A. R. RIEGER.

AIRSHIP.

APPLICATION FILED SEPT. 9, 1909.

962,977.

Patented June 28, 1910.

6 SHEETS—SHEET 1.

FIG. 12.

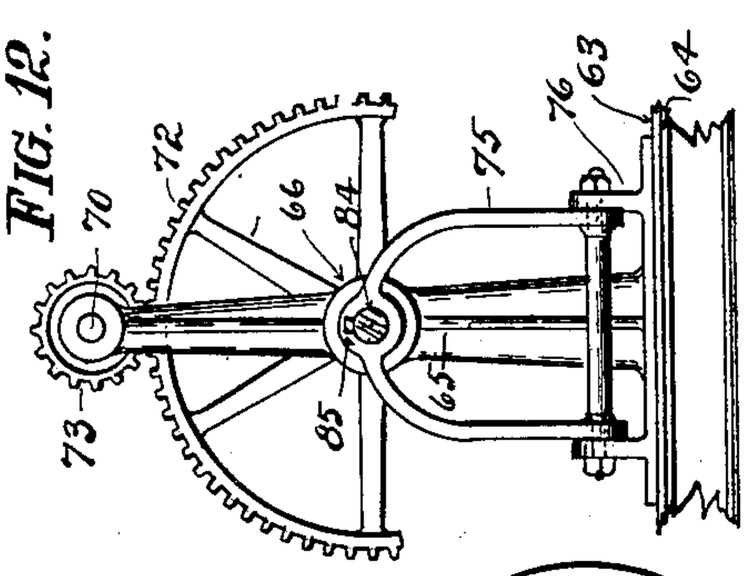

FIG. 1.

FIG. 2.

Witnesses:

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A. S. Peterson.

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August Richard Rieger;

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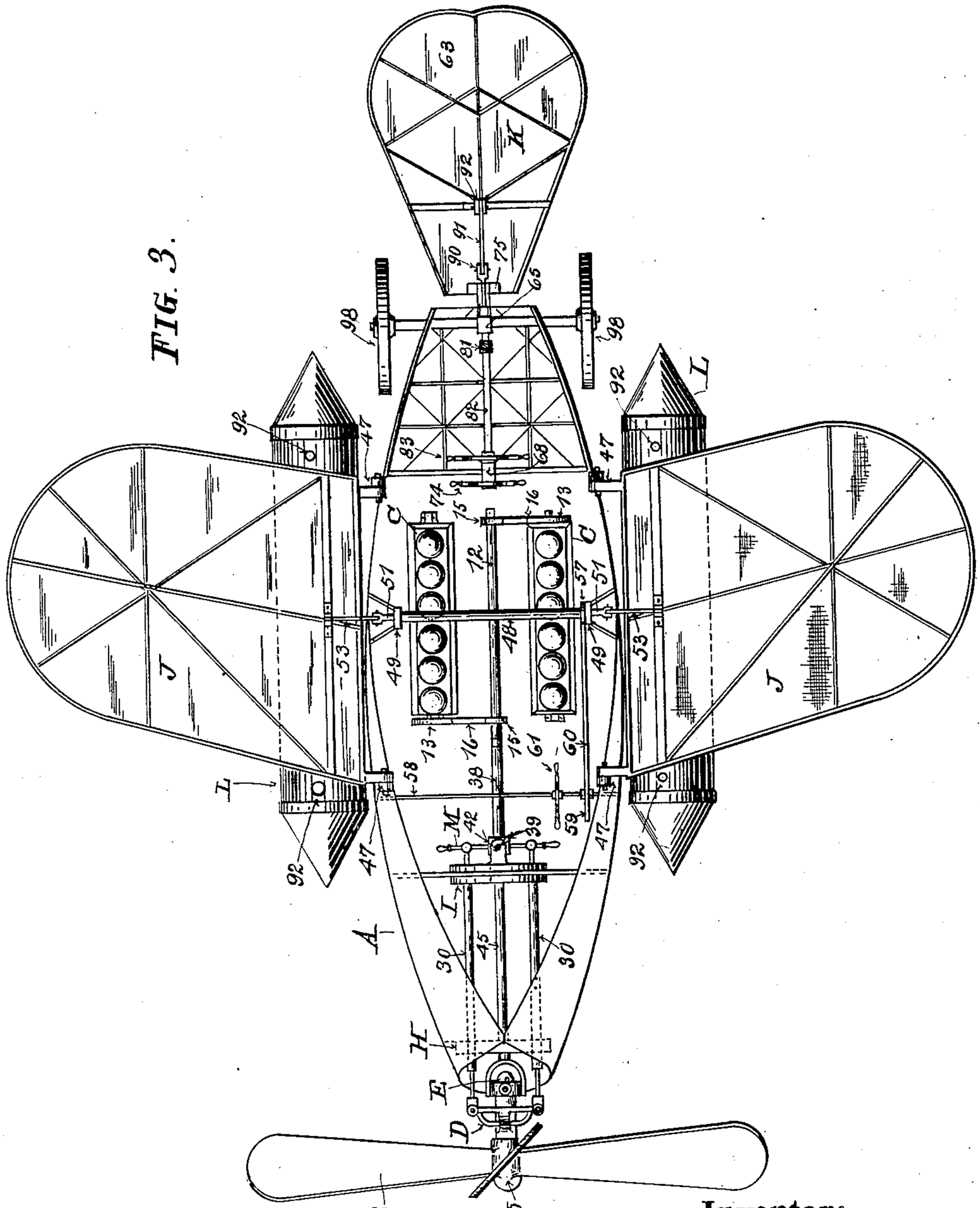
6 SHEETS—SHEET 2.

FIG. 3.



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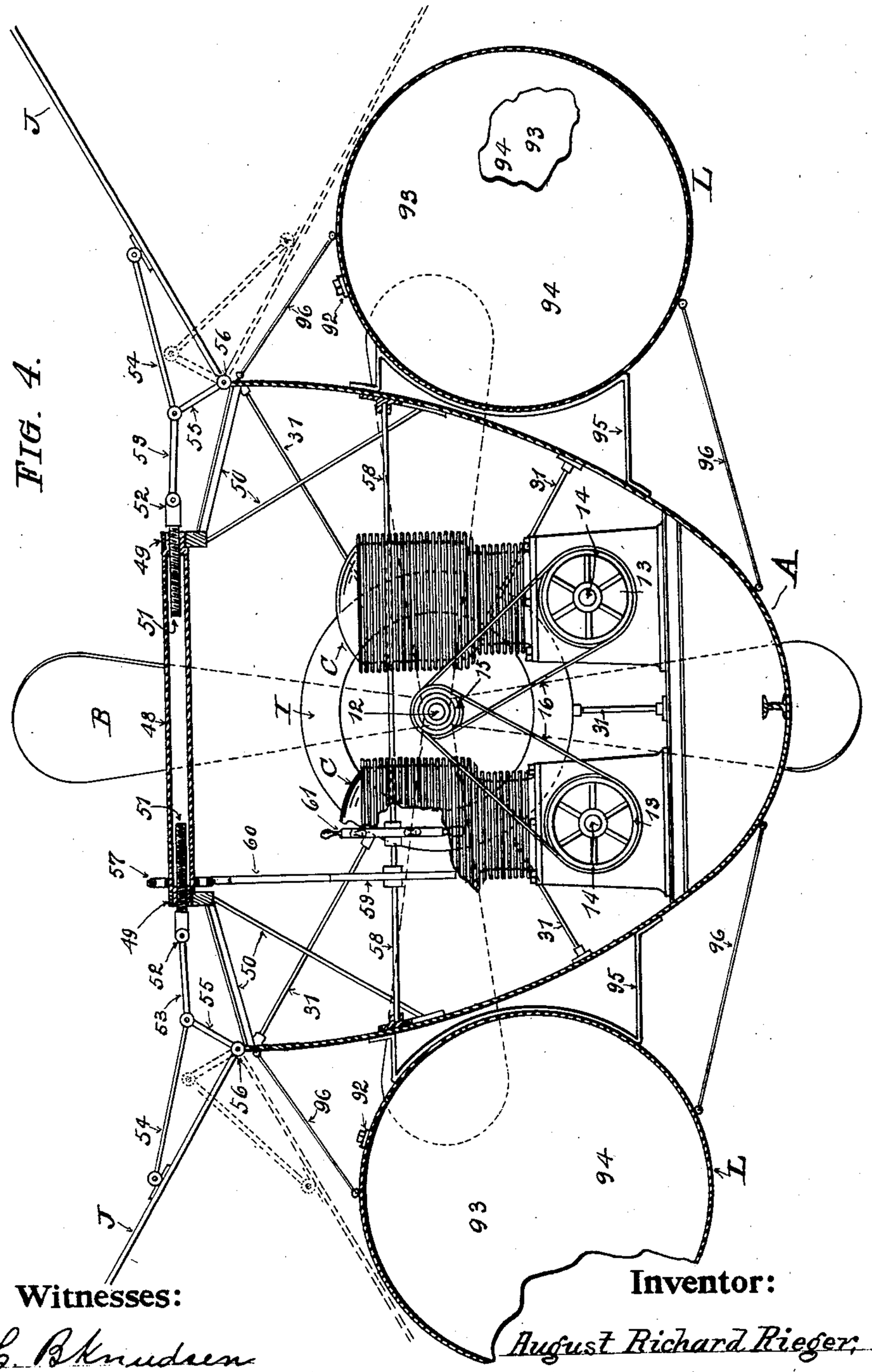
6 SHEETS—SHEET 3.

FIG. 4.



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6 SHEETS—SHEET 4.

FIG. 6.

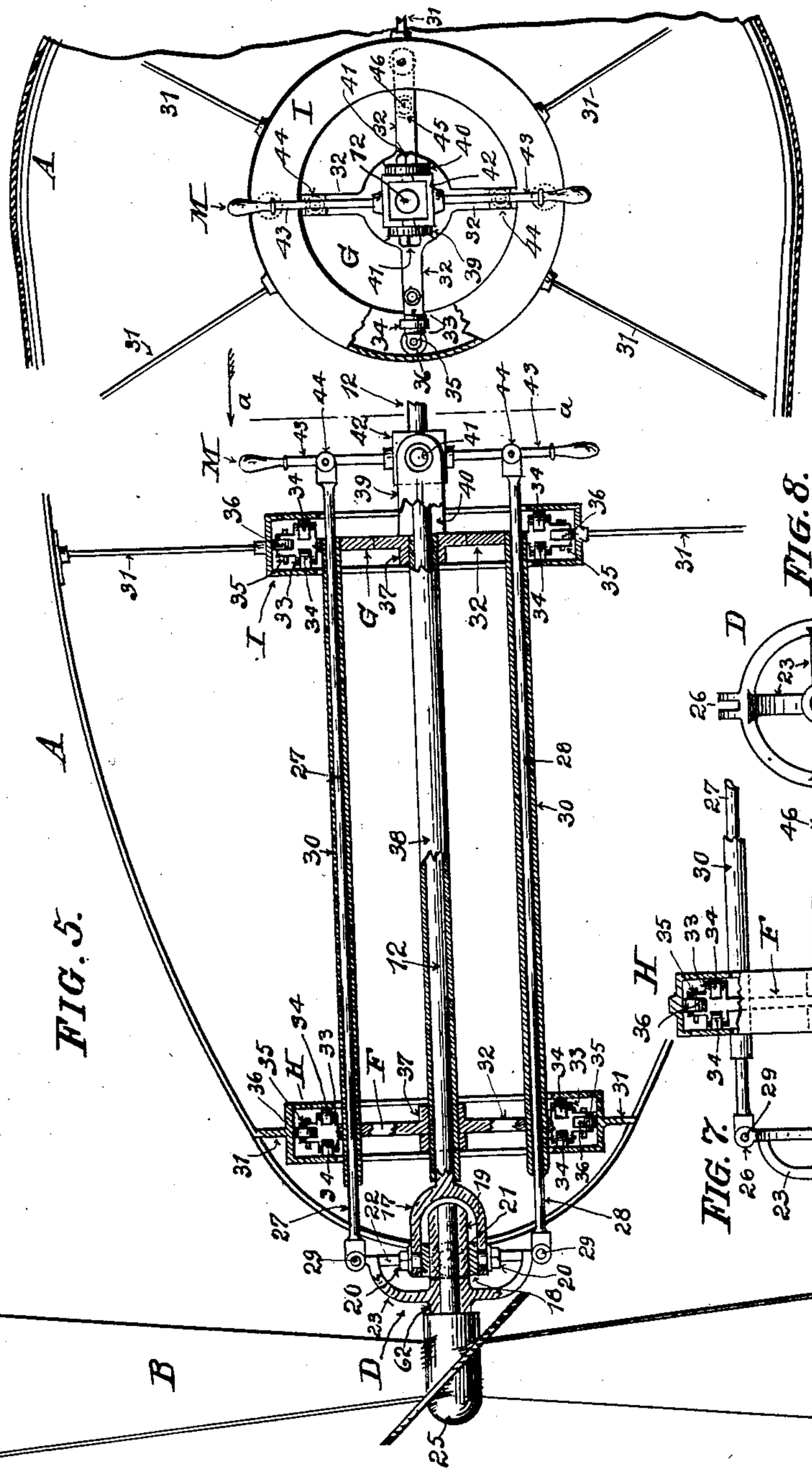

FIG. 5.

FIG. 8.

FIG. 7.

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6 SHEETS—SHEET 5.

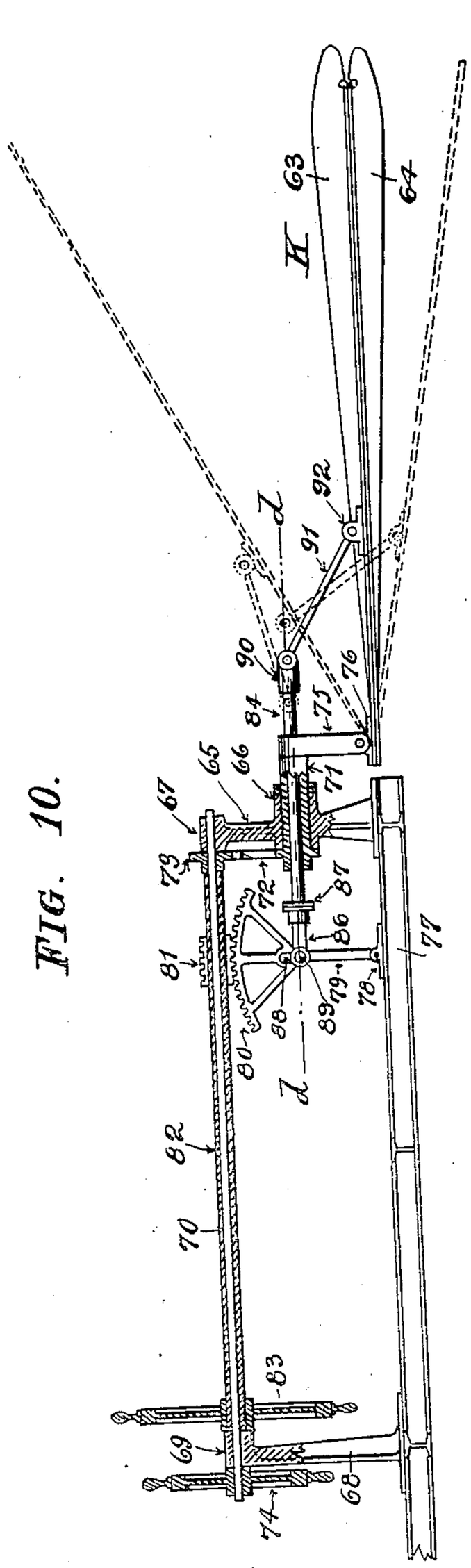

FIG. 10.

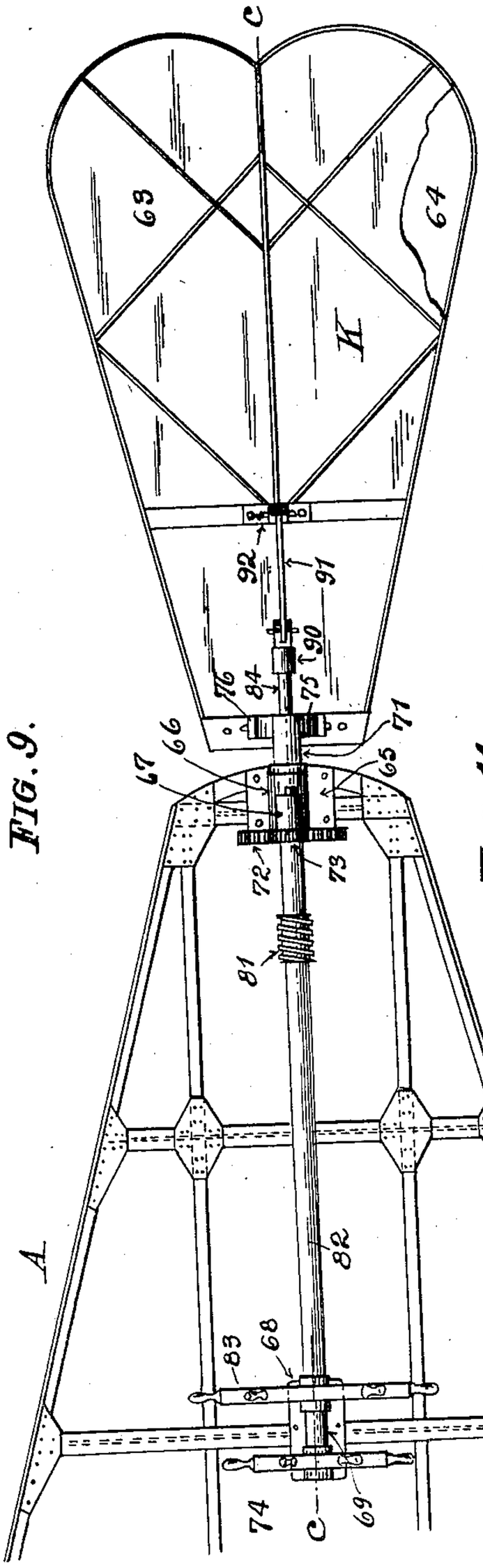

FIG. 9.

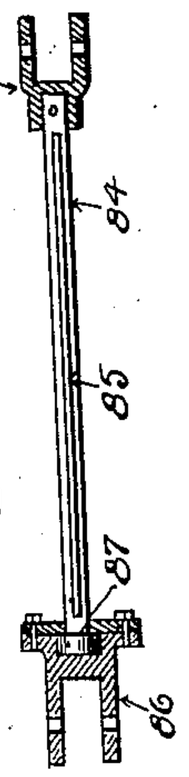

FIG. 11.

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6 SHEETS—SHEET 6.

FIG. 13.

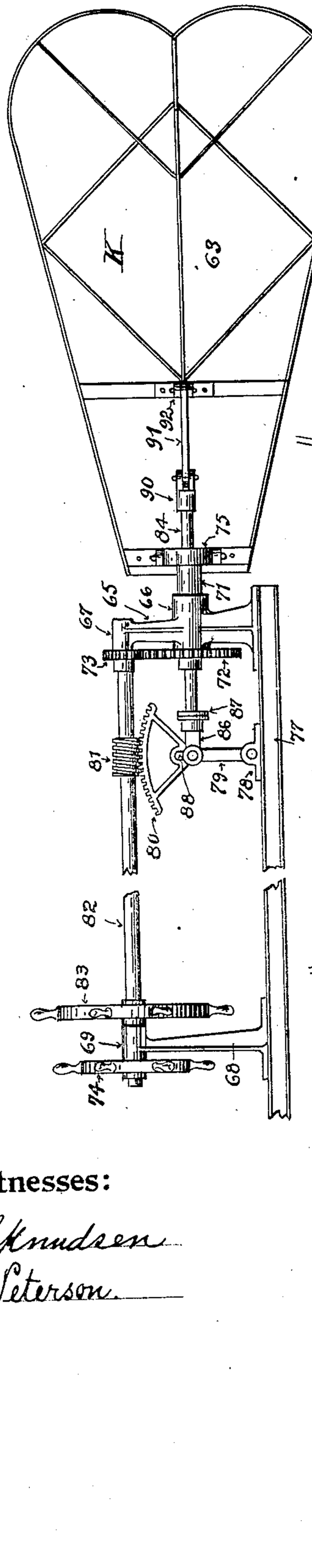
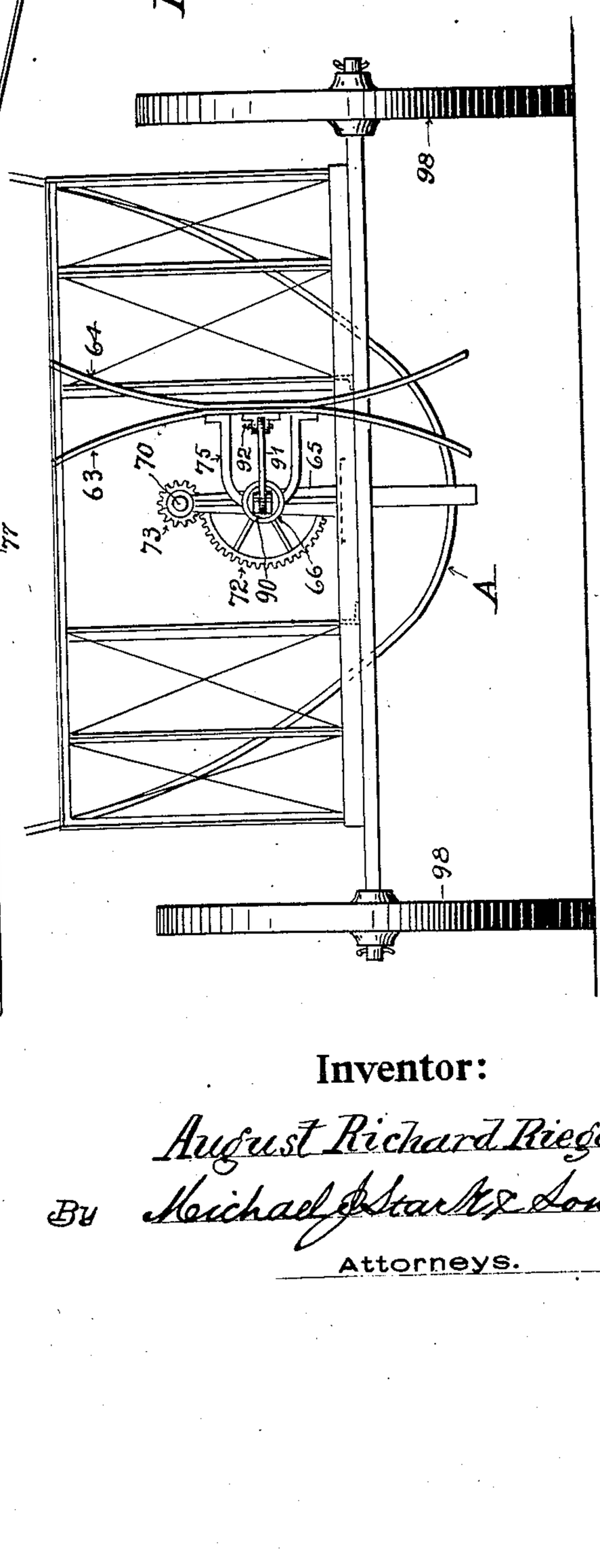


FIG. 14.



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UNITED STATES PATENT OFFICE.

AUGUST RICHARD RIEGER, OF CHICAGO, ILLINOIS.

AIRSHIP.

962,977. Specification of Letters Patent. **Patented June 28, 1910.**

Application filed September 9, 1909. Serial No. 516,820.

To all whom it may concern:

Be it known that I, AUGUST RICHARD RIEGER, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Airships; and I do hereby declare that the following description of my said invention, taken in connection with the accompanying sheets of drawings, forms a full, clear, and exact specification, which will enable others skilled in the art to which it appertains to make and use the same.

This invention has general reference to improvements in airships; and it consists, essentially, in the novel and peculiar combination of parts and details of construction, as hereinafter first fully set forth and described, and then pointed out in the claims.

In the drawings already referred to, which serve to illustrate this invention more fully, Figure 1 is a side-elevation of my improved airship. Fig. 2 is a sectional plan of a portion of the mechanism by which the propeller is operated and caused to change its axial position relative to the axial line of the airship, the section being on line *b*, *b*, of Fig. 1. Fig. 3 is a plan of the airship. Fig. 4 is a transverse-sectional elevation on line *a*, *a*, of Fig. 5, looking forward, the means for manipulating the wings of the airship being shown in section. Fig. 5 is a sectional plan of the forward portion of the airship and illustrating the device complete, for manipulating the propeller. Fig. 6 is a transverse section of the airship showing, in elevation, the means for manipulating the propeller. Fig. 7 is a plan of the forward portion of the latter means. Fig. 8 is an elevation of the cage which carries the propeller. Fig. 9 is a plan of the aft-portion of the airship and illustrating the mechanism for manipulating the tail of the airship. Fig. 10 is a sectional elevation of the devices shown in Fig. 9, the section being taken on line *c*, *c*, of Fig. 9. Fig. 11 is a sectional plan of the rod forming a part of the mechanism for manipulating the tail, the section being taken on line *d*, *d*, of Fig. 10. Fig. 12 (Sheet 1) is an elevation of the standard and appurtenants for the mechanism by which the tail or rudder of the airship is actuated. Fig. 13 is an elevation of the rudder and the mechanism for manipulating the same, the rudder being shown in a vertical position. Fig. 14 is an end-elevation of the airship illustrating the rudder in a vertical position.

Like parts are designated by corresponding symbols and characters of reference in all the various figures.

A in these drawings designates the body of this airship. It is, preferably of ovoid transverse section, and formed of a suitable skeleton frame comprising angle-bars and I-beams properly strengthened by diagonal braces and gussets, as indicated in the various figures in said drawings.

B is the propeller. It is of any of the approved construction which experience has demonstrated to be most suitable for the propulsion of an airship, and it is operated by one or more internal-combustion engines C, located approximately amidship of the body A and connected to a main transmission shaft 12, by means of driving sprocket-wheels 13, on the engine shafts 14, and driven sprocket-wheels 15 located on the main transmission-shaft 12, link-chain or other suitable drive 16, connecting the several sprocket-wheels. The forward end of the main-shaft 12 is forked at 17, to constitute, in conjunction with an annular ring 18, and a hub 19, a universal joint, E, said ring 18 being pivoted to the fork 17 by pivotal screws 20, and the hub 19 to the ring 18 by pivots 21, as clearly shown in Figs. 2 and 5. In front of the hub 19 there is a cage D, comprising an annular ring 22, provided with a hub 62, by a suitable number of curved arms or spokes 23, the hub 62 being suitably bored to form a bearing for a stud 24, on the propeller hub 25, said stud being properly fastened to the hub 19 in any approved manner. This ring 22 has, at diametrically opposite points, outwardly-projecting double-eyes 26, to which are connected rods 27, 28, by bolts 29. These rods move laterally in tubes 30, which tubes are affixed near their forward ends to a spider F, and at their rear ends to a spider G, as will hereinafter more fully appear.

H and I designate guide-rings, which, are alike in construction and are of substantially U-shape in transverse section, and so located in the airship that their centers coincide with the center line of the main shaft 12, they being suitably fastened in the ship's body by brace-rods 31. Within these annu-

lar rings H, I, are located the spiders F, G, each of which has on its arms 32 laterally-projecting double-eyes 33, wherein are pivoted, rollers 34, bearing on the inner sides of the U-shaped annular rings H, I, and these arms are forked at their outer ends at 35, to receive rollers 36, bearing on the inner peripheral portion of said annular rings H, I, thereby movably supporting the spiders F, G, in said annular rings.

The hubs 37, of the spiders F, G, are bored to fit, and they are securely fastened upon, a tube 38, surrounding the main-shaft 12 at its forward end, so that when the spiders F, G, and with them the cage D are revolved there will be no twisting action in the device. From the rear face of the spider G project two lugs 39, 40, to which are pivoted by pivotal bolts 41, a housing 42, having laterally-projecting arms 43, to which the ends of the rods 27, 28 are pivoted by the double-eyes 44, said arms serving as a tiller M, to rotate the spiders F, G, and the cage D, and at the same time to oscillate the cage D by a lateral movement of said tiller M.

In order to further stiffen the mechanism which rotates the forward spider F there are placed upon two of the arms of said spiders auxiliary tubes 45, Figs. 6 and 7, and auxiliary rods 46 so that said spiders are connected by four tubes and rods, the latter, auxiliary tubes and rods being introduced as a precautionary measure, and may be dispensed with should actual tests show that they are not required.

J are a pair of wings, serving the purpose of aeroplanes. These wings are pivoted to the sides of the ship's body by hinge-members 47, and they are swung around their pivotal points by means comprising a tubular sleeve 48 suitably journaled in bearings, 49, supported upon a proper structure 50. This sleeve is screw-threaded internally, at both ends to receive screws 51, there being double-eyes 52, on the outer ends of said screws, engaging links 53, said links being connected to further links 54, the outer ends of which engage the said wings J. At the adjacent, connecting, ends of the links 53 and 54, there are auxiliary, supporting links 55, suitably pivoted at the upper edges of the ship's body at 56. The sleeve 48 is fitted with a sprocket-wheel 57, and in the ship, and in close proximity to the tiller M, that controls the position of the propeller, there is located a transverse shaft 58, upon which is mounted a driver-sprocket 59, which connects with the driven sprocket 57 by a drive-chain 60. Upon this shaft 58 there is located a so-called steering-wheel 61, by means of which the shaft 58, and through it and its driving mechanism, the sleeve 48 is rotated. The screws 51 have right, respectively left threads so that by revolving the sleeve 48 in one direction, the screws 51 will move outwardly, and when revolved in the opposite direction will be drawn into the sleeve 48. This movement of the screws is communicated to the wings J through the links 53 and 54 and the wings thereby raised or lowered, as the case may be.

K designates the tail or rudder of the airship. It is composed of two like members, each being curved, the upper member 63, being upwardly, and the lower member 64, being downwardly curved, as indicated in Fig. 10. This rudder K is pivoted so as to be capable of being oscillated in a horizontal plane around its pivotal points, for raising and lowering it, and it is also pivoted in such a manner that it may oscillate in a vertical plane at right angles to the former plane, and the mechanism by means of which this compound movement of the rudder is accomplished comprises a standard 65, located at the rear end of the ship's skeleton frame. This standard 65 has centrally a long sleeve 66, and at its upper extremity a bearing 67. At a suitable distance forward of this standard 65 there is a further standard 68, having at its upper end a bearing 69, said bearing carrying one end of a shaft 70, the other end of which is carried in the bearing 67 of the rear-standard 65. In the sleeve 66 of the latter standard there is a tubular shaft 71, having on its inner end a segment of a gear-wheel 72, meshing with a gear-pinion 73 on the shaft 70. The inner end of this shaft 70 has a steering-wheel 74, by means of which it is rotated.

The outer end of the tubular shaft 71 is formed into a yoke 75, the lower ends of which are pivoted to bearings 76, secured to the rudder K and upon which the latter may oscillate. In front of the rear-standard 65 there is pivoted to the floor-beam 77, by a bearing 78, a lever 79, formed at its upper end into a segment of a worm-wheel 80, Fig. 10, said worm-wheel engaging a worm 81, fastened to a tubular sleeve 82, located upon the shaft 70 and having at its end adjacent to the standard 68 a steering-wheel 83. In the bore of tubular shaft 71 there is, longitudinally-movable, a rod 84, shown in detail in Fig. 11, said rod having a spline 85, engaging a groove in the bore of the tubular shaft 71 to cause it to rotate therewith without preventing longitudinal movement thereof. This rod 84 is coupled to a double-eye 86 by a swivel-coupling 87, the double-eye 86 engaging a slotted aperture 88, by a bolt 89. The outer end of this rod 84 has a double-eye 90, wherewith engages one end of a link 91, the other end whereof engages a double-eye 92, fastened to the rudder K.

It will now be observed that when the hand-wheel 74 is rotated, its shaft 70 and pinion 73 will cause the rotation of the gear-wheel 72, and through it, the tubular shaft 71 and yoke 75 and finally the rudder K.

If, however, the hand-wheel 83 is rotated, the sleeve 82 with its worm 81 will rotate the segment of a worm-wheel 80, and the arm 79 move the rod 84 horizontally and by the link 91 lift or depress the rudder K, as the case may be. It will thus be seen that the rudder K may be both rocked and raised and lowered, and that this may be done simultaneously by actuating the two hand-wheels 74 and 83 at the same time.

In order to give buoyancy to this airship there are located gas-containing cylinders L, preferably outside of the ship's body, said gas-containers L being, preferably, metallic, pointed and hollow bodies, the interior of which is provided with a series of bulk-heads 93, to divide these gas-containers into a number of cells 94, each of which is provided with a suitable filling plug 92, through which the cells may be charged with, preferably hydrogen, gas. These gas-containers L may also be made from any suitable gas-tight material, and they are secured to the ship's body by brackets 95, and guy-rods or ropes 96. These gas-containers are horizontally movable in the brackets 95 so that by shifting their position forward or backward the ship may be brought into longitudinal balance, care being taken that all the parts appertaining to this airship are so located and disposed therein that the airship is practically balanced, the center of gravity being amidship and as low as possible therein, so that any variation in the equilibrium of the ship can be compensated for, by shifting the gas-containers, as described.

To enable the airship being started on its flight, it is mounted upon wheels, there being one of these wheels, 97, forward of the ship, and two, 98, well aft thereof, the forward wheel 97 being journaled in a fork 99, so that the ship in its normal position is rearwardly inclined, its bow being the highest. If now the motors C are started, the ship will be forwardly propelled and will rise owing to the wings J being inclined and acting as aeroplanes. It can then be steered by shifting the axial line of rotation of the propeller by manipulating the tiller M. As shown in the plan Fig. 5, when the tiller M stands in a horizontal plane and at right angles to the longitudinal center-line of the ship, the axial line of revolution of the propeller will coincide with that of the main-shaft 12, but when the tiller M is pulled so that the port-arm 43 is forward and the star-board arm aft, the rods 27 and 28 will swing the cage D so that the axial line of revolution of the propeller is inclined to the axial line of revolution of the main-shaft, this position being illustrated in Fig. 2. This would cause the ship to swing to starboard. An opposite movement of the tiller M would cause the ship to veer to port. But when the tiller M is turned into a vertical position, it will revolve the spiders G, F, and if then the tiller M is pulled as heretofore described the position of the propeller B would be such as to cause the bow of the ship to rise, such a position being also illustrated in Fig. 2, if it is assumed that this figure is a vertical, and not a horizontal section or sectional plan as heretofore stated, it being obvious that this Fig. 2 may be either a vertical or a horizontal section. And in order that the ship may not depend upon a single mechanism to enable its being steered, I have provided the rudder K which, as already described, is adapted to be moved vertically as well as oscillated upon the tubular shaft 71. Thus by placing the rudder K in an elevated position, as shown in Fig. 1, the bow of the ship will be caused to rise, while when the rudder is depressed it will cause the bow to be depressed. But if the rudder is turned by manipulating the hand-wheel 83, so that the rudder will stand in a more or less vertical position, the ship will veer to port or starboard, as the case may be, while by manipulating both hand-wheels 74 and 83, a compound movement of the airship will take place.

By raising the wings J more or less (by manipulating the hand-wheel 61) the ship may be sailed more or less in a horizontal direction, depending upon the position of the wings.

The ship, when made sufficiently large so that its buoyancy permits of carrying several persons, two operators may be required to govern the same, one of whom will be placed forward to handle the tiller M and the hand-wheel 61, while the other will take his station aft and take care of the motors and operate the hand-wheels 74 and 83. Ordinarily, these two hand-wheels will require no attention when the rudder has once been set so that the ship may sail a straight course, but in case the airship is not sufficiently buoyant to carry more than one operator, I shall lengthen the shaft 70 and its appurtenants so as to place the hand-wheels 74 and 83 within easy reach of the forward aviator, thereby enabling him to perform all the various movements necessary to govern the ship, from a single station. When the airship is sufficiently buoyant to carry more than two persons the remaining persons will be so distributed in the ship as to preserve, as near as possible, its equilibrium.

I have heretofore stated that the rods 27 and 28, and the auxiliary-rods 46 are inclosed within the tubes 30 and 45 respectively. These tubes, however, may be dispensed with, if desired, since the spiders F and G are securely fastened to the tube 38 and since there is not likely to be any twisting in these rods when the tiller M is being turned.

Having thus fully described this invention, I claim as new and desire to secure to me by Letters Patent of the United States—

1. An airship, comprising, in combination, a body; motors in said body; gas-containing cylinders attached to the sides of said body and adapted to be forwardly and backwardly moved to establish and maintain the equilibrium of the ship's body, said cylinders being carried in brackets and held in position by guy-rods; wings on said body; means for elevating and depressing said wings, a propeller-wheel forward of the bow of the ship's body; means for changing the axial line of rotation of said propeller-wheel; a rudder, and means for varying the position of said rudder, as, and for the object specified.

2. In an airship, means for varying the axis of rotation of the ship's propeller, said means comprising, in combination, a propeller-wheel; a main-shaft, a universal joint connecting said propeller-wheel to said main-shaft; a cage; rods pivoted to said cage with one end, a tiller to which said rods are connected with their other ends; annular guides; spiders in said annular guides; a central tube upon said main-shaft to which said spiders are affixed, said rods passing through said spiders, said tiller being adapted to be rotated and move upon its pivot, as specified.

3. In an airship, means for varying the axis of rotation of the ship's propeller, said means comprising, in combination, a propeller-wheel at the bow of said airship; a main-shaft; a universal coupling connecting said propeller-wheel to said main-shaft; a cage interposed between the propeller-wheel and the universal coupling; two rods pivoted with their forward ends to said cage; spiders, through the arms of which said rods are passed; annular guides within which said spiders are adapted to rotate, said spiders having guiding-rollers engaging said annular guides; a tiller pivoted to one of said spiders and adapted to rotate the same, said rods being pivoted to said tiller at their rear ends.

4. In an airship, the combination, with a propeller-wheel located in front of the bow of the airship and having its axis of rotation normally coinciding with the longitudinal center line of the ship's body, of means for moving the axial line of rotation of said propeller-wheel out of coincidence, said means comprising a cage within which said propeller-wheel is journaled; parallel rods pivotally connected to said cage with their forward ends; means for maintaining the parallelism of said rods, a tiller pivoted at its center and adapted to oscillate around its pivotal point, said rods being connected to said tiller at their rear ends, whereby said tiller is adapted to rotate said cage and to move the rods longitudinally to change the angularity of said propeller wheel.

5. In an airship, the combination, with a propeller-wheel located in front of the bow of the airship, and having its axis of rotation normally coinciding with the longitudinal center line of the ship's body, of a cage located in the rear of said propeller-wheel; a stud on said propeller-wheel journaled in said cage; rods, pivotally connected to said cage with their forward ends; a pair of spiders placed a predetermined distance apart, said spiders having arms through which said rods are passed; lugs on the rear face of one of said spiders; a housing, pivoted to said lugs; arms on said housing to which said rods are pivoted at their rear ends; annular guides within which said spiders are adapted to rotate; guide-rollers near the outer ends of said spider-arms adapted to engage the inner flanks of said annular guides and further guide-rollers at the ends of said spider-arms adapted to engage the inner peripheral surfaces of said annular guides.

6. In an airship, the combination, of a ship's body; a pair of wings pivotally connected with, and projecting outwardly from the sides of said ship's body, and means for raising and lowering said wings, said means including a journaled tubular sleeve; screws in the ends of said tubular sleeve and in screw-threaded relation therewith; links connecting said screws to said wings and means for rotating said sleeve, the latter means including a sprocket wheel upon said tubular sleeve, a rotative shaft, a steering wheel upon said shaft, a sprocket wheel upon said shaft, and a belt connecting said sprocket wheels.

7. In an airship, the combination, of a ship's body; a pair of wings pivotally connected with, and projecting outwardly from the sides of said ship's body, and means for adjusting the angular position of said wings, said means including supported bearings; a tubular sleeve journaled in said bearings, screws in, and projecting from, said tubular sleeve and in screw-threaded engagement therewith, double-eyes on said screws; links connecting with said double-eyes, further links connecting with the first-mentioned links with one end and with the wings with their other ends and supporting-links connecting with the adjacent ends of said links, and means for rotating said tubular sleeve.

In testimony that I claim the foregoing as my invention I have hereunto set my hand in the presence of two subscribing witnesses.

AUGUST RICHARD RIEGER.

Attest:

MICHAEL J. STARK,
MATHILDA KEIL.