

E. M. CHASE & M. F. M. GOUVERNEUR.
STABILIZING MEANS FOR AEROPLANES.

APPLICATION FILED MAR. 17, 1910.

963,516.

Patented July 5, 1910.

4 SHEETS—SHEET 1.

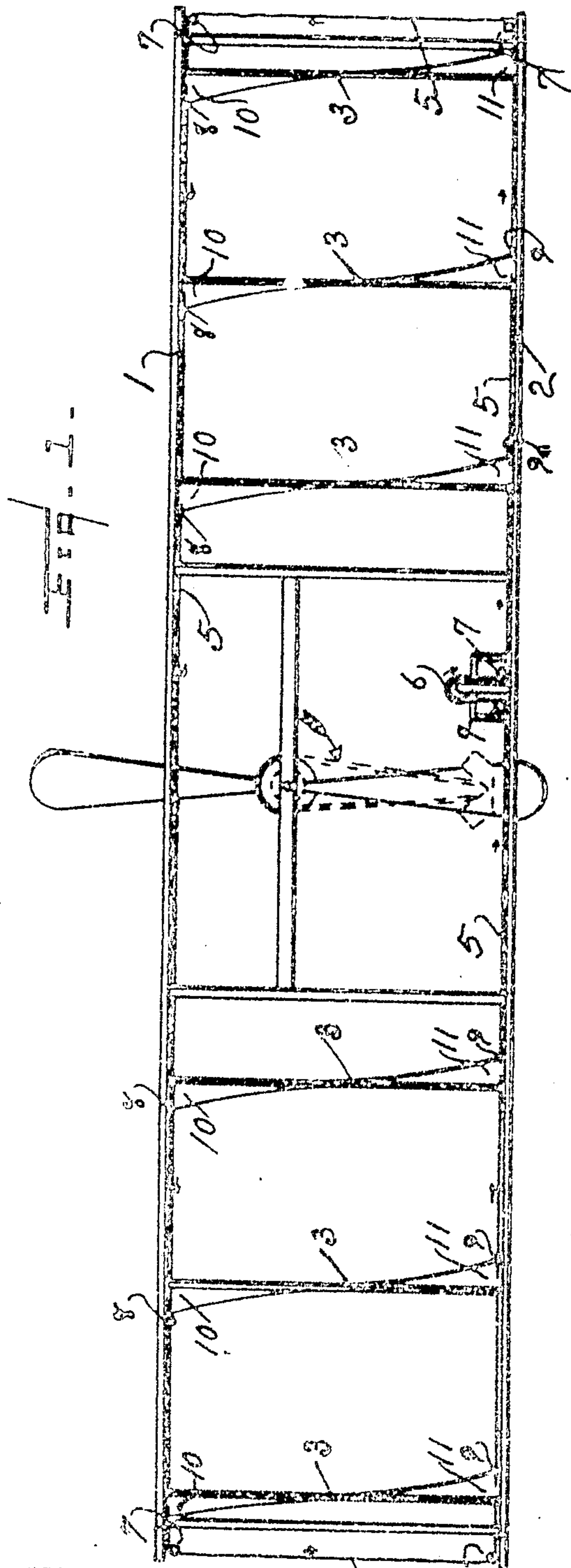
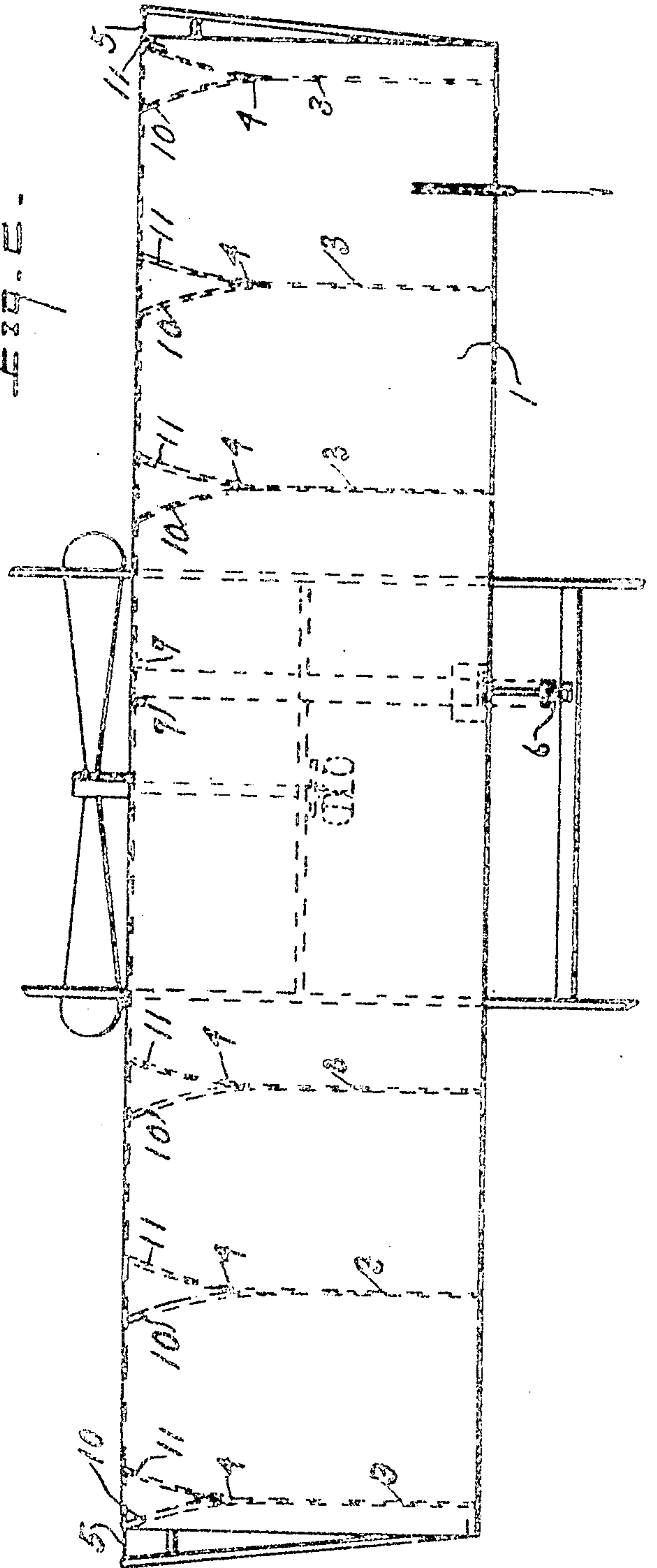


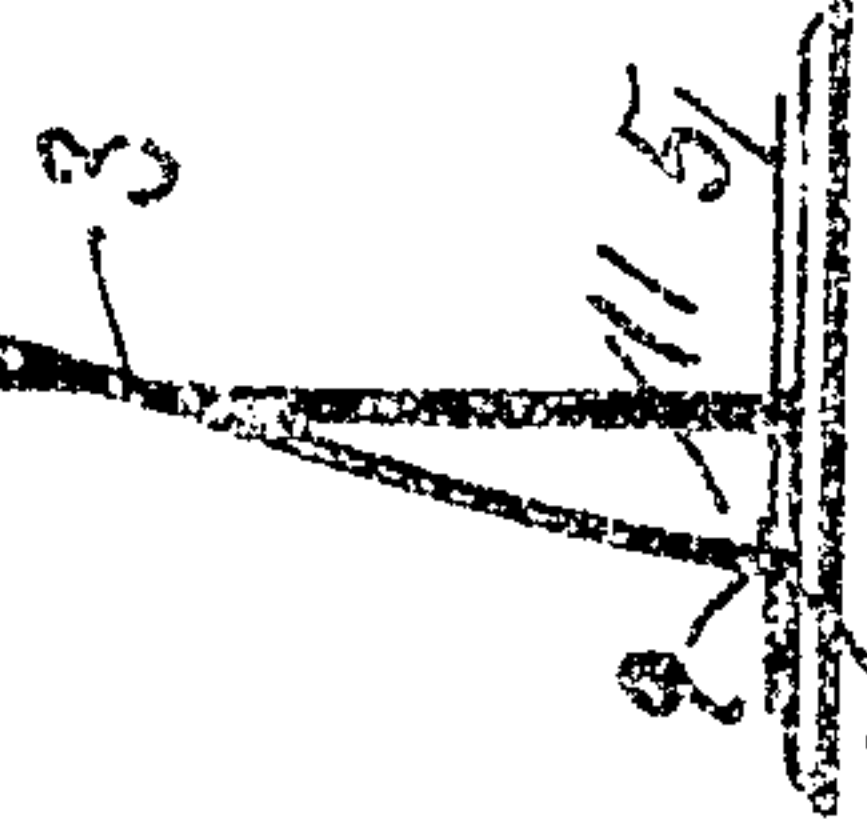
Fig. 2.



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Fig. 3.



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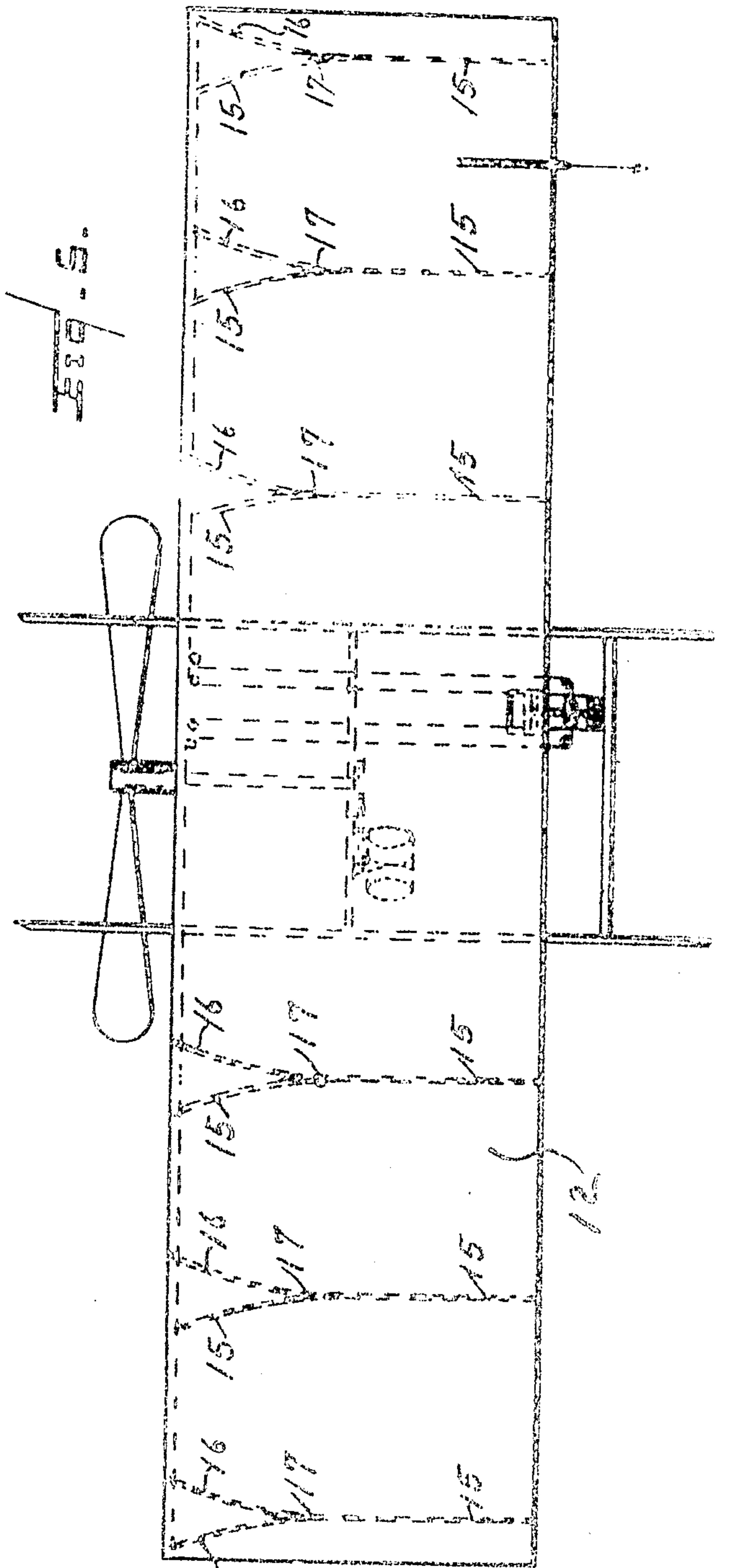
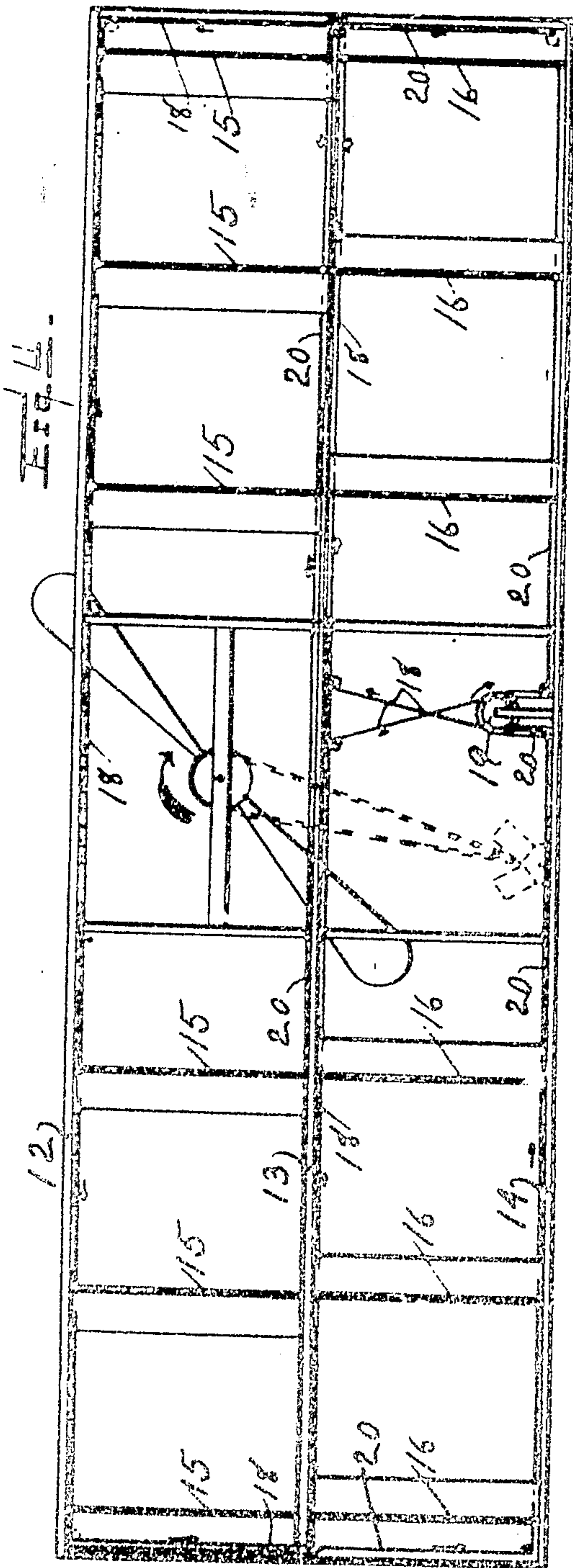
H. M. CHASE & M. F. H. GOUVERNEUR.
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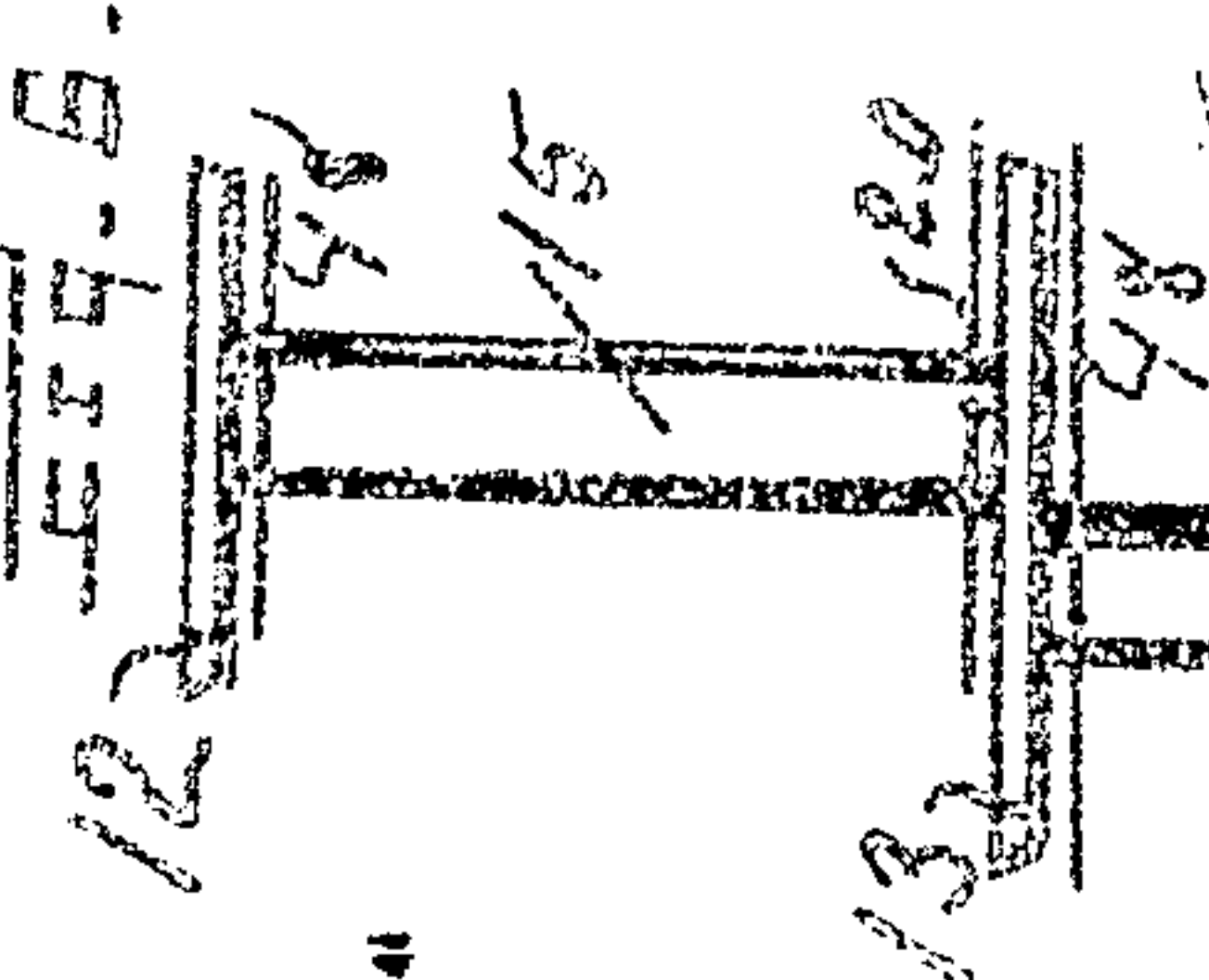
Patented July 5, 1910.

4 SHEETS—SHEET 2.



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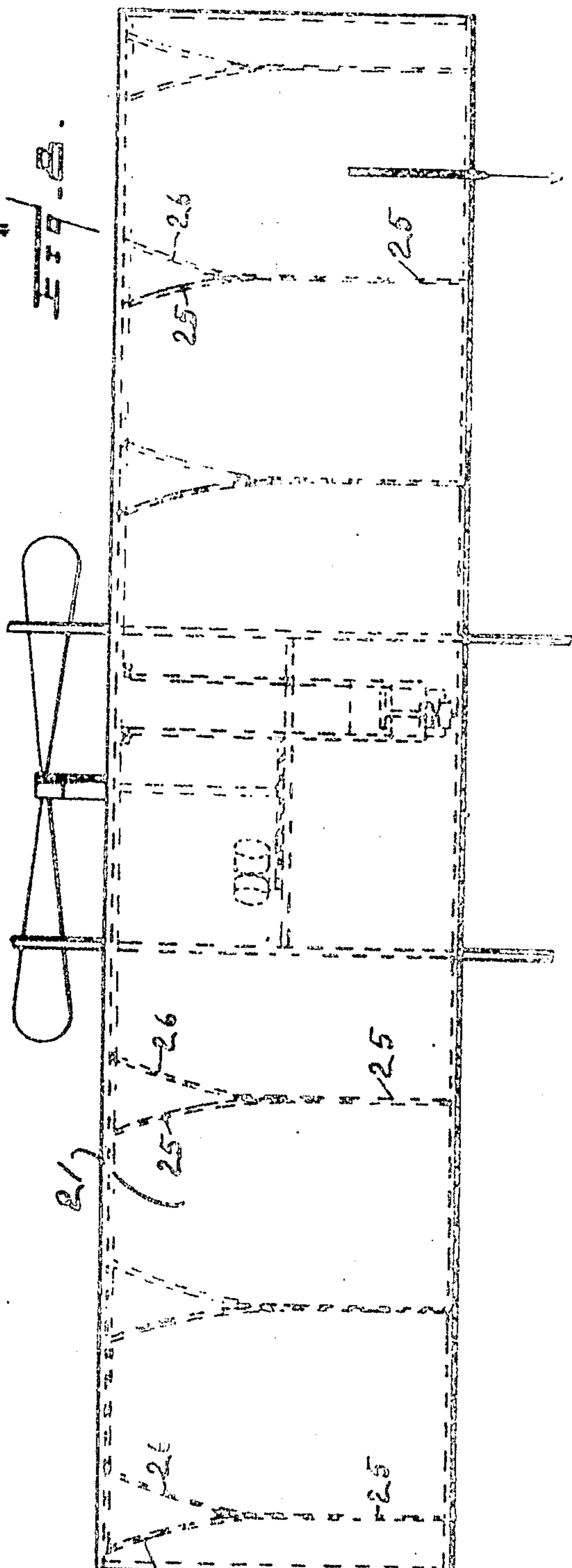
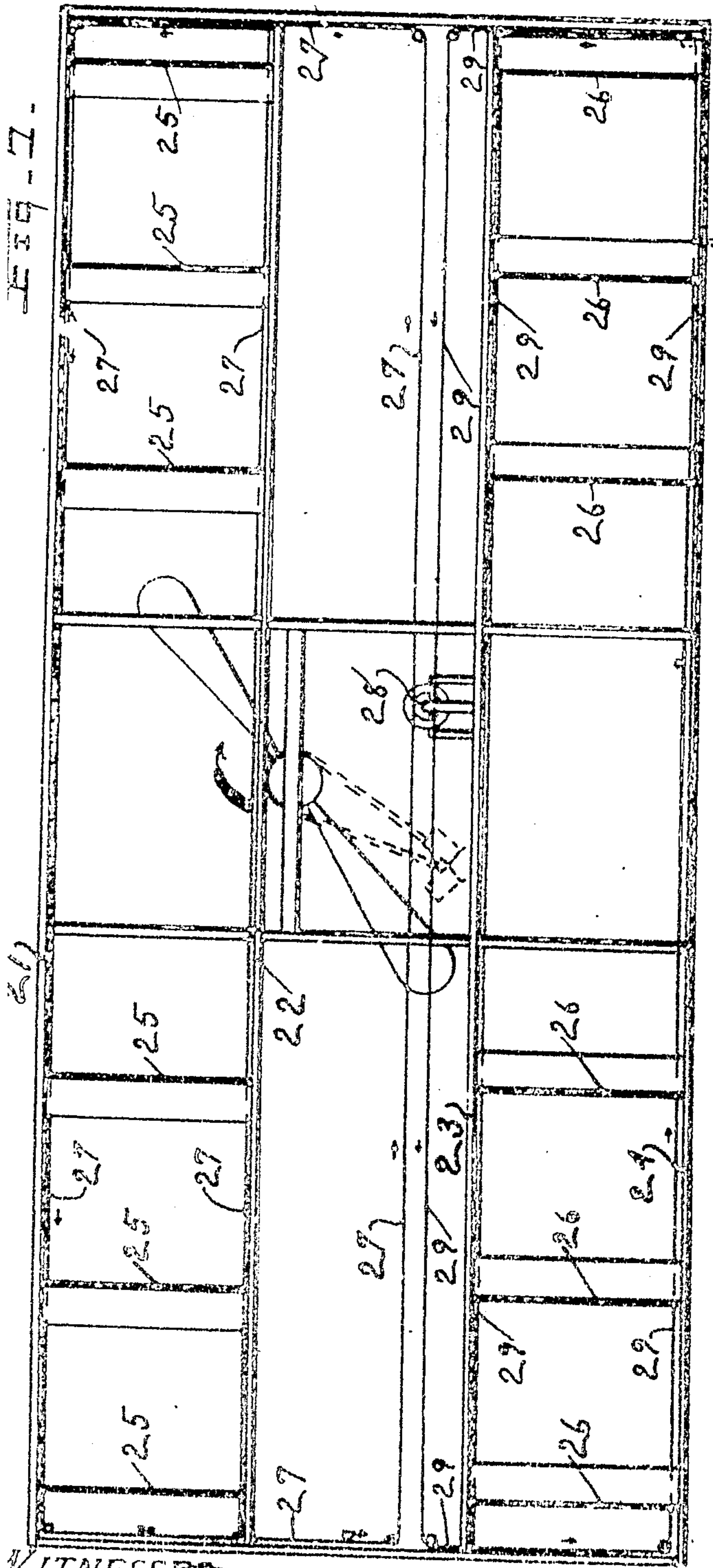
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A SEBETS-SHEET 2.



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4 SHEETS—SHEET 4.

FIG. 9.

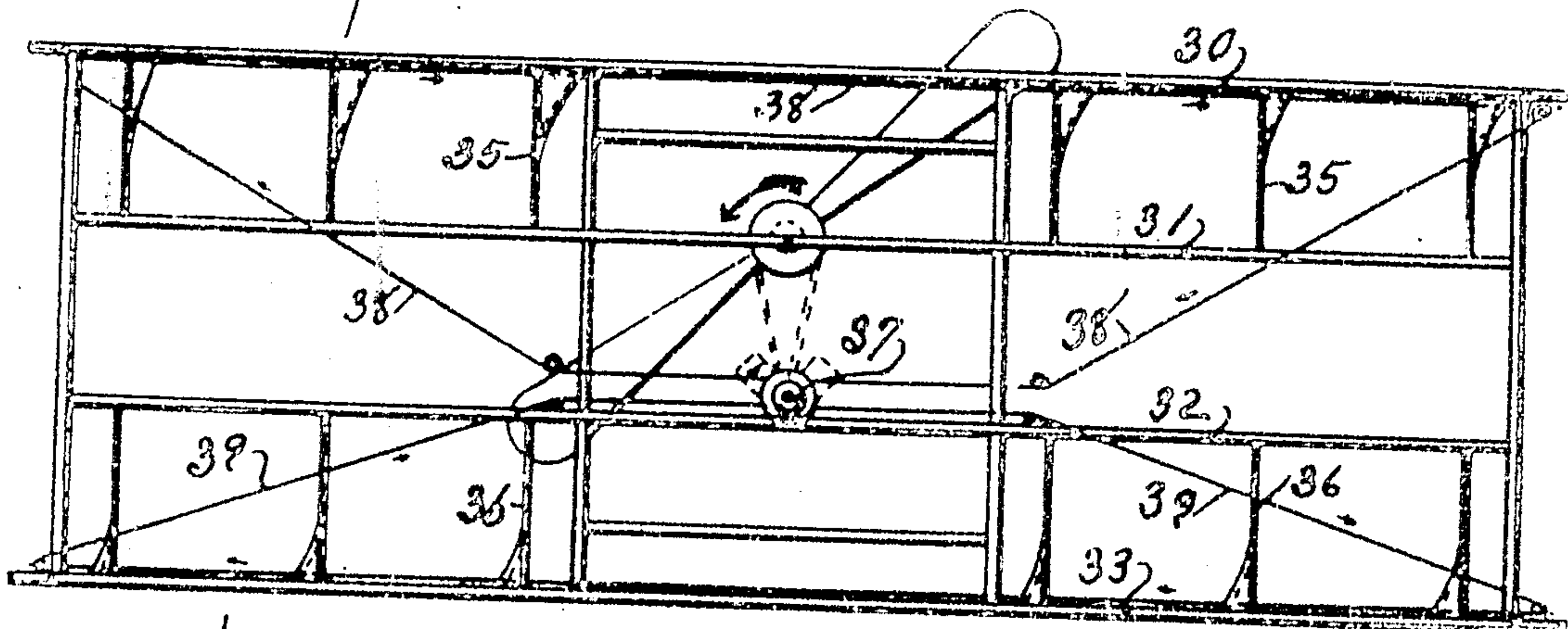


FIG. 10.

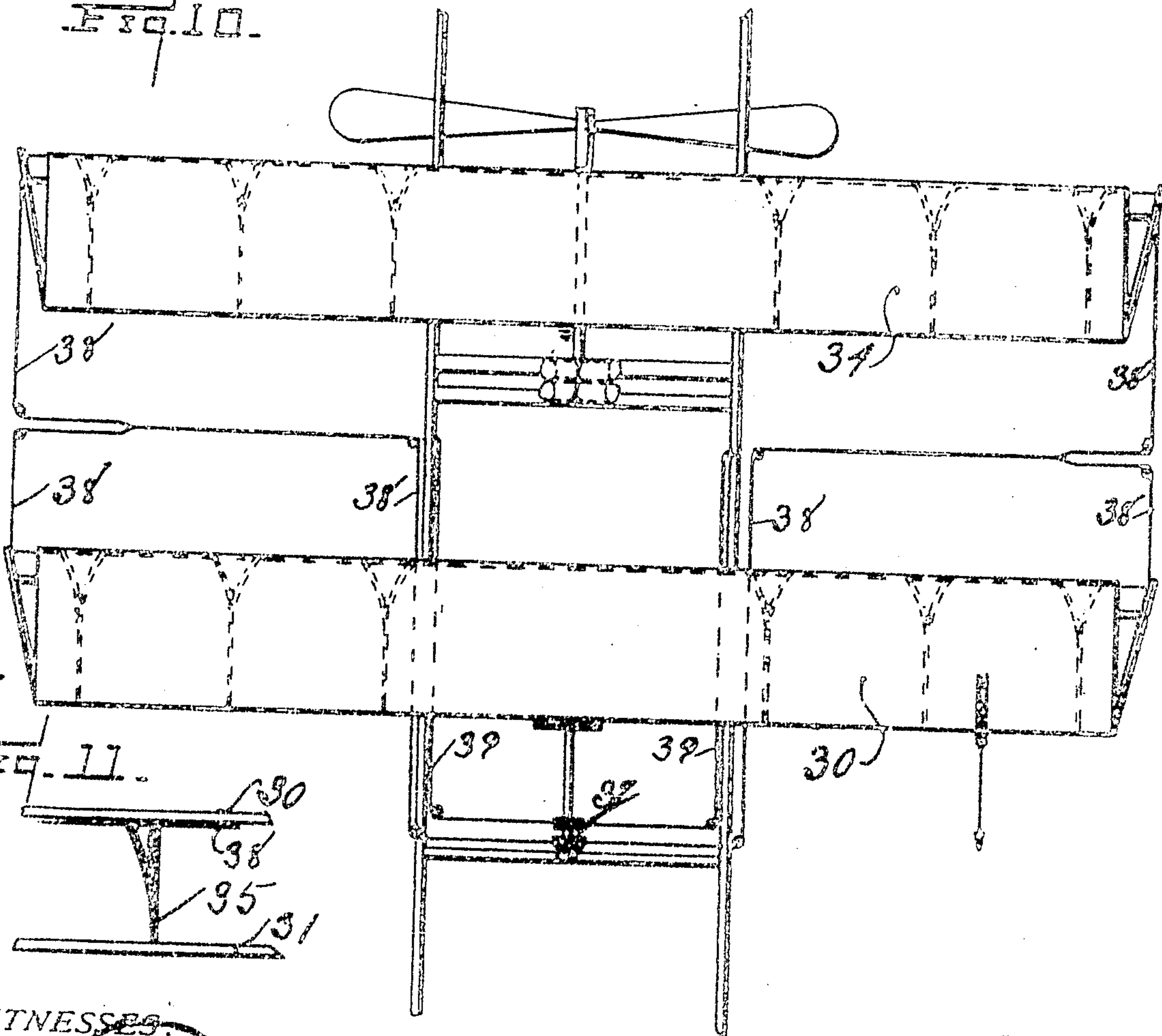
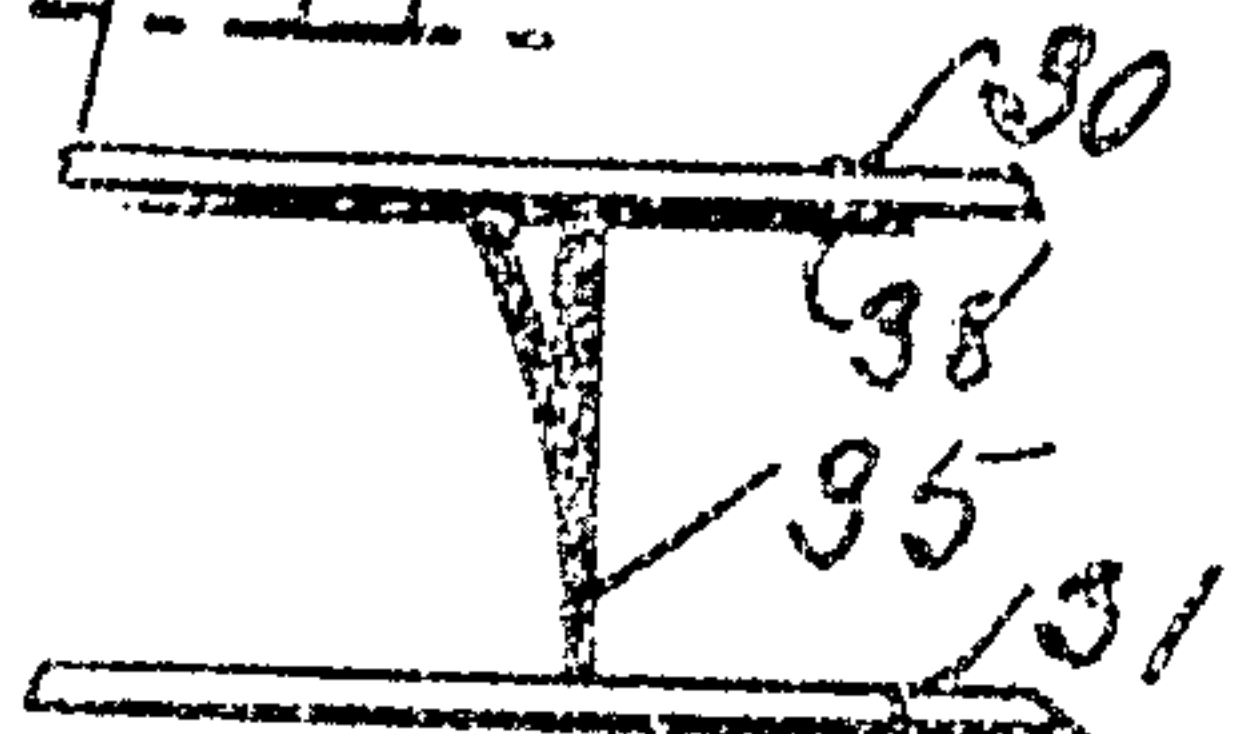


FIG. 11.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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STABILIZING MEANS FOR AEROPLANES.

203,516.

Specification of Letters Patent.

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Application filed March 17, 1910. Serial No. 510,312.

To all whom it may concern:

Be it known that we, HAROLD M. CHASE and MINOR F. H. GOUVERNEUR, citizens of the United States, residing at Wilmington, in the county of New Hanover, State of North Carolina, have invented certain new and useful Improvements in Stabilizing Means for Aeroplanes, of which the following is a description, reference being had to the accompanying drawings, forming a part hereof.

Our invention relates to aeroplanes or similar devices for navigating the air, and the object thereof is to provide improved controlling means for keeping the aeroplane level or upon an even keel or for tipping it about its longitudinal axis at will, the same being under the control of the operator of the machine.

The function above referred to is commonly referred to as "stabilizing", and our improvements provide means under the control of the operator whereby the machine may be stabilized by hand and any tendency of the same to tip sidewise, or to turn about its longitudinal axis, counteracted.

With these ends in view our invention consists in the improved stabilizing means for aeroplanes illustrated in the accompanying drawings, described in the following specification, and particularly claimed in the clauses of the concluding claim; and in such variations and modifications thereof as will be obvious to one skilled in the art to which our invention relates.

The accompanying drawings will be understood to disclose so much only of an aeroplane as is necessary to disclose the connection of our invention therewith, it being understood that the aeroplane in its entirety will be provided with such other elements of common or approved type as may be necessary to form a complete and operative machine.

In the drawing: Figure 1 is a view showing a front elevation of our invention as applied to an aeroplane having two parallel supporting planes, Fig. 2 is a view showing a plan of the same arrangement. Fig. 3 is a view showing a portion of the aeroplane illustrated in Figs. 1 and 2 as seen from the rear, Fig. 4 is a view showing a front elevation of our invention as applied to an aeroplane having three parallel supporting

planes, Fig. 5 is a view showing a plan of the same arrangement, Fig. 6 is a view showing a portion of the aeroplane illustrated in Figs. 4 and 5 as seen from the rear, Fig. 7 is a view showing a front elevation of our invention as applied to an aeroplane having four parallel supporting planes arranged in two pairs spaced apart one pair from the other, Fig. 8 is a view showing a plan view of the same arrangement, Fig. 9 is a view showing a front elevation of our invention as applied to an aeroplane having four parallel supporting planes arranged in two pairs located one above the other, as in the form shown in Fig. 7, the whole arrangement specified being employed a plurality of times along the machine longitudinally, Fig. 10 is a view showing a plan view of the same arrangement, and Fig. 11 is a view showing a portion of the aeroplane illustrated in Figs. 9 and 10 as seen from the rear.

In all the figures of the drawings the aeroplane moves in the direction of the arrow appearing at the right hand of the plan views.

Referring to Figs. 1 and 2, of the drawings, 1 and 2 are upper and lower horizontal supporting planes of an aeroplane the same extending transverse to the machine and arranged one above the other as shown.

3 represents a plurality of vertical planes or partitions located between the planes 1, 2 and preferably of such height that they extend from one plane to the other and of a length fore and aft or longitudinally of the machine corresponding with the width, or fore and aft dimension, of the supporting planes. The number of vertical planes or partitions 3 associated with each pair of horizontal supporting planes 1, 2, may be varied to a considerable degree, and more or less than six such planes, the number illustrated, may be used. The forward portions of the partitions 3, that is the portions thereof from their forward edges back to some intermediate point such as 4, is preferably maintained in a definite and unchanging form as by being secured along its upper and lower edges to the planes 1, 2 from the front edge of these planes back to the intermediate point 4 referred to. The rear portion, however, of these vertical partitions, that is the portion thereof between the points

4 and the rear edge of the partition, may be moved with reference to the forward part and the form of the partition thereby changed, the material of the partitions being sufficiently flexible to permit such an action to take place.

A suitable operating device through which the form of the rear portion of the partitions may be changed is provided, the same being shown as comprising a flexible cord or cable 5 extending longitudinally of the supporting planes 1, 2 adjacent the rear edges thereof and up and down between the extremities of the planes, said cord passing around a rotary manually operated drum 6 and being provided with guide pulleys at 7, by means of which construction motion imparted to the drum 6 will move the cord, the upper and lower runs thereof moving in opposite directions, as will be understood.

The upper and lower corners of the rear edges of the vertical partitions 3 are secured to the cord 5 at the points 8, 9 so that if the drum 6 be moved in such a way as to move the upper run of the cord 5 to the left and the lower run to the right the upper and rear portions 10 of the partitions 3 will all be moved to the left and the lower and rear portions 11 thereof to the right the net result being to warp or impart a twist to that part of each partition 3 which lies back of a vertical line passing through the point 4.

The effect produced by and following from the warping or twisting of the vertical partitions as aforesaid is to bring forces into play, due to the action of the air upon the vertical partitions as the machine moves through the air, which forces tend to turn the entire aeroplane about a longitudinal axis in a clockwise direction when the partitions are warped in the manner shown in the drawing and as indicated by the arrow upon the drawing; so that, if the machine tends to tip, or one side of it to fall, the operator will operate the drum 6, cord 5 and vertical partitions 3 in such a direction as to induce counteracting forces tending to tip the machine in an opposite direction to thereby neutralize the initial tendency to tip. Thus by operating the drum 6 when necessary the machine may be kept level or on an even keel, and the machine maintained in stabilized condition.

It will be understood that the point 4 may be anywhere along the partitions 3, and that in its limiting position coincident with the forward edge of the partition the entire partition will be warped or twisted the same as explained above when the twisting action was assumed to be localized and limited to the rear portion of the partitions.

In the embodiment of our invention disclosed in Figs. 4 and 5 three parallel horizontal supporting planes 12, 13 and 14 are employed, the same extending transverse to

the machine as in the form first referred to. Vertical planes or partitions 15 are arranged between the upper and middle planes, and similar partitions 16 between the middle and lower planes. In this form of our device there is no warping or twisting of a portion of each partition as above described, but the entire rear portion of the partitions 15, 16 is swung about a vertical line located at some point as 17 intermediate the ends of the said partitions. In order to operate the rear portions of the partitions as explained a cord or cable 18 is provided which extends from a drum 19 to the right and passes adjacent the upper rear corners of the partitions 15, thence upward and to the left adjacent the upper rear corners of the partitions 16, thence downward and to the right adjacent the upper rear corners of the partitions 16 and to the drum 19, together with a second cord or cable 20 which extends from the drum 19 to the right and passes adjacent the lower rear corners of the partitions 16, thence upward and to the left adjacent the lower rear corners of the partitions 15, thence downward and to the right adjacent the lower rear corners of the partitions 16 and to the drum 19, it being understood that the upper and lower rear corners of each partition is secured to the cord or cable which extends past it, and that suitable guides are provided for the cables. Such being the construction of the embodiment of our device as illustrated in Figs. 3 and 4, it will be obvious that the rear portions of the partitions are swung from side to side by means of the cords 18, 20 and drum 19, each partition being connected at both its upper and lower rear corners to one of said cords.

In the embodiment of our invention illustrated in Figs. 7 and 8 four supporting planes 21, 22, 23 and 24 are employed, the same being arranged in two pairs spaced apart the one pair from the other, and partitions 25 are located between the planes 21, 22 and partitions 26 between the planes 23, 24, the rear portion of each partition being arranged so that it may be swung from side to side the same as above explained in describing the embodiment of our invention illustrated in Figs. 4 and 5. In these figures the rear portions of the partitions are swung by means of a cord or cable 27 extending from a drum 28 and divided into two parts extending respectively past the upper rear and lower rear corners of the partitions 25, after which its parts unite and return to the drum; and a second cord 29 is connected with the drum 28 and operates the partitions 26; it being understood that the partitions are connected with the cords and that suitable guides are provided as hereinbefore explained.

In the embodiment of our invention illus-

trated in Figs. 9 and 10 a total of eight supporting planes is used. 30, 31, 32 and 33 represent a set of four of such planes, and a similar set is located back of and in line with these, as will be understood from Fig. 8, the upper one of which second set is designated 34. In this embodiment of our device only the upper rear corner of the partitions 35, and the lower rear corner of the partitions 36, together with the portion of the partition adjacent the corner, are movable as indicated in the drawing, so that a comparatively small portion only of each partition is warped or distorted. The mechanism for warping the partitions as disclosed comprises a drum 37 from which a cord or cable 38 leads, the same branching as shown in Fig. 10 and portions thereof extending to the front and sides of the planes and across the machine adjacent the rear upper corners of the partitions 35, after which the two branches reunite and return to the drum 37. 39 is a second cable for operating the lower rear corners of the partitions 36 in a manner similar to that above explained, it being understood that suitable guides for the cables are provided and that the partitions are secured to the cords or cables as hereinbefore explained.

The feature present in the embodiment of our invention disclosed in Figs. 9 and 10 whereby the upper or lower portion only of the rear part of the partitions is movable is obviously applicable in all arrangements wherein two partitions located one over the other are present, and a machine having this feature is somewhat simpler than one in which the entire rear portion of the partition is to be moved. The forces brought into play and acting to turn the machine about a longitudinal axis are of somewhat less magnitude than where the whole rear portion of the partitions is moved but are sufficient, ordinarily, to permit the machine to be effectively stabilized and controlled.

Having thus described our invention and explained the operation thereof, we claim and desire to secure by Letters Patent:

1. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and which planes are designed to be in a substantially horizontal position when the machine is in motion; a plurality of vertically arranged partitions located between said planes and extending longitudinally of the machine, and the rear portion of each of which partitions is movable in a direction transverse to the longitudinal axis of the machine; and means for moving the rear portion of each of said partitions in the manner aforesaid.

2. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and

which planes are designed to be in a substantially horizontal position when the machine is in motion; a plurality of vertically arranged partitions located between said planes and extending longitudinally of the machine, and the rear portions of each of which partitions is so arranged that it may be swung about a vertical axis and transverse to the longitudinal axis of the machine; and means for moving the rear portions of each of said partitions in the manner aforesaid.

3. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and which planes are designed to be in a substantially horizontal position when the machine is in motion; a plurality of vertically arranged partitions located between said planes and extending longitudinally of the machine, and the rear portion of each of which partitions is movable in a direction transverse to the longitudinal axis of the machine; and a flexible cord or cable connected with the rear portion of each of said partitions and through which said rear portions may be moved in the manner aforesaid.

4. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and which planes are designed to be in a substantially horizontal position when the machine is in motion; a plurality of vertically arranged partitions located between said planes and extending longitudinally of the machine, and the rear portions of each of which partitions is so arranged that it may be swung about a vertical axis and transverse to the longitudinal axis of the machine; and a flexible cord or cable connected with the rear portion of each of said partitions and through which said rear portions may be moved in the manner aforesaid.

5. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and which planes are designed to be in a substantially horizontal position when the machine is in motion; a plurality of partitions located between said planes and extending vertically from one plane to the other, and extending longitudinally of the machine from the front to the rear edge of the supporting planes, the rear portion of each of said partitions being movable in a direction transverse to the longitudinal axis of the machine; and means for moving the rear portions of each of said partitions in the manner aforesaid.

6. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and which planes are designed to be in a substantially horizontal position when the machine is in motion; a plurality of partitions

located between said planes and extending vertically from one plane to the other, and extending longitudinally of the machine from the front to the rear edge of the supporting planes, the rear portion of each of said partitions being movable in a direction transverse to the longitudinal axis of the machine; and a flexible cord or cable connected with the rear portion of each of said partitions and through which said rear portions may be moved in the manner aforesaid.

7. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and which planes are designed to be in substantially horizontal position when the machine is in motion; a plurality of vertically arranged partitions located between said planes and extending longitudinally of the machine, and a portion of each of which partitions is movable in a direction transverse to the longitudinal axis of the machine; and means for moving the movable portion of each of said partitions in the manner aforesaid.

8. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and which planes are designed to be in a substantially horizontal position when the machine is in motion; a plurality of partitions located between said planes and extending vertically from one plane to the other, and extending longitudinally of the machine from the front to the rear edge of the supporting planes, a portion of each of said partitions being movable in a direction transverse to the longitudinal axis of the machine; and means for moving the movable portion of each of said partitions in the manner aforesaid.

9. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and which planes are designed to be in a substantially horizontal position when the machine is in motion; a plurality of vertically arranged partitions located between said planes and extending longitudinally of the machine, and a portion of each of which partitions is so arranged that it may be swung about a vertical axis and transverse to the longitudinal axis of the machine; and means for moving the movable portion of each of said partitions in the manner aforesaid.

10. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and which planes are designed to be in a substantially horizontal position when the machine is in motion; a vertically arranged partition located between said planes and extending longitudinally of the machine, and the rear portion of which partition is so arranged that it may be warped or twisted

about a medial horizontal axis of the partition; and means for warping or twisting the rear portion of said partition.

11. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and which planes are designed to be in a substantially horizontal position when the machine is in motion; a partition located between said planes and extending vertically from one plane to the other, and extending longitudinally of the machine from the front to the rear edge of the supporting plane, the rear portion of which partition is so arranged that it may be warped or twisted about a medial horizontal axis of the partition; and means for warping or twisting the rear portion of said partition.

12. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and which planes are designed to be in a substantial horizontal position when the machine is in motion; and which planes comprise a first set of supporting planes; a second set of supporting planes arranged similarly to but occupying a lower position than said first set of supporting planes; a vertically arranged partition located between the planes comprising said first set and extending longitudinally of the machine, and the rear portion of which partition is movable in a direction transverse to the longitudinal axis of the machine; a vertically arranged partition located between the planes comprising said second set and extending longitudinally of the machine, and the rear portion of which partition is movable in a direction transverse to the longitudinal axis of the machine; and operating means adapted to move the rear portion of the partition between said first set of planes in one direction and the rear portion of the partition between the second set of planes in an opposite direction.

13. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and which planes are designed to be in a substantially horizontal position when the machine is in motion, and which planes comprise a first set of supporting planes; a second set of supporting planes arranged similarly to but occupying a lower position than said first set of supporting planes; a plurality of vertically arranged partitions located between the planes comprising said first set and extending longitudinally of the machine, and the rear portion of each of which partitions is movable in a direction transverse to the longitudinal axis of the machine; a plurality of vertically arranged partitions located between the planes comprising said second set and extending longitudinally of the machine, and the rear por-

tion of each of which partitions is movable in a direction transverse to the longitudinal axis of the machine; and operating means adapted to move the rear portions of the partitions between said first set of planes in one direction and the rear portions of the partitions between said second set of planes in an opposite direction.

14. In an aeroplane, two parallel supporting planes extending transverse to the aeroplane and arranged one above the other and which planes are designed to be in a substantially horizontal position when the machine is in motion, and which planes comprise a first set of supporting planes; a second set of supporting planes arranged similarly to but occupying a lower position than said first set of supporting planes; a plurality of partitions located between the planes comprising said first set and extending vertically from one plane to the other, and extending longitudinally of the machine from the front to the rear edge of the sup-

porting planes, the rear portion of each of said partitions being movable in a direction 25 transverse to the longitudinal axis of the machine; a plurality of partitions located between the planes comprising said second set and extending vertically from one plane to the other and extending longitudinally of 30 the machine from the front to the rear edge of the supporting planes, the rear portion of each of said partitions being movable in a direction transverse to the longitudinal axis of the machine; and operating means 35 adapted to move the rear portions of the partitions between said first set of planes in one direction and the rear portions of the partitions between said second set of planes in an opposite direction.

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In the presence of—

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