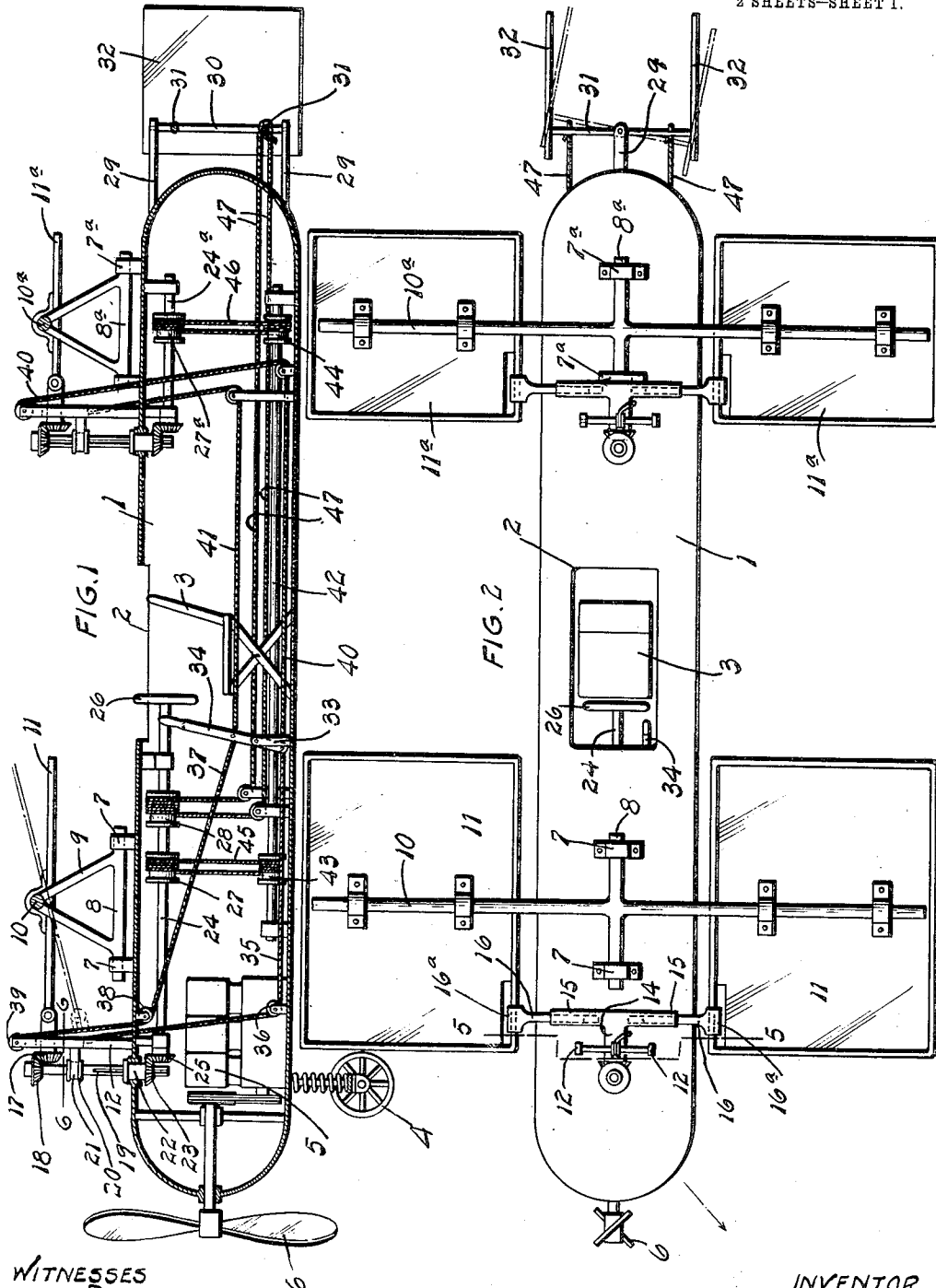


L. O. SCHOPP.
AERIAL VEHICLE STABILIZER.
APPLICATION FILED JAN. 5, 1912.

1,040,434.

Patented Oct. 8, 1912.

2 SHEETS—SHEET 1.



WITNESSES

Mr. Janus.
W. P. Smith

INVENTOR

LAURENCE O. SCHOPP

BY *W. P. Smith* ATT'Y

L. O. SCHOPP.
AERIAL VEHICLE STABILIZER.
APPLICATION FILED JAN. 5, 1912.

1,040,434.

Patented Oct. 8, 1912.

2 SHEETS—SHEET 2.

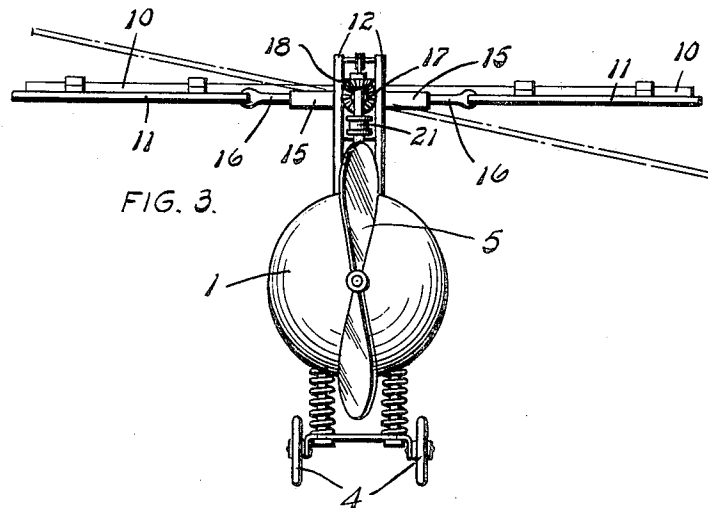


FIG. 3.

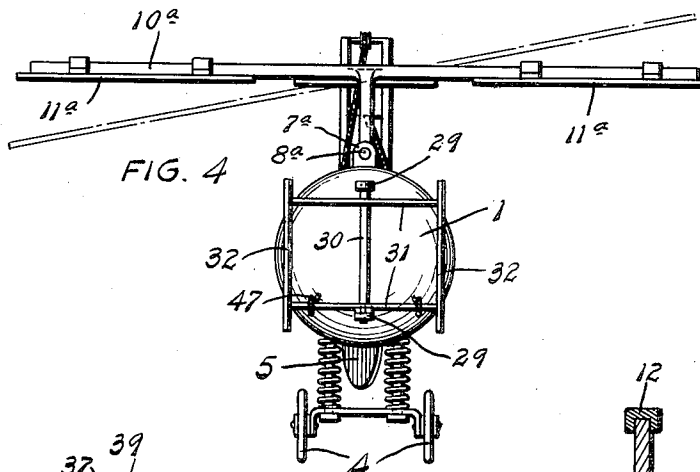


FIG. 4.

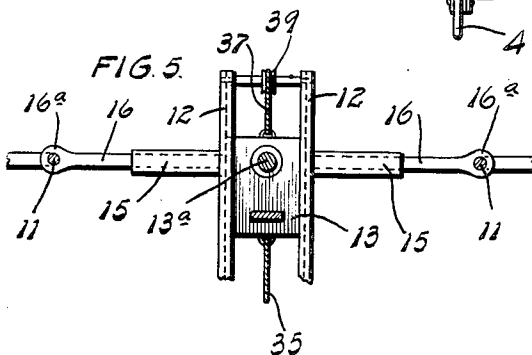


FIG. 5.

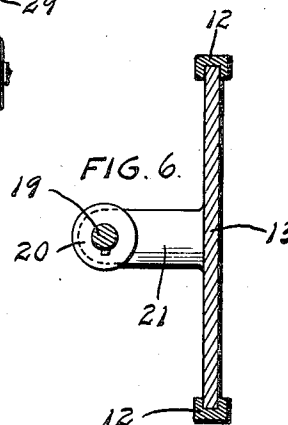


FIG. 6.

WITNESSES

Wm. Janus.
W. P. Smith

INVENTOR

LAURENCE O. SCHOPP

BY J. H. Cornwall ATT'Y.

UNITED STATES PATENT OFFICE.

LAURENCE O. SCHOPP, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-HALF TO CONRAD L. SCHOPP, OF ST. LOUIS, MISSOURI.

AERIAL-VEHICLE STABILIZER.

1,040,434.

Specification of Letters Patent.

Patented Oct. 8, 1912.

Application filed January 5, 1912. Serial No. 669,695.

To all whom it may concern:

Be it known that I, LAURENCE O. SCHOPP, a citizen of the United States, residing at St. Louis, State of Missouri, have invented a certain new and useful Improvement in Aerial-Vehicle Stabilizers, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical section taken longitudinally through the center of an aerial vehicle or flying machine of my improved construction. Fig. 2 is a plan view of the machine. Fig. 3 is a front elevational view. Fig. 4 is a rear elevational view. Fig. 5 is an enlarged cross sectional view taken approximately on the line 5—5 of Fig. 2. Fig. 6 is an enlarged detailed section taken on the line 6—6 of Fig. 1.

This invention relates generally to flying machines and more particularly to means for producing stability and automatically maintaining equilibrium of the machine during flight and particularly while the machine is turning laterally in either direction.

The principal object of my invention is to construct a flying machine having an elongated cylindrical body adapted to contain the motor and the greater portion of the operating mechanism of the machine and which body is suspended pendulum like upon longitudinally disposed and transversely disposed axes from the planes and further to provide simple means for tilting the planes both longitudinally and laterally with respect to the axes of the body of the machine for the purpose of causing the machine to ascend or descend during forward flight or to turn laterally in either direction.

When it is desired to turn laterally in either direction during flight, the planes of my improved machine can be tilted upon longitudinally disposed axes so that the planes on one side of the machine are moved downward and the planes on the opposite side are correspondingly moved upward and when so positioned, the planes impinge on the air in such a manner as to overcome the tendency of the entire machine to lose its equilibrium, for during the time the planes occupy inclined positions the body of the machine suspended below said planes auto-

matically swings to a central position, thereby shifting the center of gravity so as to oppose the forces tending to destroy stability and equilibrium.

With the above purposes my invention consists in certain novel features of construction and arrangement of parts hereinafter more fully described and claimed.

Referring by numerals to the accompanying drawings, 1 indicates the body of my improved machine which is constructed of suitable light weight, strong material of elongated cylindrical form with its ends round or pointed as desired. An opening 2 is formed in the top of the body 1 preferably at a central point and positioned within the body immediately below this opening is a seat 3 for the operator. The body is preferably equipped on the under side of its ends with small traction wheels 4 which support the machine while on the ground.

Located at any convenient point within the body of the machine, preferably in the forward portion thereof, is a motor 5 and adapted to be driven thereby is a propeller 6 which is mounted on a shaft at the forward end of the body.

Positioned on top of the body 1 and centrally arranged thereon are bearings 7 and 7^a arranged in pairs and journaled in these bearings are short longitudinally disposed shafts 8 and 8^a.

Extending upwardly from the shaft 8 on the forward portion of the machine is a pair of arms 9 and rigidly fixed to the upper ends of these arms in a plane substantially above the plane occupied by the shaft 8 is a transversely disposed shaft or rod 10. Carried by the outer ends of this shaft 10 and arranged to rock thereon is a pair of forward planes 11, the same being constructed of suitable light weight strong material preferably rectangular in form.

Connected to the rear shaft 8^a is a transversely disposed shaft 10^a and supported by the outer ends thereof is a rear pair of planes 11^a which are in every way similar to the planes 11, although this rear pair of planes may be somewhat shorter than said forward planes.

Fixed to the top of the body 1 in front of the bearings 7 is a pair of grooved standards 12 and arranged to slide vertically between these standards is a block 13. Journaled in suitable bearings in the upper portion of

this block is a short shaft 13^a and fixed on the rear end thereof is an arm 14. Projecting laterally from the end of said arm are tubular members 15 in which are loosely seated rods 16, the outer ends of which are provided with bearings 16^a that are loosely mounted on the forward ends of the inner side rails of the planes 11.

Fixed on the forward end of the shaft 13^a is a beveled pinion 17 and meshing therewith is a correspondingly beveled pinion 18 which latter is fixed on the upper end of a shaft 19. This shaft is provided with a grooved collar 20 which is engaged by a yoke 21 projecting forwardly from the lower portion of the block 13. The lower portion of the shaft 19 is grooved vertically to receive a key or feather carried by a sleeve or collar 22 which latter is journaled for rotation in a suitable bearing formed in the top of the body 1, and formed on the lower end of this collar is a beveled pinion 23. By this construction the shaft 19 is free to slide vertically through the collar 22 and when the pinion 23 is rotated, the motion is imparted to the shaft and the pinion 18 carried thereby.

24 designates a shaft which is journaled for rotation in suitable bearings depending from the upper portion of the body 1 in front of the opening 2 therein and fixed on the forward end of this shaft is a beveled pinion 25 which meshes with the pinion 23.

A hand wheel 26 is fixed on the rear end of the shaft 24 immediately in front of the seat 3 and carried by the central portion of said shaft 24 are winding drums 27 and 28.

A second mechanism identically like the mechanism just described is positioned immediately in front of the bearings 7^a and is connected to the forward inner corners of the rear pair of planes 11^a so that said rear pair of planes can be operated in the same manner as the front planes.

The shaft 24^a within the body of the machine below the rear pair of planes corresponds to the shaft 24, but said shaft 24^a is not provided with a steering wheel and it carries but one winding drum 27^a.

Projecting rearwardly from the body 1 is a pair of brackets 29 and journaled between the outer ends thereof is a vertically disposed shaft 30. Projecting laterally from this shaft 30 are horizontally disposed arms 31 and arranged upon said arms is a pair of vertically disposed planes 32 which are adapted to perform the function of rudders or steering planes for guiding the machine laterally during flight.

33 designates a bracket projecting upwardly from the bottom of the body 1 in front of the seat 3 and fulcrumed on said bracket is a hand lever 34. Connected to the lower end of this hand lever below the fulcrum point is one end of a flexible member 35 such as a wire or cable and said flexible

member extends forwardly around the pulley 36 and from thence upwardly through the top of the body 1 and is attached to the lower end of the block 13.

Connected to the lever 34 above the fulcrum point thereof is one end of a flexible member 37 which extends forwardly around the pulley 38 and from thence upwardly over a pulley 39 at the top of the grooved standards 12 and from thence said member extends downwardly and its end is connected to the top of the block 13.

One end of a flexible member 40 is connected to the lower end of the lever 34 and extends rearwardly thence upwardly and around suitably arranged grooved pulleys and the end of this flexible member is connected to the top of the vertically moving block forming a part of the operating mechanism for the rear pair of planes 11^a. One end of a flexible member 41 is connected to the lower end of this vertically moving block and the opposite end of said member 41 is connected to the lever 34 above the fulcrum point thereof.

Journaled for rotation in suitable bearings within the body 1 and upon the bottom thereof is a longitudinally disposed shaft 42 and fixed thereon immediately below the drum 27 is a drum 43. A second drum 44 is fixed on the shaft 42 directly below the drum 27^a. Connecting the drums 27 and 43 is a cable 45 and connecting the drums 27^a and 44 is a cable 46.

The central portion of a cable 47 is wound upon the drum 28 and the end portions of said cable extend rearwardly through the body 1 around suitable pulleys and the ends of said cable are connected to the outer portions of the lower one of the transverse arms 31.

During flight the machine is drawn forwardly through the air under the influence of the propeller 6 and to tilt the planes or to move the same upon their transverse axes so as to cause the machine to ascend or descend during flight, the operator manipulates the handle 34. To bring about an ascending movement, the upper end of the lever is drawn rearwardly thereby drawing the main body portion of the cable 37 rearwardly, consequently pulling the block 13 upwardly between the grooved guides 12 and, as a result, the forward ends of the planes 11 are elevated and the rear ends are correspondingly moved downward. As the block 13 is moved upwardly the arm 14 and arms 15 are likewise moved and the rods 16 forming a connection between the arms 15 and the planes 11 correspondingly move said planes. During this movement the cable 35 connected to the lower end of the block 13 moves downwardly and rearwardly for the reason that its rear end is connected to the lower end of the lever 34. Simultane-

ous and corresponding tilting movement of the rear planes 11^a is effected through the medium of the cables 40 and 41 which are connected to the lever 34 and extend therefrom rearwardly and upwardly to the vertically moving block between the rear pair of planes 11^a. As all of said planes are tilted upon their transverse axes and their forward ends are elevated, said planes will impinge upon the air during the forward movement of the entire machine thereby exerting lifting pressure and as a result the machine gradually ascends as it moves forward.

To bring about a descending movement of the machine, the upper end of the lever 34 is moved forward and by reason of the various connections between said lever and the forward ends of the planes, said planes are shifted upon their transverse axes so as to occupy inclined positions with their forward ends depressed and their rear ends elevated thereby causing the upper surfaces of the planes to impinge against the air and which action causes the machine to descend gradually during its continued forward movement. When the block 13 is moved vertically, the pinions 17 and 18 and the shaft 19 moves vertically and during such movement the lower portions of said shaft which is grooved operates through the collar 22 which latter is provided with an interior feather or key which engages in the groove in the shaft.

When it is desired to cause the machine to move laterally during flight, the operator manually engages the hand wheel 26 and rotates the shaft 24 in the direction toward which it is desired to turn, that is, if it is desired to turn toward the right hand, the hand wheel is rotated toward the right, and, vice versa. Assuming that it is desired to turn toward the left hand, the operator by means of the hand wheel 26 rotates the shaft 24 toward the left and the pinion 25 on the forward end of said shaft meshes with the pinion 23, imparting rotary motion thereto and to the shaft 19 and the pinion 18 mounted thereon. This rotary motion is imparted from the pinion 18 to the pinion 17, thereby rotating the shaft 13^a toward the left hand and as a result the arm 14 carrying the laterally projecting arms 15 is actuated with the result that the left hand one of the arms 15 is moved downward and the right hand one of said arms is moved upward. This movement is imparted to the planes 11 and as a result the transverse rod or shaft 10 is tilted to move into an inclined position as shown in Fig. 3 and during this movement the longitudinally disposed shaft 8 is rocked at its bearings. When the forward pair of planes are tilted or moved into an inclined position, the rear pair of planes is simultaneously and correspondingly moved owing to the connections between the shaft 24 and the

shaft 24^a and which connections include the shaft 42, the drums 27 and 43 connected by the cable 45, and the drums 27^a and 44 connected by the cable 46. Simultaneous with this tilting action of the planes 11 and 11^a, the vertically disposed steering planes or rudders 32 are swung toward the left hand by means of the cable 47 which operates on the drum 28 carried by the shaft 24. Thus the various planes are shifted into abnormal positions and said planes impinging against the air will develop pressure to turn the machine toward the left hand during which time the body 1 of the machine occupies its normal position.

By utilizing the longitudinally disposed rods or shafts 8 and the transversely disposed rods or shafts 10 and suspending the body from the shafts 8 and 8^a and mounting the planes to rock upon the transverse shafts the body at all times performs the function of a pendulum and is suspended in a normal position beneath the planes which latter can be independently moved relative to the body so as to bring about a vertical or lateral movement of the entire machine simultaneous with the forward movement thereof.

I do not desire to confine myself specifically to the means herein shown and described for bringing about a movement of the planes with respect to the body of the machine as said planes can be operated in various ways, but I desire to call special attention to the construction utilizing horizontally disposed and transversely disposed shafts 8, 8^a, 10 and 10^a, which may be termed primary and secondary shafts or axles, which arrangement provides for the suspension of the body of the machine below the planes, thereby materially lowering the center of gravity and permitting the body to adjust itself and maintain its normal position regardless of the positions assumed by the planes and which action may be likened to the action of a pendulum or plumb-bob.

By my improved construction and manner of uniting the planes with the body of the machine, a maximum degree of stability is obtained while the machine is in flight and particularly while the machine is turning laterally in either direction, for when the planes are tilted laterally to effect a turn in either direction, the center of gravity of the machine is correspondingly shifted and the weight of the body is utilized so as to act against the forces tending to destroy or overcome equilibrium.

The action of tilting the shafts 10 and 10^a transversely to position the planes in inclined planes when the machine is turned laterally during flight may be likened to the action of a motor vehicle or other high speed machine taking the banked or inclined turns of a speed way and in theory it is believed that the

planes will tend to automatically move into inclined positions with respect to a vertical plane through the center of the body when the rudders 32 are swung in either direction and for this reason the actuation of the mechanism for tilting the planes will require little effort on the part of the operator as it is believed that it will only be necessary to shift the steering mechanism in response to the automatic tilting movement of the planes.

It will be readily understood that minor changes in the size, form and construction of the various parts of my improved machine can be made and substituted for those herein shown and described without departing from the spirit of my invention, the scope of which is set forth in the appended claims.

I claim:

1. In a machine of the class described, the combination with a body, of a pair of longitudinally disposed shafts rotatably mounted on said body, a transversely disposed shaft rigidly fixed to each longitudinally disposed shaft, a pair of planes mounted on each transversely disposed shaft, a common means for simultaneously tilting the transverse shafts, and a common means for simultaneously tilting the pairs of planes upon said transversely disposed shafts.

2. In a machine of the class described, the combination with a body, of a pair of longitudinally disposed shafts rotatably mounted on said body, a transversely disposed shaft rigidly fixed to each longitudinally disposed shaft, a pair of planes mounted on each transversely disposed shaft, a common means for simultaneously tilting the transverse shafts, a common means for simultaneously tilting the pairs of planes upon said transversely disposed shafts, a propeller at

the forward end of the body, and a pair of vertically disposed rudders at the rear end of said body.

3. In a machine of the class described, the combination with a body, of a pair of longitudinally disposed shafts rotatably mounted on said body, a transversely disposed shaft rigidly fixed to each longitudinally disposed shaft, a pair of planes mounted on each transversely disposed shaft, a common means for simultaneously tilting the transverse shafts, a common means for simultaneously tilting the pairs of planes upon said transversely disposed shafts, a propeller at the forward end of the body, a pair of vertically disposed rudders at the rear end of said body, and means for swinging the pair of rudders laterally.

4. In a machine of the class described, an elongated, hollow, cylindrical body closed at both ends and having an opening in its top near its center, a propeller on the forward end of said body, a motor within the body for driving the propeller, steering means at the rear end of the body for steering the machine laterally during flight, a pair of longitudinally disposed shafts rotatably mounted on the body, transversely disposed shaft rigidly fixed to each longitudinally disposed shaft, a pair of planes mounted on each transversely disposed shaft, a common means for simultaneously tilting the transverse shafts, and a common means for simultaneously tilting the pairs of planes upon the transversely disposed shafts.

In testimony whereof I hereunto affix my signature in the presence of two witnesses, this 2nd day of January, 1912.

LAURENCE O. SCHOPP.

Witnesses:

M. P. SMITH,
JESSIE CLARK.