P. DANIEL.

CONTROLLING MEANS FOR AEROPLANES.

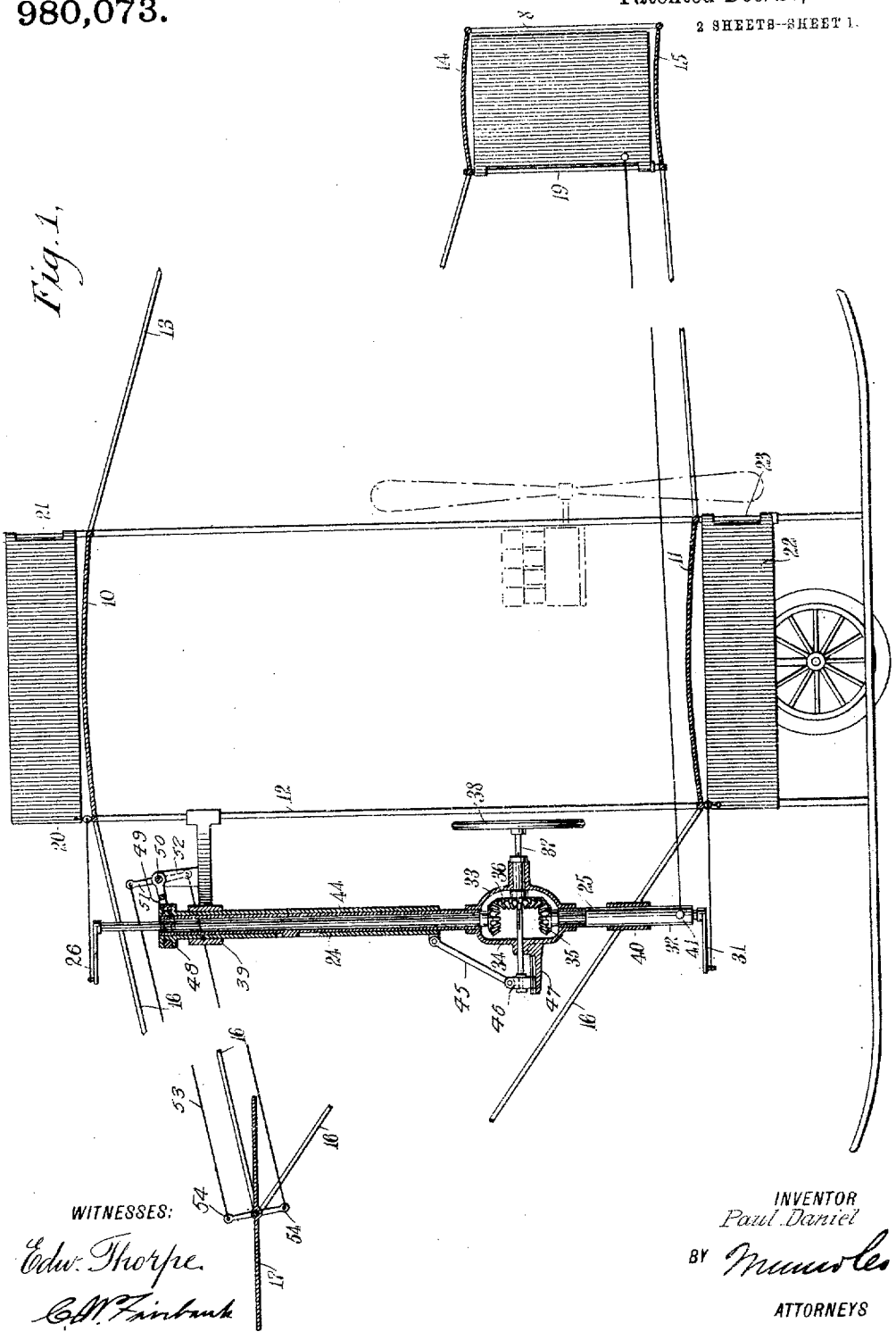
APPLICATION FILED APR. 12, 1910.

980,073.

Patented Dec. 27, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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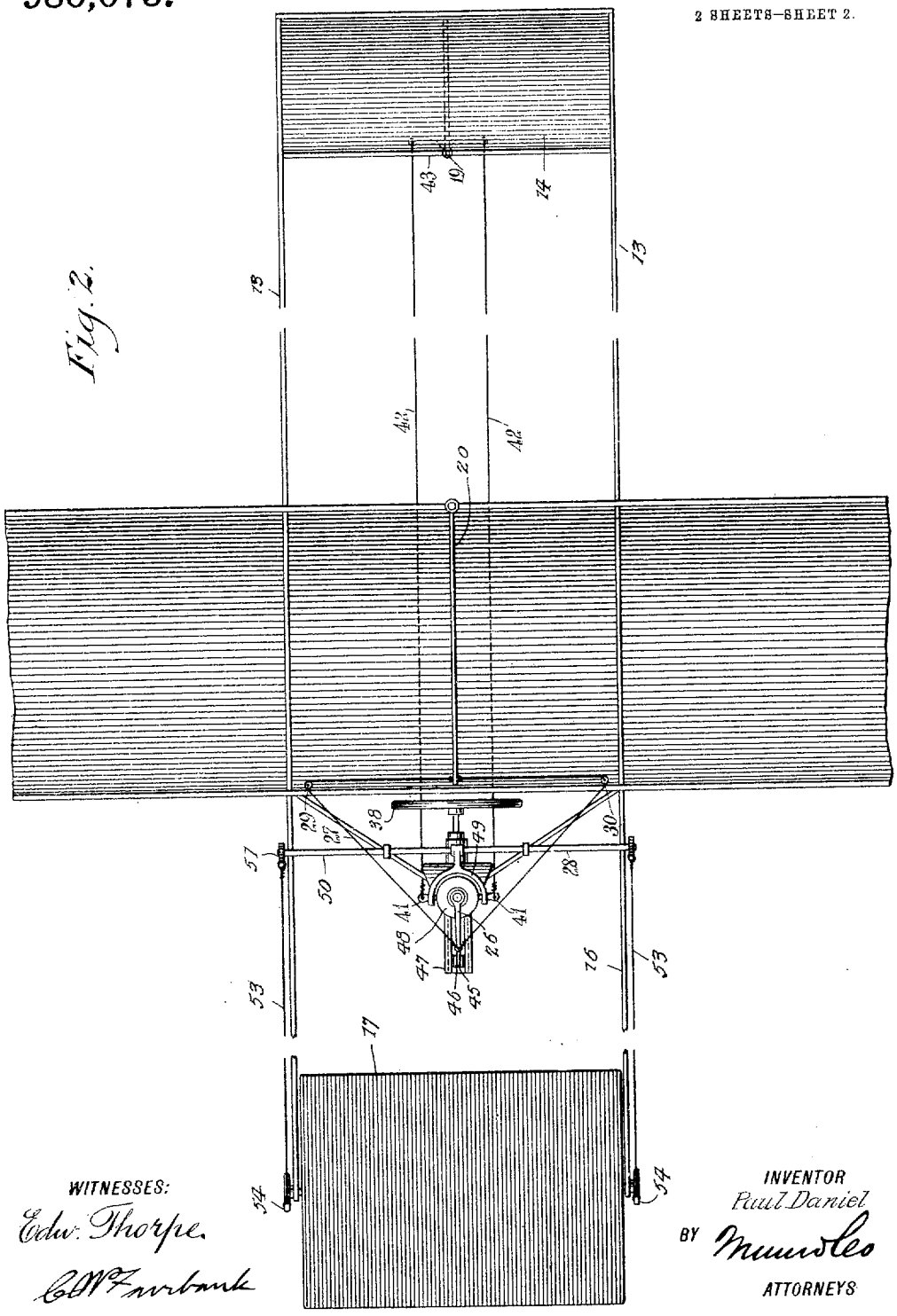
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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CONTROLLING MEANS FOR AEROPLANES.

980,073. Specification of Letters Patent. **Patented Dec. 27, 1910.**

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To all whom it may concern:

Be it known that I, PAUL DANIEL, a citizen of the Republic of France, and a resident of Perth Amboy, in the county of Middlesex and State of New Jersey, have invented a new and Improved Controlling Means for Aeroplanes, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in controlling means for aeroplanes, and more particularly to certain improvements in the positioning of the guiding, steering and balancing rudders and planes, and to the means for operating these independently or simultaneously from a single controlling member.

My invention is not limited to any particular type of aeroplane or to any of the features of construction of the supporting planes or propelling means.

The invention consists in the combination and arrangement of parts hereinafter defined in the claims, and one embodiment of which is described in the specification.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in both the figures, and in which—

Figure 1 is a vertical longitudinal section taken in the median plane of an aeroplane having my improved controlling means applied thereto, and Fig. 2 is a top plan view, a portion being shown in section.

In the specific form of aeroplane illustrated in the accompanying drawings, I employ two main superposed supporting planes 10 and 11, secured to a main frame 12. This main frame serves to support any suitable form of motor and propelling means, and also a suitable seat or support for the aviator. Extending rearwardly from the main frame is an auxiliary frame 13, constituting a tail and having small superposed planes 14 and 15, at the rear end thereof. Extending forwardly from the main frame 12 is an auxiliary frame 16, which at its front end supports an elevating plane 17. Between the two rear planes 14 and 15 is a vertically-disposed rudder 18 movable laterally about a vertical axis 19. This aeroplane so far described is of the type known as a "Farnam biplane", but I wish it distinctly understood that my invention is not in any way limited to use in connection with an aeroplane of this type.

Mounted upon the upper main plane 10, I provide a vertical plane 20, which is supported upon a vertical pivot 21 rigid with the main frame. The front end of the plane 20 is free to swing laterally and aid in maintaining stability. A second vertical plane 22 is a substantial duplicate of the plane 20, but is mounted beneath the lower main supporting plane 11. This vertical plane 22 is secured upon a vertical pivot 23 in alinement with the pivot 21, and the front end of the plane 22 is free to swing laterally. In order to maintain lateral stability of the machine, the planes 20 and 22 are mounted so as to swing simultaneously in opposite directions, and in order to steer the machine means are provided for swinging the two planes simultaneously in the same direction. For swinging these planes, I provide a vertical shaft formed of two sections 24 and 25 in vertical alinement and preferably directly in front of the aviator's seat. The upper shaft section 24 extends upwardly to approximately the level of the upper plane 10 and has a forwardly-extending arm 26. From this arm two wires 27 and 28 extend to pulleys 29 and 30, adjacent opposite sides of the front end of the plane 20, and from these pulleys the two wires extend to said front end. Thus, by rotating the shaft 24, the front end of the plane 20 may be swung in either direction. The lower shaft section 25 terminates down to approximately the level of the lower plane 11, and is provided with a forwardly-extending arm 31, to the free end of which two wires similar to the wires 27 and 28 extend over pulleys and thence to the front end of the lower plane 22.

The two shaft sections 24 and 25 are mounted within a sleeve 32, which includes a casing 33 in front of the aviator's seat. The shaft sections 24 and 25 terminate within this casing and have bevel pinions 34 and 35, respectively, both of which engage with a bevel pinion 36. The pinion 36 is keyed to a shaft 37 extending toward the aviator, and upon the rear end of this shaft is a steering

wheel or lever 38. The shaft is free to move longitudinally through the pinion 36, without altering the position of the latter, the object of which movement will be set forth more fully hereinafter.

The sleeve 32 within which are mounted the two shaft sections 24 and 25, is mounted within bearings 39 and 40 in the forwardly-extending frame 16, and is free to rotate. At one end of this sleeve, preferably the lower end, there are mounted two oppositely-disposed outwardly-extending arms 41, which are connected by rearwardly-extending wires, cords, links or the like 42, to arms 43 connected to the pivot rod 19 of the rear rudder 8.

Outside of the sleeve 32 is a second sleeve 44, which is free to move vertically. This sleeve, at its lower end, is connected by a link 45 to a slide 46 mounted on a bracket 47 carried by the casing 33. This slide is secured to the shaft 37, so that by pulling rearwardly upon the shaft 37, the link will cause the sleeve 44 to move vertically. At the upper end of the sleeve 44 is a collar 48 engaging with a yoke 49 on a rock shaft 50. The rock shaft extends horizontally and is journaled in any suitable form of bearings on the forwardly-extending frame 16. At one or both ends of the rock shaft are upwardly and downwardly-extending arms or levers 51 and 52, connected by wires, cords, links or the like 53, to similar upwardly and downwardly-extending levers or arms 54 secured to the axle or pivotal support of the front elevating plane 17, so that by a reciprocation of the sleeve 44, the elevating plane 17 may be caused to tilt in either direction and to the desired extent.

In the operation of guiding and balancing an aeroplane provided with my improved mechanism, it will be noted that there is only one single controlling member which it is necessary for the aviator to grasp. This member, illustrated as a wheel 38, serves to vary the elevation, to vary the direction, or to maintain the lateral stability, each independently of the other or all simultaneously. Furthermore, the direction in which the controlling member 38 is moved, is that which the aviator would instinctively move it to secure the desired movement of the aeroplane. For instance, if the aviator desires to fly to a greater height, he instinctively leans backward, and in so doing pulls on the wheel 38. This raises the sleeve 44, tilts the rock shaft 50 and moves the arm or arms 51 rearwardly to elevate the front edge of the elevating plane 17 and guide the machine forwardly. If he desires to change the direction of motion of the machine, he instinctively leans in the direction which he desires to turn, and in so doing carries the wheel 38 bodily with him to the desired extent. The bodily movement of the wheel 38 in the lateral direction rotates the sleeve 32 and tilts the rudder to steer the machine in the direction in which the wheel 38 is laterally tilted. Furthermore, the rotation of the sleeve 32 causes a simultaneous rotation of the two planes 20 and 22 in the same direction as the rudder was moved, so that the planes 20 and 22 act with the rudder in steering the aeroplane to change its direction of flight. If a gust of wind tilts upwardly one end of the main planes, the aviator instinctively leans toward the elevated side, and in so doing he rotates the wheel 38. This swings the plane 20 in one direction and the plane 22 in the opposite direction. The wind will thus strike one side of the plane 20 and the opposite side of the plane 22 and tend to lower one end of the main plane and raise the other. Of course the wheel 38 may be moved bodily in one direction and rotated at the same time to give the main planes any desired lateral tilt while making a curve, or to resist any such tilting. The wheel may also be pulled rearwardly, moved laterally and rotated all at the same time if conditions demand. In other words, any and every possible movement or control which can be given to an aeroplane, may be accomplished by the single controlling member 38, and the movement which is given to such controlling member to secure any desired movement of the aeroplane, is that which would result from a natural or instinctive movement of the aviator.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. An aeroplane having two vertical balancing planes for maintaining lateral stability, two vertically-disposed shaft sections in alinement with each other, operating means connecting one of said sections with one of said balancing planes, operating means connecting the other of said sections with the other of said balancing planes, and means for rotating said shaft sections simultaneously.

2. An aeroplane having two vertical balancing planes for maintaining lateral stability, two vertically-disposed shaft sections in alinement with each other, operating means connecting one of said sections with one of said balancing planes, operating means connecting the other of said sections with the other of said balancing planes, and means for rotating said shaft sections simultaneously in the same direction.

3. An aeroplane having two vertical balancing planes for maintaining lateral stability, two vertically-disposed shaft sections in alinement with each other, operating means connecting one of said sections with one of

said balancing planes, operating means connecting the other of said sections with the other of said balancing planes, and means for rotating said shaft sections simultaneously in opposite directions.

4. An aeroplane having two vertical balancing planes for maintaining lateral stability, two vertically-disposed shaft sections in alinement with each other, operating means connecting one of said sections with one of said balancing planes, operating means connecting the other of said sections with the other of said balancing planes, bevel pinions upon the adjacent ends of said shaft sections, a third bevel pinion in mesh with both of said bevel pinions, and an operating member connected to said third pinion for rotating the latter to move the same laterally.

5. An aeroplane having two vertical balancing planes, a steering rudder, two separate shaft sections, each connected to its respective balancing plane, a sleeve encircling said shaft sections, connections between said sleeve and said rudder, and means for rotating said shaft sections simultaneously in opposite direction, independently of the rotation of the sleeve, or rotating them simultaneously in the same direction together with the sleeve.

6. An aeroplane having a main supporting plane, a vertical balancing plane above the same, a vertical balancing plane beneath the same and normally in vertical alinement therewith, a steering rudder, two separate shaft sections, each connected to its respective balancing plane, a sleeve encircling said shaft sections, connections between said sleeve and said rudder, and means for rotating said shaft sections simultaneously in opposite directions independently of the rotation of the sleeve, or rotating them simultaneously in the same direction together with the sleeve.

7. An aeroplane having a vertical rudder or steering plane, a horizontal rudder or elevating plane, a rotatable member operatively connected to said vertical rudder, a rod connected to said rotatable member and extending outwardly at an angle thereto for rotating the same, said rod being free to move longitudinally in respect to said rotatable member, and connections between said rod and said horizontal rudder for operating the latter.

8. An aeroplane having a vertical rudder or steering plane, a horizontal rudder or elevating plane, a rotatable member, a rod connected to said rotatable member and extending outwardly at an angle thereto for swinging movement to rotate the same, said rod being free to move longitudinally in respect to said rotatable member, connections between said rotatable member and one of said rudders, and connections between said rod and the other of said rudders.

9. An aeroplane having a vertical rudder or steering plane, a horizontal rudder or elevating plane, a rotatable member, a rod connected to said rotatable member and extending outwardly at an angle thereto for swinging movement to rotate the same, said rod being free to move longitudinally in respect to said rotatable member, connections between said rotatable member and one of said rudders, connections between said rod and the other of said rudders, balancing means, and connections whereby said balancing means is operated upon the rotation of said rod.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PAUL DANIEL.

Witnesses:
CLAIR W. FAIRBANK,
PHILIP D. ROLLHAUS.