Draftsman

G. L. OLIVER.

AEROPLANE.

APPLICATION FILED JAN. 26, 1914.

1,102,790.

Patented July 7, 1914.

6 SHEETS—SHEET 1.

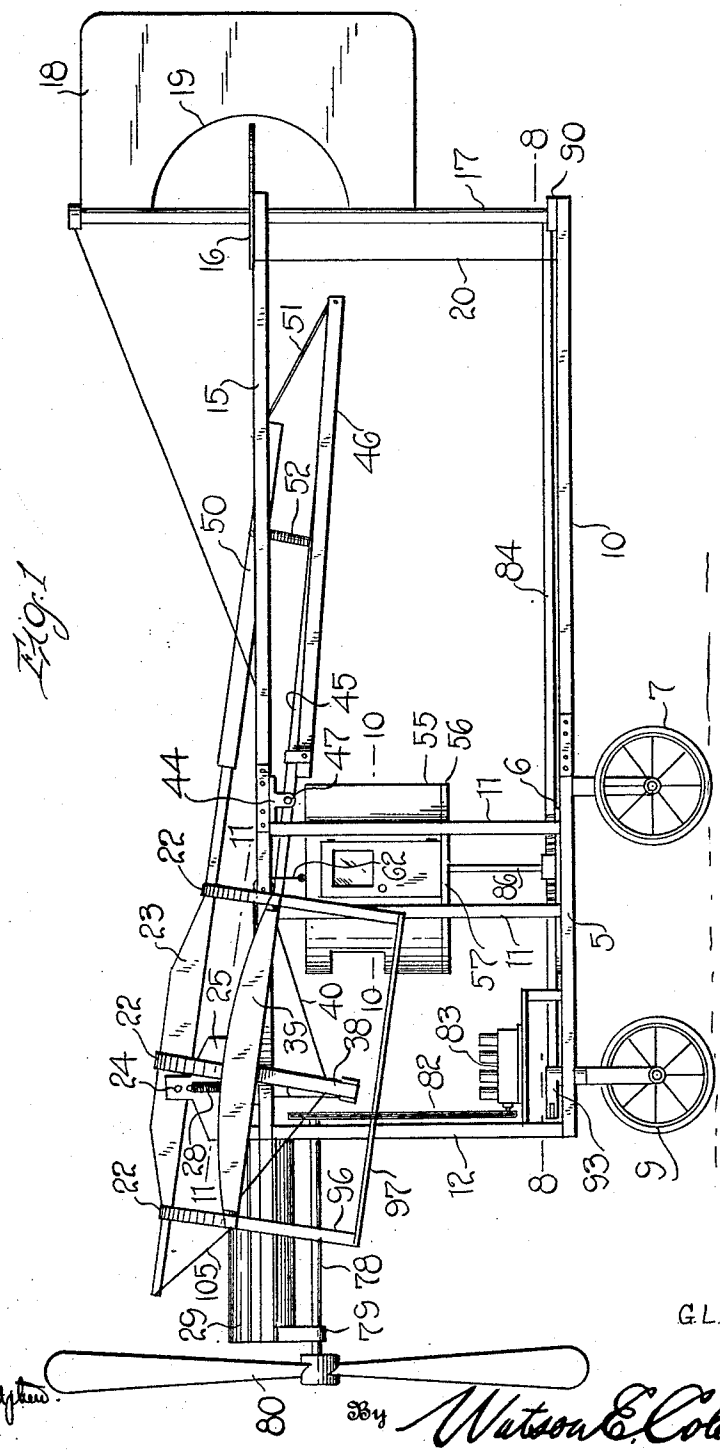


Fig. 1.

Witnesses

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6 SHEETS—SHEET 2.

Fig. 2

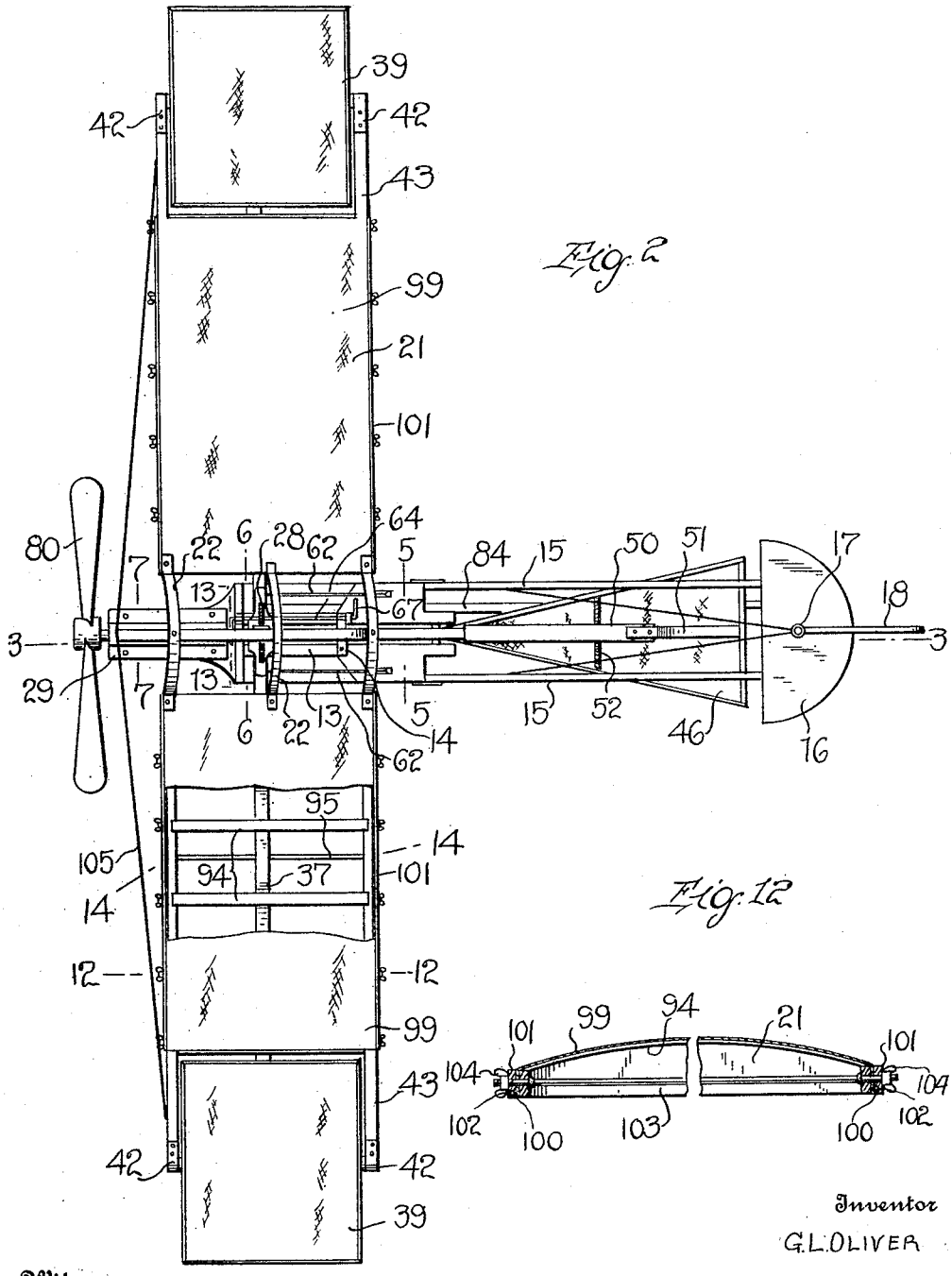


Fig. 12

Witnesses
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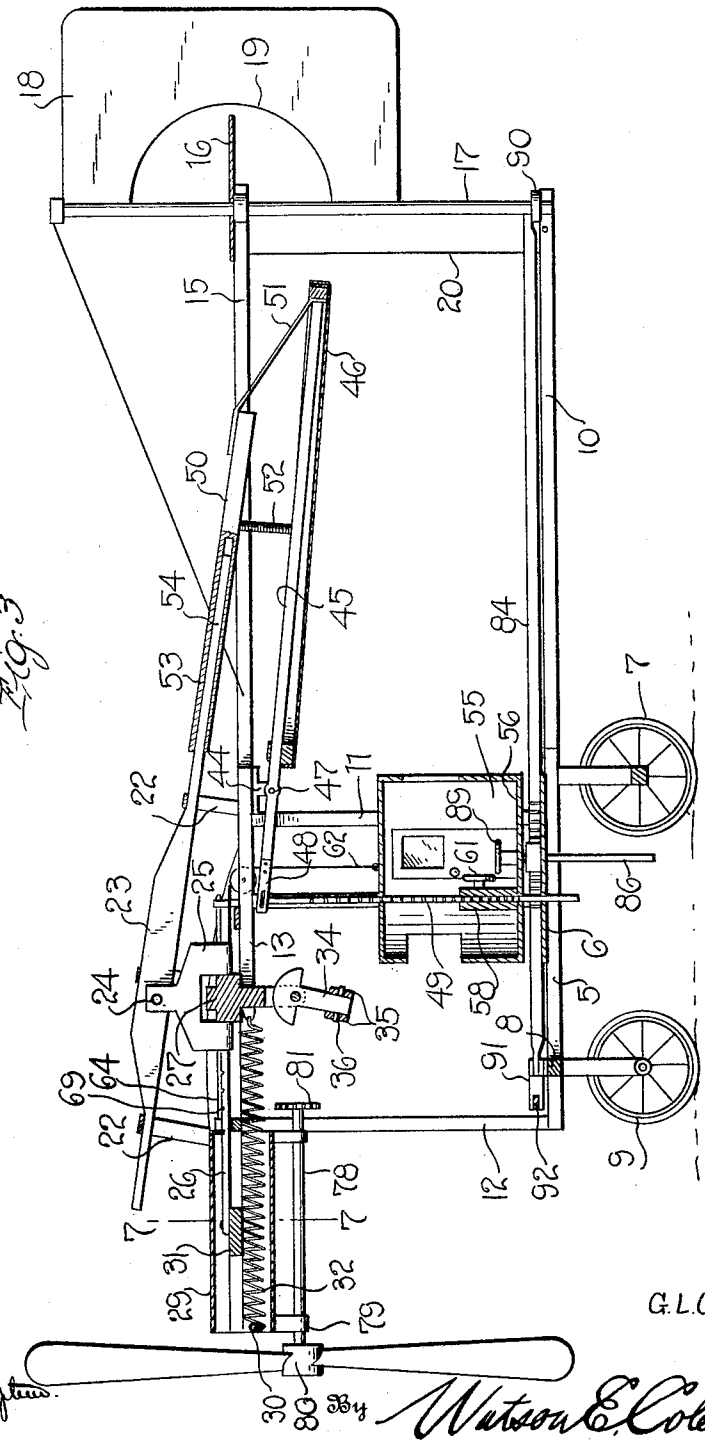
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6 SHEETS—SHEET 3.

Fig. 3



Witnesses

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6 SHEETS—SHEET 4.

Fig. 4

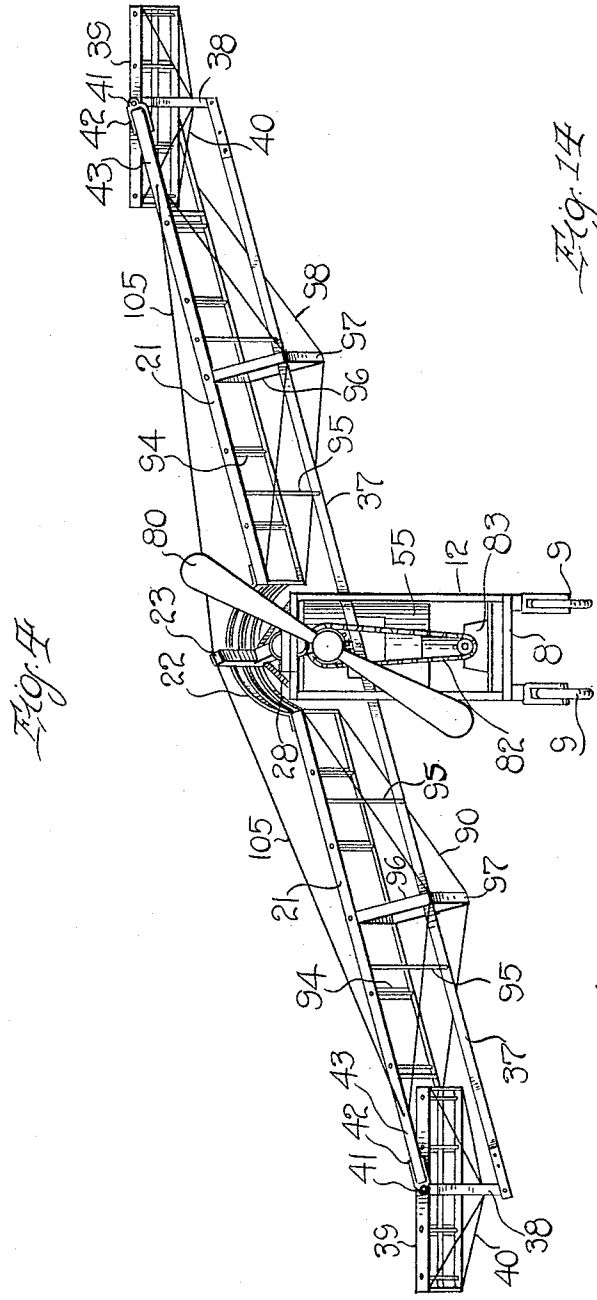


Fig. 14

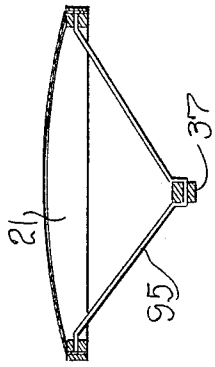
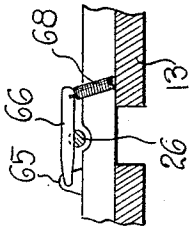


Fig. 13



Witnesses

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6 SHEETS—SHEET 5.

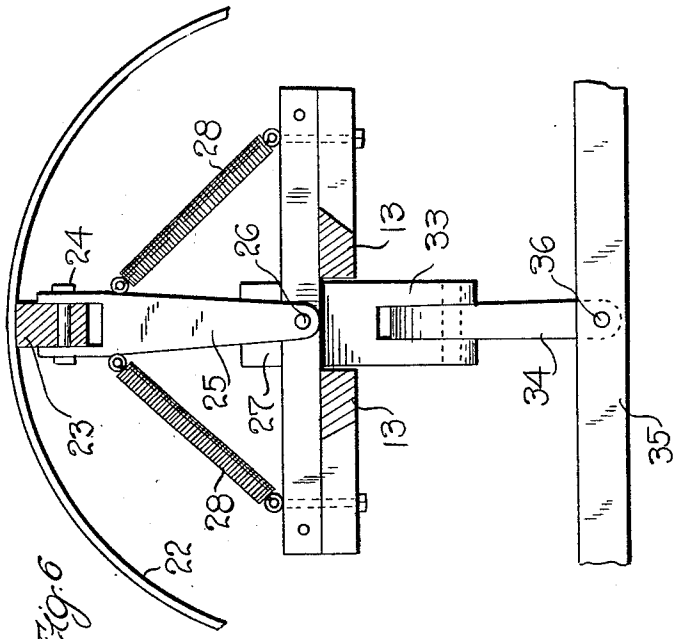


Fig. 6

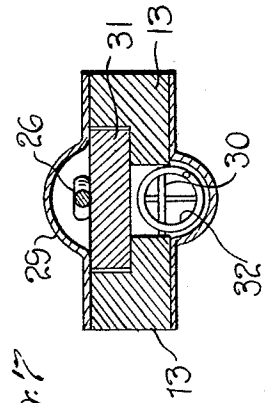


Fig. 7

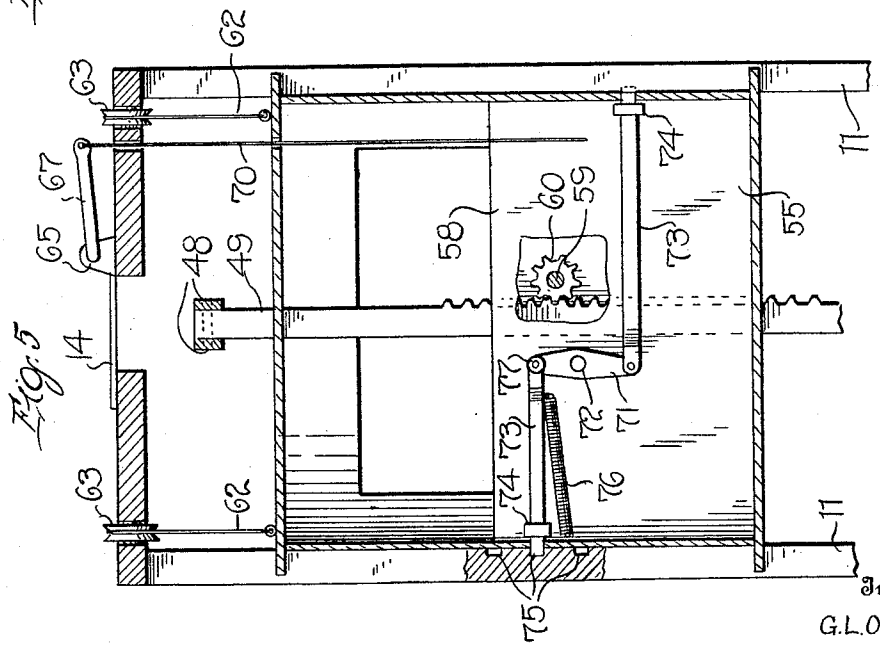


Fig. 5

Witnesses

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6 SHEETS—SHEET 6.

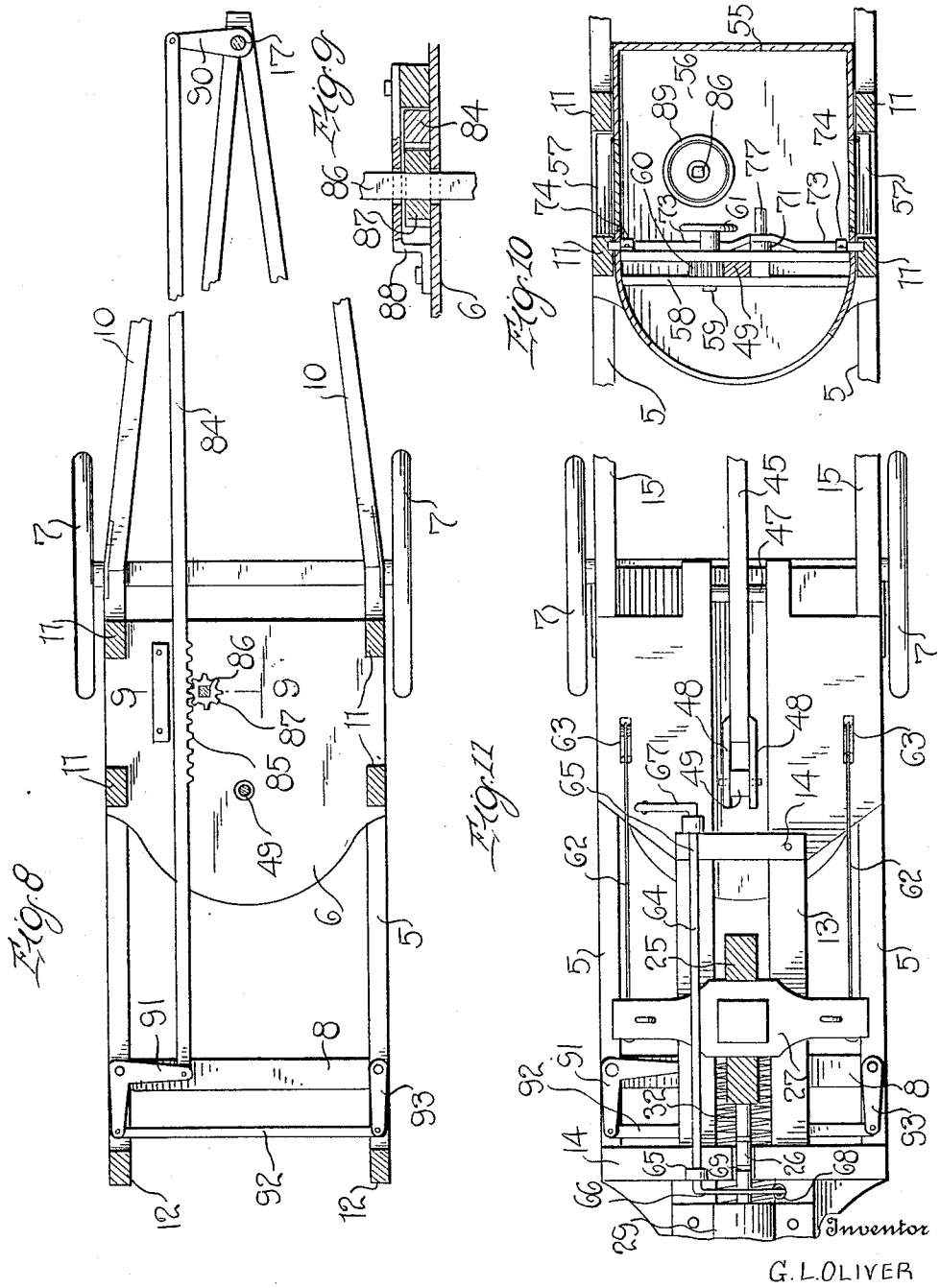


Fig. 8

Fig. 9

Fig. 10

Fig. 11

Witnesses

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Internal

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UNITED STATES PATENT OFFICE.

GEORGE L. OLIVER, OF LA GRANDE, OREGON.

AEROPLANE.

1,102,790. Specification of Letters Patent. Patented July 7, 1914.

Application filed January 26, 1914. Serial No. 814,523.

To all whom it may concern:

Be it known that I, GEORGE L. OLIVER, citizen of the United States, residing at La Grande, in the county of Union and State of Oregon, have invented certain new and useful Improvements in Aeroplanes, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to aeroplanes and more particularly to heavier-than-air machines commonly known as monoplanes, the invention having for its primary object to provide means for automatically adjusting the plane in accordance with the weight of the machine so that said plane is disposed in line with the center of gravity.

The invention has for a more specific object to provide a vertically movable adjustable car mounted upon the frame structure of the machine, a longitudinally shiftable plane, and connecting means between the car and the plane, whereby in the downward movement of the car under the weight of the passengers therein, the plane is shifted rearwardly so as to dispose the same immediately above the center of gravity.

The invention has for a further object to provide an improved mounting for the plane whereby the same is susceptible of transverse tilting movement by air pressures thereagainst, ailerons mounted upon the ends of said plane, and means connecting the ailerons to automatically tilt the same to a reverse angle with respect to the inclination of the plane.

The invention has for a further object to provide a spring held longitudinally shiftable plane, a tail member, a sliding connection between the tail member and said plane, and means operable upon an increase in the weight to be carried by the machine to shift said plane with respect to the tail piece.

The invention has for still another of its objects to provide an improved locking means whereby the plane may be secured in the position to which it has been shifted.

The invention has for a further object to provide simple and efficient means for easily and quickly securing the canvas or other covering upon the frames of the several sustaining planes.

The invention further contemplates in addition to the foregoing, improvements, the provision of a flying machine of the above type which is comparatively simple in its construction, may be easily operated and controlled by the aviator and is capable of manufacture at relatively small cost.

With the above and other objects in view as will become apparent as the description proceeds, the invention consists in certain constructions, combinations and arrangements of the parts that I shall hereinafter fully describe and claim.

For a full understanding of the invention, reference is to be had to the following description and accompanying drawings, in which—

Figure 1 is a side elevation of an aeroplane embodying my invention in its preferred form, showing the passenger car elevated and the plane in its normal position; Fig. 2 is a top plan view; Fig. 3 is a section taken on the line 3—3 of Fig. 2, showing the passenger car after it has been lowered by the weight of the passengers and the plane shifted rearwardly; Fig. 4 is a front elevation showing the plane tilted and the positions of the ailerons with respect thereto in the turning movement of the machine; Fig. 5 is a section taken on the line 5—5 of Fig. 2; Fig. 6 is an enlarged detail section taken on the line 6—6 of Fig. 2; Fig. 7 is a section taken on the line 7—7 of Fig. 2; Fig. 8 is a section taken on the line 8—8 of Fig. 1; Fig. 9 is a section taken on the line 9—9 of Fig. 8; Fig. 10 is a section taken on the line 10—10 of Fig. 1; Fig. 11 is a section taken on the line 11—11 of Fig. 1; Fig. 12 is an enlarged detail section taken on the line 12—12 of Fig. 2; Fig. 13 is a section taken on the line 13—13 of Fig. 2; Fig. 14 is a section taken on the line 14—14 of Fig. 2.

Referring in detail to the drawings, 5 indicates the lower parallel longitudinal bars of a frame structure which are connected by a bed plate 6. The rear ends of these bars are mounted upon suitable supporting wheels 7. The forward ends of said bars are connected together by a transverse bar 8 in which the vertical spindles of the front wheels 9 are rotatably mounted. To the rear ends of the frame bars 5, the rearwardly extending converging bars 10 are rigidly secured in any preferred manner. Upon each of the frame bars 5 adjacent its rear end, spaced uprights 11 are mounted, an additional upright 12 being secured to the forward end of the frame bar. The upper ends of these uprights are connected by the longitudinally disposed members 13 which are

connected and braced by the transverse plates 14. To the rear end of each of said members, a rearwardly extending longitudinal bar 15 is secured. These bars are connected at their rear ends by a horizonally disposed blade 16, and in said blade and the rear ends of the lower convergently disposed bars 10, the vertical rudder shaft 17 is rotatably mounted.

18 indicates the rudder blade which is secured to the upper end of said shaft and is cut away as at 19 to accommodate the blade 16. This blade is braced by means of the truss wires 20 which extend upwardly from the bars 10 and are secured to the ends of said blade.

21 indicates the plane whereby the machine is sustained in its flight, said plane embodying two similar sections which are connected by the bowed metal bars 22. These bars are centrally secured to a longitudinally disposed bar 23 which is fulcrumed for vertical pivotal movement as indicated at 24 upon a yoke 25. The arms of this yoke are loosely mounted upon the rear end of a rod 26 whereby said yoke may swing or turn upon the rod transversely of the machine. These yoke arms straddle a sliding block 27 which is mounted upon the longitudinal members 13. To the opposite ends of this block, the coil springs 28 are attached at one of their ends, the other ends of said springs being secured to opposite sides of the intermediate portion of the yoke 25. These springs yieldingly act to hold the pivotally mounted yoke in vertical position.

Upon the forward ends of the members 13, a sectional housing 29 is secured, said housing sections in addition to the connecting rod 30 affording a rigid brace for the forwardly projecting ends of said members. A slide member 31 is mounted within said housing upon the members 13 and to the same the forward end of the rod 26 is connected. A coil spring 32 is also arranged in said housing below the slide member and has its forward end secured to the rod or bar 30, the rear end of said spring being attached to the sliding block 27. A bifurcated hanger bearing 33 is secured to the under side of the block 27 and between the arms thereof, the member 34 is pivotally supported for swinging movement longitudinally of the machine. Upon the lower end of this latter member, the parallel metal bars 35 are pivotally mounted intermediate of their ends as indicated at 36. These bars extend transversely of the machine and between the ends thereof, the inner ends of the connecting bars 37 are secured. The outer ends of these bars are pivotally connected to the central depending bars 38 which are centrally fixed at their upper ends to the ailerons 39. These bars are braced from the aileron frames by truss wires 40. The ailerons 39 are of substantially rectangular form in plan as will be observed from reference to Fig. 2 and the same are provided with pivot studs 41 which are journaled in suitable bearings 42 mounted upon the extended ends 43 of the longitudinal bars of the frame of the main sustaining plane 21. Upon the rear end portions of the members 13, hanger bearings 44 are secured.

45 indicates the central longitudinally extending frame bar of a tail member 46, said member being of substantially triangular form in plan. In this bar, a transversely disposed pin 47 is secured, the ends of said pin being mounted in the hanger bearings 44. The forward end of the bar 45 is pivotally and slidably connected by means of the slotted plates 48 to the upper end of a vertically movable rack bar 49. This bar is moved in the manner hereinafter stated to tilt the plane 21 and tail 46 with respect to the line of flight so that the machine will be caused to either ascend or descend at the will of the aviator. A longitudinally extending bar 50 is arranged above the tail 46 and to the rear end thereof, one end of a resilient metal blade 51 is secured, the other end of said blade being secured to the central pole 45. This bar 50 is also connected to the opposite longitudinal bars of the tail frame by means of the springs 52. The forward end of the bar 50 is tubular in cross sectional form as indicated at 53 and fits snugly over the cylindrical rear end portion 54 of the central longitudinal bar 23 upon which the sections of the main plane 21 are mounted.

Between the spaced pairs of frame uprights 11, a passenger car generally indicated by the numeral 55 is mounted for vertical sliding movement. This car embodies a base or platform 56 provided with extensions 57 disposed between the contiguous frame uprights 11 to guide said car in its sliding movement. The vertical wall 58 of the car is of hollow construction and through the same, the vertically disposed rack bar 49 loosely extends, said bar extending through the platform 56 and having its lower end disposed in an opening provided in the bed plate 6. A shaft 59 is suitably mounted in the hollow wall 58 and upon the same a pinion 60 is secured for engagement by the teeth of the rack 49.

61 indicates a suitable hand hold fixed to said shaft whereby the same may be turned in order to actuate the rack bar and thereby tilt the sustaining plane 21 and the tail 46 as above explained. To the top of the car 55, the cables 62 are attached at one of their ends in any suitable manner, said cables passing over the sheaves or pulleys 63 mounted in the longitudinal members 13. The other ends of these cables are connected to the respective ends of the sliding block

27. It will be clearly understood from this construction, that the weight of a passenger or passengers upon the platform 56, will cause the car 55 to descend between the uprights 11 and through the medium of the cables 62, the sliding block 27 is drawn rearwardly. As the rod 26 is secured in this block and the plane 21 is mounted and supported upon said rod, it will be obvious that said plane is also moved rearwardly. In this movement of the block 27, the coil spring 32 is expanded. The tail 46 however, maintains a relatively stationary position, the rear end of the longitudinal bar 23 being slidable into the tubular portion of the bar 50. In this manner, the main sustaining plane 21 is shifted longitudinally of the machine in accordance with the weight in the car and thus disposed in proper relation to the center of gravity so that all liability of the machine being overbalanced by unequal distribution of the weight is obviated.

In order to lock the main plane 21 in its shifted position, I provide a rod 64 mounted in bearings 65 upon one of the members 13. The front and rear ends of this rod are provided with crank arms indicated at 66 and 67 respectively which extend in opposite directions. One end of a coil spring 68 is secured to the forward crank arm 66 and to one of the members 13. This spring normally acts to hold the arm in engagement with one of a series of notches 69 provided in the rod 26. To the other arm 67 on the rear end of the rod 64, a pull cord 70 is attached, said cord extending downwardly through an opening in one of the frame members 13 and an opening in the top of the car 55, so that the same may be readily grasped by the aviator in order to release the rod 26 for the shifting of the plane 21. The car 55 may also be locked in position and for this purpose, I provide a lever 71 fulcrumed as at 72 upon the wall 58 of the car and to the opposite ends of said lever, the arms 73 are pivotally connected. These arms move through suitable guide members 74 and are adapted for engagement in any one of a series of notches or sockets 75 provided in the frame uprights 11. To one of the arms 73 a spring 76 is connected, said spring acting to normally hold the arms in their extended positions. A suitable handle 77 is provided at the pivoted end of one of the arms 73 whereby said arms may be retracted and disengaged from the notches in the uprights 11 in order to permit of the vertical movement of the car 55.

78 indicates the propeller shaft mounted in the hanger bearings 79 depending from the housing 29 and to the forward end of this shaft, a suitable propeller 80 is secured. The rear end of the shaft is equipped with a sprocket wheel 81 which is engaged by the endless chain 82 driven from a similar sprocket wheel secured upon the shaft of an engine 83. This engine is of any approved type and is preferably mounted between the forward ends of the frame bars 5.

A longitudinally shiftable bar 84 is movably disposed upon the bed plate 6, said bar being provided with rack teeth 85. A vertical rectangular rod or shaft 86 is loosely disposed through openings in the bed plate 6 and the platform 56 of the car 55 and upon the same, a pinion 87 is arranged, said pinion being held in engagement with the rack teeth 85 on the bar 84 by means of the plate 88. The upper end of the rectangular shaft 86 is provided with a suitable hand wheel 89 whereby the rod may be turned and the bar 84 shifted. The rear end of this bar is pivotally connected to an arm 90 fixed to the lower end of the rudder shaft 17, while the forward end of said bar is pivotally connected to one arm of a bell crank lever 91 secured to the upper end of the spindle of one of the forward ground wheels 9. The other arm of the lever 91 is connected by a bar 92 to an arm 93 which is secured upon the spindle of the other of said wheels. It will be readily understood from the foregoing that when the rod 84 is shifted, the rudder blade 18 is swung to the right or left to position the same at an angle with relation to the line of flight whereby the machine may be guided in its movement. In moving over the ground after alighting, the same shifting movement of the bar 84 will turn the forward ground wheels 9 and thus guide the machine in the proper direction.

In addition to the foregoing, I have also devised a very desirable construction for the main plane 21 and means for securing the canvas or other covering upon the frame thereof. Each section of the main plane includes parallel longitudinal bars which are connected by the upwardly bowed or curved transverse ribs 94. A plurality of rods 95 are loosely mounted intermediate of their ends in the bars 37, said rods extending upwardly and outwardly and having their ends loosely mounted in the longitudinal bars of the plane sections. Thus the connecting bars whereby the ailerons are actuated are supported and braced. To each of the longitudinal bars of the sections of the main plane, midway between its ends, the depending bars 96 are secured, said bars being connected by the transverse bars 97. Truss wires 98 are secured to the ends of these latter bars and to the longitudinal bars of the frame sections.

99 indicates the canvas or other fabric covering for the frames of the sections of the plane 21. Each of the longitudinal edges of said covering is provided with a

hem in which a rod 100 is arranged. This covering is adapted to be disposed over the bowed transverse ribs 94 and the edges thereof in which the rods 100 are arranged drawn downwardly over the outer sides of the longitudinal frame bars. Securing strips or cleats 101 are provided in their lower edges with longitudinal grooves 102 to receive the rods 100. These cleats have openings formed therein at intervals to receive the transverse rods 103 which are disposed through the longitudinal frame bars and the edges of the covering or sheeting. Said rods on one of their ends are provided with heads while the other ends thereof are threaded to receive suitable nuts 104. In this manner, it will be appreciated that the covering may be very easily and quickly secured upon the frames of the plane sections or removed therefrom. It will be understood that the ailerons 39 are constructed in a similar manner to the plane sections and the covering thereof also removably secured in position, as above described. I further provide the additional trussing or bracing wires 105 which have their ends connected to the outer ends of the longitudinal bars of the respective plane sections and are secured intermediate of their ends upon the longitudinal bar 23.

From the foregoing, it is believed that the construction, arrangement and operation of the several parts of my improved aeroplane may be clearly and fully understood. Assuming that the car 55 is in the position shown in Fig. 1, in which position the sustaining plane 21 is disposed forwardly of the car, it will be apparent that when the passengers enter the car and the locking arms 73 are moved to their release positions, the weight of the passengers will cause the car to descend and through the medium of the mechanism above described shift the plane 21 rearwardly to the position shown in Fig. 3. The several parts are of such proportionate size and weight and the spring 32 of such strength that the plane will be moved to the proper position in accordance with the added weight and automatically disposed with respect to the center of gravity so that the machine will not be overbalanced but maintains a proper equilibrium in its flight. In the turning movement of the machine, when the rack bar 84 is actuated by the operator to shift the rudder blade 18, the excessive air pressure against one of the sections of the main sustaining plane 21 causes said plane to rock with respect to the body of the machine and assume a transversely inclined or tilting position as shown in Fig. 4 of the drawings. It will of course, be understood that the plane will be tilted at an opposite inclination in making a turn in the reverse direction. By means of my improved automatic shifting device for the plane, it will be seen that I have produced a highly advantageous improvement in flying machines of the monoplane type, so that the same may carry a large number of passengers without liability of rendering the machine top-heavy by the added weight and therefore in imminent danger of overturning.

While I have specifically described the several mechanical features of the machine whereby the several expressed objects may be satisfactorily and practically fulfilled, it will of course, be appreciated that such structural features are susceptible of considerable modification in the form, proportion and arrangement of the several parts employed, and I therefore reserve the privilege of resorting to all such legitimate modifications as may be fairly embodied within the spirit and scope of the invention as claimed.

Having thus described the invention, what is claimed is:

1. In a flying machine, a longitudinally shiftable sustaining plane, a pivotally mounted tail plane, a slidable connection between said planes, means connected to the tail plane whereby the same may be disposed at an inclination longitudinally of the machine, and means for shifting the sustaining plane longitudinally of the machine with respect to the tail plane.

2. In a flying machine, a sustaining plane pivotally mounted for tilting movement transversely and longitudinally of the machine, a pivotally mounted tail plane, a slidable connection between the sustaining plane and the tail plane, and means for simultaneously positioning said planes at a longitudinal inclination with respect to the line of flight.

3. In a flying machine, a longitudinally shiftable sustaining plane, a tail plane, a slidable connection between the sustaining plane and the tail plane, and means for shifting the sustaining plane with respect to the tail plane to position the same with respect to the gravity center of the machine.

4. In a flying machine, a frame structure, a sustaining plane mounted upon said frame structure for longitudinal shifting movement with respect thereto, a passenger car vertically movable in the frame structure, means connecting said car to the sustaining plane whereby the plane is longitudinally moved upon the descent of the car under the weight of a passenger and positioned with respect to the gravity center of the machine, means for locking the plane in its shifted position, and additional means for locking said movable car in the frame structure.

5. In a flying machine, a frame structure, a vertically movable passenger car mounted in said frame structure, a sustaining plane

longitudinally movable upon the frame structure, means normally holding the sustaining plane in position forwardly of said car, and means connecting the car to said plane whereby, in the descent of the car under the weight of a passenger, said holding means is overcome and the plane moved rearwardly and positioned with respect to the gravity center of the machine.

6. In a flying machine, a frame structure, a vertically movable passenger car mounted in said frame structure, a sustaining plane longitudinally movable upon the frame structure, means normally holding the sustaining plane in position forwardly of said car, means connecting the car to said plane whereby, in the descent of the car under the weight of a passenger, said holding means is overcome and the plane moved rearwardly and positioned with respect to the gravity center of the machine, and means for locking the plane in the position to which it has been moved.

7. In a flying machine, a frame structure, a vertically movable passenger car mounted in said frame structure, a sustaining plane longitudinally movable upon the frame structure, means normally holding the sustaining plane in position forwardly of said car, means connecting the car to said plane whereby, in the descent of the car under the weight of a passenger, said holding means is overcome and the plane moved rearwardly and positioned with respect to the gravity center of the machine, means for locking the plane in the position to which it has been moved, and additional means to lock the passenger car against further downward movement.

8. In a flying machine, a frame structure, a slide member mounted in the frame structure, a rod connected to said slide member, a sustaining plane pivotally mounted upon the rod and movable therewith, a spring connected to the slide member to yieldingly hold said slide member against movement in one direction, and vertically movable means mounted in the frame structure and connected to the plane to move said plane against the action of the holding spring and position the same with respect to the gravity center of the machine.

9. In a flying machine, a frame structure, a slide member mounted in the frame structure, a rod connected to said slide member, a sustaining plane pivotally mounted upon the rod and movable therewith, a spring connected to the slide member to yieldingly hold said slide member against movement in one direction, vertically movable means mounted in the frame structure and connected to the slide member to move said slide member against the action of the holding spring and position the same with respect to the gravity center of the machine, and a locking device engageable with said rod to hold the plane in the position to which it has been moved.

10. In a flying machine, a frame structure, a slide member mounted in the frame structure, a rod connected to said slide member, a sustaining plane pivotally mounted upon the rod and movable therewith, a spring connected to the slide member to yieldingly hold said slide member against movement in one direction, vertically movable means mounted in the frame structure and connected to the slide member to move said slide member against the action of the holding spring and position the same with respect to the gravity center of the machine, a locking device engageable with said rod to hold the plane in the position to which it has been moved, and additional means for locking said movable means in the frame structure against vertical movement.

11. In a flying machine, a frame structure, a slide member mounted upon said frame structure, a rod connected to said slide member, a sustaining plane pivotally mounted upon said rod for transverse tilting movement, a coil spring secured at one end to the frame and having its other end attached to said slide member to yieldingly hold the slide member against shifting movement in one direction, a passenger car vertically movable in the frame structure, flexible connections between said passenger car and the slide member whereby, in the descent of said car under the weight of a passenger, the action of the spring is overcome and said plane shifted rearwardly and positioned with respect to the gravity center of the machine, and means for locking the plane in its shifted position.

12. In a flying machine, a frame structure, a pivotally mounted sustaining plane longitudinally movable upon said frame structure, a tail plane, a slidable connection between the sustaining plane and the tail plane, means connected to the tail plane whereby the same and the sustaining plane may be disposed at an inclination longitudinally of the machine, and means mounted in the frame structure for shifting the sustaining plane with respect to the tail plane to position the same with respect to the gravity center of the machine.

13. In a flying machine, a frame structure, a sustaining plane pivotally and slidably mounted upon said frame structure, a tail plane, means for connecting the tail plane to the sustaining plane for pivotal movement therewith, but permitting of the sliding movement of the sustaining plane with relation to the tail plane, a passenger car vertically movable in the frame structure, and connecting means between said car and the sustaining plane whereby, in the descent of said car under the weight of a passenger, the

sustaining plane is shifted longitudinally with respect to the gravity center of the machine.

14. In a flying machine, a frame structure, a sustaining plane longitudinally movable upon said frame structure, a tail plane, a slidable connection between the tail plane and said sustaining plane, a vertically movable passenger car mounted in the supporting frame, connecting means between said car and the sustaining plane whereby, in the descent of said car under the weight of a passenger, said plane is moved longitudinally and positioned with respect to the gravity center of the machine, and manually operable means in the car connected to said tail plane whereby the same may be disposed at a longitudinal inclination with respect to the frame structure.

15. In a flying machine, a frame structure, a spring held longitudinally movable rod mounted in said frame structure, a sustaining plane pivotally mounted upon said rod for transverse tilting movement, and movable longitudinally of the frame with said rod, means yieldingly holding the plane against such transverse tilting movement, and means mounted in the frame structure and movable by gravity for shifting said plane longitudinally of the frame to position the same with respect to the gravity center of the machine.

16. In a flying machine, a frame structure, a spring held longitudinally movable rod mounted in said frame structure, a sustaining plane mounted upon said rod for transverse and longitudinal tilting movement, said plane being also movable with said rod longitudinally of the frame structure, a vertically movable passenger car mounted in the frame structure, connecting means between said car and the rod, whereby in the descent of the car under the weight of a passenger, said plane is moved longitudinally and positioned with respect to the gravity center of the machine, and additional means engageable with said sliding rod to lock the plane in the position to which it has been moved.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

GEORGE L. OLIVER.

Witnesses:
HARRIS F. FRENCH,
CLAUDE H. SCRANTON.

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