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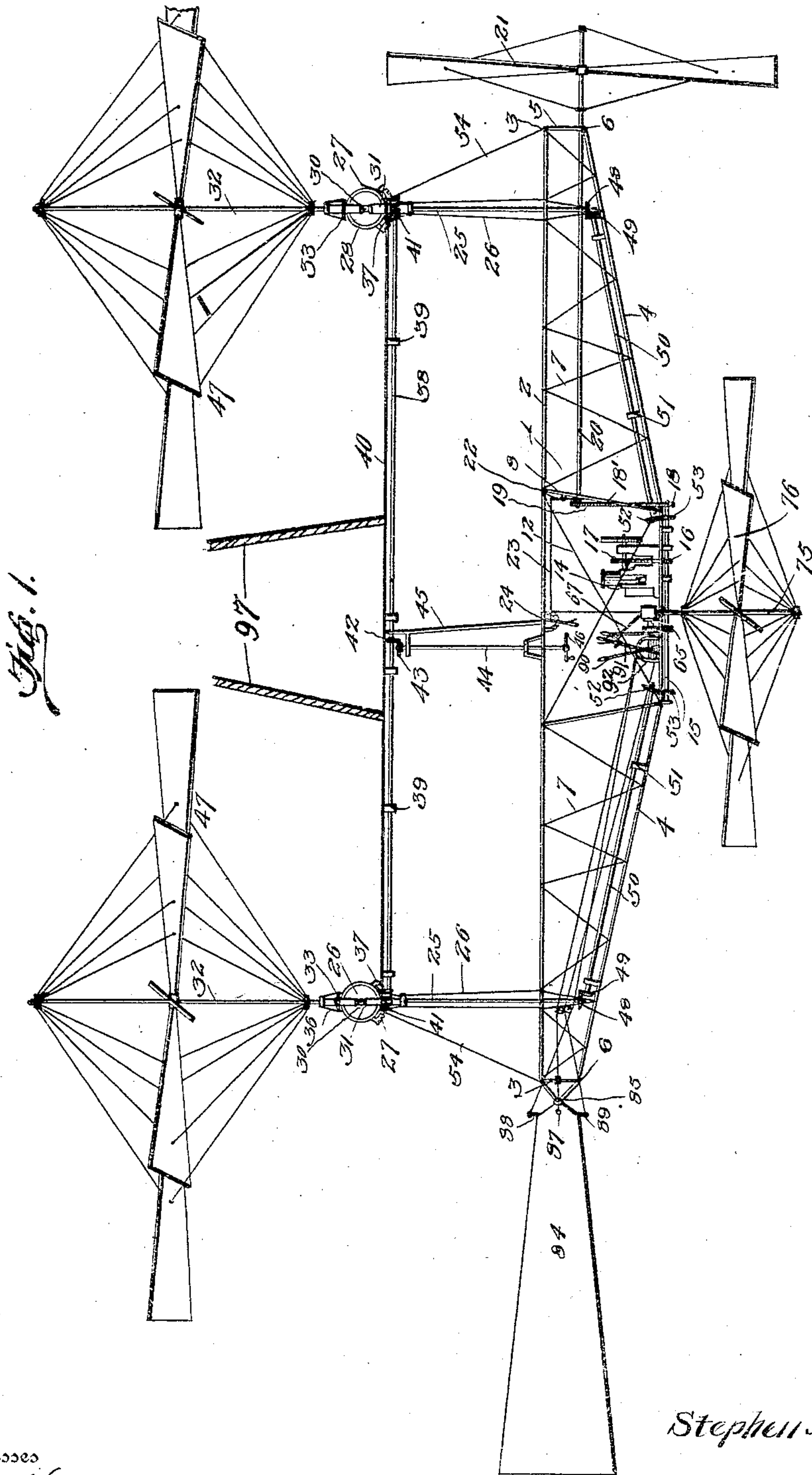
PATENTED JULY 26, 1904.

S. M. CRAIG.  
FLYING MACHINE.

APPLICATION FILED JUNE 18, 1903.

NO MODEL.

5 SHEETS—SHEET 1.



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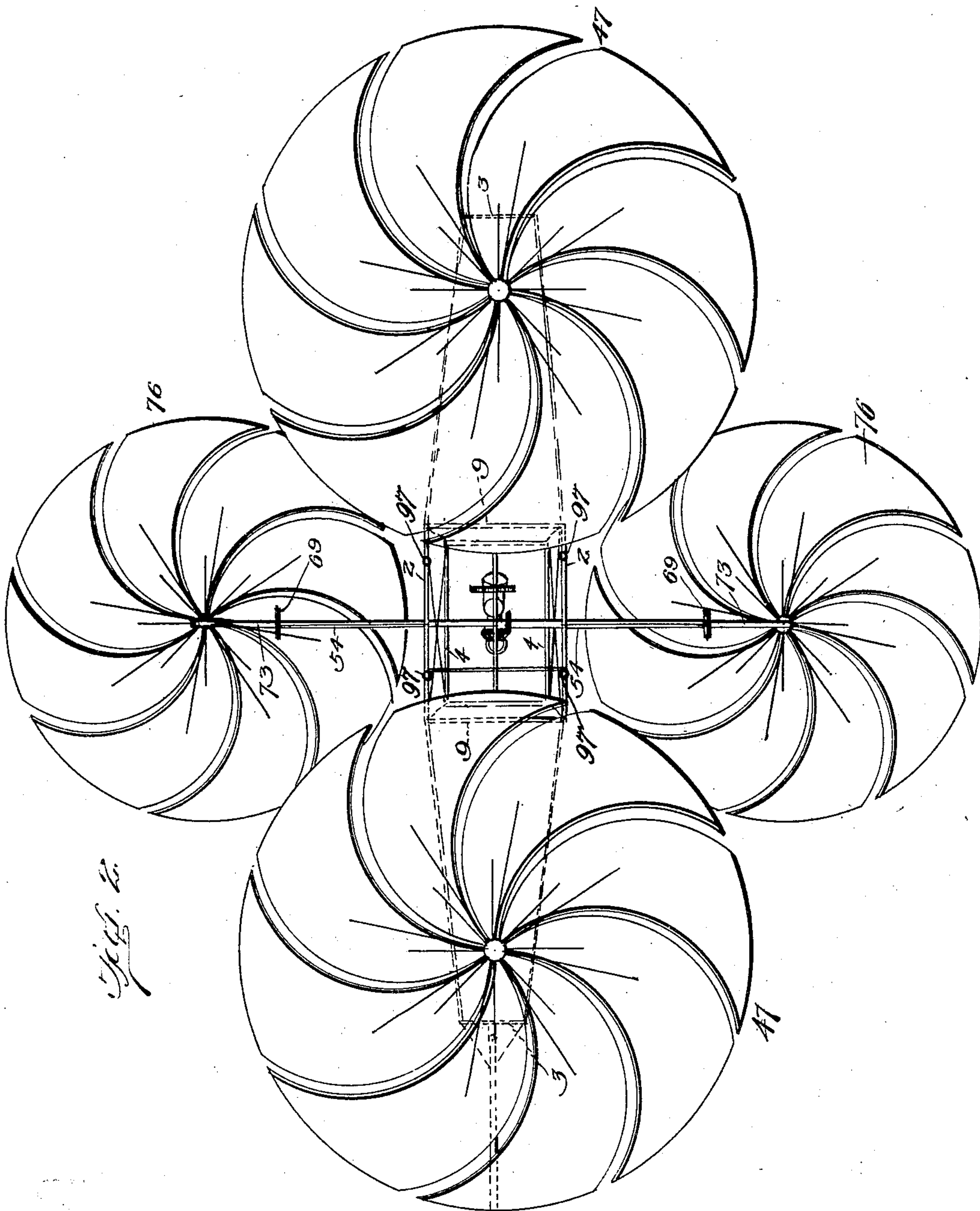
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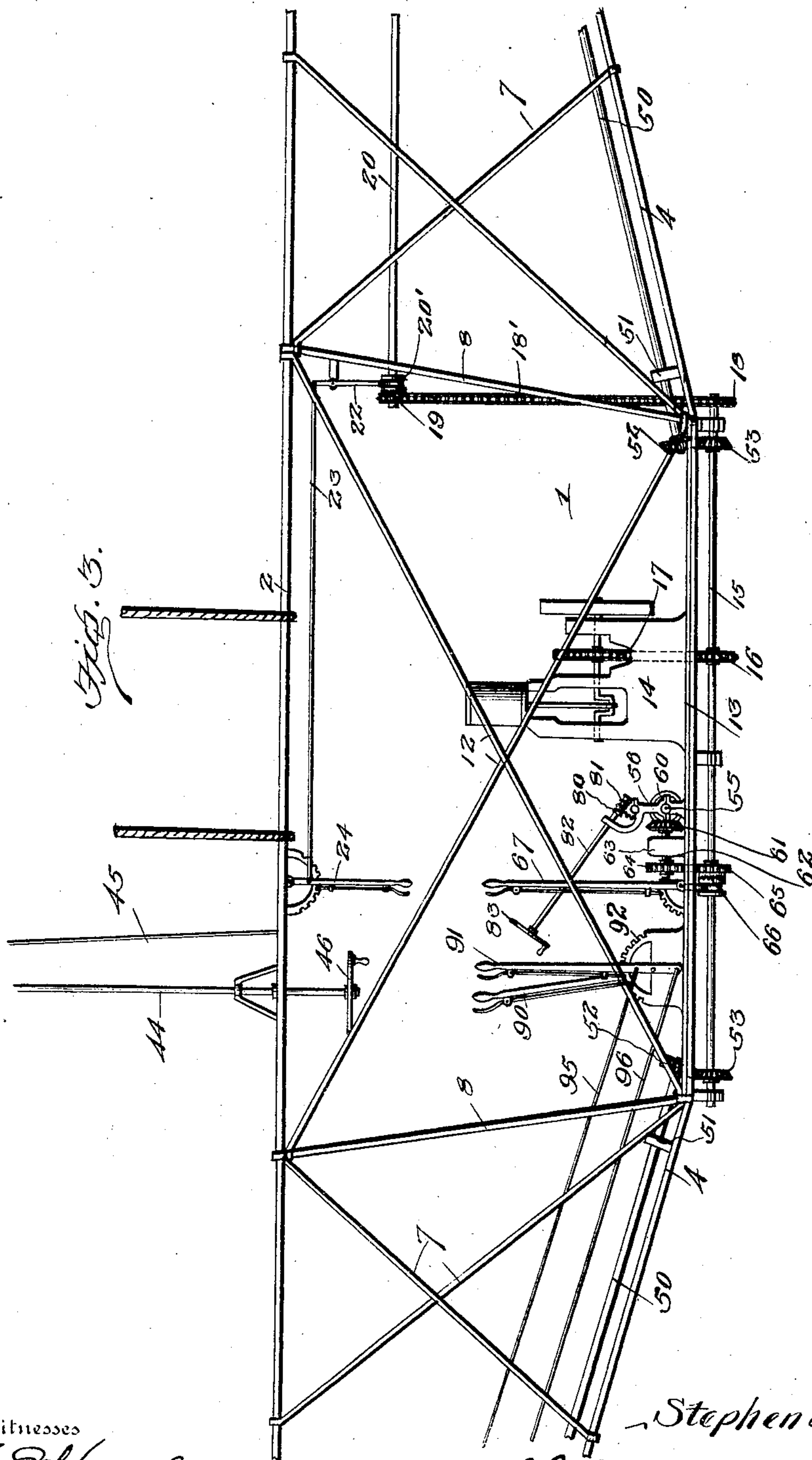
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5 SHEETS—SHEET 3.



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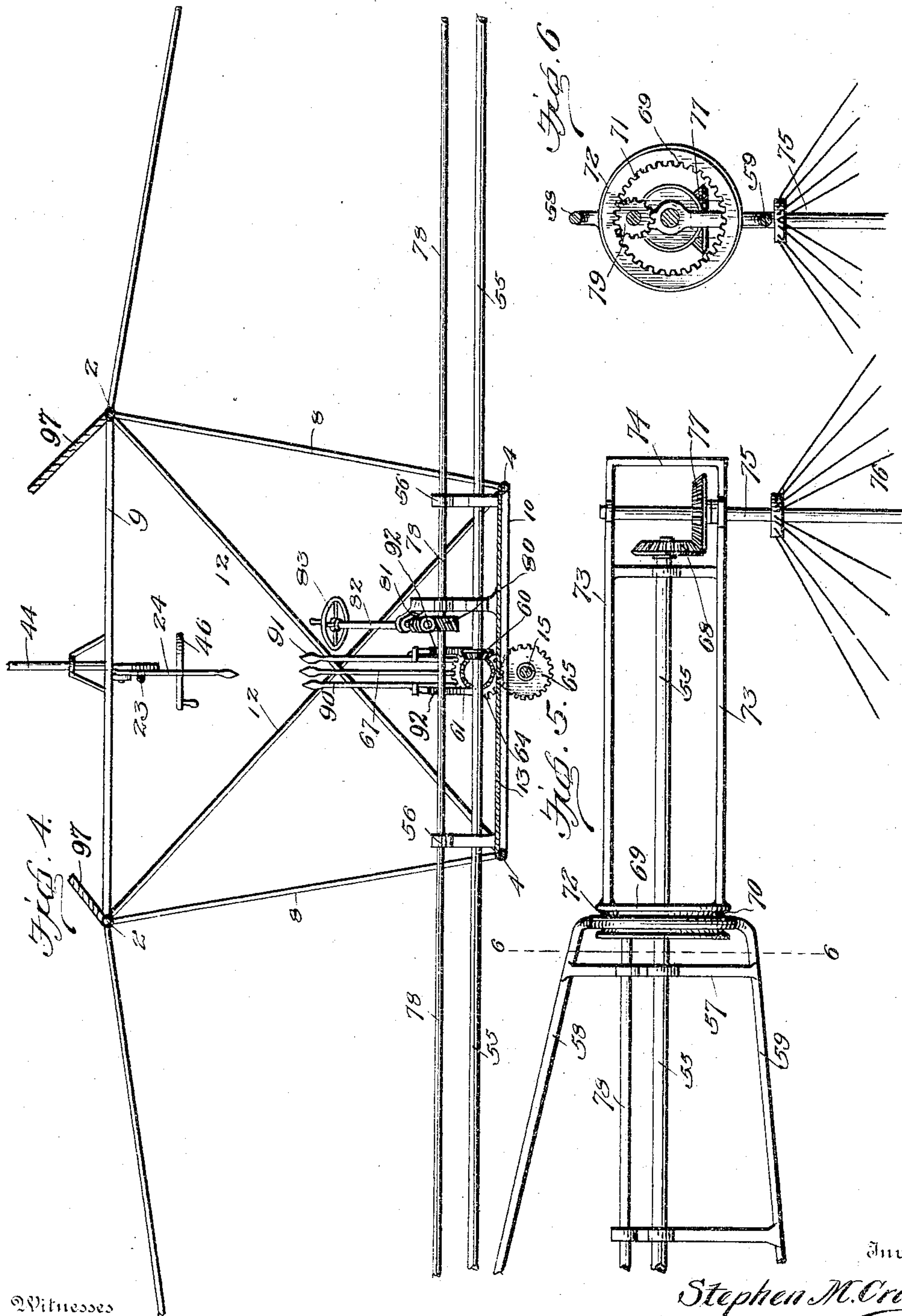
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5 SHEETS—SHEET 4.



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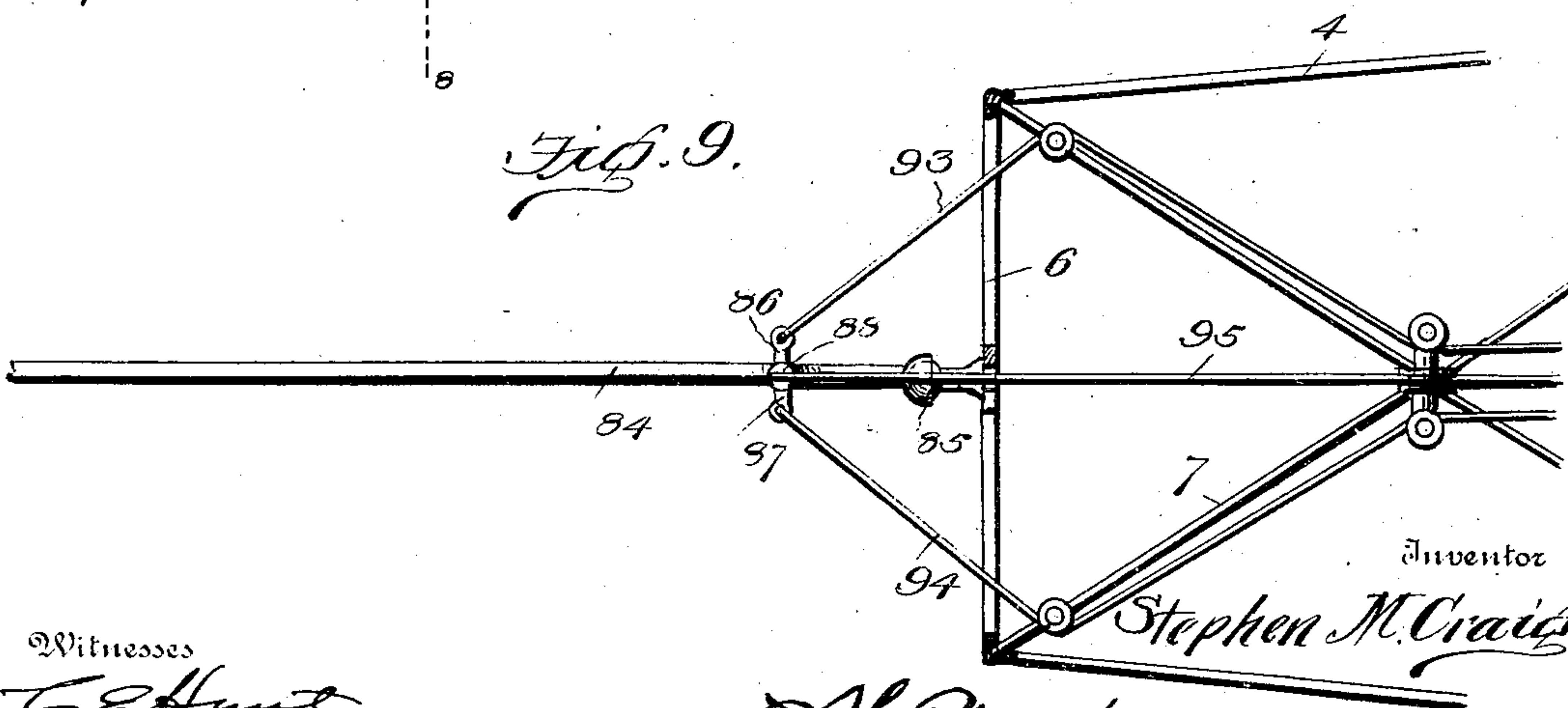
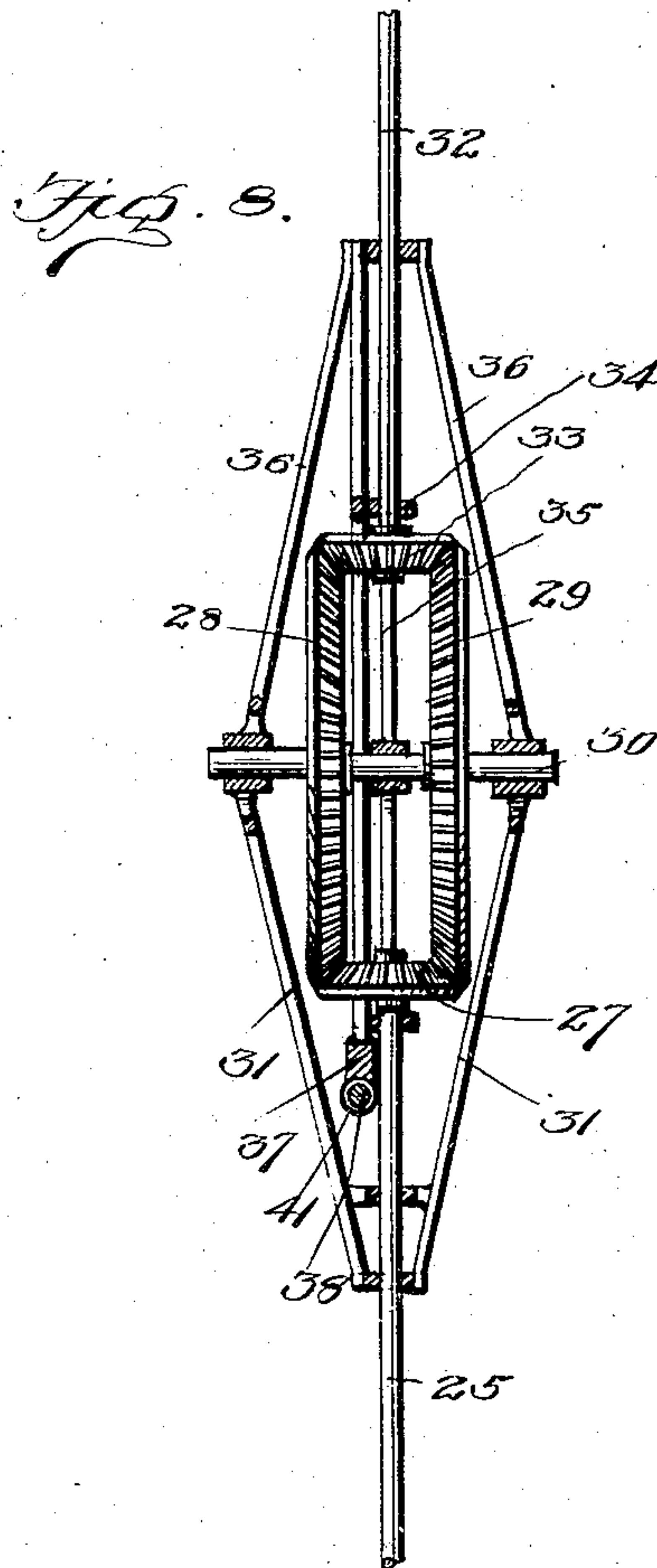
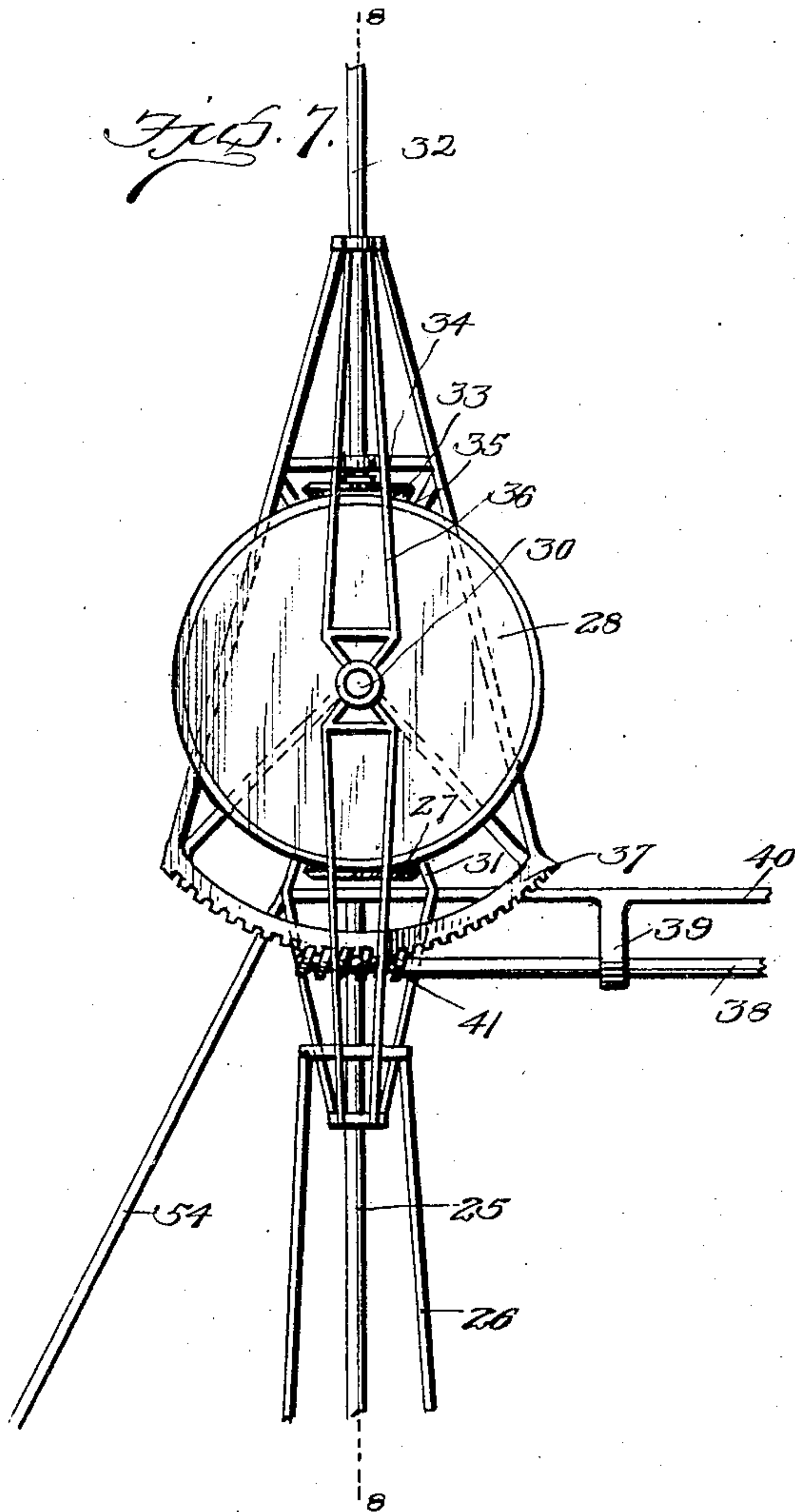
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5 SHEETS—SHEET 5.



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# UNITED STATES PATENT OFFICE.

STEPHEN MERRILL CRAIG, OF MOSCOW, IDAHO.

## FLYING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 766,021, dated July 26, 1904.

Application filed June 18, 1903. Serial No. 162,129. (No model.)

*To all whom it may concern:*

Be it known that I, STEPHEN MERRILL CRAIG, a citizen of the United States, residing at Moscow, in the county of Latah and State of Idaho, have invented certain new and useful Improvements in Flying-Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it ap-  
 10 pertains to make and use the same.

This invention relates to improvements in flying-machines for aerial navigation.

The object of the invention is to provide a machine of this character which may be  
 15 quickly raised to any desired height and propelled and steered through the air at the will of the operator.

A further object is to provide a flying-machine which will be comparatively simple in  
 20 construction, easily managed, the structure of which be strong and durable, but light in weight, and which will be well adapted to the use for which it is designed.

With these and other objects in view the  
 25 invention consists of certain novel features of construction, combination, and arrangement of parts, as will be more fully described, and particularly pointed out in the appended claims.

30 Figure 1 is a side elevation of the complete machine. Fig. 2 is a top plan view of the same. Fig. 3 is a side elevation, on an enlarged scale, of the car or platform. Fig. 4 is a central vertical cross-sectional view  
 35 through the car on the line of the shaft of the side fans. Fig. 5 is an enlarged detail side view of the means for tilting the side elevating-fans. Fig. 6 is a vertical sectional view of the same on the line 6-6 of Fig. 5. Fig. 7  
 40 is an enlarged detail side view of means for supporting and tilting the top elevating-fans. Fig. 8 is a cross-sectional view on the line 8-8 of Fig. 7. Fig. 9 is a detail plan view, partly in section, of the outer end of the frame,  
 45 showing the rudder connection.

In the drawings, 1 denotes the body or supporting-frame of the machine, constructed in skeleton form and consisting of two upper longitudinally-disposed bars or rods 2, which

are spaced apart and arranged parallel with  
 each other for a short distance at the center,  
 and from said parallel portions they gradually  
 converge toward their ends, at which points  
 they are connected together by cross-bars 3.

4 denotes two longitudinally-disposed bars  
 55 or rods arranged below the bars 2 and not so far apart as the bars 2. The central portions of the bars 4 are also arranged parallel with each other, and from said parallel portions they converge and are inclined upwardly  
 60 toward the bars 2 and are connected to the same by short vertically-disposed bars 5 and are also connected together by cross-bars 6. The pairs of bars 2 and 4 are connected together and to each other by a series of diag-  
 65 onally-arranged brace rods or wires 7.

8 denotes upwardly-projecting bars arranged at the ends of the parallel portions of the rods or bars 2 and 4 and are adapted to connect the same and to form the corners of  
 70 a car. Cross-bars 9 and 10 connect the upper and lower ends of the bars 8 at their point of juncture with the bars 2 and 4, and diagonally-arranged cross-braces 12 connect the opposite upper and lower corners of the sides of the  
 75 car-frame formed by the bars 2, 4, and 8.

A suitable flooring or platform 13 is formed on the lower side bars 4 and cross-bars 10, on which is supported the engine 14 and driving mechanism for the machine. Below the plat-  
 80 form 13 is arranged a central longitudinally-disposed power-shaft 15, suitably journaled in hangers, and on said shaft is fixed a spocket-wheel 16, which is connected by a sprocket-chain 17 to a spocket-wheel on the drive-  
 85 shaft of the engine. On the outer end of the shaft 15 is fixed a sprocket-wheel 18, which is connected by a sprocket-chain 18' to a sprocket-wheel 19, loosely mounted on the end of a horizontal longitudinally-disposed  
 90 shaft 20, arranged in the front part of the frame 1 and suitably journaled in bearings carried by said frame. The outer end of the shaft 20 projects beyond the end of the frame and has mounted thereon a propeller 21, which  
 95 may be of any suitable construction, the blades of which are suitably braced to the shaft 20.



20' denotes a clutch member slidably mounted upon the inner end of the shaft 20 to rotate therewith. The said clutch member is adapted to be moved into engagement with a coacting  
 5 clutch member formed on the loosely-mounted sprocket-wheel 19 by means of a forked shifting-lever 22, suitably mounted in the frame of the car. To the upper end of the lever is connected one end of an operating-rod 23, the  
 10 opposite end of which is connected to an operating-lever 24, arranged at the opposite end of the car.

25 denotes vertically-disposed shafts arranged near each end of the frame 1 and suitably mounted and braced therein by brace-  
 15 rods 26. On the upper ends of the shafts 25 are mounted bevel gear-pinions 27, which are adapted to mesh with bevel gear-wheels 28 and 29, arranged above the same and mounted  
 20 upon a shaft 30, which is supported above the pinions 27 by means of braces 31, which are connected at their lower ends to the brace-rods 26 and shafts 25.

32 denotes shafts which are practically extensions of the shafts 25, and on the lower  
 25 ends of the shaft 32 are mounted bevel gear-pinions 33, which are adapted to mesh with the gear-wheels 28 and 29 above the pinions 27. The lower ends of the shafts 32 above  
 30 the pinions 33 are supported in cross-bars 34, which are supported by inclined braces 35, pivotally connected at their lower ends to the shafts 30 between the gear-wheels 28 and 29. The shafts 32 are further supported and  
 35 braced by inclined brace-bars 36, pivotally connected at their lower ends to the outer ends of the shafts 30 beyond the gear-wheels 28 and 29.

37 denotes segmental racks arranged below  
 40 the pinions 27 and connected by diverging brace-bars to the extension-shafts 32 and also connected by braces to the shafts 30 between the wheels 28 and 29.

38 denotes a horizontal longitudinally-disposed shaft arranged above the machine and rotatably journaled in hangers 39, connected  
 45 to a rod or bar 40, which is arranged above the shaft 38 and connected at its ends to the braces 31. On the ends of the shaft 38 are  
 50 formed fixed worm-gears 41, which are adapted to mesh with the segmental racks 37. On the shaft 38, about midway the length of the same, is fixed a bevel gear-pinion 42, which is adapted to mesh with a bevel-pinion 43,  
 55 fixed to the upper end of a vertically-disposed shaft 44, which is suitably mounted on brace-rods 45, which extend from the bar 40 to the top bar of the car. On the lower end of the shaft 44 is fixed a hand-wheel 46, which when  
 60 turned will rotate the shaft 44, which in turn will rotate the shaft 38 and worm-gears 41, which being in mesh with the segmental racks 37 will turn the same, thereby tilting the extension-shafts 32, as will be understood.

47 denotes the upper elevating-fans carried  
 65 by the extension-shafts 32. These fans may be of any suitable construction, but are preferably formed with eight blades suitably arranged upon a central hub and braced to the shaft 32. 70

On the lower end of the shafts 25 are fixed bevel gear-pinions 48, which are adapted to mesh with similar gears 49, fixed on the  
 75 ends of inclined shafts 50, which are suitably mounted in bearings 51 on the lower portions of the ends of the frame 1. On the inner ends of the shafts 50 are fixed bevel-gears 52, which are adapted to mesh with the bevel-gears 53, mounted on the ends of the shaft  
 80 15 and from which shaft motion is transferred to the shafts 25 to rotate the same and the fans 47, as will be understood.

54 denotes brace-rods connected at their lower ends to the ends of the frame, the upper  
 85 ends of the rods being connected to the upper ends of shafts 25 and braces 26 to securely brace and hold the shafts 25 in position.

55 denotes a transversely-arranged shaft journaled in bearings 56 on the platform of  
 90 the car and supported near its outer ends in bearings 57, which are supported by the upper and lower inclined brace bars or rods 58 and 59.

60 denotes a bevel-gear mounted upon the  
 95 shaft 55 near the center of the same, said gear being adapted to mesh with a similar bevel-gear 61, fixed to the end of a short longitudinally-disposed shaft 62, journaled in bearings 63 on the car-platform. On the op-  
 100 posite end of the shaft 62 is fixed a spur-gear 64, which is adapted to mesh with a similar gear 65, loosely mounted on the power-shaft 15. A clutch member 66 is slidably  
 105 mounted on the shaft 15 to rotate therewith, said clutch member being adapted to be moved into engagement with a clutch member formed on the gear 65, whereby when said clutch members are engaged motion will be transferred from the power-shaft 15 to rotate the  
 110 shaft 55. A clutch-shifting lever 67 is pivoted in the platform and adapted to be operated to shift said clutch. On the outer ends of the shaft 55 are fixed bevel gear-pinions 68.

69 denotes rings or bands having annularly-  
 115 grooved outer surfaces 70 and provided on their inner surfaces with annular series of gear-teeth 71. The rings or bands 69 are arranged around the shaft 55 near the outer  
 120 ends of the same and are supported by means of annular collars 72, carried by the outer ends of the brace-rods 58 and 59. Fixed to the outer faces of the rings or bands 69 are horizontally-projecting arms 73, arranged one  
 125 above the other and connected at their outer ends by vertically-disposed bars or plates 74. In the outer ends of the arms 73 are journaled the upper ends of depending shafts 75, on



which are mounted the lower or side elevating-fans 76. On the upper ends of the shafts 75 are fixed bevel gear-pinions 77, which are adapted to mesh with the bevel gear-pinions 68 on the ends of the shaft 55, as shown, and by means of which the fans 76 are rotated.

78 denotes a transversely-disposed rod or shaft arranged immediately above the shaft 55 and in line with the same, the shaft 78 being journaled in extensions of the bearings 57. On the outer ends of the shaft 78 are fixed spur gear-pinions 79, which are adapted to mesh with the internal annular series of teeth 71, formed on the ring 69, so that when the shaft 78 and gear-pinions 79 are turned the pinions will rotate the rings or bands 69, which will turn the arms 73, carrying the fan-shafts 75, and tilt the same and the fans 76 to such angle as may be desired.

80 denotes a worm-gear fixedly mounted upon the rod or shaft 78, and 81 denotes a worm fixed on the lower end of a suitably-mounted inclined shaft 82, having at its opposite end a hand-wheel 83, whereby the shaft 82 may be turned to rotate the shaft 78 and tilt said fans in the manner just described.

The fans 76 may be of any suitable construction, the blades of the same being suitably braced to the shafts 75.

84 denotes the rudder, the inner end of which is connected to the rear end of the frame 1 by a universal joint 85. To the inner end of the rudder are connected the ends of laterally-projecting arms or levers 86 and 87.

88 and 89 denote upper and lower projecting arms or levers also connected to the inner end of the rudder.

90 and 91 denote operating-levers pivoted above the platform of the car and carrying pawls which are adapted to operate in conjunction with segmental racks 92. The lower ends of the levers 90 and 91 are adapted to project below the pivotal points of the same.

93 and 94 denote ropes which connect the rudder-arms 86 and 87 to the lever 90 at points above and below its pivotal connection, whereby the rocking of said lever will swing the rudder 84 laterally one side or the other.

95 and 96 denote ropes which connect the rudder-arms 88 and 89 to the lever 91 above and below the pivotal point of the same, whereby the rocking of this lever will swing the rudder up or down above or below the horizontal plane of the same.

97 represents ropes or cables connected to the frame for supporting the frame and operating mechanism from a gas-field. (Not shown.)

In operation the upper and lower elevating-fans are first started to raise the machine to the desired height. The propeller is then thrown into gear and the elevating-fans tilted forwardly by the mechanism herein described, in which position they assist the pro-

PELLER in the propulsion of the machine, as well as keeping the same up. The course of the machine is determined and controlled by the rudder through the operating-levers and ropes connecting with the same. It will be noted that all the controlling levers and wheels are arranged at one end of the car in convenient reach of the operator, so that every part of the machine is under the control and may be quickly thrown into or out of gear or manipulated at the will of the operator.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

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

1. In a machine of the character described, the combination with a supporting-frame of upper elevating-fans arranged above and at each end of said frame and adapted to be tilted, means for operating said fans in their upright and tilted positions, a horizontal transversely-disposed shaft supported upon said frame, means for rotating said shaft, brace-rods adapted to support the outer ends of said shaft, lower elevating-fans arranged at the outer ends of said shaft and adapted to be operated thereby, an exteriorly-grooved ring or band rotatably supported in the outer ends of said brace-rods, and having an interior, annular series of gear-teeth, horizontally-projecting supporting-arms fixed to said ring or band the outer ends of which are adapted to support said lower fans, a transversely-arranged shaft having on its ends spur gear-pinions which are adapted to engage the annular series of teeth in said rings or bands whereby upon rotation of said shaft said rings or bands and the supporting-arms fixed thereto will be turned to tilt said lower fans, a propeller arranged at the forward end of said framework and a rudder arranged at the rear end of the same, and means for operating the same, substantially as described.

2. In a machine of the character described, the combination with an open framework, having a centrally-arranged platform or car, of perpendicular shafts rotatably supported near each end of said framework, upper elevating-fans mounted upon short shafts and arranged above said perpendicular shafts, a system of gearing adapted to connect said upper and lower shafts to rotatably support said fans and permit the same to be tilted forwardly or rearwardly, segmental racks car-



ried by said fan-shafts, a horizontal longitudinally-disposed shaft supported above said framework, worm-gears carried at the ends of said shaft and adapted to engage the teeth  
5 on said segmental racks, means for rotating said shaft and worm-gears to actuate said rack and tilt said fans, a transverse shaft rotatably supported upon said platform, lower elevating-fans arranged at the ends of said  
10 shaft, and adapted to be driven thereby, means whereby said lower fans may be tilted, a propeller rotatably mounted at the forward

end of said framework, means for driving said propeller, and steering apparatus arranged at the rear end of said framework, substantially 15 as described.

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

STEPHEN MERRILL CRAIG.

Witnesses:

JOHN CRAIG,  
JOHN F. HOGUE.