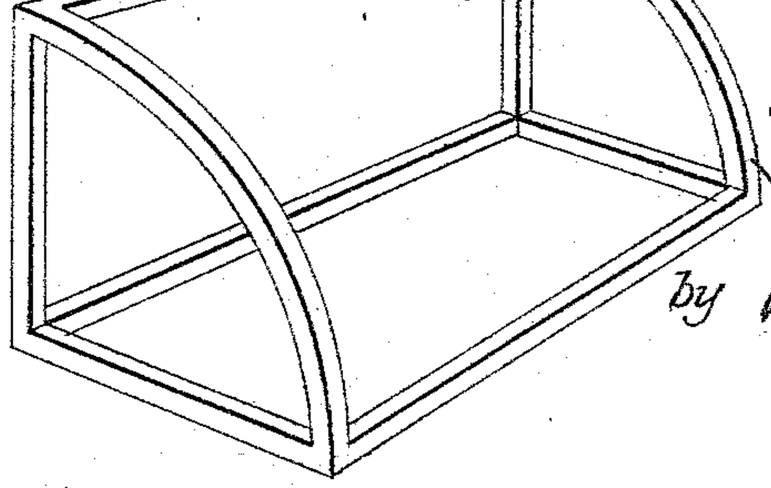


Fig. 18.

Fig. 19.



Witnesses:
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Walter S. Dodge.

Martin Braun
Inventor;
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UNITED STATES PATENT OFFICE.

MARTIN BRAUN, OF CAPE VINCENT, NEW YORK.

AERIAL SHIP.

SPECIFICATION forming part of Letters Patent No. 356,743, dated February 1, 1887.

Application filed March 29, 1886. Serial No. 197,000. (No model.) Patented in Germany March 5, 1885, No. 34,853.

To all whom it may concern:

Be it known that I, MARTIN BRAUN, of Cape Vincent, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Aerial Ships, of which the following is a specification.

My invention relates to aerial ships, and the improvements relate more particularly to the ship described in Letters Patent issued to me bearing date February 8, 1870, numbered 99,629.

In the drawings, Figure 1 is a side elevation of my improved balloon-ship; Fig. 2, a bottom plan view; Fig. 3, a top plan view of the driving apparatus; Fig. 4, an end view of the ship, partly in section; Figs. 5, 6, 14, and 15, views illustrating details of the propellers; Figs. 7 and 8, detail views relating to the regulator of the driving apparatus; Figs. 9 and 10, detail views of the rudder-operating mechanism; Figs. 11 and 12, views illustrating certain details; Fig. 13, a longitudinal central section showing the relative arrangement of the various parts; Fig. 16, a perspective view of two cells, separated, which form a part of the balloon; Fig. 17, a perspective view of one of the cells, placed at and forming the ends of the balloon; Fig. 18, a plan view of the sheet of which the cells are formed, and Fig. 19 a perspective view of a frame or former used in constructing the cells of metal.

As in my former patent above referred to, the ship consists of three principal parts—viz., the gas-holder or balloon, the boat or body, and the mechanism by which it is elevated, propelled, and steered.

The gas-holder or balloon A is of elliptical shape in plan, of semicircular form approximately in cross-section, and is arranged with its convex side uppermost. The balloon or holder is composed of a series of cells or chambers, 1 2 3 4 3 2 1, each of which is in itself an air-tight gas-holder, and which, when in place upon the platform, give the desired shape to the balloon. In Figs. 16 and 17 are shown three of these cells, the two represented in Fig. 16 being such as would be used about in the mid-length of the balloon, while that shown in Fig. 17 would be used at the ends to give the desired taper. It will be noticed that the base and contiguous faces of the cells or chambers are straight, while the exterior face is curved to conform to and give the desired curvature, both longitudinally and transversely, to the balloon or holder as a whole. The walls of the cells or gas-holders may be made of silk or other fabric impervious to air; or they may be made of thin sheets of aluminium. When the textile material is employed, I cut it in the form shown in Fig. 18, the blank thus cut comprising the base a^2, ends a^3, back a^4, and curved exterior a^5, and after the blank is folded along the dotted lines it is sewed along its edges. In making the cells of metal I first construct a frame-work, as shown in Fig. 19, of the requisite shape, and upon this frame-work I build the cells, the aluminium or other metallic sheets being cut to proper size to fit upon the frame-work. The sheets, being supported by the frame-work, are soldered or otherwise joined along their edges; but before completely closing the cell the frame-work is removed therefrom. Between the adjacent faces of the cells, and under the bottoms thereof, I place a sheet, a^6, of strong textile fabric, which prevents the cells from bulging outward or downward, and over the exterior of all the cells 1 2 3 4 3 2 1, when in place, I pass a netting or covering, C^3, as shown in Fig. 1, which is fastened to the metallic band C. In order to further insure the retention in place of the separate gas cells or chambers I provide each cell with bands or cords C^2 at their lower outer edges, by which the cells may be secured to the frame-work. There are two rows of cells or chambers 1 2 3 4 3 2 1, one row on each side of the longitudinal axis of the ship, thus making in the present instance fourteen cells in all; but it is to be understood that the number of cells or chambers may be increased or diminished, as found desirable.

I am aware that it has been proposed to support an air-vessel by a series of independent gas bags or holders, each connected to and supporting the frame of the air-ship independently of the others, and this I do not claim.

The cells or chambers which form my gas-holder, while independent of one another in one sense, are firmly secured together in place by the netting or covering, the cells or chambers conforming in shape with and giving the desired form to the has-holder as a whole. This feature, so far as I am aware, is original with me.

The bottom of the gas-holder A, which is flat, is supported upon a frame-work consisting of horizontal cross-pieces 5, 6, 7, 8, 9, 10, 11, and 12, the latter being supported at the middle upon the grate-like keel B, as shown in Fig. 1, the ends of the horizontal cross-pieces being connected by means of a wire rope, C, Figs. 1 and 2, thus stiffening and bracing the frame-work. The binding wire or rope C, passing around the edge of the platform upon which the balloon or holder rests, is secured to the netting or covering, and holds the same in place by means of fastenings C'. (Shown in the enlarged detail view forming a part of Fig. 1.) These fastenings may be either loops sewed to the netting or they may be staples which are driven into the frame-work. The keel B is fastened to the cross-pieces by means of wires or other light and strong fastenings. Over the frame-work is extended a sheet of silk, rubber, or other thin and impervious material, upon which the gas-cells 1 2 3 4 rest, and which may or may not form the balloon-bottom, as deemed best.

D indicates the boat or cabin, which is suspended from the frame-work or the gas-holder by means of cables D', as shown in Figs. 1 and 2.

Referring now to Figs. 3, 4, 5, 6, and 15, the elevating and propelling mechanism will be explained. These mechanisms are mounted upon and operated by or through the same shaft, the air-screw or elevator being directly above the propeller. In Fig. 3 the course of the vessel is indicated by the arrow 13, while arrows 14 and 15 represent, respectively, the direction of rotation of the air-screw or elevator and the propeller. In order that one side or half of each propeller may not interfere with or counteract the action of the other half thereof the inner half of each is partially inclosed in housings 16, as shown in Fig. 3. The air-screw or elevator E is mounted upon a shaft, 20, or upon a hub, 19, carried thereby, the shaft 20 being supported at its upper and lower ends in arms 21, projecting from the housings 16, as shown in Figs. 4 and 5, and carrying at its lower end a bevel gear-wheel, 22. The latter wheel 22 meshes with a similar gear-wheel, 23, carried upon the end of a main driving-shaft, 24, mounted in the car D. Motion may be imparted to the shaft 24 by any suitable motor. The outer ends of the vanes of the air-screws E are connected by a band, 17, from which depend four arms, 18, as clearly shown in Figs. 4, 14, and 15, said arms forming supports or hangers for the outer ends of the radial shafts 25 of the vanes of the propellers F.

As shown in Figs. 14 and 15, the band 17, connecting the outer ends of the vanes of wheel E, is formed, preferably, of a single piece of metal cut to proper shape and provided with four flat triangular elevations or wings, 55, projecting upward from its upper edge, and to the triangular elevations the vanes of the wheel E are secured. The vanes are riveted at their outer edge or periphery to the inclined wall or edge of the triangular elevations or wings 55, as shown in Fig. 15, and thus the wheel E is stiffened and braced and the interior of the wheel left open and unobstructed. The band 17 may, if desired, be formed of several pieces of metal, riveted or otherwise fastened together; but I prefer to make it of one piece, as it renders the wheel stronger.

The vanes of the elevator or screw E may be made of a single piece of metal circular in form, of two semicircular pieces, or of four separate pieces, as may be desired; but I prefer to make them of the two semicircular pieces, each piece forming two vanes.

The inner ends of the shafts 25 of the propeller-vanes project through the tubular nave or hub 19, where they are each provided with a rigid head or lever, 26, the latter provided each with two arms, as shown in Figs. 5 and 6. On one of these arms is mounted a roller, 27, while to the other is attached a spiral spring, 28, connected to the hub 19, as shown. A tubular post or block, 29, projects upward into the lower end of the hub or nave 19 nearly to the shafts 25 of the vanes, as clearly shown in Figs. 4, 5, and 6, the upper end of the post 29 being closed.

The head or upper end of the post or block 29 is formed with a concentric opening occupying about one quarter of the circumference of the head, beneath which opening is hinged at one end a bearing plate or track, 30. This plate or track inclines downward from its hinge, the inclination being varied as desired by means presently explained.

The head or the collar is so arranged that the roller 27, when moving thereon throughout three-quarters of a revolution of shaft 20, will maintain the vane in a horizontal or nearly horizontal position and extend the spring 28, as shown in Figs. 5 and 6; but as soon as the opening is reached the spring rocks the vane on its axis 25 and throws the roller 27 down into the seat or depression, and thus causes the vane to assume a vertical position. As the shaft 20 continues its rotary motion, the roller 27 rides up the inclined plate or track 30 and gradually returns the vane to a horizontal position.

In order that the inclination of the vanes may be varied so as to cause the propeller F to assist or act as an adjunct to the elevator E, the arc-shaped pivoted plate or track 30 is made adjustable and is raised and lowered from its pivot 31 as a center by means of the devices shown in Figs. 5, 7, and 8. The shaft 20 is encirled by a collar or sleeve carrying at its upper end a horizontal plate, 32, fashioned at one end into a curved rack-bar, 34, and carrying at a diametrically-opposite point a roller, 33. The arc-shaped plate 30 is provided with an inclined spur or rib on its under side, as shown in Fig. 7, which rests upon the roller 33, and it will be seen that as the roller 33 is moved horizontally about shaft 20, one way or

the other, the plate 30 will be raised or lowered correspondingly, and thus vary the inclination the vanes assume. To cause this movement of the plate 32, I provide a shaft, G, carrying at one end a gear-wheel, 35, to mesh with the rack-bar 34, and at the other end with a gear-wheel, 36, to mesh with a gear, H, on a shaft, I, extending into the car, as shown in Fig. 13. The shaft I is preferably provided with a hand-wheel, J, as also shown in said figure.

It will be seen that by turning the hand-wheel J the operator may vary the inclination of the blades or vanes of the propeller-screw F.

Referring now to Figs. 9, 10, 12, and 13, the rudder and the steering apparatus will be fully explained. The rudder is sector-shaped and is composed of two sections, 37 and 38, the latter, 38, being hinged to the former, as clearly indicated in Fig. 12, while the section 37 is rigidly secured to the end of the tubular shaft 39. Elastic bands or springs 40 (see Figs. 12 and 13) extend from the outer corners of the rudder to the frame-work of the gas-holder, so as to counterbalance the rudder in its normal position. (Indicated by the letter *z* in Fig. 13.) The hinged section 38 is provided near its inner end with an arm, 41, to which is jointed the steering-rod 42, the latter being encircled by the tubular shaft 39. As the rod 42 is moved lengthwise through the rod 39, it rocks the tail section 38 of the rudder upon its pivot, and causes it to assume either of the positions indicated by the letters *x* and *y* in Fig. 13, or any intermediate position.

The tubular steering-rod 39 is supported within the car by a stationary bracket, K, and provided with a hand-lever, 43, by which to turn or rotate the rod 39 and the rudder carried thereby. The inner end of the rod 42 is threaded, as shown in Fig. 9, and fits within a threaded sleeve, 44, in the end of the tubular rod 39, the sleeve being provided with a hand-wheel, 45. The latter is rigidly secured upon the sleeve 44 and provided with a grooved hub or collar, which latter, in connection with a grooved bracket or holder, 46, prevents end movement of the sleeve 44. As the hand-wheel 45 is turned or rotated, it causes a similar movement of the sleeve 44 and causes the rod 42 to move into or out of the sleeve 44, according to the direction in which the latter is turned. A modification of this device is illustrated in Fig. 10, wherein the end of the rod 42 is connected to the upper end of a lever, 48, pivoted to a bracket, 47, and weighted at its lower end.

It is only necessary to rock the lever 48 upon its pivot, and thus move the rod 42 in or out, as desired, and to swing it laterally to turn the rudder obliquely to the normal plane.

In order to compensate for the weight of the occupants and preserve the vessel in a horizontal position, I provide a shifting weight, 49, which is adapted to run on wire ropes or tracks L, as shown in Figs. 11 and 13, the weight or ballast 49 being secured to and moved by an endless band, 53, passing over pulleys 50 and 52, as shown.

The pulley 52 is carried by a vertical shaft, 51. Said shaft is provided with a hand-wheel, 54, by which it may be turned.

I do not wish to be understood as claiming, broadly, a rudder adapted to be rotated about its longitudinal axis and to be deflected laterally to said axis, nor the application of a movable counter-weight to an air-vessel, as I am aware that both of these devices are old and well known.

Having thus described my invention, what I claim is—

1. In an air-vessel, the combination of the gas-holder A, formed of a series of independent gas-cells, a covering for said holder, a horizontal frame-work upon which said holder rests, a binding rope or band secured to the ends of the timbers of the frame-work, and fastenings securing the netting or covering to the band, substantially as shown and described.

2. In an air-vessel, the combination of gas-holder A, the elevating-screws E, propellers F, below the latter, and a shaft, 20, common to both the screw and the propeller.

3. In an air-vessel, the combination, with the elevating-screw E, the propeller F, below the latter, having oscillating vanes, and a cam or track for rocking said vanes at predetermined intervals, whereby the propeller may be caused to assist in elevating, as desired.

4. In an air-vessel, the combination, with the housing 16 and shaft 20, the arm 21, for supporting said shaft, elevating-screw E, band 17, encircling said screw, depending arms 18, hub 19, and vane-shafts 25, journaled at one end in the arms 18 and at the other end in the hub 19.

5. In an air-vessel, in combination with the housing 16, shaft 20, arms 21, for supporting said shaft, hub 19, elevating-screw E, propeller F, provided with vane-shaft 25, rocking head 26, provided with two arms and a roller, 27, spring 28, secured to said head, and cam-surface 30, for actuating the rocking head, arranged and operating substantially as described.

6. In combination with shaft 20, hub or nave 19, vane-shaft 25, a spring, 28, secured thereto and to the nave or hub, collar 29, inserted in the end of the nave 19 and provided with an inclined plate, 30, as and for the purpose described.

7. In combination with nave or hub 19, shaft 20, post 29, inserted in the end of the hub 19 and having a closed end, and an arc-shaped plate, 30, pivoted to the post 29, as and for the purpose set forth.

8. In an aerial vessel, the combination, with the propeller F, its vane-shafts 25, levers 26 thereon, and its shaft 20, of a post, 29, rigidly secured to the vessel, a hub, 19, secured to the shaft 20 and rotating therewith, and a plate, 30, pivoted at one end to the top of the post 29 and adapted to rise and fall, whereby the blades of the propeller are caused to oscillate

upon their axes to a greater or less extent as the plate is raised or lowered.

9. In an aerial vessel, the combination, with the propeller F and its shaft 20 and hub 19, the fixed post 29 and its pivoted plate 30, arranged substantially as shown, of a plate, 32, rotating freely upon the shaft 20 and provided with wheel 33 and rack 34, a gear-wheel, 35, meshing with the rack, and shafts G I, arranged, substantially as shown, to rotate the plate 32 and thereby cause the plate 30 to rise or to fall, as and for the purpose forth.

10. In combination with the rudder having the hinged plate 38, the elastic bands or springs 40, connected to the hinged plate and to the body of the vessel, as and for the purpose set forth.

11. In combination with the tubular steering-rod 39, the rudder secured thereto and having the pivoted tail-plate, and the reciprocating rod 42 within the tubular rod 39, connected to the pivoted tail 38.

12. In combination with tubular rod 39, the rudder secured thereto and composed of sections 37 and 38, rod 42, connected to the section 38, extending through the tubular rod 39, and threaded at its end, a bracket, K, a hand-lever, 43, connected to shaft 39 and adapted to rock the same, sleeve 44, fitted in the end of rod 39 and threaded to receive the end of rod 42, a clamp, 46, or its equivalent, for preventing end movement of the sleeve 44, and a hand-wheel, 45, for rotating said sleeve and causing a reciprocation of the rod.

13. In an air-vessel, the combination, with the ways or guides L and the weight 49, of the endless band 53 and the pulleys 50 and 52 at opposite ends of the band.

14. In an air-vessel, the combination, with the ways or guides L and the weight 49, of the endless band 53, pulleys 50 and 52 at opposite ends thereof, a vertical shaft, 51, and a hand-wheel, 54, arranged and operating substantially as described.

15. In combination with tubular shaft 39, provided with a lever for turning it, rudder 37 38, carried by said shaft, rod 42, connected with the movable section 38 of the rudder, and means, substantially as described, for moving the rod 42 longitudinally.

16. In an air-ship, the elevator or screw E, composed of band 17, provided with vertical elevations 55, and the vanes attached at their peripheries to the elevations, substantially as shown.

17. In an air-ship, the combination of the vertical shaft 20, the band 17, provided with vertical elevations 55 and depending arms 18, and the vanes secured at the outer edge to the elevations, as shown.

18. In an aerial vessel, the combination, with the frame-work, of the separate independent cells mounted thereupon side by side, the sheets a^6 between the adjacent faces of the cells and between their bottoms and the frame-work, the cords or bands C^2, secured to each cell, the net or covering C^3, and the binding band or rope C, all constructed and arranged substantially as shown and described.

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