O. L. DUNTON.

AEROPLANE.

APPLICATION FILED JULY 3, 1909.

1,002,908.

Patented Sept. 12, 1911.

3 SHEETS—SHEET 1.

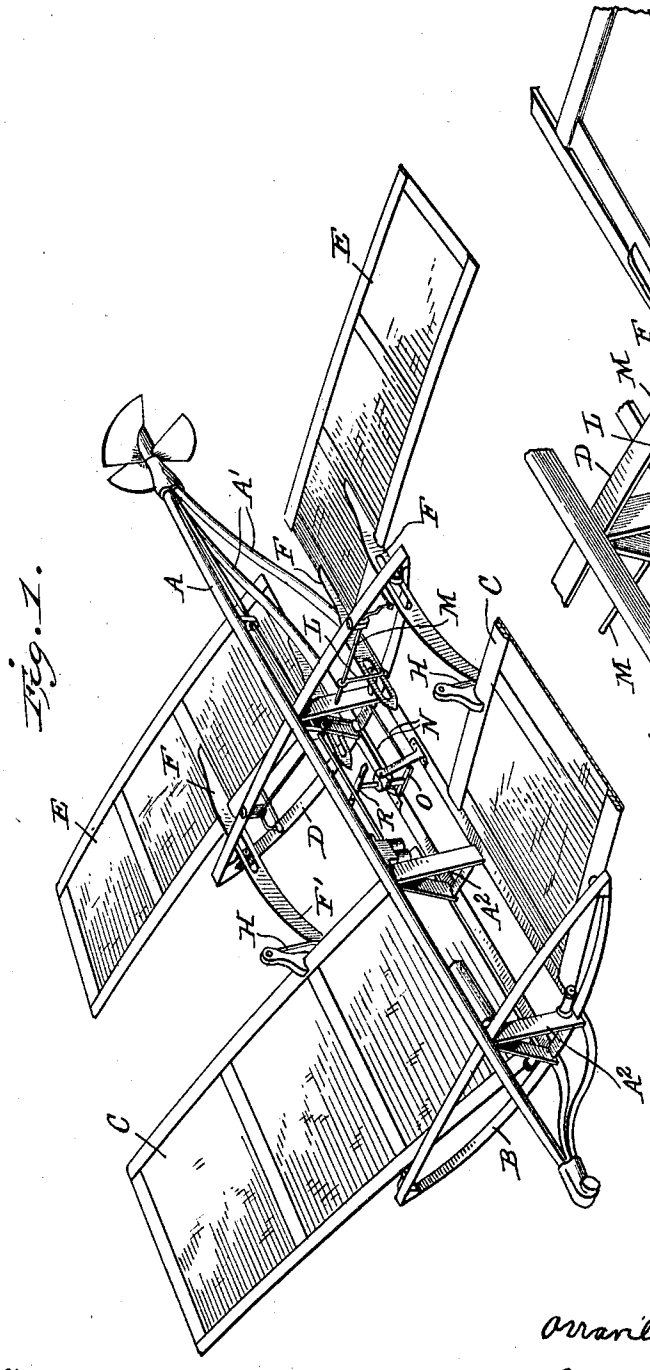

Fig. 1.

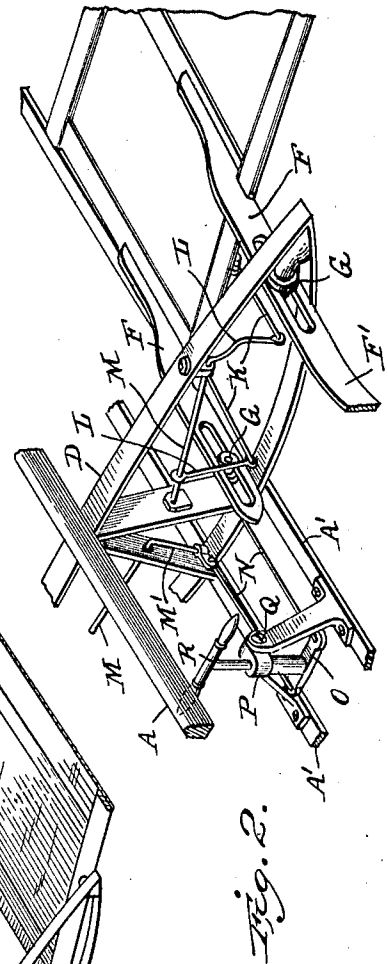

Fig. 2.

Witnesses

P. A. Gallagher Jr.

Thomas Durant

Inventor

Orranill L. Dunton

By Church & Church

his Attorneys

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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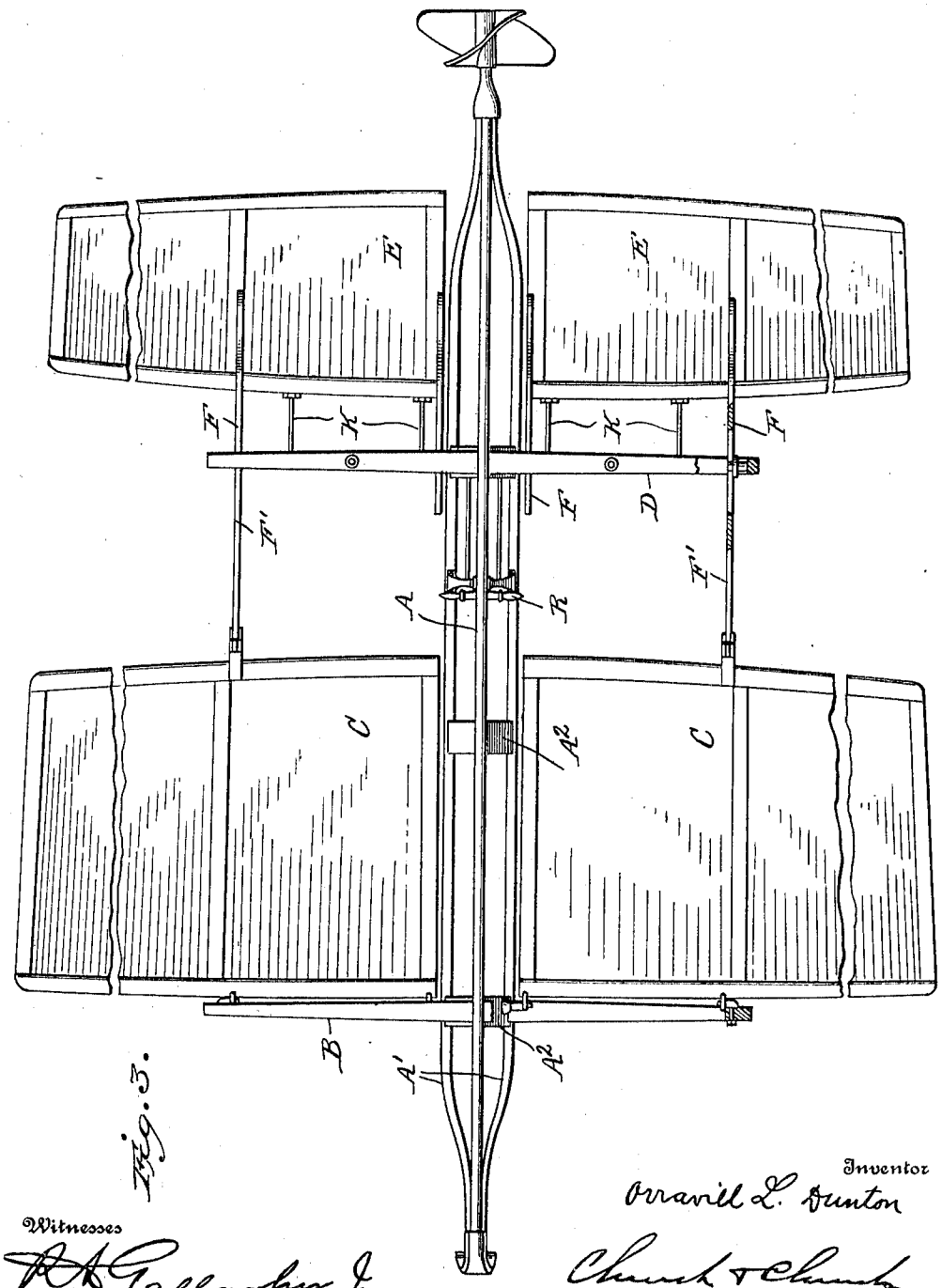

Fig. 3.

Witnesses

R. A. Gallagher Jr.

Thomas Durant

Inventor

Orraville L. Dunton

Church & Church

his Attorneys

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

O. L. DUNTON.

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Fig. 4.

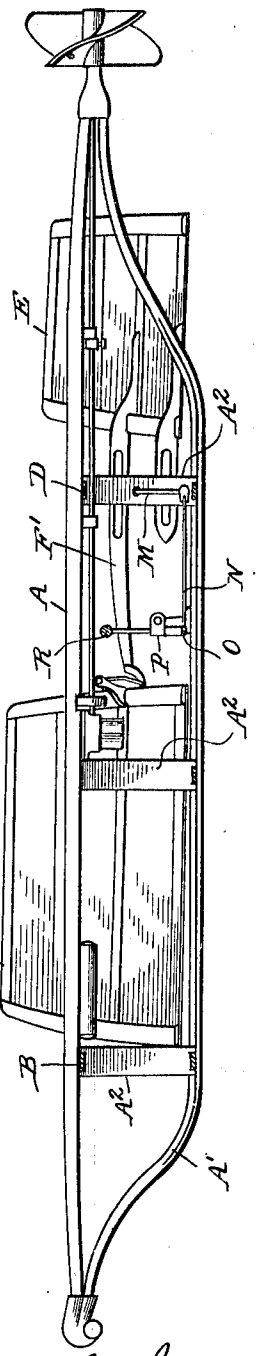
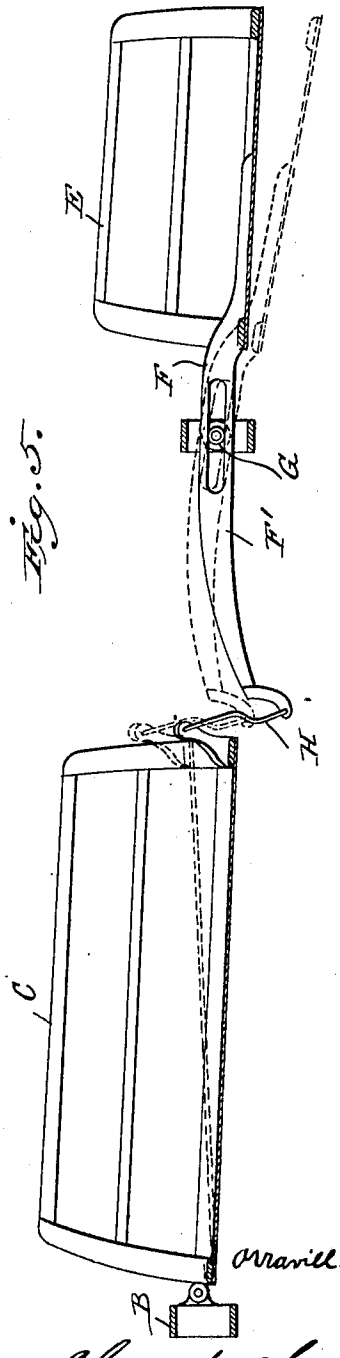


Fig. 5.



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Orville L. Dunton

By Church & Church

his Attorneys

UNITED STATES PATENT OFFICE.

ORRAVILL L. DUNTON, OF NORTH ADAMS, MASSACHUSETTS.

AEROPLANE.

1,002,908. Specification of Letters Patent. **Patented Sept. 12, 1911.**

Application filed July 3, 1909. Serial No. 505,904.

To all whom it may concern:

Be it known that I, ORRAVILL L. DUNTON, a citizen of the United States, residing at North Adams, Berkshire county, State of Massachusetts, have invented certain new and useful Improvements in Aeroplanes; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

This invention relates to that type of aeroplanes or flying machines in which the weight is sustained by the reaction resulting when a plane of extended area is moved through the air edgewise at a small angle of incidence.

The objects of the invention are to provide for a more stable balance, to automatically adjust the planes whereby each will bear its due proportion of the weight and to provide for the steering both vertically and horizontally, by a movement of the planes with respect to each other, whereby one or the other may be given a predominating sustaining or guiding influence.

The type of aeroplane adopted for illustrating the invention is one in which the planes on each side of the body of the machine normally occupy a position one in front of the other and extend outwardly and upwardly from the body of the machine, although it will be understood that the invention is applicable to other types of aeroplanes such, for instance, as those embodying superposed or parallel planes, and, hence, I do not wish to be restricted herein to the particular type illustrated.

In the accompanying drawings—Figure 1 is a perspective view of an aeroplane embodying the present improvements, one of the planes or wings being broken away. Fig. 2 is a similar view, on an enlarged scale, of the steering mechanism for guiding the aeroplane either vertically or horizontally. Fig. 3 is a top plan view. Fig. 4 is a sectional view taken longitudinally of the body. Fig. 5 is a sectional view through the two planes or wings on one side of the body and illustrating the action of the automatic adjusting mechanism connecting the wings or planes.

Like letters of reference indicate the same parts in all the figures.

The body of the aeroplane may be of any desired form but is preferably of relatively light truss construction embodying a longitudinal strut of any desired construction having sufficient strength to form a main rib or back bone A and a plurality of downwardly curved runners or ribs A' connected at their ends to the main rib or back bone A and braced at intermediate points by triangularly arranged braces A^2. Near the forward end of the body is a transverse truss frame preferably formed by bowed top and bottom members B united together at their ends and at an intermediate or central point connected to the top and bottom ribs of the main frame, preferably at a point where one of the triangular braces is located. The front planes C are hinged at their forward edges to the truss frame B and, as shown in Fig. 1, are preferably inclined upwardly from their inner to their outer edges in order that the center of gravity of the machine may be in a plane below the center of wing support, and, therefore, constantly exert a tendency to maintain the transverse level of the machine. A truss frame D corresponding to the truss frame B is arranged on the body in rear of the front wings or plane C and is adapted to form the support for the rear wings or planes E. The rear wings or planes E are also hinged at their forward edges, and, in addition, are adapted to be moved bodily forward or backward either together or independently at will of the operator, as will be hereinafter pointed out, for the purpose of adjusting the balance or guiding the machine.

The front and rear sustaining planes or wings being hinged only at the forward edges, it is obvious that, in order to support the weight of the machine, provision must be made for maintaining them in position to transmit the sustaining pressure to the body of the machine and, in accordance with the present invention, this is accomplished automatically, the movement of one plane in one direction operating through suitable intermediate connections to move the other plane in the opposite directions, for instance, if the front plane swings upwardly on its axis the rear plane is simultaneously swung

downwardly and inasmuch as they cannot both move in the same direction at the same time, each will exert a controlling influence upon the other and each will be caused to sustain its due proportion of the load and will be automatically adjusted so as to compensate for fluctuations in sustaining pressure.

Various mechanical means well understood by those skilled in the art will at once suggest themselves as suitable for connecting the front and rear planes or wings whereby the movements will be automatically controlled one from the other and whereby each wing or plane will be adjusted to support its due proportion of the load. As a convenient and simple mechanism for accomplishing the desired end, the rear wings or planes E are provided with forwardly extending arms F adapted to slide and swing about anti-friction rollers G secured to the truss frame D. The arms F have forwardly extending ends F′ and constitute levers by means of which the rear wings or planes may be swung up or down. The forward ends of the levers are conveniently connected by links H with the rear edges of the forward planes C. The leverage of the controlling levers it is obvious must be proportioned to the relative size of the front and rear planes or wings, the proportion being such that both planes or wings will normally occupy a slightly inclined position with the forward edges elevated so that both may have the proper angle of incidence during the progress of the machine through the air. As illustrated, the rear wing or plane is of somewhat less area than the forward plane (approximately two-thirds) and the leverage exerted by the controlling lever is such that pressure exerted centrally of the two planes or wings will result in neither of them being tilted and the sum of the pressures represents the sustaining effect on the machine. Any change in the pressure exerted on one plane and not exerted on the other will change its angular position about its axis and cause the machine to rise or fall, as the case may be. This tendency to alter the course of the machine, is however, counter-acted immediately and automatically because of the fact that as the first mentioned plane swings about its center and changes the direction of flight the other plane is moved in a direction to counteract such tendency and maintain the body of the machine at its normal level. It is obvious, that if the power exerted by either the front or rear plane in controlling the position of the other plane be augmented or reduced, the influence of one or the other will predominate and tend to raise or lower the front or rear end of the machine as the case may be. This fact is taken advantage of in order to guide or steer the machine both vertically and horizontally. The means adopted for accomplishing this end consist in an adjustment of the length of the lever or connection between the planes, or what is equivalent thereto a shifting of one plane with relation to its pivotal center or axis, whereby the leverage exerted by it is varied.

Conveniently, the rear planes or wings are provided with forwardly extending links K connected with crank arms L on a crank shaft M. Said shaft is journaled in the truss frame D and at its inner end is pivotally connected through a crank arm M′ and link N with the end of a cross-head O journaled in a pivotal bearing P, which latter is, in turn, pivoted or journaled on an axis Q supported from the main frame of the machine. It will be understood that the mechanism described is duplicated on each side of the machine and the links N are connected with opposite ends of the crosshead O. Said crosshead O is provided with a transverse handle R and the arrangement is such that the operator may swing the bearing P about its center Q so as to simultaneously move the rear planes on both sides of the machine either toward the front or rear or by turning the handle, he may swing the crosshead so as to advance the wing or plane on one side and at the same time move the wing or plane on the opposite side toward the rear. The simultaneous movement of both rear planes will control the movement of the machine in a vertical direction and the differential movement of the planes will control the movement of the machine in a horizontal direction. The effect of the connection between the front and rear planes will be best understood by reference to Fig. 5, in which one position of the planes is shown in full lines, and the position the planes would occupy if pressure beneath the forward plane should be augmented and tend to turn the front of the machine upwardly is shown in dotted lines. The forward plane having been moved upwardly under the increase of pressure would automatically move the rear plane downwardly to counteract the tendency of the machine to turn upwardly.

In operation, the two connected planes are practically in motion all the time each exerting a controlling influence upon the other and each thereby being caused to sustain its due proportion of the weight without moving the entire body of the machine, as would necessarily be the case in order to restore equilibrium if rigidly mounted planes were employed.

In the preferred arrangement of the connected sustaining planes the front and rear planes have their centers of pressure to the front and rear, respectively, of the center of gravity of the machine; thus, as shown, the center of gravity of the machine is ap-

proximately in line with the rear edges of the forward planes, although it is not thought to be essential that this particular relation of the center of gravity to the connected sustaining planes should be maintained under all circumstances, inasmuch as the planes will, as before explained, automatically adjust themselves to the proper sustaining angle and the operator by moving the movable planes toward the front or rear may cause the machine to travel at the desired inclination to the horizon.

While but one of the arms F on each side is shown extended to form a controlling lever connected with the forward plane, all of the arms may be similarly extended and connected with the forward planes and as before intimated other and well-known mechanical expedients may be employed for connecting the planes to cause them to simultaneously move in opposite directions and, hence, I do not wish to be limited to the particular connecting means illustrated. The connection between the planes in the present invention it will be observed is such that at corresponding points parallel with the direction of flight the planes are deflected in opposite directions, the invention being entirely different in this respect from those flying machines in which the planes on opposite sides of the center are simultaneously deflected in opposite directions, but at corresponding points parallel with the direction of flight are deflected in the same direction.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is:—

1. In an airship of the aeroplane type, the combination with a pair of sustaining planes on each side of the machine adapted to be deflected by the sustaining pressure, of mechanical operating connections between the planes on the same side of the machine, whereby deflection of one causes a deflection of the other in the opposite direction.

2. In an air ship of the aeroplane type, the combination with a pair of sustaining planes on each side of the machine capable of vertical deflection, of operating connections between said planes whereby the deflection of one plane causes the deflection of the other in an opposite direction and means for shifting said operating connections whereby the balance of power between the planes due to said connections may be varied.

3. In an air ship of the aeroplane type, the combination with a pair of sustaining planes on each side of the machine and one arranged in front of the other and capable of vertical deflection, of operating connections between said planes whereby the deflection of one plane causes the deflection of the other in an opposite direction and means for shifting said operating connections whereby the balance of power between the planes due to said connections may be varied.

4. In an air ship of the aeroplane type, the combination with a pair of sustaining planes, one in front of the other and capable of free vertical deflection, of pivotally connected mechanical connections operatively connecting the planes together for moving them positively in opposite directions whereby the deflection of one plane in either direction deflects the other plane in an opposite direction.

5. In an air ship of the aeroplane type, the combination of an independent pair of sustaining planes on each side of the machine, the planes of each pair mechanically connected together for simultaneous deflection in opposite directions, the deflection of said planes of each pair being entirely controlled one by the other.

6. In an air ship of the aeroplane type, the combination of an independent pair of sustaining planes on each side of the machine one arranged in front of the other and the planes of each pair capable of vertical deflection, and operating connections between said planes forming the sole means whereby the deflection of one plane is resisted and controlled by the other.

7. In an air ship of the aeroplane type, a pair of sustaining planes connected together for simultaneous deflection in opposite directions and means whereby the distance between the planes may be varied at the will of the operator and the influence of one plane on the other varied.

8. In an air ship of the aeroplane type, a pair of sustaining planes connected together for simultaneous deflection in opposite directions, and means whereby the power of the connections may be varied to vary the influence of one plane on the other.

9. In an air ship of the aeroplane type, a pair of sustaining planes capable of vertical deflection and one movable bodily toward and from the other whereby the influence of one plane on the other is varied and connections between said planes whereby the deflection of one controls the deflection of the other.

10. In an air ship of the aeroplane type, a pair of sustaining planes supported at their forward edges and capable of vertical movement at their rear edges, a lever connection between said planes whereby the rear edges of the planes are simultaneously moved in opposite directions and means for shifting the relations of the lever and its fulcrum whereby the balance of power between the planes may be varied.

11. In an air ship of the aeroplane type, an independent pair of sustaining planes on

each side of the machine pivoted at their forward edges and one arranged in front of the other and a lever connection between said planes whereby they are controlled one by the other to swing simultaneously in opposite directions.

12. In an air ship of the aeroplane type, a pair of sustaining planes pivoted at their forward edges and one movable bodily toward and from the other to vary the influence of one plane on the other, a lever connection between the planes whereby they are caused to swing simultaneously in opposite directions, and means for adjusting the position of the bodily movable plane.

13. In an air ship of the aeroplane type, a pair of sustaining planes projecting on each side and capable of vertical deflection, connections between the planes on the same side whereby the deflection of one controls the deflection of the other, and means whereby the power of one over the other through said connections may be varied.

14. In an air ship of the aeroplane type, a pair of sustaining planes projecting outwardly and upwardly on each side and capable of vertical deflection, connections between the planes on each side whereby the deflection of one in one direction causes the deflection of the other in the opposite direction, and means for varying the power of one plane over the other simultaneously on both sides.

15. In an air ship of the aeroplane type, a pair of sustaining planes projecting outwardly and upwardly on each side and capable of vertical deflection, one plane on each side being bodily movable toward and from the other to vary the influence of one plane on the other, operating connections between the planes on each side whereby the upward deflection of one causes the downward deflection of the other and an operating mechanism for moving the bodily movable plane toward and from the other plane.

16. In an air ship of the aeroplane type, a pair of sustaining planes on each side one plane on each side being movable toward and from the other to vary the influence of one plane upon the other, a crosshead connected with said movable planes, and a pivoted bearing in which the crosshead is journaled whereby the planes may be moved simultaneously in the same direction or in opposite directions toward and from the other planes.

17. In an air ship of the aeroplane type, an independent pair of sustaining planes on each side of the machine one in front of the other and capable of vertical deflection and counter-balancing connections between the planes whereby the sustaining pressure on each plane tends to deflect the other plane downwardly.

ORRAVILL L. DUNTON.

Witnesses:
THOMAS DURANT,
ALEXANDER S. STEUART.