DE WITT C. MoCALLUM.

AERODROME.

APPLICATION FILED JUNE 3, 1910.

996,105.

Patented June 27, 1911.

3 SHEETS—SHEET 1.

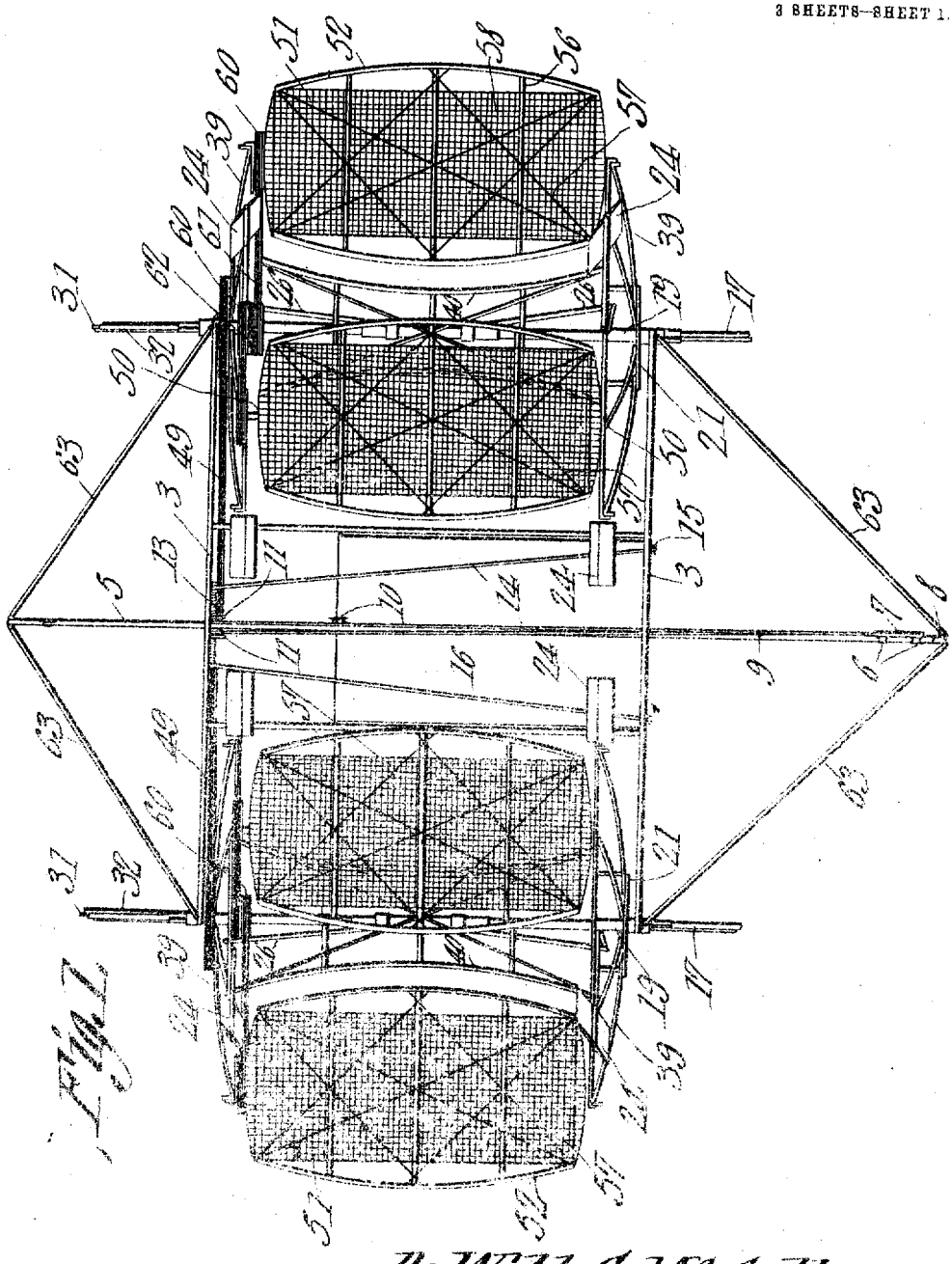

Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 2.

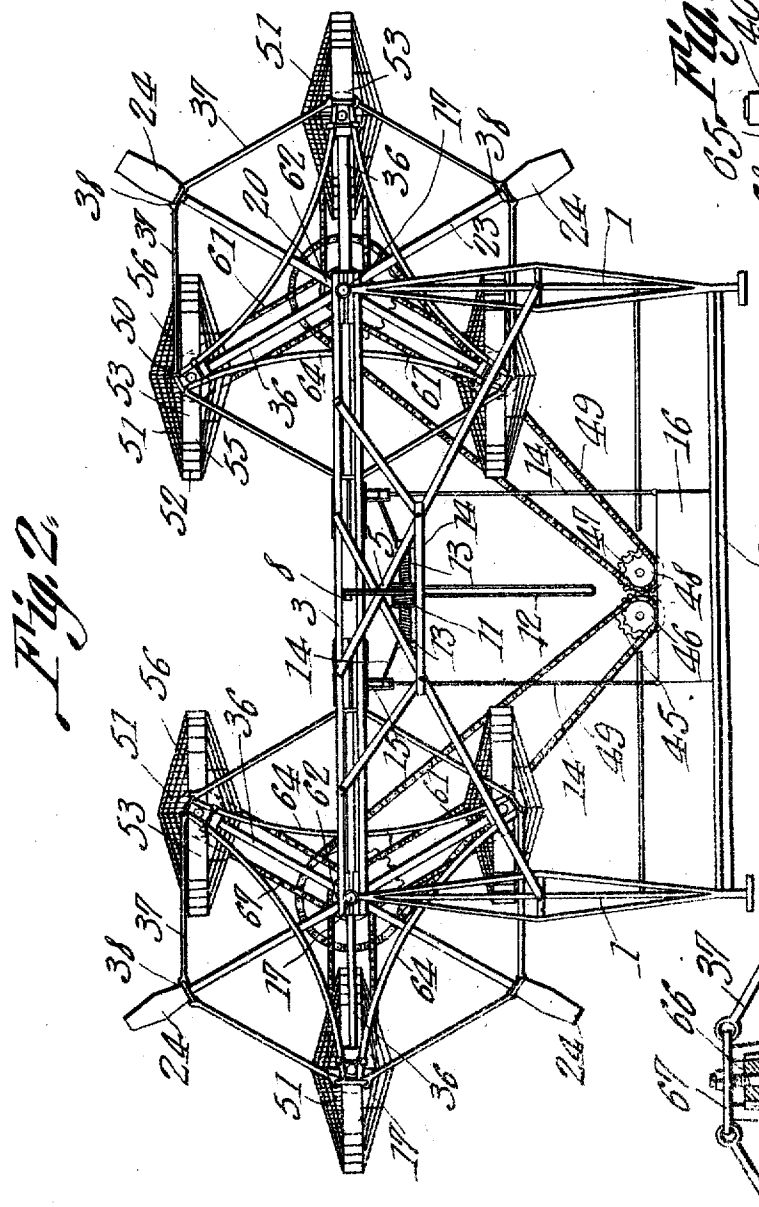


Fig. 3.

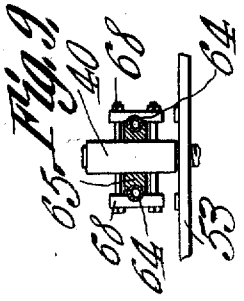
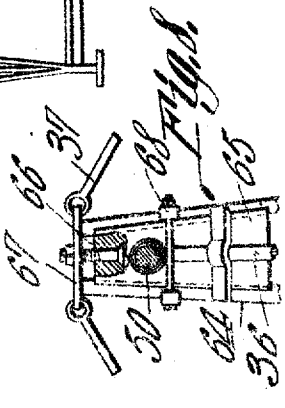


Fig. 4.



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3 SHEETS—SHEET 3

Fig. 3.

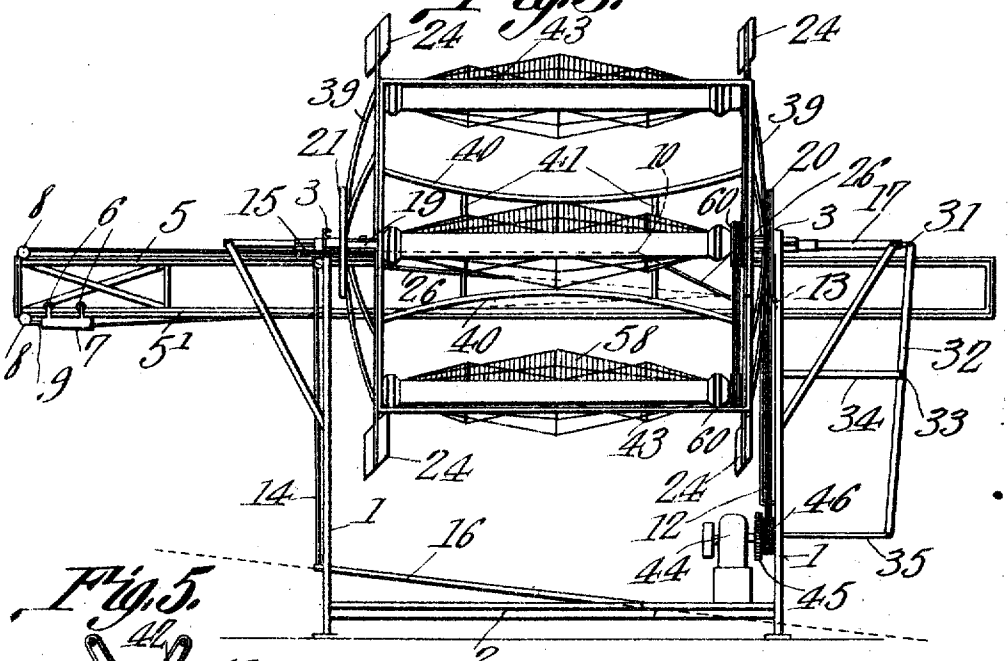


Fig. 5.

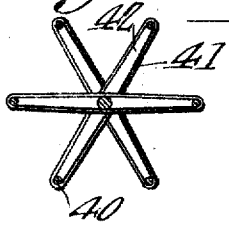
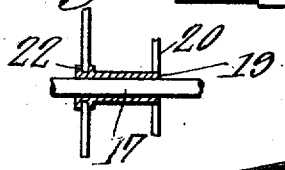


Fig. 7.

Fig. 6.

Fig. 10.



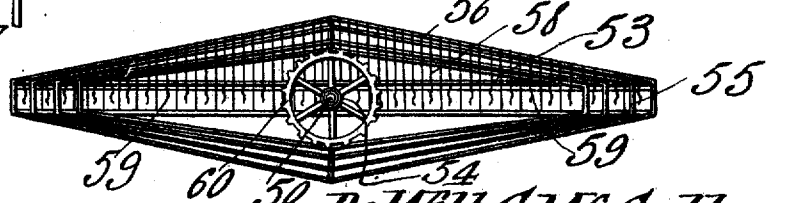


Fig. 4.

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UNITED STATES PATENT OFFICE.

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AERODROME.

996,105. Specification of Letters Patent. Patented June 27, 1911.

Application filed June 3, 1910. Serial No. 564,768.

To all whom it may concern:

Be it known that I, DE WITT CLINTON McCALLUM, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Aerodrome, of which the following is a specification.

This invention relates to aerodromes or air ships of the heavier than air type and one of its objects is to provide a machine of this character utilizing opposed revoluble series of elevating planes mounted for movement about axes extending longitudinally of the machine, each of said planes being so constructed as to produce the maximum displacement of air during the downward movement thereof but which are adapted to move upwardly with practically no resistance from the atmosphere.

A further object is to combine propelling blades with the revoluble series of elevating planes, these blades being shiftable about their longitudinal axes so that the driving power thereof can be varied at will and the machine readily reversed or turned as a result of the manipulation of the blades.

Another object is to provide manually operated means for balancing the machine fore and aft, said balancing mechanism being operatively connected with a shiftable floor adapted to be maintained substantially horizontal irrespective of the forward or backward tilting of the sustaining planes and the other parts of the elevating and propelling mechanism.

A still further object is to provide a machine having a frame which is compact, light and durable.

With these and other objects in view the invention consists of certain novel details of construction and combinations of parts hereinafter more fully described and pointed out in the claims.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings:—Figure 1 is a plan view of the machine. Fig. 2 is an end elevation thereof. Fig. 3 is a side elevation. Fig. 4 is an enlarged side elevation of one of the elevating planes. Fig. 5 is a side elevation of one set of radial frame braces. Fig. 6 is an elevation of a portion of the central shaft of one series of elevating planes, the position of one of the propeller blades relative thereto being shown. Fig. 7 is an enlarged section on line A—B Fig. 6. Fig. 8 is an enlarged view, partly in elevation and partly in section of one of the adjustable bearings of an elevating plane. Fig. 9 is a transverse section through the parts shown in Fig. 8. Fig. 10 is a view partly in section and partly in elevation showing the sleeve employed for connecting a gear to the spokes of the revoluble structure.

Referring to the figures by characters of reference 1 designates corner posts formed of light trussed rods or tubes and connected together adjacent their ends by base strips 2 and, at their upper ends by top strips 3, these last mentioned strips being extended from side to side of the machine and being preferably arranged in pairs, as shown especially in Fig. 2. Braces 4 may connect these top strips with the corner posts so as to produce a rigid frame capable of withstanding all ordinary strains to which the machine may be subjected while in flight.

A central longitudinally extending frame 5 is mounted upon the middle portions of the cross strips 3 and the adjoining portions of the braces 4, this frame being made up of upper and lower strips connected at their ends, the said strips projecting beyond the front and rear ends of the frame of the machine. The lower strip 5′ of the frame 5 constitutes a track on which are mounted rollers 6 supporting a weight 7. Guide sheaves 8 are carried by the front end of the frame 5 at the upper and lower corners thereof and support a cord 9 which is fastened to the front end of the weight and extends rearwardly from the upper sheave 8, over and downwardly from an intermediate guide sheave 10 and to a drum 11 about which it is wrapped. An intermediate portion of the cord is looped and hangs downwardly from the drum 11 as shown at 12, said cord being extended from the drum and secured at one end to the rear end of the weight 7. The cord is so arranged on the drum that when one run thereof is pulled downwardly the drum 11 will be rotated and the cord will pull the weight 7 in one direction while, when the other run of the loop 12 is pulled downwardly, the rotation of the drum 11 will be reversed and the weight 7 will be drawn in the opposite direction. By means of this cord with its depending loop 12, the weight 7 can be shifted so as to shift the center of gravity so as to either maintain the frame substantially horizontal

while the load thereon is shifted or to tilt the frame and the mechanism carried thereby so as to control the flight of the machine.

A smaller drum 13 rotates with the drum 11 and has separate cords 14 secured to it and adapted to be wound thereon, these cords extending over guide sheaves 15 secured to the front top strip 3 and hanging downwardly from said sheaves, the lower ends of the cord being attached to the movable end of a floor 16 hingedly connected at its rear end to the base frame of the machine. The two drums 11 and 13 are so proportioned that when the main portion of the machine is tilted by shifting the weight 7, the floor 16 is either raised or lowered relative to the base frame 2 so as to be maintained substantially horizontal.

The machine is provided with two series of elevating and propelling devices, one of the series being located at each side of the upper portion of the frame. The mechanism at each side of the machine consists of a longitudinally extending tubular shaft 17 which is held against rotation in any suitable manner and has a longitudinal slot 18 therein adjacent its center.

A sleeve 19 is mounted to rotate upon each end portion of the tubular shaft 17, there being a gear 20 secured to one of the sleeves while a disk 21 is secured to the other sleeve. Sockets 22 are formed within each sleeve and constitute end bearings for radially extending stems 23, the outer ends of which are formed with propeller blades 24. Arms 25 extend radially from these stems (see Fig. 6) and are attached, by means of links 26, to collars 27 which are fixedly mounted upon a sleeve 28. This sleeve is slidably mounted on the shaft 17 and has an interior annular groove 29 into which project one or more pins 30 radiating from a rod 31 which is slidable within the shaft 17. This rod extends beyond one end of the shaft and is connected to one end of a lever 32 fulcrumed, as at 33, upon an arm 34 extending rearwardly from the machine. An operating rod 35 is attached to the lower end of the lever 32 and by means thereof said lever can be actuated so as to shift the rod 31 longitudinally within the stationary tubular shaft 17. By reason of the pin connections between the rod 35 and the sleeve, said sleeve 28 can thus be moved along said tubular shaft so as to simultaneously swing all of the arms 25 in the same direction and thus move the blades 24 about their central longitudinal axes or, in other words, simultaneously vary the pitches of the propeller blades. As the sleeve 28 has an interior annular groove engaged by the pin 30, it will be seen that said sleeve is free to rotate about the shaft 17 with the sleeve 19 and the propellers 24.

Spokes 36 are extended radially from the socketed portions of the sleeves 19 and are equidistant from the stems 23, the outer ends of the spokes being connected by braces 37 extending from the spokes to collars 38 in which the outer end portions of the stems 23 are mounted to rotate. Braces extend from the disk 21 and the sprocket 20, as indicated at 39 and are attached to the spokes 36 and the collars 38.

The spokes at the two ends of the shaft 17 are connected, adjacent their inner ends, by bowed connecting strips 40. These strips are provided at intermediate points with radial braces in the form of elongated loops 41 extending around the strips 40 and straddling the shaft 17, there being filling strips 42 interposed between the shaft and the strips 40 and secured to the straps 41. It is of course to be understood that these braces rotate upon the shaft 17 with the spokes to which the strips 40 are attached.

The collars 38 may be formed at the ends of connecting strips 43. The spokes 36, stems 23, and the connections 40 and 43, thus form a rigid frame mounted for rotation about the shaft 17.

A motor 44 is mounted upon the base frame 2 and has a gear 45 upon its shaft and a sprocket 46 also secured to said shaft. Gear 45 meshes with a gear 47 and a sprocket 48 rotates with the gear 47. A chain 49 is driven by each sprocket 48, one of these chains being mounted on each of the sprockets 20. It will thus be seen that the two sprockets 20 will be simultaneously rotated in opposite directions and the revoluble frames at the two sides of the machine will thus be revolved.

The outer end portions of the spokes 36 are arranged adjacent bearings for trunnions 50 extending from the ends of the frames of the elevating planes 51. Each of these planes preferably consists of upper and lower bowed side strips 52 and upper and lower end strips 53, there being blocks 54 secured between these end strips and from which the trunnions 50 extend. The side strips 52 are connected by upstanding braces 55 and angular cross strips 56 are arranged above and below the side strips and connect said strips. These cross strips constitute rests for diagonally disposed brace wires 57, the upper strips 56 also serving to support wires 58 extending longitudinally of the frame and supporting flaps 59 of silk or other suitable fabric. These flaps are so proportioned as to swing against the wires 58 and lap one another when the plane is moving downwardly, while, when said plane is moving upwardly, the flaps will assume vertical positions and permit air to pass freely between them.

One trunnion 50 of each frame 51 has a sprocket 60 secured to it, said sprocket being engaged by a chain 61 mounted on a

sprocket 62 which is fastened to the shaft 17 and is held against rotation thereon. It will be seen therefore that if three of these elevating planes are carried by each rotating structure, three sprockets 62 will be fixedly secured to the fixed shaft 17, one being provided for each of the planes 51. The sprockets 60 and 62 are of the same diameter and, while only one sprocket has been shown in connection with each frame 51, it is to be understood that if preferred, one of these sprockets may be arranged on each of the trunnions 50 of each plane 51. The connections between the sprockets 60 and 62 are such that during the rotation of the spokes 36, the elevating planes will be constantly maintained parallel to one another and to the base frame 2.

When it is desired to elevate the machine the motor 44 is set in motion and the propeller blades 38 are shifted by the rods 35 and levers 32 so that all of the blades at each end of the machine will lie in the same plane of rotation. The blades will therefore travel through the air without any noticeable resistance therefrom and a high speed of rotation of the plane carrying spokes 36 can thus be obtained. The chain 49 rotates the sprocket 20 and the spokes 36 and stems 23 are moved about the shaft 17, the chains 61 and the sprockets 60 and 62 serving to maintain the planes constantly parallel to one another. As these planes travel downwardly, the flaps 59 carried thereby will swing upwardly against the wires 58 and cause the downward displacement of the air and the consequent upward movement of the entire machine, it being noted that the two sets of planes rotate in opposite directions as indicated by arrows in Fig. 2. During the upward movement of each of the elevating planes, the flaps 59 are swung downwardly away from the wires so as to permit the air to pass between them and thus offer practically no resistance to the upward movement of the planes. After the machine has attained a desired elevation it can be propelled either forwardly or backwardly by shifting the blades 24 by means of rods 34 and levers 32. Should all of the blades be given the same pitch, the machine will be driven straight ahead but, by swinging the blades at one side of the machine to a greater extent than those at the other side the machine can be turned to one side without the necessity of utilizing a rudder for steering it, this being due to the fact that one set of blades will exert a greater driving action than the other set. By shifting one set of blades 24 so that they will be pitched directly the reverse of the other set, the machine can be very quickly turned.

By shifting the weight 7, the load carried by the machine can be counter-balanced prior to or immediately following the starting of the machine and, while the machine is in flight, this weight can be moved so as to tilt all parts of the machine with the exception of the floor 16 so that the elevating planes during their movement about the shafts 17, will exert not only an elevating action, but will also tend to propel the machine either forwardly or backwardly, according to the direction in which it is tilted. The course of the machine can thus be readily controlled. this manipulation of the weight being especially advantageous when it is desired to soar upwardly or downwardly without depending altogether upon the elevating action of the planes, due to the rotation thereof.

Importance is attached to the fact that each of the elevating planes is substantially concavo-convex, the lower face of the plane being concaved so as to more positively act upon the air and thus increase the efficiency of the planes as sustaining means.

It is to be understood of course that braces may be arranged wherever desired upon the machine. For example, guy wires 63 may be extended from the ends of the central strips 3 and along diverging lines to the upper ends of the corner posts 1. Also, curved braces 64 may be connected to the ends of the spokes 36, the stems 23 being journaled within them.

As has been stated, the outer ends of the spokes are arranged adjacent bearings in which the trunnions 50 are mounted. As shown in Figs. 8 and 9 the said spokes are connected by means of cross strips 65 to the braces 64 and a bearing block 65 is adjustably mounted between the braces 64 and is connected, by means of a screw 66 to a cap plate 67 secured to the outer ends of the braces 64. This screw is swiveled within the block 65 and by adjusting the screw, the block can be shifted between the braces so as to move the trunnion 50 journaled therein away from the shaft 17 and thus take up the slack in the chain 61. The braces 37 are connected preferably to the ends of cap plates 67. A clip 68 extends around the braces 64 and the block 65 and, when tightened, prevents displacement of the parts.

It is of course to be understood that various changes may be made in the construction and arrangement of the parts without departing from the spirit or sacrificing any of the advantages of the invention as defined in the appended claims.

What is claimed is:—

1. An aerodrome including a main frame, structures revoluble about axes extending longitudinally of the frame at the sides thereof, means carried by and revoluble with each of the structures for propelling the machine longitudinally and means carried by and revoluble with each of the structures for propelling the machine upwardly.

2. An aerodrome including a main frame, structures carried thereby and mounted for rotation about axes extending longitudinally of the frame, said structures being arranged side by side, elevating planes carried by each of said structures, means for maintaining all of the planes parallel with the plane of the axes of the structures, propelling blades radiating from and revoluble with each of said structures, and means for varying the pitch of said blades during the rotation of the structures.

3. An aerodrome including structures mounted for rotation in opposite directions, elevating planes carried by said structures, propeller blades mounted on and revoluble with the said structures, and extending radially beyond the structures, and means for simultaneously rotating all of the blades upon each structure to vary the pitch thereof.

4. In an aerodrome a main frame, elevating mechanism connected thereto, a longitudinally movable weight carried by the frame, a tiltable floor, and means for simultaneously shifting the weight and floor to tilt the main frame and maintain the floor substantially horizontal.

5. An aerodrome including a main frame, elevating mechanism carried thereby, a longitudinally extending track upon the frame and extending beyond one end thereof, a weight movably mounted on the track, manually operated means for shifting said weight to change the center of gravity, and a tiltable floor carried by the main frame and shiftable by said weight actuating means.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

DE WITT CLINTON McCALLUM.

Witnesses:
S. K. PARKS,
GEO. POMEROY.