

J. B. ELLINGER,
AIRCRAFT.

APPLICATION FILED JUNE 20, 1917.

1,275,233.

Patented Aug. 13, 1918.

3 SHEETS—SHEET 1.

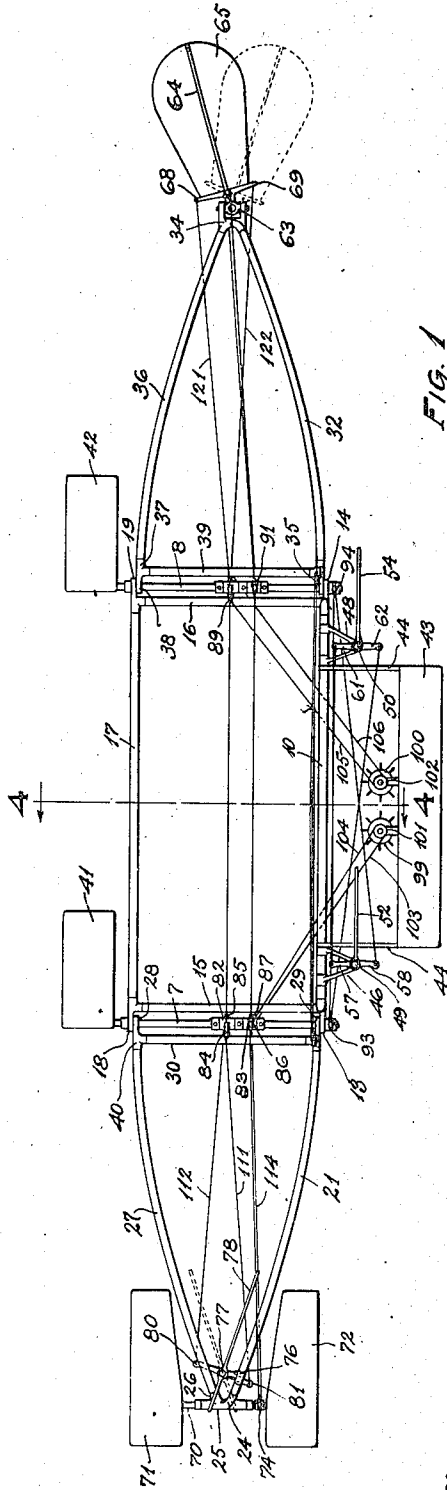


FIG. 1

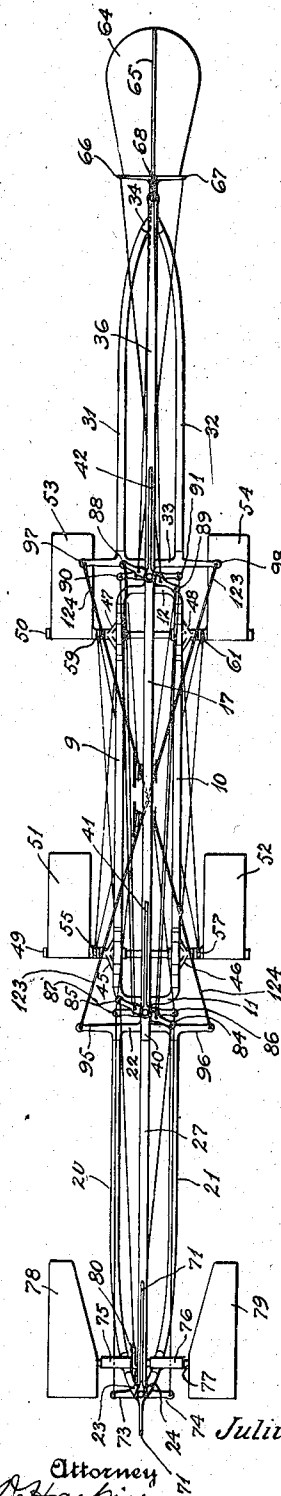


FIG. 2

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3 SHEETS—SHEET 2.

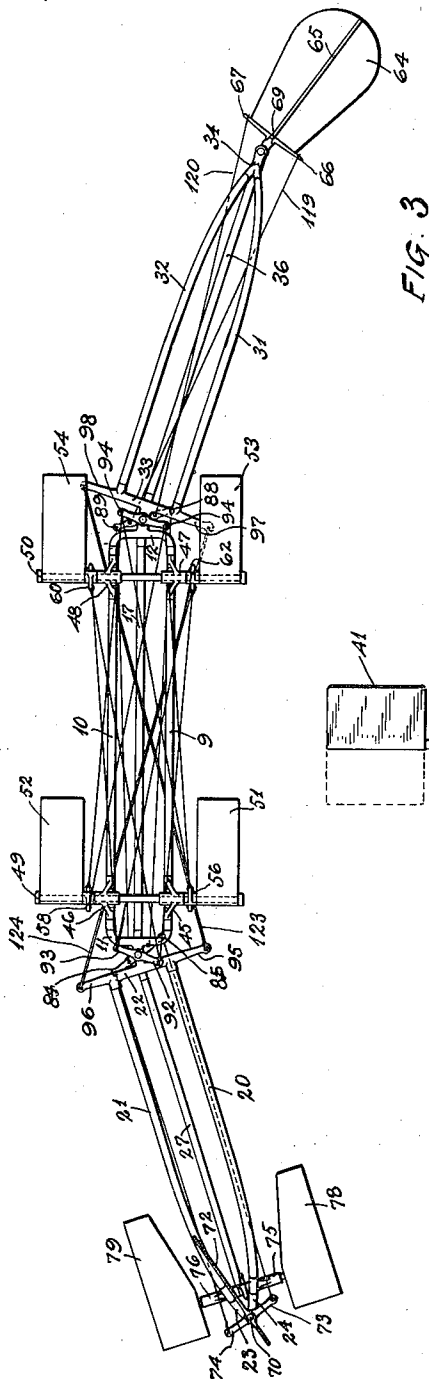


FIG. 3

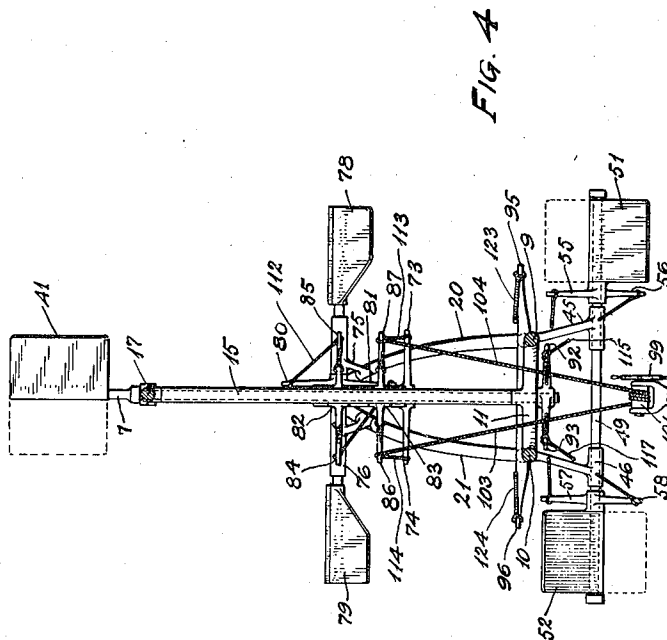


FIG. 4

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3 SHEETS—SHEET 3.

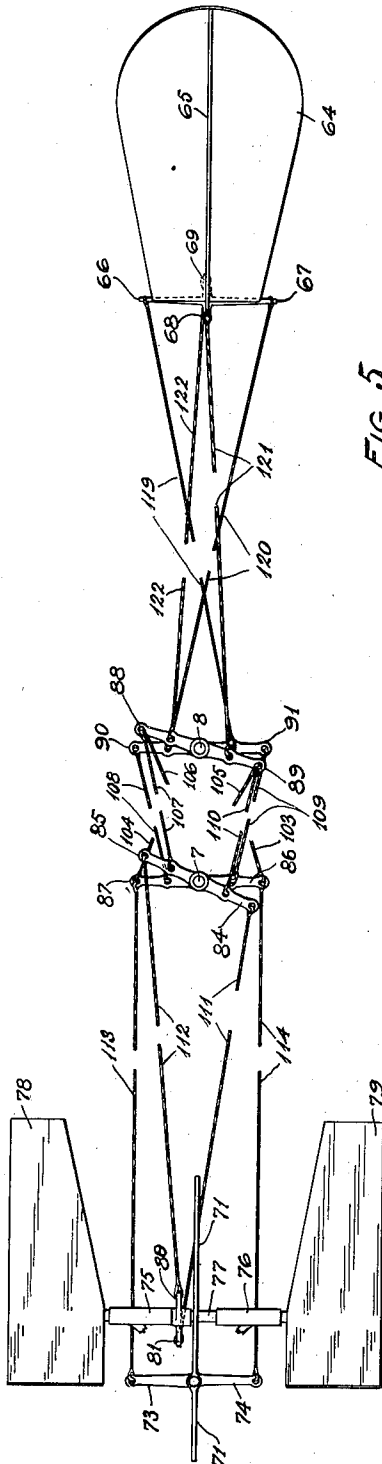


Fig. 5

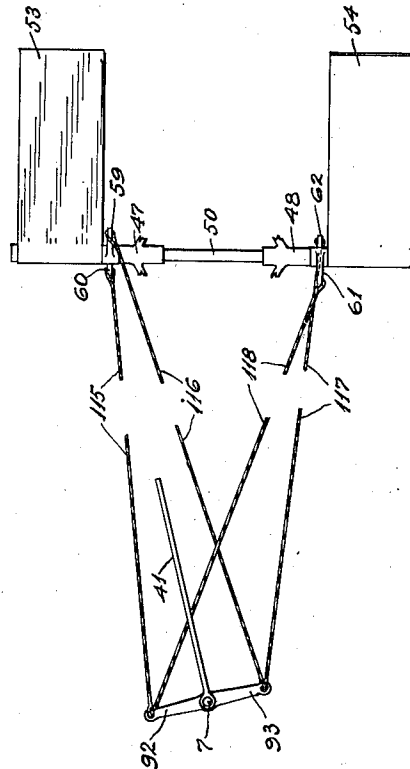


Fig. 6

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AIRCRAFT.

1,275,233.

Specification of Letters Patent.

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Application filed June 20, 1917. Serial No. 175,952.

To all whom it may concern:

Be it known that I, JULIUS B. ELLINGER, citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented a certain new and useful Improvement in Aircraft, of which the following is a specification.

My invention relates to improvements in air craft, and the object of my invention is to provide a metal frame which shall include a series of sections whose adjacent ends are articulated one to the other in such manner that said frame shall be flexible to a degree that shall permit its different sections to turn in sidewise directions each to a different angle with respect to any of its other sections, and which metal frame shall be adapted to serve as a frame for an airplane that is heavier than air or for dirigible air ship that is lighter than air, whereby such air plane or such air ship shall be operatively adapted to travel in a circle of less radius than would be possible with an air craft having a rigid frame.

Another object of my invention is to provide an air craft embodying a frame of the class described together with associated wing-planes, and mechanism for controlling said wing planes, whereby said air craft may be directed to travel in any desired course.

I accomplish this object by devices illustrated in the accompanying drawings wherein—

Figure 1 is a view in side elevation of associated parts of an air craft embodying one form of my invention;

Fig. 2 is a plan view of the same, showing the same parts as they are relatively disposed when the air craft is traveling in a straight line in a horizontal plane;

Fig. 3 is a view of the bottom of parts of the same showing said parts as they are relatively disposed when the air craft is traveling in a circular course in a horizontal plane;

Fig. 4 is an enlarged view of the same in vertical mid-section on broken line 4, 4 of Fig. 1.

Fig. 5 is an enlarged plan view of associated details of the same, and

Fig. 6 is an enlarged plan view of other details of the same.

Referring to the drawings, throughout which like reference numerals indicate like parts, a metal frame, preferably made of tubular rods, embodies a forward section, a middle section and a rearward section, the rearward end of the forward section being articulated to the forward end of the middle section by a vertical pivot rod 7 while the rearward end of said middle section in a like manner is articulated to the forward end of the rearward section by a vertical pivot rod 8.

The middle section comprises a rectangular base member having spaced side rails 9 and 10 whose like ends are rigidly united by struts 11 and 12.

Projecting forwardly from the central portion of the strut 11 is a lug 13 which serves as a bearing for the lower end portion of the front rod 7, and projecting rearwardly from the central portion of the strut 12 is a lug 14 which serves as a bearing for the lower end portion of the rod 8. Extending vertically upward from the strut 11 is a stud 15, and rigidly fixed in the central portion of the strut 12 to extend vertically upward therefrom is a stud 16. The upper ends of the studs 15 and 16 are rigidly united by a top rail 17 which extends therebetween.

Projecting forwardly from the front end of the top rail 17 is a lug 18 which serves as a bearing for the upper end portion of the pivot rod 7, and projecting rearwardly from the rearward end portion of the top rail 17 is a lug 19 that serves as a bearing for the upper end portion of the pivot rod 8.

The forward section includes a base member having two side rails 20 and 21 whose rearward ends are spaced from each other and are rigidly united by a transverse strut 22 and which side rails 20 and 21 are curved upwardly from their rearward ends and toward each other to points where their for-

ward ends are each rigidly fixed in a different one of two lugs 23 and 24, respectively, which lugs 23 and 24 are integral with a bracket 25.

5 The bracket 25 is also provided with a rearward and upwardly projecting integral lug 26 to which is rigidly connected the forward end of a top rail 27 which curves upwardly and rearwardly to terminate in a fitting 40 which is provided with a lug 28 that is articulated with the lug 18 by the upper end portion of the pivot rod 7.

10 Projecting rearwardly from the central portion of the transverse strut 22 is an integral lug 29 that is articulated with the lug 13 of the strut 11 by means of the lower end portion of the pivot rod 7.

15 A stud 30 is disposed to extend vertically upward from the central portion of the strut 22 to the fitting 40 thus rigidly to unite said strut 22 and said fitting 40.

20 The rearward section includes a base member having two side rails 31 and 32 whose forward ends are spaced from each other and are rigidly united by a transverse strut 33 from which said side rails 31 and 32 extend rearwardly in an upward curve, their rearward end portions being bent in a curve toward each other to terminate in a pivot bearing bracket 34 with which they are rigidly connected.

30 Projecting forwardly from the central portion of the transverse strut 33 is a lug 35 which is articulated with the lug 14 of the strut 12 by means of the lower end portion of the pivot rod 8.

35 Rigidly secured to the bracket 34 is the rearward end of a top rail 36 which extends forwardly therefrom in an upward curve to terminate in a fitting 37, to which it is rigidly attached, which fitting 37 is provided with an integral lug 38 that is articulated to the lug 19 by means of the upper portion of the pivot rod 8.

40 A stud 39 is disposed to extend vertically downward from the fitting 37 to the central portion of the strut 33 thus rigidly to connect said fitting with said strut 33.

45 Rigidly attached to the projecting upper end portion of each of the pivot shafts 7 and 8 is a vertical dorsal plane, as planes 41 and 42 respectively.

A pivot car 43 is rigidly attached to the side rails 9 and 10 by suspension rods 44.

50 Fastened to the forward end portion of each of the side rails 9 and 10 is a downwardly projecting bracket, as brackets 45 and 46; and similar brackets 47 and 48 are fastened to the rearward end portions of said side rails 9 and 10 respectively.

60 Rigidly associated with the brackets 45 and 46 to extend transversely therethrough, to project outwardly from the outer sides thereof, is a rod 49, and in a like manner a

rod 50 is associated with the brackets 47 and 48. 65

Independently articulated to each of the outwardly projecting opposite end portions of the rod 49 is a plane, as planes 51 and 52 respectively; and in a like manner planes 53 and 54 are articulated to the opposite end portions of the rod 50. 70

Rigidly associated with the forward end portion of each of the planes 51, 52, 53 and 54 are oppositely projecting tilting arms, as arms 55 and 56, arms 57 and 58, arms 59 and 60 and arms 61 and 62 respectively. 75

Articulated to the brackets 34 at the rearward end of the rearward section, by means of a universal joint 63 is a rudder comprising a vertical plane 64 and a horizontal plane 65, to the forward end of each of which is attached oppositely projecting tilting arms, as arms 66 and 67 and arms 68 and 69 respectively, as shown more clearly in Figs. 1 and 2; said rudder being thus adapted to swing in vertical directions or in sidewise directions as may be required. 85

Mounted to be rotatively movable in the brackets 25 at the forward end of the forward section, is a vertical shaft 70 upon whose upwardly projecting end portion is fastened a vertical plane 71 and upon whose downwardly projecting end portion is fastened a vertical plane 72, said shaft 70 being provided with rigidly attached arms 73 and 74 that are disposed at right angles to the planes 71 and 72. 90

Rigidly mounted on the side rails 20 and 21 near the bracket 25 are two upwardly projecting brackets 75 and 76 respectively through both of which extends a transverse shaft 77 that is rotatively movable therein and upon whose outwardly projecting opposite end portions are rigidly mounted planes 78 and 79 which are thus adapted to be tilted simultaneously to different angles with respect to a horizontal plane, said shaft 77 being provided with tilting arms 80 and 81 which are rigidly fastened thereto. 95

100 Freely mounted on the central portion of the pivot rod 7 to swing in horizontal planes are two levers through whose hubs 82 and 83 extends said pivot rod 7, and each of said hubs 82 and 83 is provided with oppositely projecting integral arms, as arms 84 and 85 and arms 86 and 87 respectively; and in a like manner there are mounted on the pivot rod 8 two levers having arms 88 and 89 and arms 90 and 91 respectively. 105

Rigidly attached to the lower end portion of the pivot rod 7 are oppositely projecting arms, as arms 92 and 93; and rigidly attached to the lower end portion of the pivot rod 8 are similar oppositely projecting arms only one of which is shown and which is designated by the numeral 94 in Fig. 1. 110

Projecting from each of the opposite ends

of the transverse strut 22 is a lug, as lugs 95 and 96, and projecting from each of the opposite ends of the strut 33 is a similar lug, as lugs 97 and 98.

5 Rotatably mounted in the car 43 are two controlling hand wheels 99 and 100 with which are associated drums 101 and 102, respectively, to which are operatively attached cables 103 and 104 and cables 105 and 106, respectively; the cable 104 extending to and connecting with the arm 87, while the cable 103 extends to and connects with the arm 86, as shown more clearly in Fig. 4.

10 The cable 105 extends to and connects with the arm 89 while the cable 106 extends to and connects with the arm 88.

The arms 85 and 88 are connected by a cable 107, while the arms 87 and 90 are connected by a cable 108.

20 The arms 86 and 91 are connected by a cable 109 and the arms 84 and 89 are connected by a cable 110.

The arm 84 is connected with the arm 81 by a cable 111, while the arm 85 is connected with the arm 80 by a cable 112.

25 The arm 87 is connected with the arm 73 by a cable 113, while the arm 86 is connected with the arm 74 by a cable 114.

30 The arm 60 is connected with the arm 92 by a cable 115, while the arm 59 is connected with the arm 93 by a cable 116.

The arm 93 is connected with the arm 62 by a cable 117 and the arm 92 is connected with the arm 61 by a cable 118.

35 The arm 91 is connected with the rudder arm 66 by a cable 119, while the arm 90 is connected with the rudder arm 67 by a cable 120.

40 The arm 89 is connected with the rudder arm 68 by a cable 121, while the arm 88 is connected with the arm 69 by a cable 122.

45 The arm 95 is connected with the arm 98 by a cross cable 123, while the arm 96 is connected with the arm 97 by another cross cable 124.

In the operation of the air craft if the hand wheel 99 be turned in a clockwise direction the plane 71 will be turned to direct the course of the air craft toward the right hand, the rudder plane 65 being simultaneously turned to swing toward the right hand to aid said plane 71 in making the air craft turn toward the right hand in its course, and obviously, if said hand wheel 99 be turned in a contra-clockwise direction the air craft would be directed in a circular course toward the left hand.

50 If the hand wheel 100 be turned in a clockwise direction the arm 88 will pull on the cable 122 to cause the rudder plane 64 to be depressed and at the same time the cable 110 would be actuated to cause the arm 85 to pull on cable 111 to swing upwardly the planes 78 and 79 with the result that the air craft

would be turned to travel in a declining 65 course.

Manifestly, if the hand wheel 100 be turned in a contra-clockwise direction the rudder plane 64 would swing upwardly and the planes 78 and 79 would swing downwardly to cause the air craft to travel in an inclined course. 70

The arms attached to the lower ends of the pivot shafts 7 and 8 which serve to actuate the dorsal planes 41 and 42 are so connected by cables with the arms which control the planes 51 and 52, 53 and 54 that automatically if a gust of wind strikes the dorsal planes 41 and 42 to turn them toward the right hand then the planes 51 and 53 will be turned downwardly, while the planes 52 and 54 will be turned upwardly, thus to maintain the air craft on an even keel. 80

Obviously, if the wind forces the dorsal planes 41 and 42 toward the left hand then the planes 51 and 53 will be turned upwardly while the planes 52 and 54 will be turned downwardly with the same effect of maintaining the air craft on an even keel. 85

Each of the three sections may be inclosed in a separate gas bag to make the air craft lighter than air or large air planes may be fixed to the central section or to all of the sections to make an air craft heavier than air. 90

Manifestly, changes may be made in the forms, dimensions and arrangement of parts of my invention without departing from the spirit thereof. 95

What I claim is: 100

1. An air craft frame of the class described, which embodies a series of sections disposed end to end, the adjacent ends of which are articulated one to the other by vertical pivot rods; a rudder articulated to the rearward end of the rearward one of said sections by means of a universal joint, said rudder including a vertical plane and a horizontal plane; a vertical plane associated with the forward one of said sections and adapted to be swung in sidewise directions; a transverse shaft mounted to be rotatively movable in bearings attached to the forward end portion of the forward one of said sections to project from each of opposite sides thereof; a plane attached to each of the opposite end portions of said transverse shaft and adapted to swing to different angular positions with respect to a horizontal plane; a vertically disposed dorsal plane rigidly fastened to the upper end portion of each of said vertical pivot rods; a transverse rod rigidly associated with the forward end portion of the bottom portion of an intermediate one of said sections; a transverse rod rigidly associated with the rearward portion of the bottom portion of said intermediate one of said sections; a 105 110 115 120 125

separate plane articulated with each of the opposite end portions of each of said transverse rods; a car suspended from said intermediate one of said sections; two controlling hand wheels rotatably mounted in bearings fixed in said car; cables operatively associated with one of said hand wheels, with said rudder and with said vertical plane that is associated with the forward end of said forward section whereby said vertical plane and said rudder may be turned in sidewise directions in response to rotative movements of said one of said hand wheels; other cables operatively associated with the other one of said hand wheels, with said rudder and with said transverse shaft that is disposed at the forward end of the forward one of said sections, whereby the planes of said shaft and said rudder may be swung to different angular positions with respect to a horizontal plane in response to rotative movements of said other one of said hand wheels; and other cables operatively associated with said vertical dorsal planes and with the several planes of said transverse rods whereby swinging sidewise movements of said dorsal planes will cause the planes of said transverse rods to move to different angular positions with respect to a horizontal plane.

2. An air craft frame comprising a series of sections disposed end to end, the adjacent ends of which are articulated one to the other by vertical pivot rods, and a rudder articulated to the rearward end of the rearward one of said sections by means of a universal joint, said rudder including a vertical plane and a horizontal plane.

3. An air craft frame comprising a series of sections disposed end to end, the adjacent ends of which are articulated one to the other by vertical pivot rods, a rudder articulated to the rearward end of the rearward one of said sections by means of a universal joint, said rudder including a vertical plane and a horizontal plane, and a vertical plane associated with the forward one of said sections and adapted to be swung in sidewise directions.

4. An air craft frame comprising a series of sections disposed end to end, the adjacent ends of which are articulated one to the other by vertical pivot rods, a rudder articulated to the rearward end of the rearward one of said sections by means of a universal joint, said rudder including a vertical plane and a horizontal plane, a vertical plane associated with the forward one of said sections and adapted to be swung in sidewise directions, a transverse shaft mounted to be rotatively movable in bearings attached to the forward end portion of the forward one of said sections to project from each of opposite sides thereof, and a plane attached to each of the opposite end portions of said

transverse shaft and adapted to swing to different angular positions with respect to a horizontal plane.

5. An air craft frame comprising a series of sections disposed end to end, the adjacent ends of which are articulated one to the other by vertical pivot rods, a rudder articulated to the rearward end of the rearward one of said sections by means of a universal joint, said rudder including a vertical plane and a horizontal plane, a vertical plane associated with the forward one of said sections and adapted to be swung in sidewise directions, a transverse shaft mounted to be rotatively movable in bearings attached to the forward end portion of the forward one of said sections to project from each of opposite sides thereof, a plane attached to each of the opposite end portions of said transverse shaft and adapted to swing to different angular positions with respect to a horizontal plane, a car suspended from an intermediate one of said sections, two controlling hand wheels rotatively mounted in bearings fixed in said car, cables operatively associated with one of said hands wheels, with said rudder and with said vertical plane that is associated with the forward end of said forward section whereby said vertical plane and said rudder may be turned in sidewise directions in response to rotative movements of said one of said hand wheels, and other cables operatively associated with the other one of said hand wheels, with said rudder and with said transverse shaft that is disposed at the forward end of the forward one of said sections, whereby the planes of said shaft and said rudder may be swung to different angular positions with respect to a horizontal plane in response to rotative movements of said other one of said hand wheels.

6. An air craft frame comprising a series of sections disposed end to end, the adjacent ends of which are articulated one to the other by vertical pivot rods, a rudder articulated to the rearward end of the rearward one of said sections by means of a universal joint, said rudder including a vertical plane and a horizontal plane, a vertical plane associated with the forward one of said sections and adapted to be swung in sidewise directions, a transverse shaft mounted to be rotatively movable in bearings attached to the forward end portion of the forward one of said sections to project from each of opposite sides thereof, a plane attached to each of the opposite end portions of said transverse shaft and adapted to swing to different angular positions with respect to a horizontal plane, a vertically disposed dorsal plane rigidly fastened to the upper end portion of each of said vertical pivot rods, a transverse rod rigidly associated with the forward end portion of the

bottom portion of an intermediate one of
said sections, a transverse rod rigidly asso-
ciated with the rearward portion of the bot-
tom portion of said intermediate one of said
5 sections, a separate plane articulated with
each of the opposite end portions of each of
said transverse rods, and cables operatively
associated with said vertical dorsal planes
and with the several planes of said trans-

verse rods whereby swinging sidewise move- 10
ments of said dorsal planes will cause the
planes of said transverse rods to move to
different angular positions with respect to a
horizontal plane.

In witness whereof I hereunto subscribe 15
my name this 11th day of June, A. D. 1917.

JULIUS B. ELLINGER.