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FIP8301 OR 1,309,710
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J. F. WEBB, Sr.

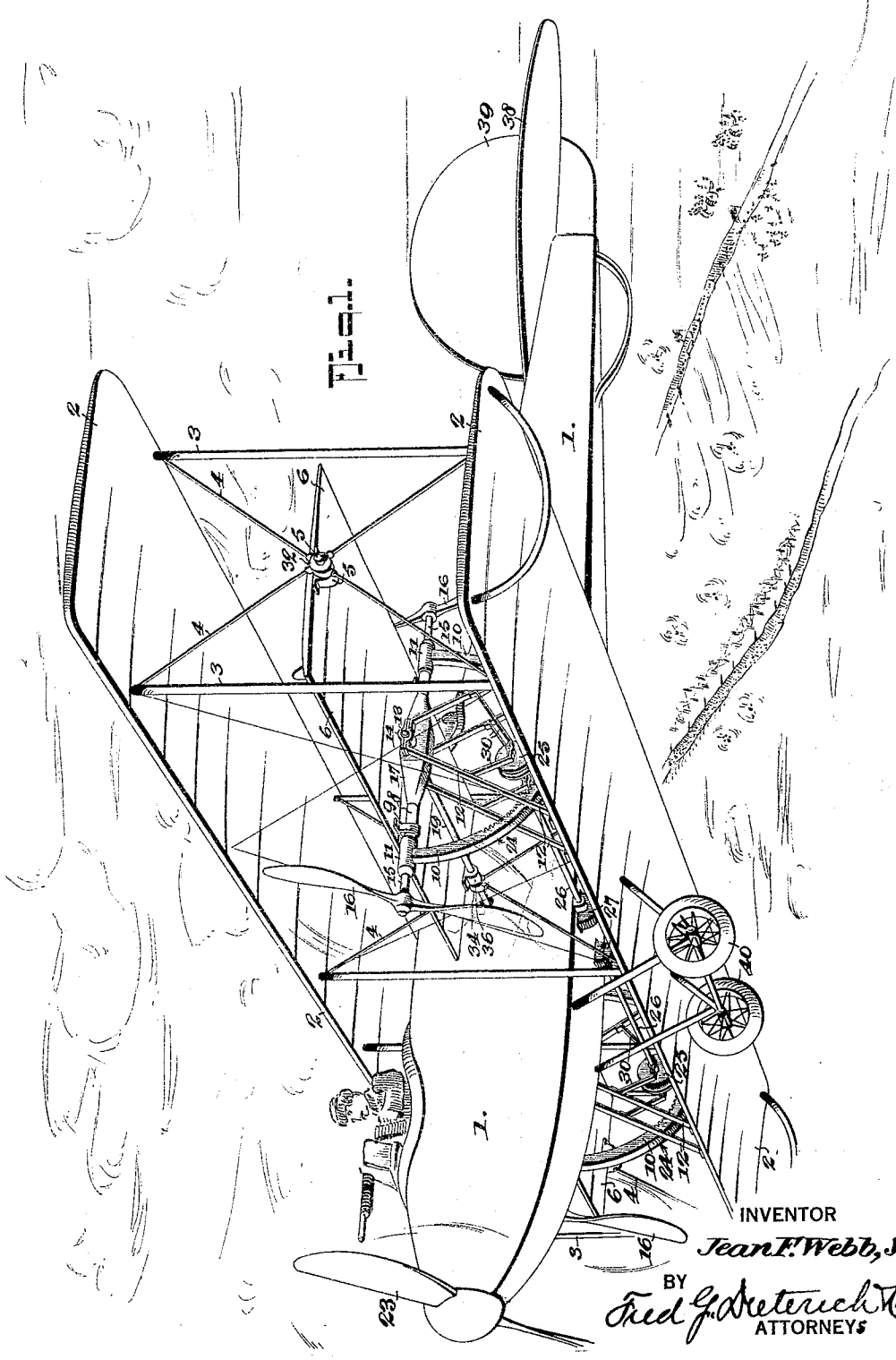
AEROPLANE.

APPLICATION FILED NOV. 14, 1917.

1,309,710.

Patented July 15, 1919.

7 SHEETS—SHEET 1.



INVENTOR
Jean F. Webb, Sr.
BY
Fred G. Dieterich & Co.
ATTORNEYS

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

48

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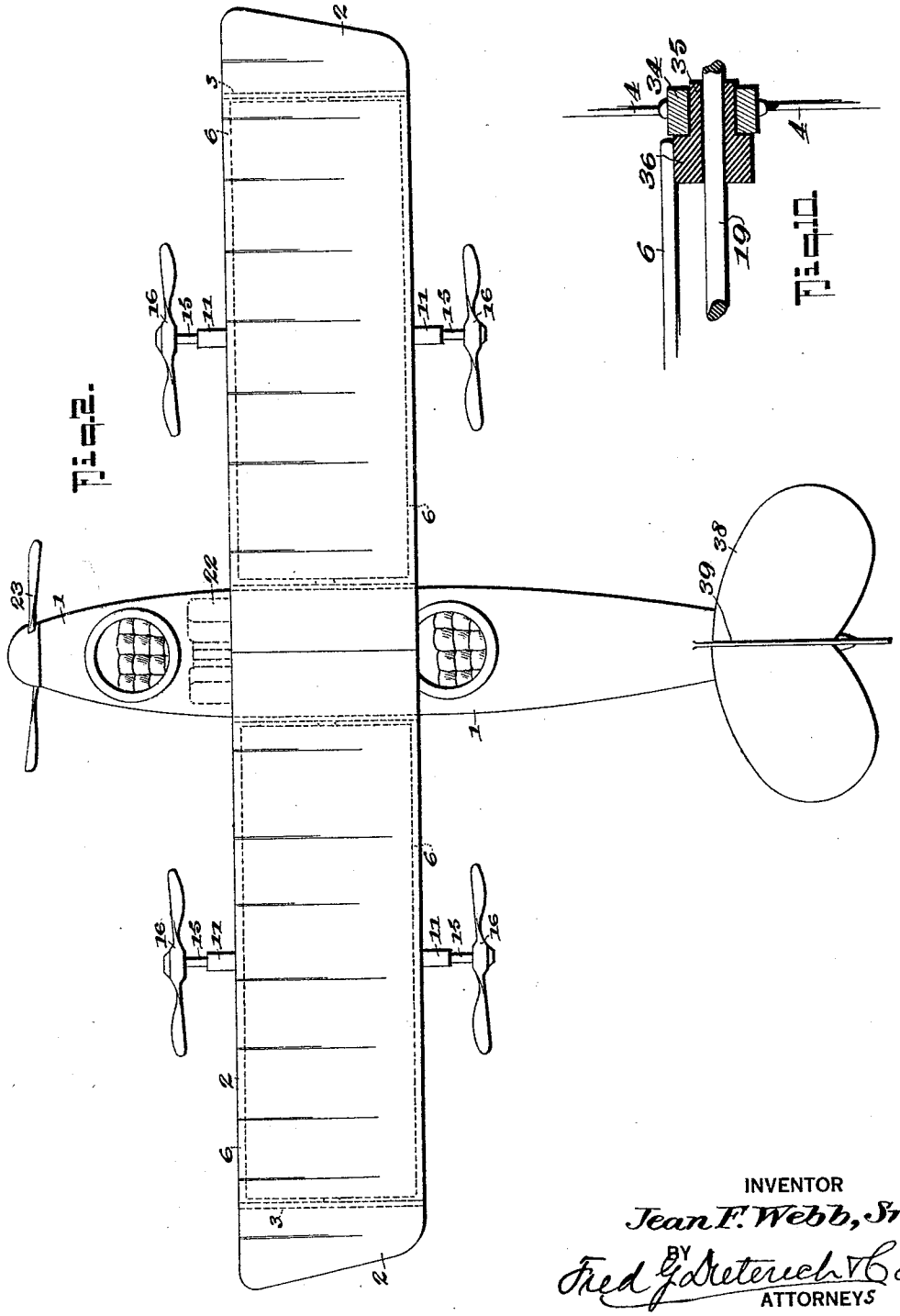


Fig. 2.

Fig. 10.

INVENTOR

Jean F. Webb, Sr.

BY

Fred G. Dieterich & Co

ATTORNEYS

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

244. AERONAUTICS

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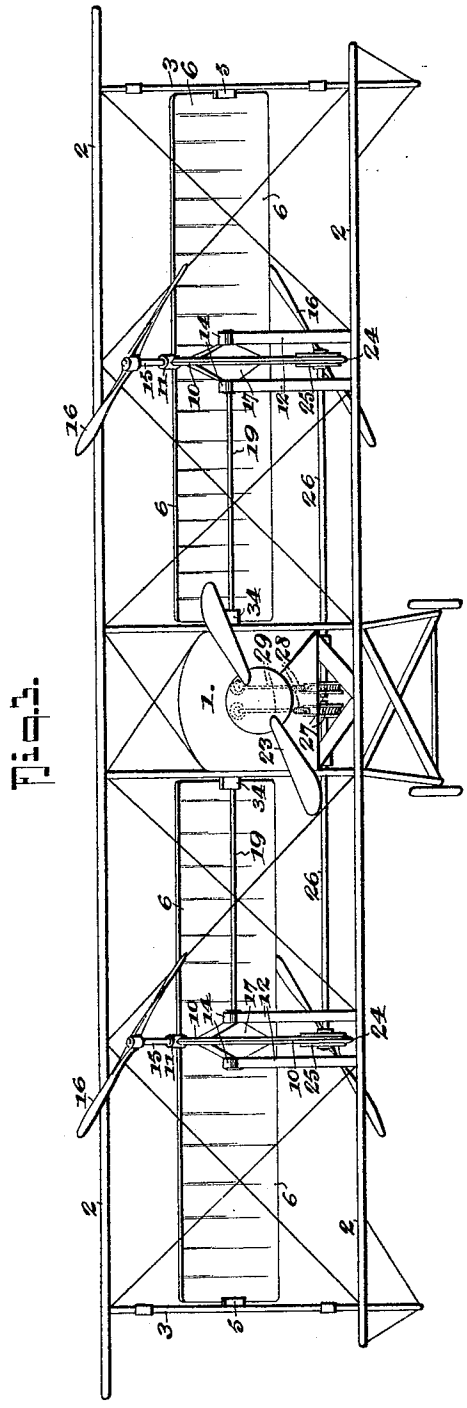


Fig. 7.

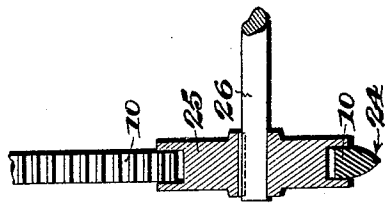
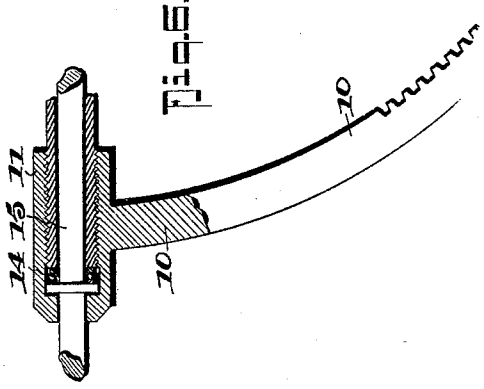


Fig. 6.



INVENTOR

Jean F. Webb, Sr.

BY

Fred G. Dieterich & Co

ATTORNEYS

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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J. F. WEBB, Sr.

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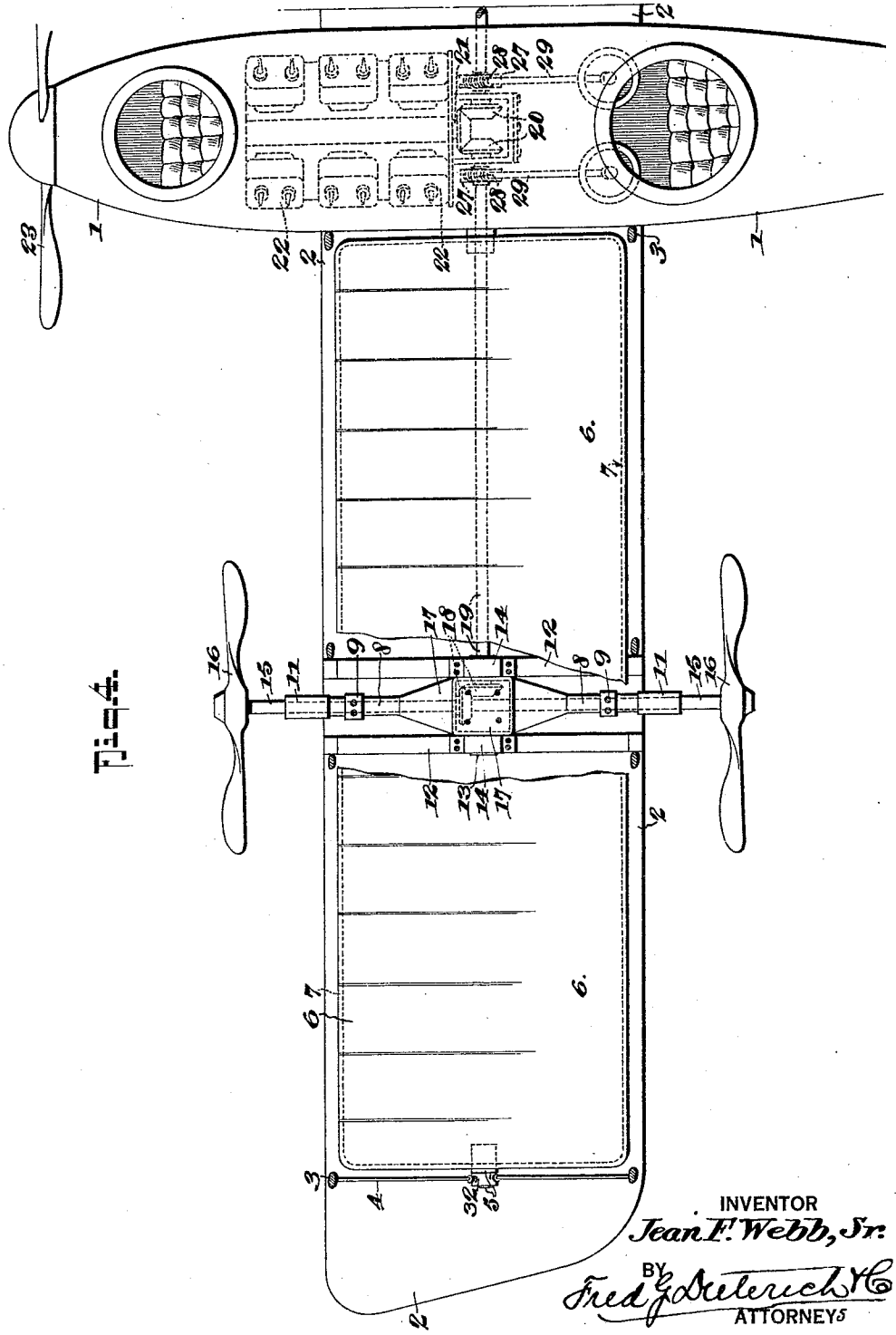


Fig. 4.

INVENTOR
Jean F. Webb, Sr.
BY
Fred G. Dieterich & Co
ATTORNEYS

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

J. F. WEBB, Sr.

AEROPLANE.

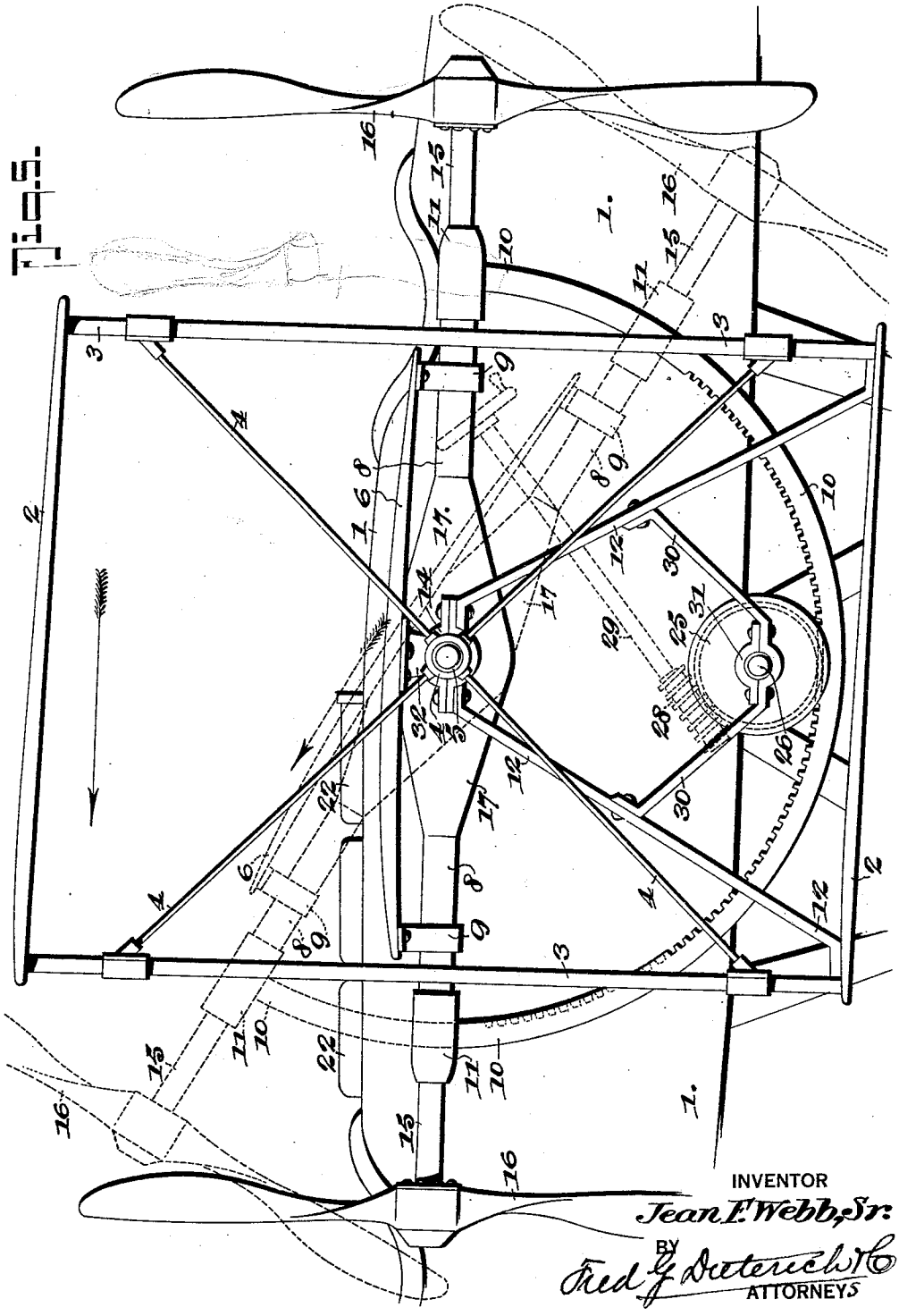
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7 SHEETS—SHEET 5.

FIG. 5.



INVENTOR

Jean F. Webb, Sr.

BY

Fred G. Dieterich & Co

ATTORNEYS

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

J. F. WEBB, Sr.

AEROPLANE.

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7 SHEETS—SHEET 6.

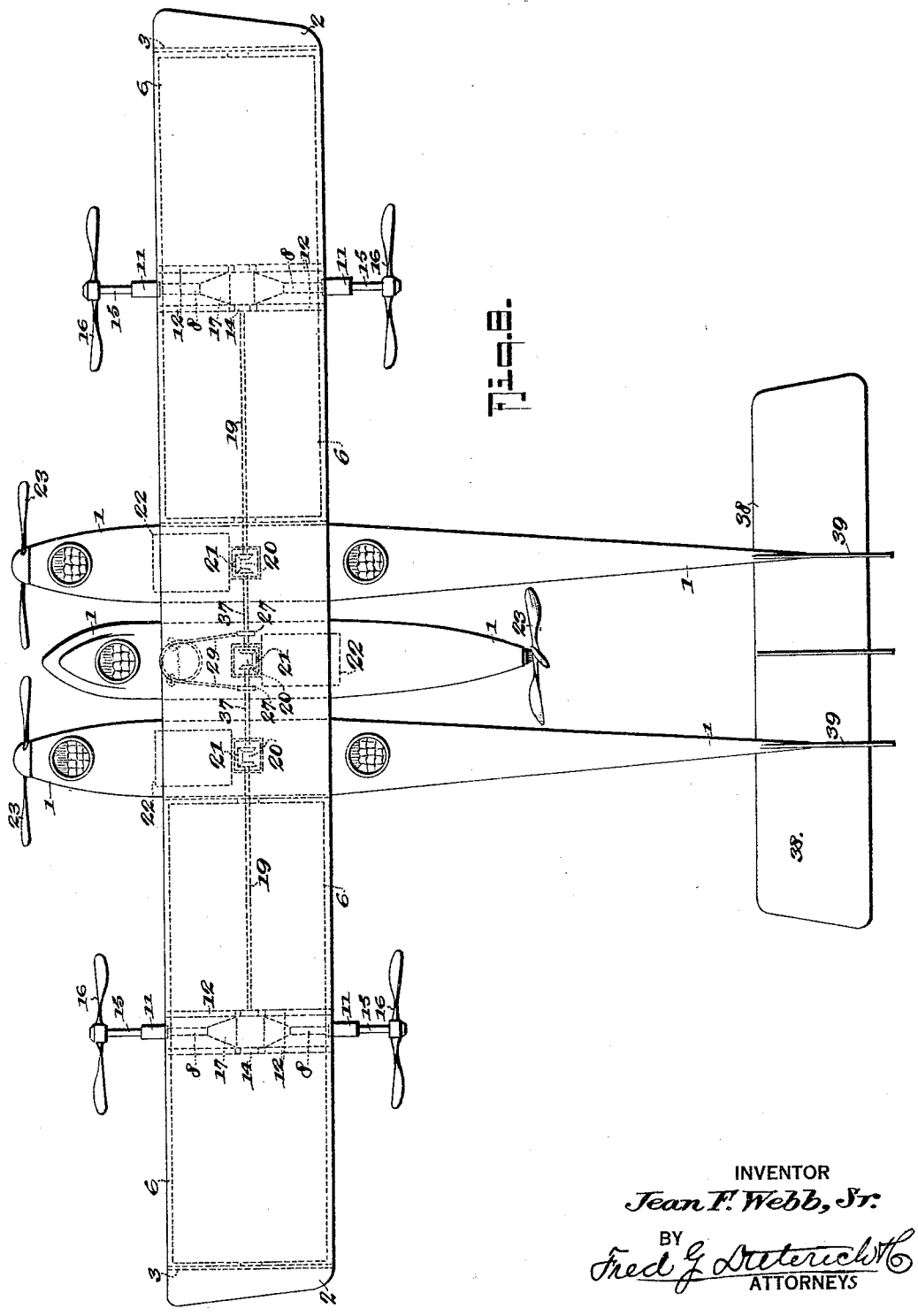


Fig. 8.

INVENTOR

Jean F. Webb, Sr.

BY

Fred G. Dieterich & Co

ATTORNEYS

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

J. F. WEBB, Sr.

AEROPLANE.

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7 SHEETS—SHEET 7.

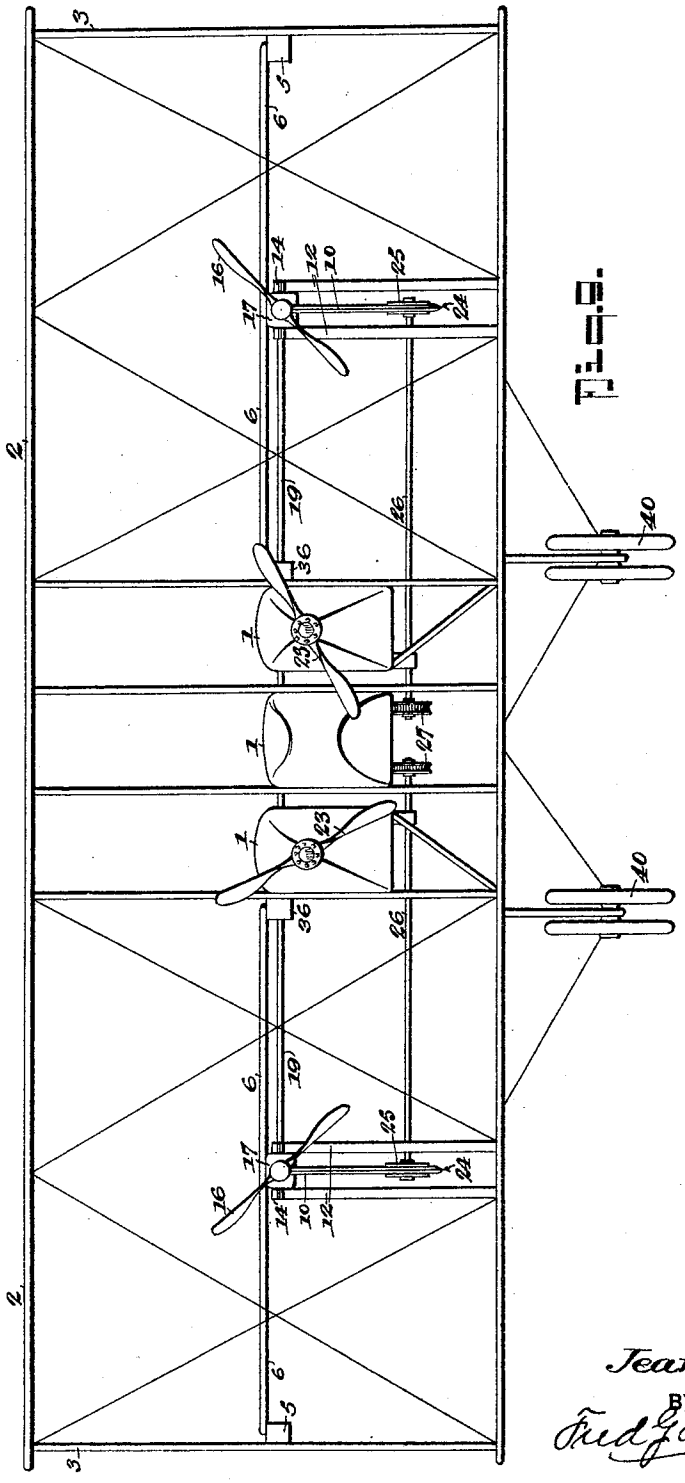


Fig. 9.

INVENTOR

Jean F. Webb, Sr.

BY

Fred G. Dieterich & Co

ATTORNEYS

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

48

UNITED STATES PATENT OFFICE.

JEAN F. WEBB, SR., OF NEW YORK, N. Y.

AEROPLANE.

1,309,710. Specification of Letters Patent. Patented July 15, 1919.

Application filed November 14, 1917. Serial No. 201,979.

To all whom it may concern:

Be it known that I, JEAN F. WEBB, Sr., residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Aeroplanes, of which the following is a specification.

The invention primarily has for its object to provide a practical, powerful aeroplane adapted for very heavy duty in commercial use, such as carrying fast mail, express, passengers or freight, and to that end the invention provides a structure possessing such unusual lifting and sustaining power that it will support and carry a much greater weight per given area, or number of square feet of plane surface, than is possible by those aeroplanes now in use.

Another object of the invention is to provide a structure having great flexibility of control while in flight, in rising and landing, and one having such stability and steadiness of flight as to render the machine quite safe against unusual air disturbances.

Again, the invention has for its object to provide a multiplane structure (triplane or more) one of the intermediate plane-sets of which may be inclined to change the angle of incidence at will, and thereby aid in effecting a rapid climb or descent and a safer landing than can otherwise be attained.

Another object of the invention is to combine, with such tilting planes, auxiliary propeller units which are tiltable with the said planes and are designed to add their efforts to increase the lifting and carrying power of the machine as well as the climbing power and descent thereof, and also to aid in preventing accidents in alighting, as the angle of the auxiliary propellers and the tiltable planes can be changed in such manner that the speed can be graduated to a slow and safe landing without jar or shock.

A further object of the invention is to provide for the joint or individual control of the tiltable planes and the corresponding pivotal movement of the auxiliary propeller units at the two sides of the machine, whereby they may be moved as one or moved separately, as desired, to aid in controlling the stability and flight of the machine, the auxiliary propellers being all intergeared and geared with the power plant or power plants, whereby should a propeller break, the load will be automatically distributed to the remainder.

The invention also resides in those novel details of construction, combination and arrangement of parts, all of which will be first fully described, then be specifically pointed out in the appended claims and illustrated in the accompanying drawings, in which:—

Figure 1 is a perspective view illustrating a machine embodying the invention in flight.

Fig. 2 is a top plan view of the machine shown in Fig. 1.

Fig. 3 is a front elevation of the same.

Fig. 4 is a horizontal section of a portion of the machine shown in Fig. 2, taken just below the upper plane, parts of the midplane being broken away to show the structure beneath.

Fig. 5 is an enlarged end elevation of a part of the machine shown in Fig. 1.

Fig. 6 is a detail section showing one of the auxiliary propeller shaft bearings.

Fig. 7 is a detail section showing the flanged pinion in engagement with the rack that shifts the midplane on its axis.

Fig. 8 is a top plan view showing the invention as applied to an aeroplane having a plurality of power plants.

Fig. 9 is a front elevation of the structure shown in Fig. 8.

Fig. 10 is a detail view of a portion of the invention.

In the drawings, in which like letters and numerals of reference indicate like parts in all of the figures, 1 represents the fuselage mounted in the usual way to be sustained by the upper and lower fixed planes 2—2 that are spaced apart by vertical struts 3 and diagonal braces 4, the braces 4 serving to sustain the trunnion bearings 32 for the tiltable midplanes 6, the parts 1 to 4 being made as in the present practice, and, *per se*, constituting no part of my invention.

In applying my invention to aeroplanes, one of the intermediate planes 6 (the midplane of the present case) is provided with a suitable light rectangular framework 7 which sustains the usual plane surface and to which framework the trunnions 5 are

secured, the frame 7 also being fastened to the shaft housing 8 of the auxiliary propelling mechanism by suitable securing clamps 9. 10 designates arcuate racks which are secured to the end bearings 11 of the auxiliary propelling mechanism housing 8 and which extend between the supports 12 in which the trunnions 13 are journaled, the supports 12 being suitably braced and secured to the plane structure.

The bearings 11 are provided with combination annular and thrust ball bearings 14 and serve to journal the auxiliary propeller shafts 15 on which the auxiliary propellers 16 are mounted. 17 indicates the gear boxes whose trunnions 13 are mounted in the supports 12, the gear boxes forming a continuation of the shaft housing 8 and inclosing beveled gears 18—18, by means of which the auxiliary propellers are driven from the countershaft 19 which is itself geared as at 20—20 with the driving shaft 21 of the engine 22 that constitutes the main power plant of the machine. 23 indicates the main propeller which is driven from the engine 22 in the usual manner, the construction of the engine 22 and the propeller 23 being of the conventional type.

Each arcuate rack 10 (there being one provided for each auxiliary propeller and tilting unit) has its front edge beveled as at 24 to reduce the wind resistance and the rack 10 is operated by a flanged pinion 25 on a shaft 26 which carries a worm gear 27 that meshes with the worm 28 on the controlling shaft 29, there being preferably a shaft 29 provided for the shaft 19 at each side of the machine so that the auxiliary controlling units and tilting planes at the two sides of the machine may be manipulated either simultaneously as one or individually, as may be found desirable in practice.

30 designates a support which carries bearings 31 for the shaft 26. 32 designates the bearings supported by the diagonal braces 4 at the ends of the machine in which the trunnions 5, that sustain the tiltable plane 6, are journaled. The diagonal braces 4 adjacent to the fuselage, support a bearing 34 in which is journaled the projecting portion 35 of the trunnion 36, through which passes the shaft 19; it being understood that the pivotal axes of the planes 6 are in transverse alinement and coincident with the axis of the trunnions 13 on which the auxiliary propeller units are carried.

The invention may be applied to aeroplanes having but a single power plant, as shown in Figs. 1—4, inclusive, of the drawings, or it may be applied to a structure embodying a plurality of power plant units and such a structure is shown in Fig. 8, from which it will be observed that a plurality of fuselages 1—1 are employed, each sustaining an engine or power plant 22 to drive the main propellers 23 of which there are three shown in the illustrations. When the invention is applied to such a structure, however, the various power plants are intergeared as at 37, so that the three main power plant units will operate as one, whereby should one of the engines break, the other engines will take care of the load and the shafts 19 are gear-connected at 20—20 with the adjacent power plant so that the auxiliary propellers and the main propellers will turn in unison, and in the event of one or the other of such engines breaking, the load will be distributed between the remainder.

38 designates the usual horizontal rudder and 39 the usual vertical rudders of the aeroplanes, it being understood that the construction of the fuselage and the rudders of the machine may be in accordance with the established practice, and the usual controls for effecting the operation of the various parts may be provided, but as such, *per se*, constitute no part of the present invention I have not deemed it necessary to illustrate the same.

While the invention has been described especially with reference to aeroplanes, it will be understood that it may be also adapted for use in hydroaeroplanes, in which event the hydroaeroplane floats will be substituted in lieu of the alighting gear 40 shown, but as such structure of alighting gear and hydroplaning elements may be of the conventional type, further description and illustration of the same is thought to be unnnecessary.

In operation, the invention is especially advantageous in obtaining quick rising or dipping effects, according as the midplanes are tilted upwardly or downwardly, with relation to the direction of flight, and it is also of great advantage in landing as by throwing the tilting plane upwardly as the machine nears the ground, the flight may be checked, and at the same time by thus increasing the angle of the tilting plane with relation to the line of flight, a greater lifting effect is obtained at the moment of landing, so as to engage the ground with less force and less danger of "nosing" the machine into the ground than would be the case were all the planes stationary, and inasmuch as the auxiliary propelling mechanism turns with the tilting planes their effective action will be added to that of the tilting planes and thus the stability of the machine is greatly increased.

It will be observed that by putting both the tilting planes and the auxiliary propelling mechanism on the same oscillatable framework there is obtained the double lifting effect of the rising or sustaining angle

of the pivoted plane, of the upward pressure of the air striking the under side of the plane and the pull upward at the same angle of the auxiliary propellers; and this double synchronous lifting and sustaining power is in addition to the ordinary power exerted by the upper and lower planes and gives to this machine a far greater weight carrying or sustaining power than is possessed with the old form of fixed rigid planes.

It will also be observed that constructing a machine in accordance with my invention, the machine has such climbing and lifting power, and such flexibility of control that its angle of flight can be quickly changed by the aviator from a level to an upward one of forty degrees or more, and the pivoted plane is held securely locked at the angle needed (by virtue of the worm and worm gear connection 27—28) until the height desired is attained, whereupon the midplanes and auxiliary propellers can be turned back to a level parallel with the upper and lower planes and the machine thereupon becomes an ordinary triplane in form but far more speedy and powerful.

Where speed alone is required, the additional force of the propellers will greatly increase it, and, at the same time, will add to the stability of the aeroplane by positively keeping it on a level keel or line of flight and thus decrease the liability of accidents from sudden gusts or changes of the wind which cause the "side slip" that is so often fatal.

It is also thought that by the use of the invention, the aeroplane will have a far greater sustaining power in the light rarefied air of very high altitudes of 20,000 feet or more, where the engine is much less effective on its present single propeller, for the auxiliary propellers will greatly assist it in maintaining the weight in the thin atmosphere.

The use of the invention will also enable the aeroplane to rise quickly into the air in starting, without the present need of a long run to gain momentum, for, by tilting and locking the pivoted middle plane at a sharp rising angle the air force will at once begin wedging it upward and this force combined with the upward pull of the auxiliary propellers at the same angle will lift it clear almost instantly, thus enabling the aeroplane (or hydroplane, if such structure be present) to rise from the deck length of a ship. Hydroplanes for coast guard or naval duty will thus be enabled to rise direct from the deck, or from the surface of the water and in returning to the vessel, the aviator can tilt the middle plane to a lifting angle in descending and can graduate the speed by slowing down the engine until gravity overcomes propelling force and it will settle down easily on the deck. This method of control also prevents landing accidents on land.

The use of the invention will greatly increase the practical values of aeroplanes for military use by increasing the speed, by increasing its ability to carry weight of torpedoes, bombs and machine guns and by the mere fact that it can be almost poised in mid-air while bombs are being actually dropped on the ship, fort or other object to be destroyed; then the machine can easily sail away with all propellers driving forwardly.

By its increased speed and its power to climb rapidly into the air at a much more acute angle than is now possible, an aeroplane equipped with the present invention will be a most effective safe-guard against Zeppelins, for it will be quite impossible for them to escape from the machine guns and bombs of defending aviators using these machines. It has been thoroughly demonstrated during the present war that during all forms of aerial battle the aviator who can get his machine above his opponent has the one below him at his mercy.

Again, the invention will be especially suitable in naval use for scouting against submarines, for the middle plane can be set at a lifting angle and all propellers slowed down until the lifting force will just overcome gravity at the slow speed which will enable the observer to "spot" the submarine accurately. Having the ability to slow down and almost poise in mid-air gives the aviator the power to drop, with deadly effect, the under-water explosive bombs directly upon the submarine or, if the submarine is submerged, so near to it that it will be destroyed; the dropping of bombs can be thus effected with greater accuracy than is possible from a swiftly moving machine.

Full sized "Fiske" aerial torpedoes can also be easily carried and handled by a machine embodying the present invention and such machine will therefore be more deadly and destructive in naval warfare than other machines at present in use.

It will be observed that the present invention combines in a single structure three novel coöperative features namely: the distribution of the full power of the engines between a plurality of propellers in a practical manner to increase the propelling power; the use of a pivoted midplane to increase the lifting and weight carrying ability; and the synchronous movement of both the pivoted plane and the auxiliary propellers through the arc of a circle to increase their lifting effect as desired.

From the foregoing description, taken in connection with the accompanying drawings, it is thought the complete construction,

operation and advantages of the invention will be readily understood by those skilled in the art.

What I claim is:

1. An aeroplane having at least three sustaining planes extending to substantially equal planing distances at each side of the fuselage, two of which are fixed and rigid, means for mounting an intermediate plane so that the same may be rotated on a transverse axis to change the angle of inclination, said aeroplane also having a main propelling mechanism including a power plant and a propeller, an auxiliary propeller mechanism mounted on an axis to turn with the intermediate plane, and means under control of the aviator for tilting said intermediate plane and said auxiliary propeller mechanism to change the angle of inclination at will.

2. An aeroplane having a fixed sustaining plane structure and a main propeller structure and power plant, combined with an auxiliary sustaining plane structure disposed parallel to the fixed sustaining plane structure, an auxiliary propeller structure disposed in a plane parallel to that containing the main propeller, and means for sustaining said auxiliary plane and said auxiliary propeller structure pivotally on an axis transversely of the aeroplane, and means for inclining said auxiliary plane and said auxiliary propeller structure on the pivotal axis.

3. An aeroplane having a fixed sustaining plane structure and a main propeller structure and power plant, combined with an auxiliary sustaining plane structure disposed parallel to the fixed sustaining plane structure, an auxiliary propeller structure disposed in a plane parallel to that containing the main propeller, and means for sustaining said auxiliary plane and said auxiliary propeller structure pivotally on an axis transversely of the aeroplane, and means for simultaneously inclining said auxiliary plane and said auxiliary propeller structure on the pivotal axis whereby the same may move as a unit.

4. In an aeroplane having fixed upper and lower planes, a main propeller and power mechanism; an intermediate oscillatable plane, an auxiliary propelling mechanism fixed with relation to the intermediate plane and bodily oscillatable therewith, means for mounting said intermediate plane and said auxiliary propelling mechanism so that they will be susceptible of inclination, and means for effecting the inclination of said intermediate plane and auxiliary propeller and means for driving said auxiliary propeller mechanism.

5. In an aeroplane having fixed upper and lower planes, a main propeller and power mechanism; an intermediate oscillatable plane, an auxiliary propelling mechanism fixed with relation to the intermediate plane and bodily oscillatable therewith, means for mounting said intermediate plane and said auxiliary propelling mechanism so that they will be susceptible of inclination, means for effecting the inclination of said intermediate plane and auxiliary propeller mechanism and means for driving said auxiliary propeller mechanism from said main power mechanism.

6. In an aeroplane having fixed upper and lower planes, a main propeller and power mechanism; an intermediate oscillatable plane, an auxiliary propelling mechanism fixed with relation to the intermediate plane and bodily oscillatable therewith, means for mounting said intermediate plane and said auxiliary propelling mechanism so that they will be susceptible of inclination, means for effecting the inclination of said intermediate plane and auxiliary propeller mechanism as a unit about a common axis, and means for driving said auxiliary propeller mechanism.

7. In an aeroplane having fixed upper and lower planes, a main propeller and power mechanism; an intermediate oscillatable plane, an auxiliary propelling mechanism fixed with relation to the intermediate plane and bodily movable therewith, means for mounting said intermediate plane and said auxiliary propelling mechanism so that they will be susceptible of inclination, means for effecting the inclination of said intermediate plane and auxiliary propelling mechanism, said means including provisions for locking the same to hold the intermediate plane and the auxiliary propelling mechanism in their various adjusted positions.

8. In an aeroplane having upper and lower sustaining planes, a main power plant engine located between said planes and a main propeller driven by said engine; the combination of an auxiliary propelling mechanism and an intermediate sustaining plane journaled on a horizontal axis between the upper and lower planes, said auxiliary propelling mechanism including an auxiliary propeller, a driving shaft and gear connection between said auxiliary propeller and the power plant engine and including an auxiliary propeller shaft geared with the engine shaft and extending to project beyond the front of the planes on which shaft the auxiliary propeller is located, and means for connecting said intermediate plane with said auxiliary propeller mechanism, and means whereby said auxiliary propeller shaft and said intermediate plane may be oscillated about a horizontal axis to change the inclination of the same.

9. In an aeroplane having upper and lower sustaining planes, a main power plant engine located between said planes and a main propeller driven by said engine; the

combination of an auxiliary propelling mechanism and an intermediate sustaining plane journaled on a horizontal axis between the upper and lower planes, said auxiliary propelling mechanism including an auxiliary propeller, a driving shaft and gear connection between said auxiliary propeller and the power plant engine and including an auxiliary propeller shaft geared with the engine shaft and extending to project beyond the front of the planes on which shaft the auxiliary propeller is located, means for connecting said intermediate plane with said auxiliary propeller mechanism, means whereby said auxiliary propeller shaft and said intermediate plane may be oscillated about a horizontal axis to change the inclination of the same and means for locking said last named parts in their different adjusted positions.

10. In an aeroplane having upper and lower sustaining planes, a main power plant engine located between said planes and a main propeller driven by said engine; the combination of an auxiliary propelling mechanism and an intermediate sustaining plane journaled on a horizontal axis between the upper and lower planes, said auxiliary propelling mechanism including an auxiliary propeller, a driving shaft and gear connection between said auxiliary propeller and the power plant engine and including an auxiliary propeller shaft geared with the engine shaft and extending to project beyond the front of the planes on which shaft the auxiliary propeller is located, means for connecting said intermediate plane with said auxiliary propeller mechanism, means whereby said auxiliary propeller shaft and said intermediate plane may be oscillated about a horizontal axis to change the inclination of the same, means for locking said last named parts in their different adjusted positions, said last named means comprising an arcuate rack, an auxiliary propeller shaft housing to which said rack is secured, a pinion meshing with said rack, a shaft connected with said pinion, and means under control of the aviator for turning said shaft.

11. In an aeroplane having upper and lower sustaining planes, a main power plant engine located between said planes and a main propeller driven by said engine; the combination of an auxiliary propelling mechanism and an intermediate sustaining plane journaled on a horizontal axis between the upper and lower planes, said auxiliary propelling mechanism including an auxiliary propeller, a driving shaft and gear connection between said auxiliary propeller and the power plant engine and including an auxiliary propeller shaft geared with the engine shaft and extending to project beyond the front of the planes on which shaft the auxiliary propeller is located, means for connecting said intermediate plane with said auxiliary propeller mechanism, means whereby said auxiliary propeller shaft and said intermediate plane may be oscillated about a horizontal axis to change the inclination of the same, means for locking said last named parts in their different adjusted positions, said last named means comprising an arcuate rack, an auxiliary propeller shaft housing to which said rack is secured, a pinion meshing with said rack, a shaft connected with said pinion, means under control of the aviator for turning said shaft, said last named means comprising a controlling shaft having a worm and worm gear connection with said pinion shaft.

12. In an aeroplane having upper and lower sustaining planes, a main power plant engine located between said planes, a main propeller driven by said engine; the combination of an auxiliary propelling mechanism and an intermediate plane journaled on a horizontal axis between the upper and lower planes, said auxiliary propelling mechanism including a driving shaft and gear connections with the power plant engine and also including an auxiliary propeller shaft geared with the driven shaft and extending to project beyond the front of the planes, an auxiliary propeller carried by the projecting end of said auxiliary propeller shaft, an arcuate rack connected with said auxiliary propeller mechanism and said intermediate plane for turning the same about the horizontal axis to change the inclination of the same.

13. In an aeroplane structure which includes upper and lower main sustaining planes, a fuselage, steering rudders, a plurality of main power engines, main propellers driven from said engines, the combination of auxiliary propeller mechanism including an auxiliary propeller shaft, bearings in which said shaft is rotatable, means for mounting said bearings to turn about a horizontal axis, drive gear connections between the several main power plant engines, power transmission connections between the said engines and the auxiliary propeller mechanism and also mounted to turn on the horizontal axis with said auxiliary propeller mechanism, and aviator controlled means for effecting the turning action of said auxiliary propeller mechanism and said intermediate planes about the horizontal axis.

14. In combination with an aeroplane having the usual upper and lower sustaining planes, fuselage, steering rudders, main power plant and main propeller units; an auxiliary propeller mechanism at each side of the machine, said auxiliary propeller mechanisms each including an auxiliary propeller shaft, an auxiliary propeller and a housing

for said auxiliary propeller shaft, and means for mounting said housings to turn about a transverse horizontal axis, auxiliary sustaining planes at each side of the machine connected with the auxiliary propelling mechanism housings and oscillatable about the horizontal axis therewith, a rack and pinion device for effecting said oscillation, and aviator controlled means for independently oscillating the auxiliary propelling mechanisms and their respective intermediate planes and means for driving said auxiliary propellers from the main power plant.

15. In combination with an aeroplane having the usual upper and lower sustaining planes, fuselage, steering rudders, main power plant and main propeller units; an auxiliary propeller mechanism at each side of the machine, said auxiliary propeller mechanisms each including an auxiliary propeller shaft, an auxiliary propeller, and a housing for said auxiliary propeller shaft, means for mounting said housings to turn about a transverse horizontal axis, auxiliary sustaining planes at each side of the machine connected with the auxiliary propelling mechanism housings and oscillatable about the horizontal axis therewith, a rack and pinion device for effecting said oscillation and aviator controlled means for independently and collectively oscillating the auxiliary propelling mechanisms and their respective intermediate planes and means for driving said auxiliary propellers from the main power plant.

16. In combination with an aeroplane having the usual upper and lower sustaining planes, fuselage, steering rudders, main power plant and main propeller units; an auxiliary propeller mechanism at each side of the machine, said auxiliary propeller mechanisms each including an auxiliary propeller shaft, an auxiliary propeller and a housing for said auxiliary propeller shaft, means for mounting said housings to turn about a transverse horizontal axis, auxiliary sustaining planes at each side of the machine connected with the auxiliary propelling mechanism housings and oscillatable about the horizontal axis therewith, a rack and pinion device for effecting said oscillation, aviator controlled means for independently oscillating the auxiliary propelling mechanisms and their respective intermediate planes, means for driving said auxiliary propellers from the main power plant, said controlling means comprising controlling shafts in reach of the aviator and irreversible gear and power transmitting connections between said controlling shaft and the said auxiliary propeller mechanism and intermediate planes whereby the same may be tilted by the aviator and locked in any position.

17. In combination with an aeroplane having the usual upper and lower sustaining planes, fuselage, steering rudders, main power plant and main propeller units; an auxiliary propeller mechanism at each side of the machine, said auxiliary propeller mechanisms each including an auxiliary propeller shaft, an auxiliary propeller and a housing for said auxiliary propeller shaft, means for mounting said housings to turn about a transverse horizontal axis, auxiliary sustaining planes at each side of the machine connected with the auxiliary propelling mechanism housings and oscillatable about the horizontal axis therewith, a rack and pinion device for effecting said oscillation, aviator controlled means for independently and collectively oscillating the auxiliary propelling mechanisms and their respective intermediate planes, means for driving said auxiliary propellers from the main power plant, said controlling means comprising controlling shafts in reach of the aviator and irreversible gear and power transmitting connections between said controlling shaft and the said auxiliary propeller mechanism and intermediate planes whereby the same may be tilted by the aviator and locked in any position.

JEAN F. WEBB, SR.

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