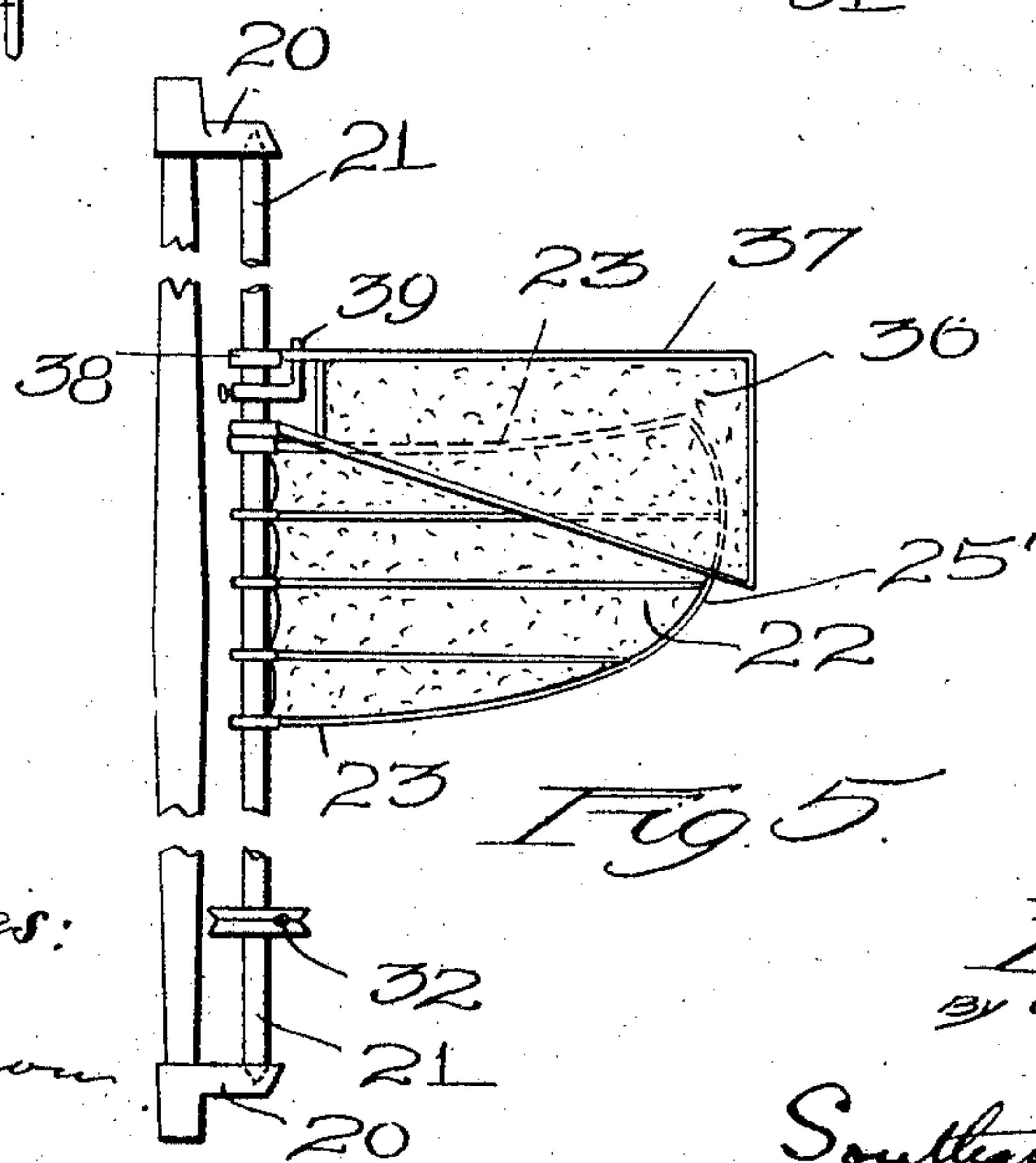
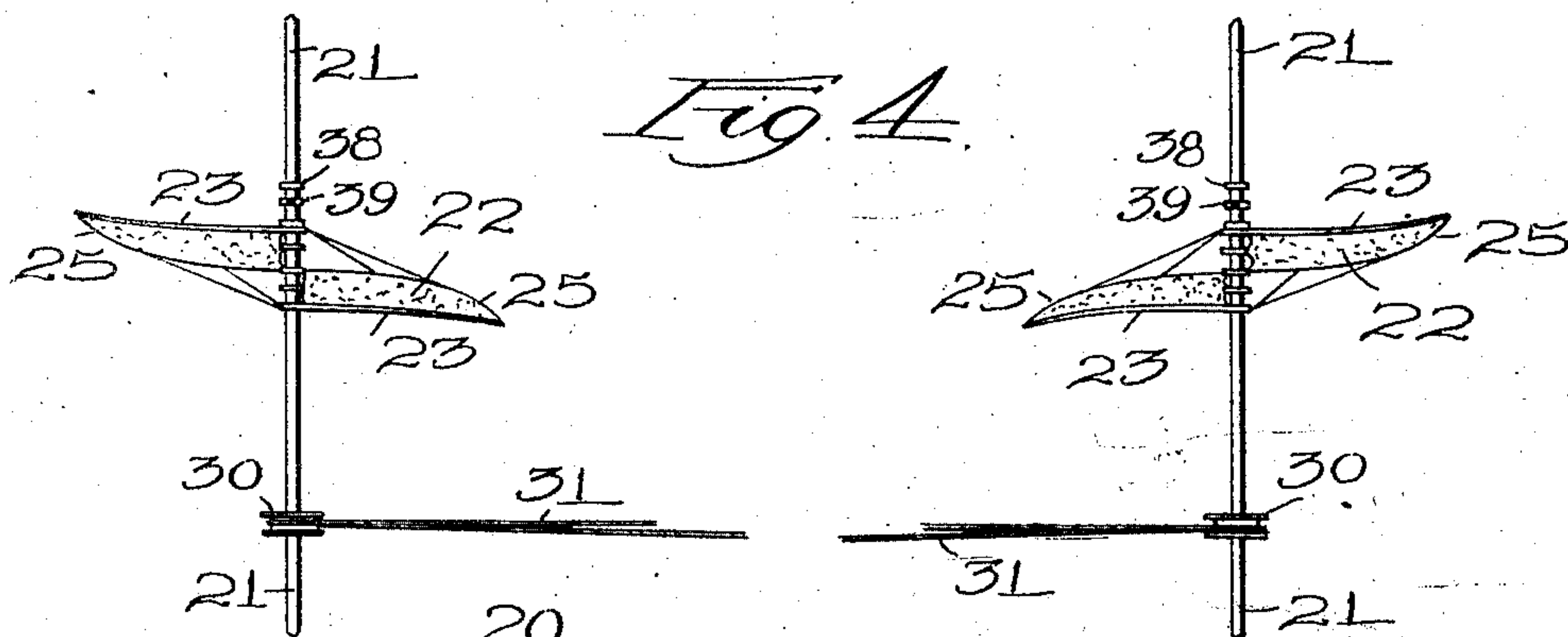
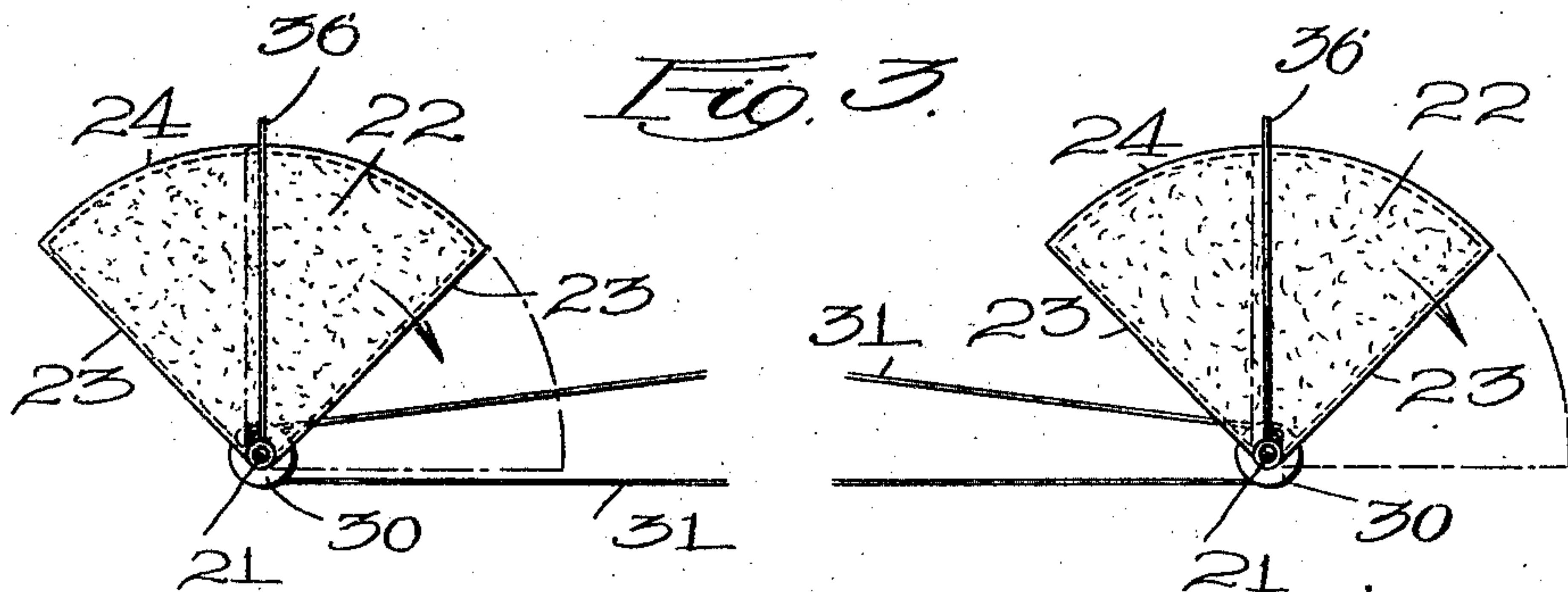


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AEROPLANE.
APPLICATION FILED JULY 12, 1910.

998,333.

Patented July 18, 1911.

2 SHEETS-SHEET 2.



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AEROPLANE.

998,333.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FREDERICK FARMER, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Aeroplane, of which the following is a specification.

This invention relates to an aeroplane and is capable of application to monoplanes, biplanes, gliders and other machines of this general character.

The principal objects of the invention are to provide a simple and practical means for balancing the machine and keeping it on an even keel, and to provide means of this character which will be operated automatically by the tilting or tipping of the machine and which can be operated by hand if desired.

Further objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings in which—

Figure 1 is a plan of a biplane constructed in accordance with this invention. Fig. 2 is a side view of the same. Fig. 3 is a plan of the balancing or stabilizing planes. Fig. 4 is a front elevation thereof, and Fig. 5 is an end view of the same.

The invention is shown as applied to a type of machine having a top plane 10, bottom plane 11, front control 12, rear rudder 13, tail 14, propeller 15, and other features which are known in this art. The form and construction of the frame-work, propellers, rudders, etc. may be of any desired style and character and one type only is selected for illustration herein.

The frame work is provided at the opposite front end corners with top and bottom forgings or castings 20 on its end struts. These forgings or castings fit the strut sockets and are provided with bearings on the top and bottom, respectively, for a vertical tubular shaft 21. On each of these shafts is fixed a warped balancing or stabilizing plane 22 preferably supported by a pair of radial arms 23. Each of these arms is fixed to the shaft and extends therefrom substantially in a horizontal line, but they are spaced from each other on the shaft, the upper arm being at a material distance above the lower arm. At the ends these arms are connected by a rib 24 which extends from the end of one to the end of the other in an inclined

direction. This rib may be of any desired shape but it is shown herein as curved. These arms and the rib form a frame or skeleton to determine the shape of the warped plane 22. At its upper end the rib 24 turns upwardly and at the lower end downwardly, so as to produce corresponding curves 25 in the plane. From the construction that has been described, it will be seen that this warped plane is higher on one side than on the other, and that it gradually rises from the low side to the high side through an angle of about ninety degrees, the arms being placed at about right-angles to each other. The curves 25 accentuate this feature.

The two balancing planes are located so that both upper arms are on the outer side.

The two shafts 21 are provided with pulleys 30 in the same plane. A belt, chain or cable 31 is fixed to these pulleys as by screws 32 so that the two shafts must turn together simultaneously and through the same arc. It will be understood that these flexible connections 31 can be operated by hand as they pass directly in front of the operator. However, it is desired to have them operate automatically and for this purpose a pendulum 35 is shown at the center of the machine hung from a pivot 36 above so as to swing freely transversely of the machine and connected with one of the strands of the endless connection 31.

If desired, the pendulum instead of being an otherwise useless weight by itself, can be formed by using the radiator 33 of the gas engine or by using the seat 34 for the operator for that purpose. In this case, the seat is swung from a pivot at about the height of the operator's shoulder. By the latter two devices, the weight of the parts of the machine is not materially increased by the addition of this controlling device. It will be obvious that with the parts as arranged, the pendulum, radiator, or seat will hang vertically downward and when the machine is operating on an even keel, will keep at the center. This is the position shown in Figs. 1 and 3 and the balancing planes are located in a central neutral position with the vane 25 also in neutral position extending directly backward from the shafts 21. Now, if the car tips in either direction, it will be seen that the pendulum will swing in that direction with respect to the car and carry the flexible connection

toward one of the planes and away from the other. This acts on the two pulleys to turn the shafts and swing the upper plane inwardly and the lower one outwardly.

5 The plane that is swung outwardly will come into a position in which the higher arm 23 projects out beyond the end of the machine. It will be obvious, that on account of the construction of this balancing

10 plane, its projection into this position will produce an additional buoyancy on this side and cause this end of the car to rise. This is due to the shape of the warped plane and the position of the high arm thereof and

15 is assisted by its curved edges. At the same time the other plane swings inwardly and its lower arm comes to the front while its high arm is at the rear. In this way, it goes through the air in such way as to cause a

20 depressing effect at this end, although not as great as the buoyant effect on the other end. While this double result is effective for the purpose of righting the machine and bringing it back to a level position, it has

25 one disadvantage in that the two planes being at different distances from the center have a tendency to swing the machine around slightly and take it out of its course to one side. In order to avoid depending

30 on the ordinary rudders for the purpose of counter-acting this effect, automatic means is shown for the purpose of immediately causing a steering action to take place in the opposite direction. This consists in the pro-

35 vision of a vertical vane 36 in connection with each of the balancing planes. Each of these vanes normally is centrally located and extends from the shaft back to the center of the rib 24. Each vane is mounted

40 on a frame 37 which has an eye 38 encircling the shaft 21 and is adapted to swing thereon. The position of each vane is limited by a dog 39 fixed to the shaft and adapted to engage the outer side of the frame 37

45 while the vane is swinging to its limiting position. This dog is so located on the vertical shaft 21 that when the plane starts to swing inwardly it brings the vane around toward the center of the machine. At this

50 time the other vane is left free, because its dog moved away from it. In this way, it will be seen that the steering effect of the planes can be entirely counter-acted.

The purpose of the upward curves 25 in

55 the two balancing planes is to counteract the tendency to drift, produced when the planes are operated. By the upward turn at the outer side the air is forced to pass under the plane and thus tend to lift it.

60 While I have illustrated and described a preferred embodiment of the invention, and shown it as applied to a particular type of aeroplane, I am aware that many modifications can be made therein, and that

65 it can be applied to many or all types of

aeroplanes, by any person skilled in the art without departing from the scope of the invention as expressed in the claims. Therefore, I do not wish to be limited to all the details of construction shown and described, 70 or to the particular type of machine illustrated, but

What I do claim is:—

1. In an aeroplane, the combination with the plane or planes, of a vertical shaft, a 75 balancing plane fixed to said shaft and having two rearwardly extending edges at an angle to each other, the outer one of said edges being higher than the inner one, and means for turning the balancing plane about 80 the axis of the shaft.

2. In an aeroplane, the combination of the plane or planes, a pair of vertical shafts located at opposite sides thereof, and a balancing plane extending rearwardly from 85 each shaft in a general horizontal direction, each of said planes having an outer edge and an inner edge, said outer edges being higher than the inner edges, and a rear edge connecting the ends of the outer edges. 90

3. In an aeroplane, the combination of the plane or planes, vertical shafts located at opposite sides thereof, a balancing plane extending rearwardly from each shaft, each 95 of said planes having an outer edge and an inner edge, said outer edges being higher than the inner edges, and a rear edge connecting the ends of the outer edges, and means for simultaneously operating said balancing planes to swing one inwardly and 100 the other outwardly.

4. In an aeroplane, the combination of the plane or planes, a pair of vertical shafts located at opposite sides thereof, balancing 105 planes extending rearwardly from each shaft in a general horizontal direction, and means automatically operated by the tipping of the aeroplane for swinging both of said balancing planes in the same direction and bringing the one on the lower side out 110 and the one on the upper side in.

5. In an aeroplane, the combination of the plane or planes, a pair of balancing planes extending in a general horizontal direction 115 rearwardly, and means automatically operated by the tipping of the aeroplane for swinging both of said balancing planes in the same direction and bringing the one on the lower side out and the one on the upper 120 side in.

6. In a device of the character described, the combination of a pair of vertical shafts one at each side of the device, two arms on 125 each shaft at an angle to each other, and projecting outwardly from the shaft substantially in a horizontal direction, the outer of said arms on each shaft being higher than the inner arm, a frame-work connecting said arms and a covering for the 130 frame work and arms constituting a warped

plane with the high side out, and means for normally keeping both of said warped planes in a neutral position in which they have no effect upon the relative height of the two sides of the device, and for automatically swinging them, when the device tips, toward the side which tips down.

7. In a device of the character described, the combination of a pair of vertical shafts one at each side of the device, two arms on each shaft at an angle to each other, and projecting outwardly from the shaft in a horizontal direction, the outer of said arms on each shaft being higher than the inner arms, a frame-work connecting said arms, a covering for the frame-work and arms constituting a warped plane, means for normally keeping both of said warped planes in a neutral position, and for automatically swinging them when the device tips, said means comprising a pair of pulleys on said shafts, an endless flexible connection for said pulleys, and a weight suspended from above and connected with said flexible connection.

8. In a device of the character described, the combination of a pair of vertical shafts one at each side of the device, two arms on each shaft at an angle to each other, and projecting outwardly from the shaft, the outer of said arms on each shaft being higher than the inner arm, a covering for the arms constituting a warped plane, means for normally keeping both of said warped planes in a neutral position and for automatically swinging them when the device tips, said means comprising a flexible endless connection connected with said shafts and adapted to turn them both through the same angle and in the same direction, and a gas engine radiator suspended from above and free to swing transversely of the device and connected with said flexible connection, whereby the swinging of said radiator as the device tips will move the connection and swing the shafts.

9. In a device of the character described, the combination of a pair of vertical shafts one at each side of the device, two arms on each shaft at an angle to each other, and projecting outwardly from the shaft, the outer of said arms on each shaft being higher than the inner arms, a covering for the arms constituting a warped plane, means for normally keeping both of said warped planes in a neutral position and for automatically swinging them when the device tips, said means comprising an endless flexible connection connected with said shafts, and a seat for the operator suspended from above and connected with said flexible connection, whereby when the car tips the seat will swing and move the flexible connection to turn the shafts.

10. In a device of the character described, the combination of a vertical shaft, a pair

of arms fixed to the shaft and extending from the same at right angles to the shaft and at an angle to each other, one of said arms being higher than the other, a covering connecting said arms and producing a warped balancing plane, and means for turning said shaft to bring either one of said arms to the front, whereby the warped plane will be either depressed or buoyed up, according to its position.

11. In a device of the character described, the combination of a warped balancing plane oscillatable on a vertical axis, having two outer arms projecting substantially horizontally from said axis at an angle to each other, one located higher than the other, a covering for said arms connecting one arm with the other and constituting a warped balancing plane, said cover projecting upwardly along the outer arm and downwardly along the inner arm.

12. In a device of the character described, the combination of a vertical shaft, a pair of arms fixed to the shaft and extending from the same at an angle to each other, one of said arms being higher than the other, a covering connecting said arms and producing a warped balancing plane, means for turning said shaft to bring either one of said arms to the front, whereby the warped plane will be either depressed or buoyed up, and a vane mounted to swing on said shaft and normally extending directly backwardly therefrom, said shaft being provided with means for swinging the vane to a position in which the vane acts as a rudder to counter-act the steering effect of the operation of the balancing plane.

13. In an aeroplane, the combination of the plane or planes, vertical shafts located at opposite sides thereof, a balancing plane extending backwardly from each shaft, means automatically operated by the tipping of the aeroplane for swinging both of said balancing planes in the same direction and bringing the one on the lower side out and the one on the upper side in, and means for counteracting the steering effect produced by this operation.

14. In a device of the character described, the combination of a pair of vertical shafts one at each side of the device, two arms on each shaft at an angle to each other, an arm projecting outwardly from the shafts, the outer of said arms on each shaft being higher than the inner arms, a frame-work connecting said arms, a covering for the frame-work and arms, means for normally keeping both of said coverings in a neutral position in which they have no effect upon the relative height of the two sides of the device, and for automatically swinging them when the device tips, and means for automatically counteracting the steering effect produced thereby.

15. In a device of the character described, the combination of a vertical oscillatable shaft, a balancing plane secured thereto and projecting backwardly therefrom, a vertical vane mounted to turn on said shaft and extending backwardly therefrom, and a dog on the shaft for swinging said vane.

16. In an aeroplane, the combination of a plane or planes, a balancing plane at each side of the center of the aeroplane and means for laterally shifting said balancing planes, and an automatic steering means adjacent to each of said balancing planes.

17. In an aeroplane, the combination of a

plane or planes, a balancing plane at each side of the aeroplane, a steering vane adjacent to each of said balancing planes and means for automatically bringing each steering vane into action when needed to counteract the steering effect of its adjacent balancing plane.

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

FREDERICK FARMER.

Witnesses:

ALBERT E. FAY,

C. FORREST WESSON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."