A. J. BERNIER.

AEROPLANE.

APPLICATION FILED MAR. 20, 1922.

1,417,884.

Patented May 30, 1922.

3 SHEETS--SHEET 1.

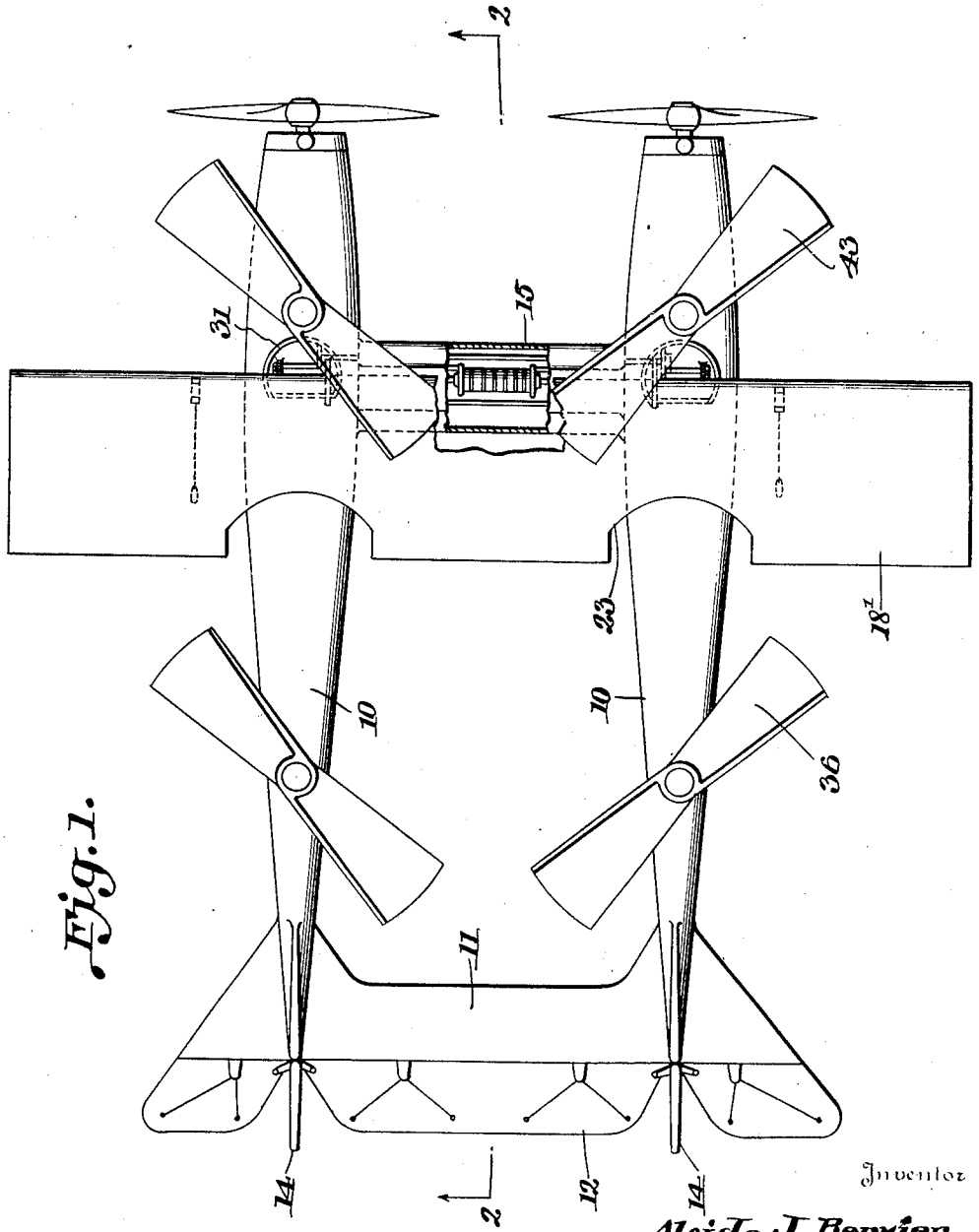

Fig. 1.

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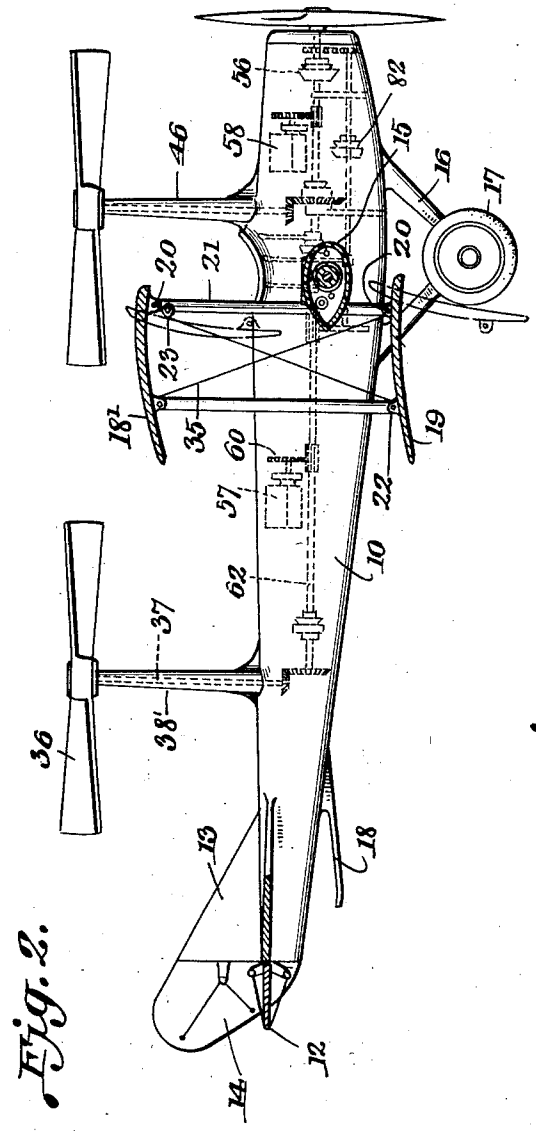

Fig. 2.

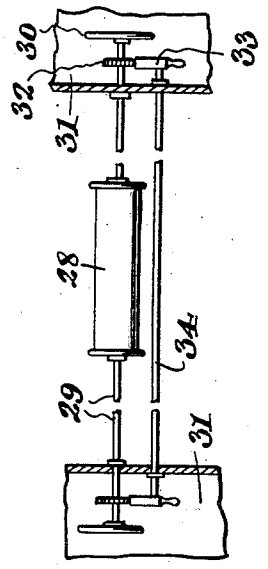

Fig. 4.

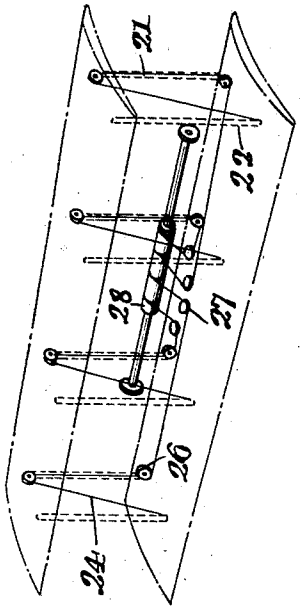

Fig. 3.

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3 SHEETS—SHEET 3.

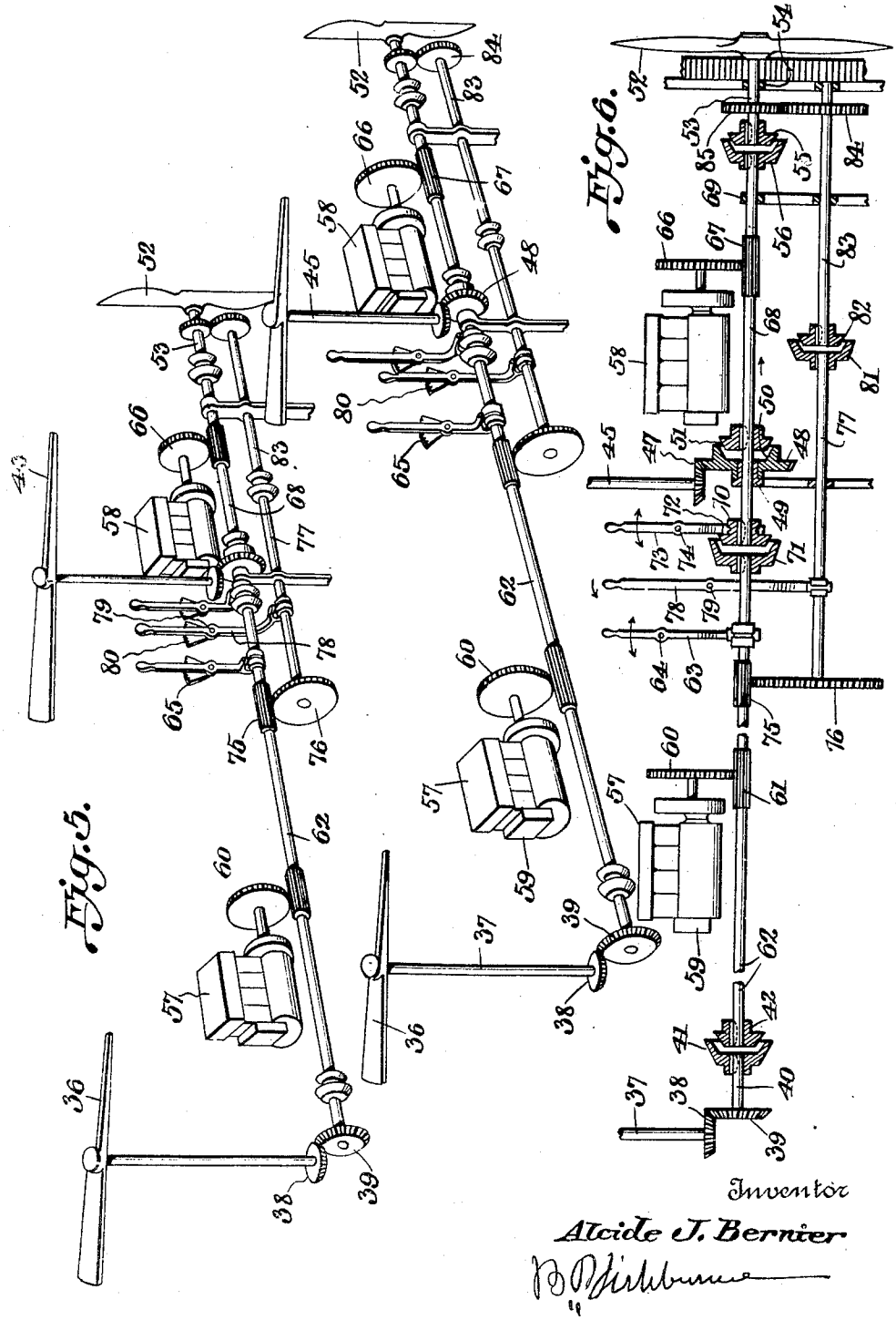

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

ALCIDE J. BERNIER, OF WASHINGTON, DISTRICT OF COLUMBIA.

AEROPLANE.

1,417,884. Specification of Letters Patent. Patented May 30, 1922.

Application filed March 20, 1922. Serial No. 545,081.

To all whom it may concern:

Be it known that I, ALCIDE J. BERNIER, a citizen of the Dominion of Canada, and subject of the King of Great Britain, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Aeroplanes, of which the following is a specification.

My invention relates to improvements in aeroplanes.

An important object of my invention is to provide an aeroplane having a propeller or propellers to raise the same, a propeller or propellers to cause the same to travel longitudinally, after being elevated to a suitable height.

A further object of the invention is to so locate the elevating propeller with respect to the fuselage of the aeroplane, that suitable openings are provided in proximity to the lifting propellers.

A further object of the invention is to provide means to fold the sustaining wings, so that they assume an approximately vertical position, when the elevating propellers are operating to raise the machine.

A further object of the invention is to provide an aeroplane having two engines in each fuselage, with novel carrying so that the engines may be employed to drive the elevating propellers, and either engine may be employed to drive the tractor propeller, or both engines coupled together and employed to drive the tractor propeller.

A further object of the invention is to provide means whereby either engine may be free from connection with the elevating propeller or the tractor propeller, so that the engine may be started with the self-starter and subsequently thrown into connection with the propeller.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same,

Fig. 1 is a plan view of an aeroplane embodying my invention,

Fig. 2 is a side elevation of the same,

Fig. 3 is a perspective view of the sustaining planes, showing the means to fold them,

Fig. 4 is a side elevation of a winding drum and associated elements,

Fig. 5 is a perspective view of the engines, propellers, and gearing, removed from the machine, and,

Fig. 6 is a side elevation, parts in section, of one unit of the driving means.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of my invention, the numeral 10 designates fuselages which are spaced, as shown, providing a large opening between the same. The rear ends of the fuselages are connected by a rigid stabilizing plane 11, to which are connected vertically swinging rudders or elevators, 12, which may be operated in any well known or preferred manner. The numeral 13 designates vertical fins, upon which are pivoted steering rudders 14, also operated by any suitable means. The forward portions of the fuselages are rigidly connected by means of a casing 15, as shown.

Each fuselage 10, Fig. 2, is mounted upon a chassis 16, carrying a wheel or wheels 17. Each fuselage is also equipped near its end with a depending support or skid 18, which retains the rear end spaced from the ground, upon landing.

Extending transversely of the fuselages are upper and lower sustaining planes 18′ and 19, which are pivotally connected, at 20, with struts 21, which are suitably rigidly secured to the fuselages. The planes are also pivotally connected with rear struts 22, and the two sets of struts together with the sustaining planes, constitute a parallelogram, whereby the planes may be swung downwardly to a folded position, and will be substantially vertically arranged. The upper plane 18 preferably has portions of its material cut away, at 23, so that it may fold properly.

Means are provided to permit the sustaining planes being lowered and to raise them, such means comprising cables 24, connected with the lower plane 19, and adjacent the lower end of the rear struts, and extending diagonally over a pulley 25, and downwardly to engage a pulley 26. The cable then engages the pulley 27, and passing from this pulley on to a drum 28, upon which the cable is wound. This drum is mounted within the casing 15 and is rigidly secured to a transverse shaft 29, provided at its ends with wheels 30, for turning the same. The shaft 28 is rotatable within suitable bearings carried by the fuselages, and the wheels 30 are

arranged in the cock pits 31, in convenient reach of the operator.

The shaft 29 is provided at its ends with ratchet wheels 32, rigidly secured thereto, which are engaged by dogs 33, rigidly mounted upon a transverse rock shaft 34 suitably pivotally mounted upon the fuselage. The ratchet wheels and dogs permit the drum 29 being turned in one direction to wind the cable upon the same, for elevating the planes 18 and 19, but lock the drum against turning movement in a reverse direction, so that the wings cannot improperly fold. The operator from either cock pit may operate the dog to release the ratchet wheel and hence turn the drum. When in the elevated position, the planes are braced by diagonal cables 35, connected with the upper plane near the rear struts and with the lower plane near the forward struts. These cables are flexible and do not interfere with the folding of the planes.

Each fuselage is provided with a rear elevating propeller 36, rigidly mounted upon a vertical shaft 37, journaled in a housing 38'; rigidly secured to the fuselages. This propeller is arranged rearwardly of the sustaining planes and between them and the stabilizing wing 11. The opening between the two fuselages, provides for the free passage of the air downwardly from the elevating propeller. Each vertical shaft 37 is provided at its lower end with a beveled gear 38, rigidly secured thereto, and this beveled gear is in permanent mesh with a beveled gear 39, rigidly mounted upon a short shaft 40. This shaft 40 extends longitudinally of the fuselage and is suitably mounted thereon so that it can rotate but cannot move longitudinally. The shaft 40 is equipped with a friction clutch element 41, as shown. The clutch element 41, is adapted to engage with a coacting clutch element 42, in a manner to be described. Each fuselage also has a forward elevating propeller 43, which is rigidly mounted upon a vertical shaft 45, journaled in a housing 46, rigidly secured to the fuselages near and in advance of a cock pit, and also in advance of the sustaining planes. When the sustaining planes are folded or lowered, the space between the fuselages permits of the free downward passage of the air currents. At its lower end, each shaft 45 is provided with beveled gearing 47, in permanent mesh with a beveled gear 48, which is rotatable upon a tubular bearing 49, suitably mounted in the fuselage. The gear 48 is free to rotate but does not move longitudinally. The gear 48 has a friction clutch element 50 formed integral therewith, to engage a coacting friction clutch element 51, to be described.

Arranged in advance of each fuselage is a tractor propeller 52, which is rigidly mounted upon a short shaft 53, journaled in a suitable bearing 54. This short shaft is free to revolve but cannot move the longitudinally. The shaft 53 has a clutch element 55 rigidly mounted thereon, adapted to engage with a coacting clutch element 56.

Mounted within each fuselage are rear and forward internal combustion engines 57 and 58, each of which are equipped with a self-starter 59 of any well known or preferred type. The rear engine 57 is connected with and drives a gear 60, in permanent engagement with a sliding gear 61, which is rigidly mounted upon a shaft 62. This shaft extends longitudinally of the fuselage and is mounted therein in suitable bearings. The shaft 62 is free to rotate and also to be moved longitudinally in either direction. The clutch element 42 is rigidly mounted upon the rear end of the shaft 62. The shaft 62 is shifted longitudinally by means of a lever 63, having a slidable connection with the shaft at its lower end, as is well known. This lever is pivoted at 64, to be swung longitudinally of the fuselage, and is equipped with suitable latch means 65, to lock it in the desired position.

The location of the rear engine 57 is clearly shown in Fig. 2, and the forward engine 58 is also clearly shown, slightly in advance of the vertical shaft 45. The engine 58 drives a gear 66, in permanent mesh with a sliding gear 67, rigidly mounted upon a shaft 68. This shaft extends longitudinally within the fuselage and is journaled in suitable bearings, including a bearing 69, and the tubular bearing 49. At its forward end, the shaft 68 has the clutch element 56 rigidly secured thereto. The shaft 68 extends rearwardly through and beyond the tubular bearing 49 and is there connected with a clutch element 70, rigidly secured to the same to engage a clutch element 71, rigidly mounted upon the shaft 62. The shafts 60 and 62 are separate, but may be locked together through the medium of clutch elements 70 and 71. The clutch element 70 is shifted by means of a fork 72, formed upon the lower end of the lever 73, pivoted at 74.

I also provide means whereby the rear engine may be connected with the tractor propeller, to drive the same, in the event that the forward engine in the same unit is inoperative, and is cut out, or vice versa.

To accomplish this, I arrange a sliding gear 75 upon the shaft 62, and this sliding gear permanently engages a gear 76, rigidly mounted upon a longitudinal shaft 77, suitably journaled in the fuselage. The shaft 77 is free to rotate and may also be shifted longitudinally, and the shaft is shifted by a forked lever 78, pivoted at 79, and having suitable latch means 80 to hold it in the desired position. The shaft 77 carries at its forward end a clutch element 81, to engage and disengage a clutch element 82, which is

rigidly mounted upon the end of a separate longitudinal shaft 83. The shaft 83 is suitably journaled in bearings in the fuselage and is free to rotate but cannot move longitudinally. The shaft 83 carries a gear 84, engaging a gear 85, rigidly mounted upon a short shaft 53.

The operation of the aeroplane is as follows: Two pilots sit in the two cock pits, and suitable means of communication are provided between them. This may be done by means of audible or visible signals, telephone or the like. Assuming that the machine is upon the ground and it is desired to raise the same. The engines in both fuselage are started, which may be done by means of self-starters. At this time, the levers are all in the neutral position, and the engines are all disconnected from the propellers. It is desired that the rear and front lifting propellers, in each unit, be thrown into action about the same time, and also that the propellers in the two units be thrown into action at about the same time. Suitable signals being had between the two pilots. the pilot in each cock pit swings the levers 63 and 73 forwardly, whereby the lifting propellers are connected with the engines. When the lever 63 is swung forwardly, the shaft 62 moves rearwardly and clutch elements 41 and 42 engage. Clutch element 71 also moves rearwardly, and hence clutch element 70 will not engage it as the shaft 68 is moved rearwardly to bring clutch element 51 into engagement with clutch element 50. It is thus seen that the rear engine has connection with the rear lifting propeller, and the forward engine has separate connection with the forward lifting propeller, the two engines at this time being connected. When the lifting propellers are thus started the aeroplane begins to ascend, and the pressure upon the wings 18 and 19 will tend to force them downwardly, and these wings may accordingly be folded. The operator in either cock pit now moves the dog 33 out of engagement with the ratchet wheel 32 and slowly turns the hand wheel 30 to permit the planes to fold. By folding these planes, the pressure upon the machine is substantially reduced, and the lifting propellers can more readily elevate the same. When the desired elevation is obtained, the lifting planes are first returned to the upper position, and locked in this position. The levers 63 and 73 are first shifted to the neutral position, which serves to cut the rear and forward lifting propeller in each unit from connection with the engines. As soon as this has been done, the forward lever 73 in each unit is shifted rearwardly, whereby the shaft 68 is moved forwardly and the clutch element 56 brought into engagement with the clutch element 55. The forward engine is therefore connected with the tractor propeller. It may be desired to drive the tractor propeller in each unit by both engines, which will be connected in series, and to accomplish these the lever 63 is swung rearwardly, and as this lever, beneath its pivot, is longer than the lever 73, clutch element 71 will be thrown into engagement with clutch element 70, and the two shafts 62 and 68 directly connected.

It might be desired to drive the tractor propeller, by means of the rear engine 57, with the forward engine 58 entirely cut out, as in the event of the forward engine being out of order, To accomplish this, the lever 73 is shifted to the neutral position, whereby the clutch element 56 disengages the clutch element 55, and lever 63 is also shifted to the neutral position, so that clutch element 71 disengages clutch element 70. Lever 78 is now shifted rearwardly and clutch element 81 will engage clutch element 82. The shaft 62 will now rotate the gear 75, driving gear 76, driving shaft 77, shaft 83, gear 84, and gear 85. In descending, either one or both of the engines may be in operation, as desired, and of course the speed of the engines is controlled in the usual manner.

It is preferred to construct the machine with the two fuselages 10. However, the invention is not solely restricted to this arrangement, as some degree of success may be obtained by using only one fuselage, carrying the forward and rear lifting propellers, the tractor propeller, the forward and rear engines, and the form of driving means or gearing shown and described.

It is to be understood that the form of my invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size, and arrangement of parts may be resorted to without departing from the spirit of my invention, or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. In an aeroplane, a pair of spaced fuselages, a rear stabilizing plane connecting the rear ends of the fuselages, means connecting the forward ends of the fuselages, substantially vertically struts secured to the fuselages, transverse sustaining planes pivoted at their forward edges to the struts to swing vertically, means whereby the planes may be raised and lowered and held in the raised position, rear lifting propellers carried by the fuselages and arranged between the stabilizing plane and the sustaining planes, forward lifting propellers carried by the fuselages and arranged in advance of the sustaining planes, tractor propellers carried by the forward ends of the fuselages, and means for driving said propellers.

2. In an aeroplane, a pair of spaced fuselages, means for rigidly connecting the same, substantially vertical struts secured to the fuselages, transverse sustaining planes having their forward portions pivotally connected with the upper and lower portions of said struts, rear struts pivotally connecting the rear portions of the sustaining planes, diagonally arranged cables connected with the rear portion of the lower sustaining plane and extending upwardly and forwardly and secured to the forward struts, a transverse drum upon which the cables are wound, means to turn the drum, rear lifting propellers connected with the fuselages rearwardly of the sustaining planes, forward lifting propellers connected with the fuselages forwardly of the sustaining planes, tractor propellers carried by the forward ends of the fuselages, and means for driving said propellers.

3. In an aeroplane, a pair of spaced fuselages, upstanding struts connected with the fuselages, vertically swinging transverse planes pivotally mounted upon the struts at points near their forward edges, rear struts pivotally connected with the rear portions of the planes, diagonally arranged cables to swing the planes upwardly, a drum upon which the cables are wound, a transverse shaft carrying the drum and extending into the fuselages, manually operated elements carried by the ends of the shaft, toothed wheels mounted upon the ends of said shaft, a transverse rock shaft, and dogs carried by the ends of the rock shaft and engaging the toothed wheels, lifting propellers carried by the fuselages and arranged above the transverse planes, tractor propellers carried by the forward ends of the fuselages, and means to drive the propellers.

4. In an aeroplane, a pair of spaced fuselages, a rear stabilizing plane connecting the ends of the fuselages, means connecting the forward ends of the fuselages, vertically swinging transverse sustaining planes carried by the fuselages, means to swing the planes upon their pivots and hold them against swinging movement, a rear lifting propeller carried by each fuselage and arranged between the stabilizing plane and sustaining planes, a forward lifting propeller carried by each fuselage and arranged in advance of the sustaining planes, forward and rear engines carried by each fuselage, means whereby the rear engine may drive the rear lifting propeller, separate means whereby the forward engine may drive the forward lifting propeller, a tractor propeller carried by each fuselage, and means whereby the forward and rear engines may be coupled together and connected with the tractor propeller to drive it.

5. In an aeroplane, a pair of connected fuselages, transverse sustaining planes carried by the fuselages, a rear lifting propeller carried by each fuselage, a forward lifting propeller carried by each fuselage, forward and rear engines carried by each fuselage, means whereby the rear engine may be connected and disconnected with and from the rear propeller, separate means whereby the forward engine may be connected and disconnected with and from the forward propeller, a tractor propeller carried by each fuselage, and means whereby the forward and rear engines may be connected together and connected with the tractor propeller to drive it.

6. In an aeroplane, a pair of connected fuselages, transverse sustaining planes carried by the fuselages, rear lifting propellers carried by the fuselages, forward lifting propellers carried by the fuselages, forward and rear engines carried by each fuselage, means whereby the rear engine may be connected and disconnected with and from the corresponding rear propeller, separate means whereby the forward engine may be connected and disconnected with and from the forward propeller, a tractor propeller carried by the fuselage, means whereby the forward and rear engines may be directly connected and disconnected and the forward engine connected and disconnected with the tractor propeller, and means whereby the rear engine may be connected and disconnected with and from the tractor propeller.

7. In an aeroplane, a fuselage, a sustaining plane carried thereby, forward and rear longitudinal drive shafts carried by the fuselage, forward and rear engines in the fuselage to drive the forward and rear shafts, forward and rear lifting propellers carried by the fuselage, means for connecting and disconnecting the rear drive shaft and rear propeller, means for connecting and disconnecting the forward drive shaft and forward propeller, means for connecting and disconnecting said drive shafts, a tractor propeller carried by the fuselage, means for connecting and disconnecting the forward drive shaft and propeller, supplemental longitudinal drive shafts, means for connecting and disconnecting the supplemental drive shafts, driving means between the rear drive shaft and the rear supplemental drive shaft, and driving means between the forward supplemental drive shaft and the tractor propeller.

In testimony whereof I affix my signature.

ALCIDE J. BERNIER.