No. 701,359. Patented June 3, 1902.

C. F. A. KLOTZ.

AIR SHIP.

(Application filed July 8, 1901.)

(No Model.) 5 Sheets—Sheet 1.

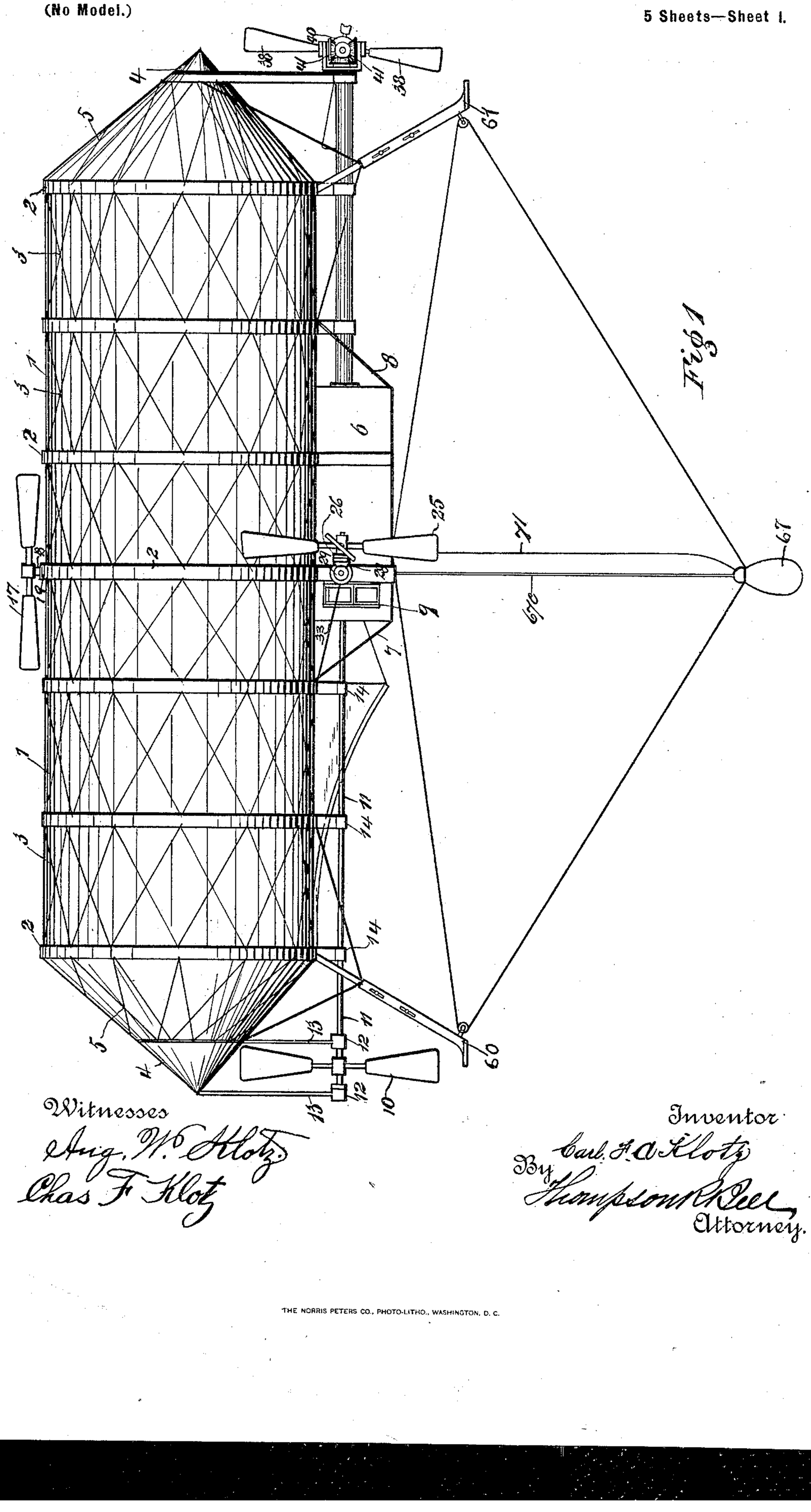

Fig. 1.

Witnesses
Aug. W. Klotz.
Chas F. Klotz

Inventor
Carl F. A. Klotz
By Thompson & Peel
Attorneys.

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(No Model.) 5 Sheets—Sheet 2.

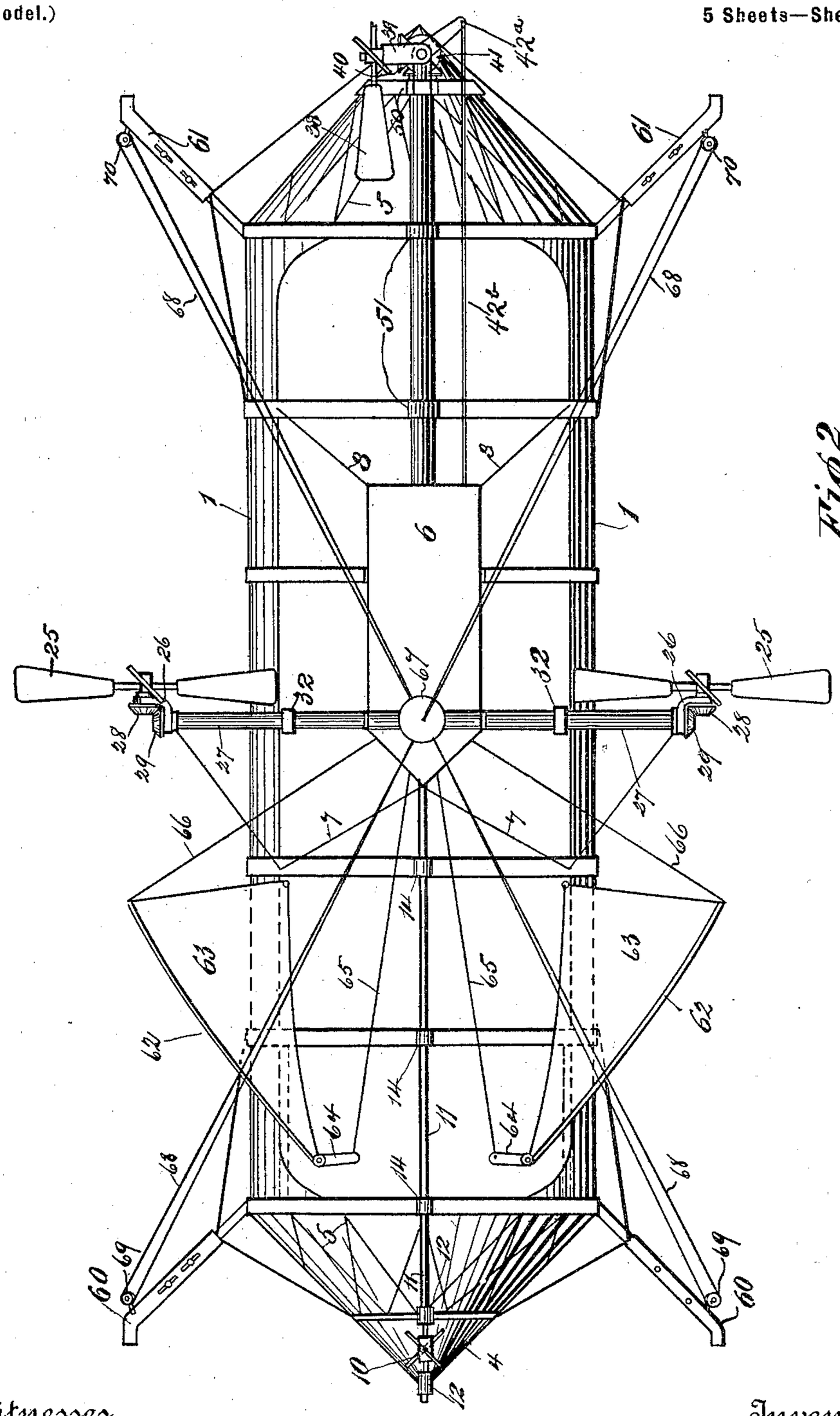

Fig. 2.

Witnesses
Aug. W. Klotz.
Chas F. Klotz

Inventor
Carl F. A. Klotz
By Thompson & Peel
Attorney.

No. 701,359.

Patented June 3, 1902.

C. F. A. KLOTZ.

AIR SHIP.

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(No Model.)

5 Sheets—Sheet 3.

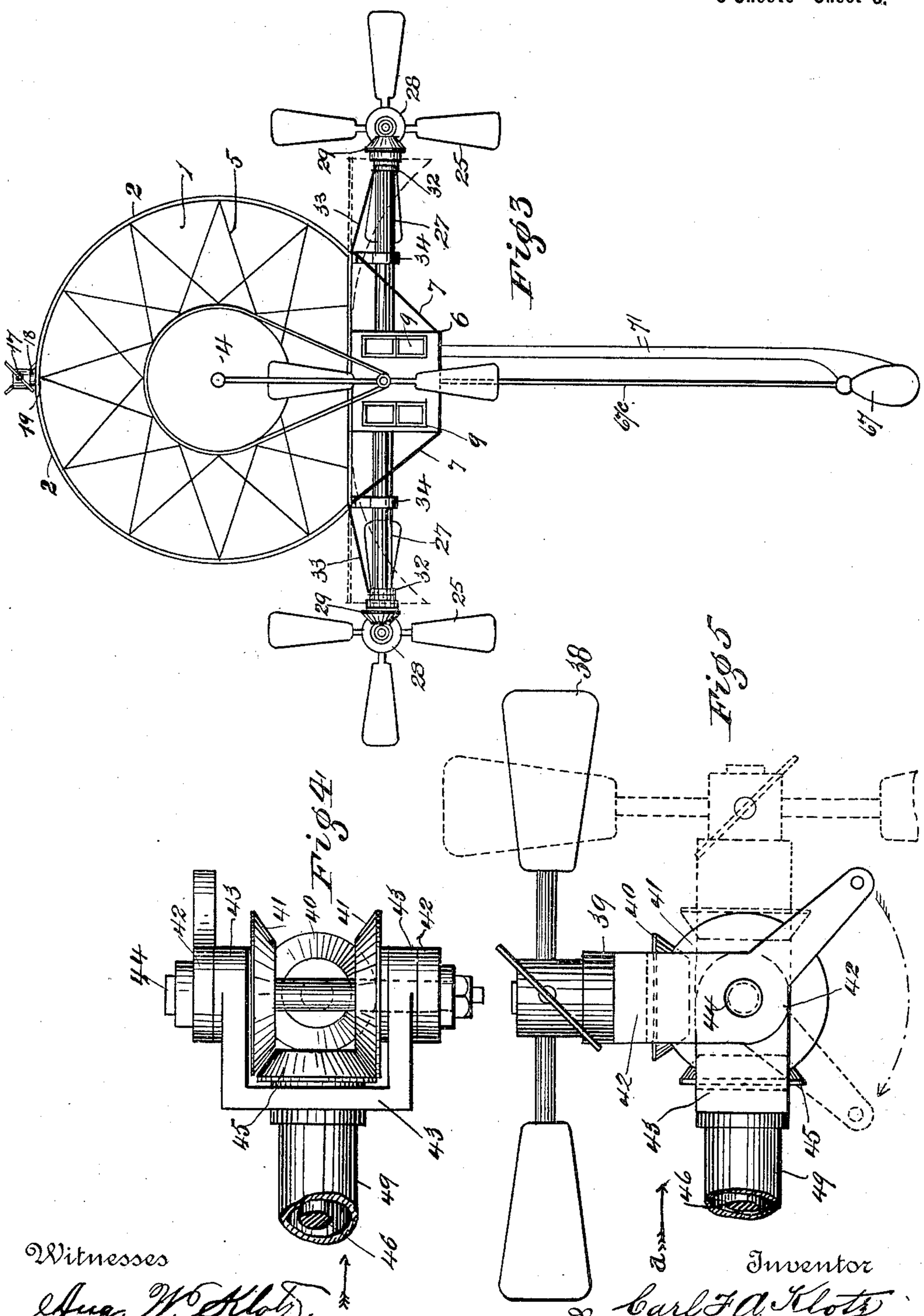

Fig 3

Fig 4

Fig 5

Witnesses

Aug. W. Klotz.

Chas. F. Klotz.

Inventor

By Carl F. A. Klotz

Thompson & Bee

Attorney.

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C. F. A. KLOTZ.

AIR SHIP.

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(No Model.) 5 Sheets—Sheet 4.

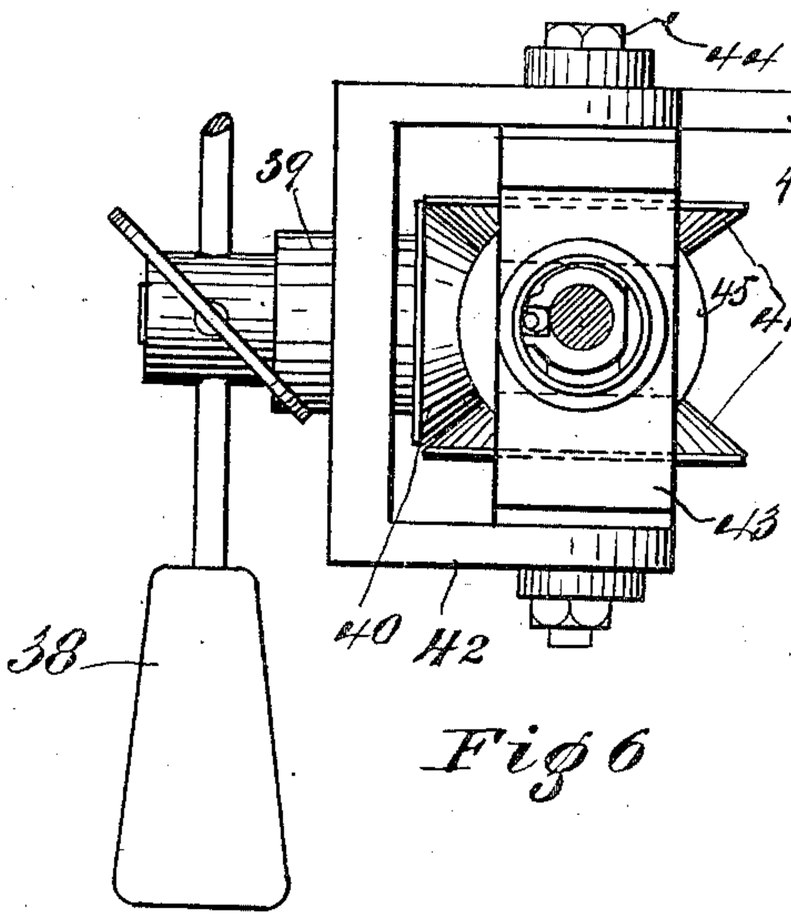

Fig 6

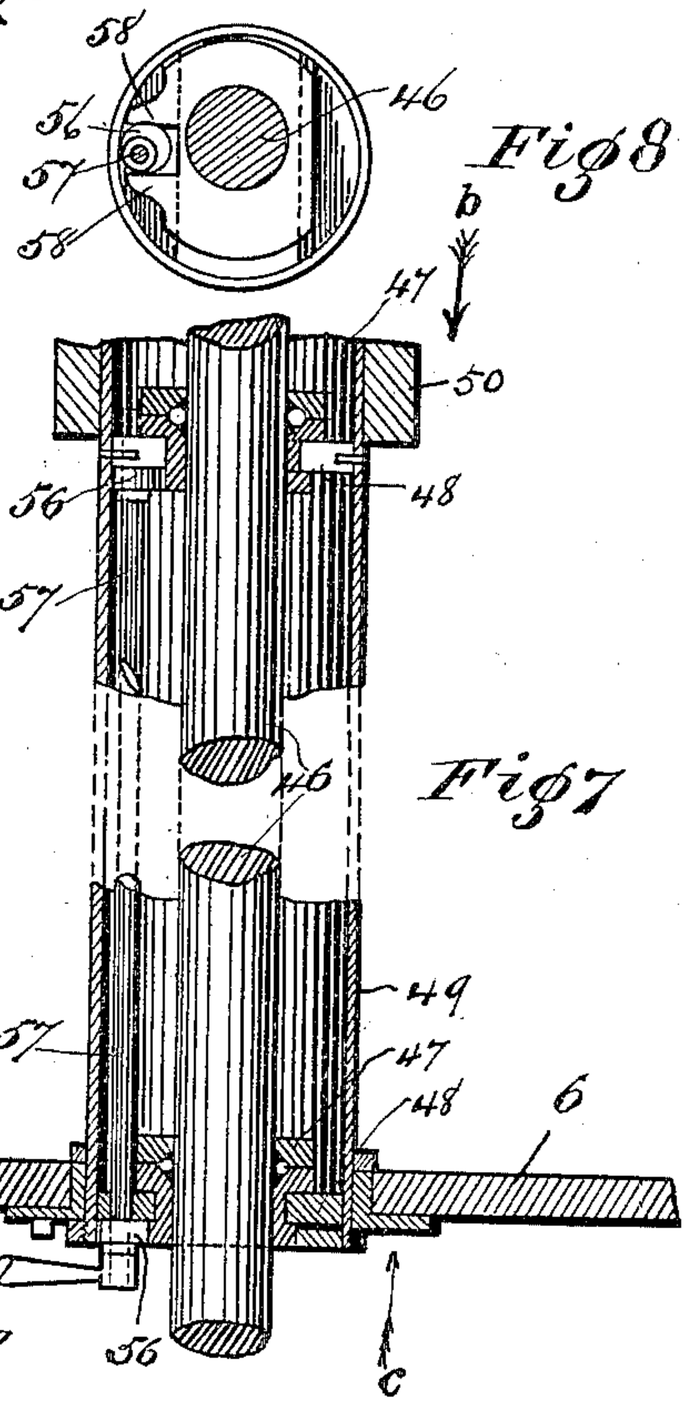

Fig 8

Fig 7

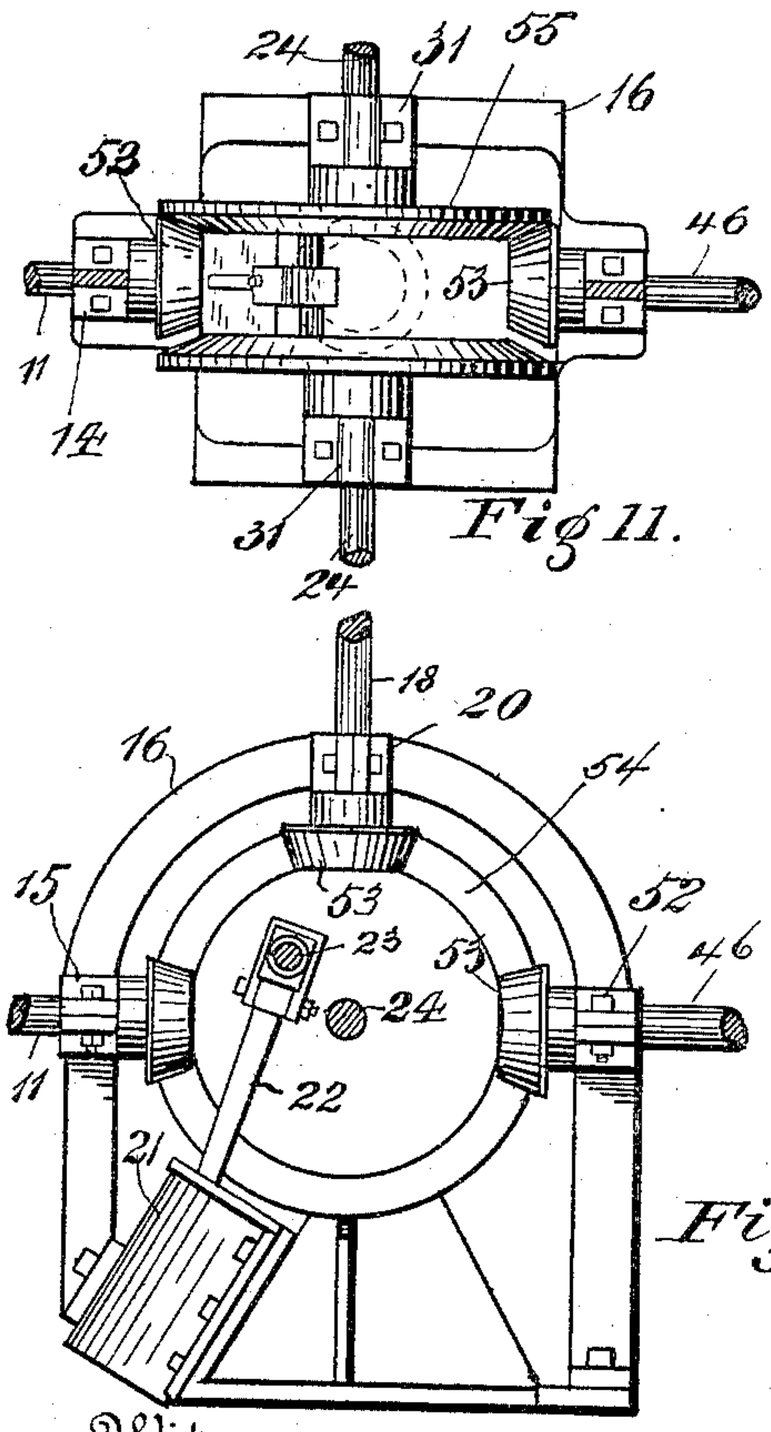

Fig 11.

Fig 10

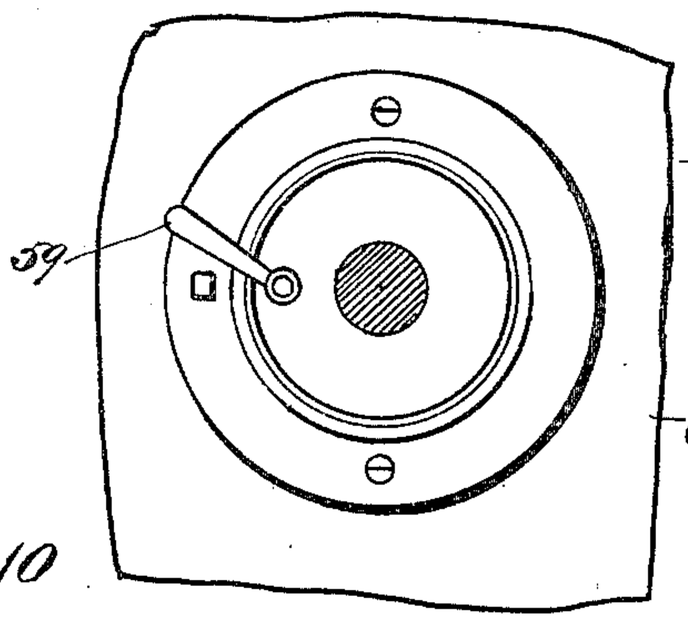

Fig 9

Witnesses
Aug. W. Klotz
Chas. F. Klotz

Inventor
Carl. F. A. Klotz
By Thompson & Lee
Attorney.

No. 701,359. Patented June 3, 1902.

C. F. A. KLOTZ.

AIR SHIP.

(Application filed July 8, 1901.)

(No Model.) 5 Sheets—Sheet 5.

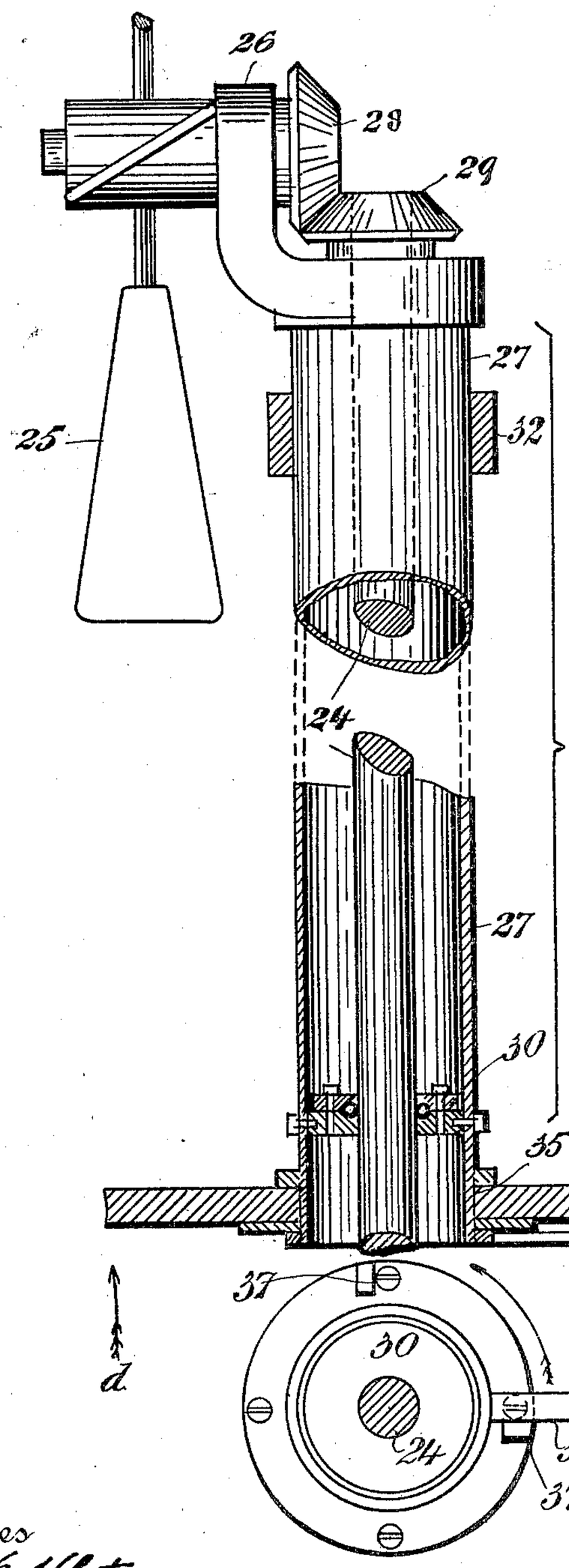

Fig 12

Fig 13

Witnesses
Aug. W. Klotz.
Charles F. Klotz.

Inventor
Carl F. A. Klotz
By Thompson & Bell
Attorney.

UNITED STATES PATENT OFFICE.

CARL F. A. KLOTZ, OF INDIANAPOLIS, INDIANA.

AIR-SHIP.

SPECIFICATION forming part of Letters Patent No. 701,359, dated June 3, 1902.

Application filed July 8, 1901. Serial No. 67,430. (No model.)

To all whom it may concern:

Be it known that I, CARL F. A. KLOTZ, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented new and useful Improvements in Air-Ships, of which the following is a specification.

My invention relates to certain new and useful improvements in air-ships and in the arrangement and construction of the machinery for propelling the same; and it consists in a sharp-pointed elongated cylindrically-shaped buoyant vessel or balloon to the bottom side of which and intermediate between the pointed ends thereof is securely attached a pilot-house, in which latter is located the motor which operates the various propellers by which the ship is propelled and steered or guided through the atmosphere, as hereinafter more fully set forth, and particularly pointed out in the claims.

The chief object of this invention is to provide means whereby the balance or trim of the vessel may be readily adjusted and maintained; also, to provide suitable mechanism whereby the power for driving the same will be concentrated in the pilot-house and distributed to each of the propellers by independently-operated shafts; also, to arrange such mechanism whereby the operation of the propellers will be entirely and completely under the control of the operator within said pilot-house. I attain these objects by means of the mechanism illustrated in the accompanying drawings, in which similar numerals of reference designate like parts throughout the several views.

Figure 1 is a side elevational view of the air-ship. Fig. 2 is an inverted plan view of the same. Fig. 3 is a front end elevational view of the same. Fig. 4 is an enlarged detail broken-off view of the propelling mechanism of the steering-propeller. Fig. 5 is a similar broken-off plan view of the same. Fig. 6 is an end view of the same looking in the direction of the arrow *a*. (See Figs. 4 and 5.) Fig. 7 is an enlarged detail longitudinal sectional view of the shaft-carrying tube of the rear or steering propeller and showing the means whereby said shaft is moved in a direction transverse with the axis of said shaft to change the direction of rotation of said steering-propeller. Fig. 8 is an end view of the same looking in the direction of the arrow *b*. (See Fig. 7.) Fig. 9 is a similar end view looking in the direction of the arrow *c*. (See also Fig. 7.) Fig. 10 is an enlarged broken detail view of the motor. Fig. 11 is a plan view of the same. Fig. 12 is an enlarged detail longitudinal sectional broken view of the shaft-carrying tubes of the side propellers and showing the means whereby said shaft-carrying tubes may be rotated one-quarter of a revolution independently of the driving-shafts thereof to change the positions of said side propellers to operate to either propel the vessel in a forward direction or to assist in elevating the latter, and Fig. 13 is an end view of the same looking in the direction of the arrow *d*. (See Fig. 12.)

The balloon 1 is of prepared silk or other light non-porous material and is cylindrical in form and provided with pointed or coned ends, which form of construction is preferred, as it offers less resistance to the air. Reinforcing-ribs 2 encircle the balloon 1 at suitable intervals apart along the said balloon, and between said ribs are diagonally arranged the braces 3, which may be of light wire, aluminium wire, or other suitable material combining lightness with strength, extend between said ribs 2, and are secured at their ends to said ribs to not only maintain the same in position relatively to each other, but also to serve as a backing or support for the silk balloon or reservoir 1 against the pressure of the gas confined therein. Similar braces 5 extend from the end ribs 2 to the pointed metallic ends or cones 4 of the balloon 1 to retain the said ends in position and to relieve said balloon from end or longitudinal strain. The pilot-house 6, wherein the power or motor for driving the propelling mechanism is situated, is suspended in position beneath said balloon 1 intermediate the ends thereof, and is secured to two or more of the intermediate ribs 2 by bolts or other suitable fastenings and by the forward braces 7 and the rear braces 8. The pilot-house 6 is wedge-formed at its front portion and is provided with the forward observation or pilot windows 9. The forward propeller 10 is mounted on its shaft 11, and said shaft 11 extends backwardly from the forward portion of the ves-

sel to and into the interior of the pilot-house 6, and is supported in its journal-bearings 12 of the hangers 13 at its forward end, the journal-bearings 14 at points intermediate said forward bearings and the pilot-house 6, and in the bearings 15, formed in the frame 16 of the motor. The top or elevating propeller 17 is secured on the top end of the vertical shaft 18, and the said shaft extends directly through the balloon 1 into said pilot-house 6, and is supported at its top end in a suitable journal-bearing 19, formed in the intermediate rib 2, and at its bottom end in the journal-bearing 20, formed in the top portion of the frame 16 of the motor.

The motor may be of any suitable type of power-generator, preferably a gasolene-engine, (see Figs. 10 and 11,) as by the use of such a greater amount of power may be obtained with a minimum "dead" weight or load to be carried, and said motor consists of the cylinder 21, secured to its supporting-frame 16, which is provided with the connecting-rod 22, which connects the crank 23 of the crank-shaft 24 with the piston of said cylinder 21 to impart rotative motion to said crank-shaft 24 and by which means all the propellers or propelling mechanism is driven.

I will now proceed to describe the mechanism whereby the air-ship is propelled and navigated when in mid-air and also the means whereby said propellers are manipulated independently to perform their various functions and the manner of distributing the power thereto to either operate all said propellers simultaneously or to cause any one of the series of propellers to perform its various functions independently of the operation of the other propellers to accomplish the various movements required and necessary in aerial navigation.

The side propellers 25 are mounted to turn in the journal-bearings 26, secured on the outer ends of the shaft-carrying tubes 27 and to propel the vessel in a forward direction, and said propellers have their axes at right angles with the crank or main driving shaft 24 and are provided with the friction-bevels 28, which are adapted to contact with their driving-bevels 29. The bevels 29 are secured on the outer projecting ends of the crank-shaft or main driving-shaft 24, and said shaft its journaled at its outer ends and intermediate points in the journal-bearings 30, secured on the shaft-bearing tube 27 and at its inner crank portion in the main bearings 31, formed in the frame 16 of the motor. The shaft-carrying tubes 27 extend outwardly from each side of the pilot-house 6 at right angles with the longitudinal axis of the balloon 1 and are mounted to be rotated in their outer bearings 32, secured to the ribs 2 of the balloon by the braces 33, the intermediate bearings or hangers 34, secured to the intermediate rib 2, and the inner bearings 35, secured in the side walls of said pilot-house 6. The crank or main shaft carrying tubes 27 are provided with the hand-levers 36, by which said tubes are rotated manually in their bearings till said lever contacts with either the upper or side stops 37, which latter are provided for the purpose of limiting the rotation of the said tubes to one-quarter of a turn and also serve to indicate the position of the said propellers, whether they be in the position indicated in Figs. 1, 2, and 3 or in a position at right angles therewith to assist in elevating the balloon.

The steering-propeller 38 is journaled in the end or steering-fork journal 39 and is provided with the friction-bevel 40, which contacts with both the idler friction bevel-wheels 41. The end or steering fork 42 is pivoted on the ends of the bifurcations of the fork 43 concentrically with the axes of the idler bevel-wheels 41 by the pivotal pin 44, which latter also forms the journal for the idler-bevels 41, so that the bevel-wheel 40 will be in contact with both the idlers 41, no matter what the position of the fork 42 may be relative to the longitudinal axis of the balloon 1, and said fork 43 is mounted upon and supported by the tail-shaft 46, to be hereinafter described, and is designed to form a support for the fork 42. The driving friction bevel-wheel 45 is secured on the extreme end of the tail-shaft 46 and is adapted to contact with either of the idlers or idler bevel-wheels 41 to drive or rotate the steering-propeller 38 in either a right or a left hand direction of rotation, and is moved into and out of contact with said idler bevel-wheels 41 by suitable mechanism hereinafter described. The tail-shaft 46 is journaled in the journal-bearings 47, which are preferably of the ball-bearing type, and said journal-bearings are mounted in guideways 48, secured at the outer and inner ends of the tail-shaft-supporting tube 49 and at points intermediate the ends thereof, and the said tube 49 is firmly secured at its forward end to the rear wall of the pilot-house 6 and at its rear end is supported and is secured to the balloon 1 by the hanger 50, and at points intermediate the ends thereof by the intermediate hangers 51, secured to the end ribs 2 of said balloon. The tail-shaft 46 extends into the interior of the pilot-house 6 and is journaled at its forward end in the journal 52, formed in the frame 16 of the motor. Friction bevel-wheels 53 are keyed on each of the propeller-shafts 11, 18, 24, and 46 and each contact with the beveled friction-face 54 of the crank-disk 55 to be rotated simultaneously. The tail-shaft bearings 47 are adapted to slide in their ways 48 to move or slightly spring the rear end of said tail-shaft 46 in a direction transverse with that of its axis to move the friction drive-bevel 45 into or out of contact with either of the idler friction-bevels 41 to cause either a right or left hand rotation of the steering-propeller 38, and the said tail-shaft journal-bearings are operated to move in their ways by the eccentrics 56, secured on the hand-

shaft 57. The eccentrics 56 are adapted to work freely between the lugs 58, formed integral on the bearings 47, and the said hand-shaft 57 is journaled in the ways 48 at one side of the journal-bearings 47 and is provided with the manipulating-lever 59, by which said shaft 57 is manually operated to move said journal-bearings 47, as previously described.

The rear or steering-propeller supporting-fork 42 is provided with the steering-lever 42^a, to the end of which lever is connected the steering-rod 42^b, which latter extends forwardly to and into the pilot-house 6 to be within easy reach of the pilot, and by these means the said fork 42 is rotated on its pivotal pin 44 to change the position of the propeller 38 to cause the vessel to either turn or to assist in propelling the same.

Fore-and-aft supporting-legs 60 and 61 are provided for the purpose of supporting the vessel when the latter is on the ground, and the said legs are preferably made extensible, so that the said vessel may be supported in either a higher or lower position from the ground.

Underneath and toward the fore part of the vessel are pivoted the booms 62, to which are secured the triangular canvas wings or sails 63, the inner angular portions of which are permanently secured to the bottom flat portion of the balloon 1. Each of the said booms 62 is provided with the lever-arms 64, to the ends of which are secured the cables 65, which latter extend into the pilot-house 6 and are provided for the purpose of extending said wings or sails 63, as shown in Figs. 1, 2, and 3. The shipping-cables 66 are connected to the free ends of the booms 62 and also extend into the pilot-house 6 and are provided for the purpose of hauling in the booms 62 when the use of the wings or sails 63 is not required. The wings 63 are provided for the purpose of steadying the vessel and preventing rolling while floating in the air.

A water or weighted vessel 67, preferably a water-containing vessel, is provided for the purpose of a ballast and for trimming the vessel and is suspended by a suitable cable 67^c from the bottom of the pilot-house 6. Adjusting fore-and-aft cables 68 are connected to said vessel and extend diagonally from said weighted vessel over and around the fore-and-aft sheaves or pulleys 69 and 70 back to the pilot-house 6, and the said cables are arranged so that said vessel 67 may be moved in any position, either forwardly, backwardly, or sidewise, underneath the vessel to trim and retain the latter in equilibrium. Tubes or hose-pipes 71 may be extended from the water vessel 67 to the cylinder of the motor to form a cooling means therefor when a gas or other explosive engine or motor is used.

The form of shaft-carrying tubes 26 of the side propellers 25 (illustrated in Figs. 12 and 13) may also be constructed as illustrated in Figs. 7, 8, and 9 when it is desired to rotate said side propellers in either a right or left hand direction, and thereby assist in the steering of the vessel.

The operation of the vessel is as follows: The balloon 1 is first charged with hydrogen or other light gas by any suitable means, and owing to the buoyancy of said balloon the vessel in its entirety is elevated in the atmosphere. The motor is now put in operation, and the forward, upper, side, and end propellers 10, 17, 25, and 38 are put in operation. When it is desired to elevate the vessel more rapidly, the side propellers 25 are set in horizontal position to assist in elevating or raising the vessel, and when the said vessel is elevated to a sufficient height said propellers 25 are moved into their positions, as shown in Figs. 1, 2, and 3, to propel the vessel. The steering-propeller 38 is adapted to be placed in position to either turn the vessel to the right or left by causing the same to be rotated in either a left or right hand direction, and when said steering-propeller 38 is required to assist in propelling said vessel in a forwardly direction it is moved into position so that its axis will be in alinement with the axis of the tail-shaft 46 and driven in the right direction of rotation to cause the vessel to advance through the atmosphere.

Having thus fully described this my invention, what I claim as new and useful, and desire to cover by Letters Patent of the United States therefor, is—

1. In an air-ship, the combination with a gas-reservoir, of a pilot-house suspended from the bottom thereof, a motor arranged in said pilot-house, propellers connected to said motor for elevating and driving the ship, booms pivotally connected to the bottom of the gas-reservoir, flexible wings connected along one of their edges to the bottom of the gas-reservoir and along another edge to the booms, said wings being adapted when spread to prevent rolling of the ship, means for opening said wings, and means for closing the same.

2. In an air-ship, the combination with a gas-reservoir, of a pilot-house suspended from the bottom thereof, a motor arranged in said pilot-house, transversely-extending shafts connected to said motor and passing through the pilot-house, rotatable tubes inclosing said shafts, propellers mounted upon said tubes and operatively related to said shafts, a tail-shaft extending rearwardly from said pilot-house and also connected to said motor, a tube inclosing said tail-shaft, a steering-propeller adjustably mounted upon said tube and adapted to swing in a horizontal plane, gearing between said shaft and said propeller, adjustable bearings arranged in said tube and in which the tail-shaft is journaled, a rod extending through said shaft-tube, and rotatably mounted therein, and cams carried by said rod and engaging said bearings for adjusting the latter, whereby the gearing be-

tween the tail-shaft and the steering-propeller may be caused to reverse the direction of movement of the steering-propeller.

3. In an air-ship, the combination with a gas-reservoir, of a pilot-house suspended from the bottom thereof, a motor arranged in said pilot-house, transversely-extending shafts connected to said motor and passing through the pilot-house, rotatable tubes inclosing said shafts, propellers mounted upon said tubes and operatively related to said shafts, a tail-shaft extending rearwardly from said pilot-house and also connected to said motor, a tube inclosing said tail-shaft, a steering-propeller adjustably mounted upon said tube and adapted to swing in a horizontal plane, gearing between said shaft and said propeller, adjustable bearings arranged in said tube and in which the tail-shaft is journaled, a rod extending through said shaft-tube and rotatably mounted therein, cams carried by said rod and engaging said bearings for adjusting the latter, whereby the gearing between the tail-shaft and the steering-propeller may be caused to reverse the direction of movement of the steering-propeller, and means connected to the steering-propeller and extending into the pilot-house for swinging the steering-propeller to the desired positions.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CARL F. A. KLOTZ.

Witnesses:

AUG. W. KLOTZ,

CHAS. F. KLOTZ.