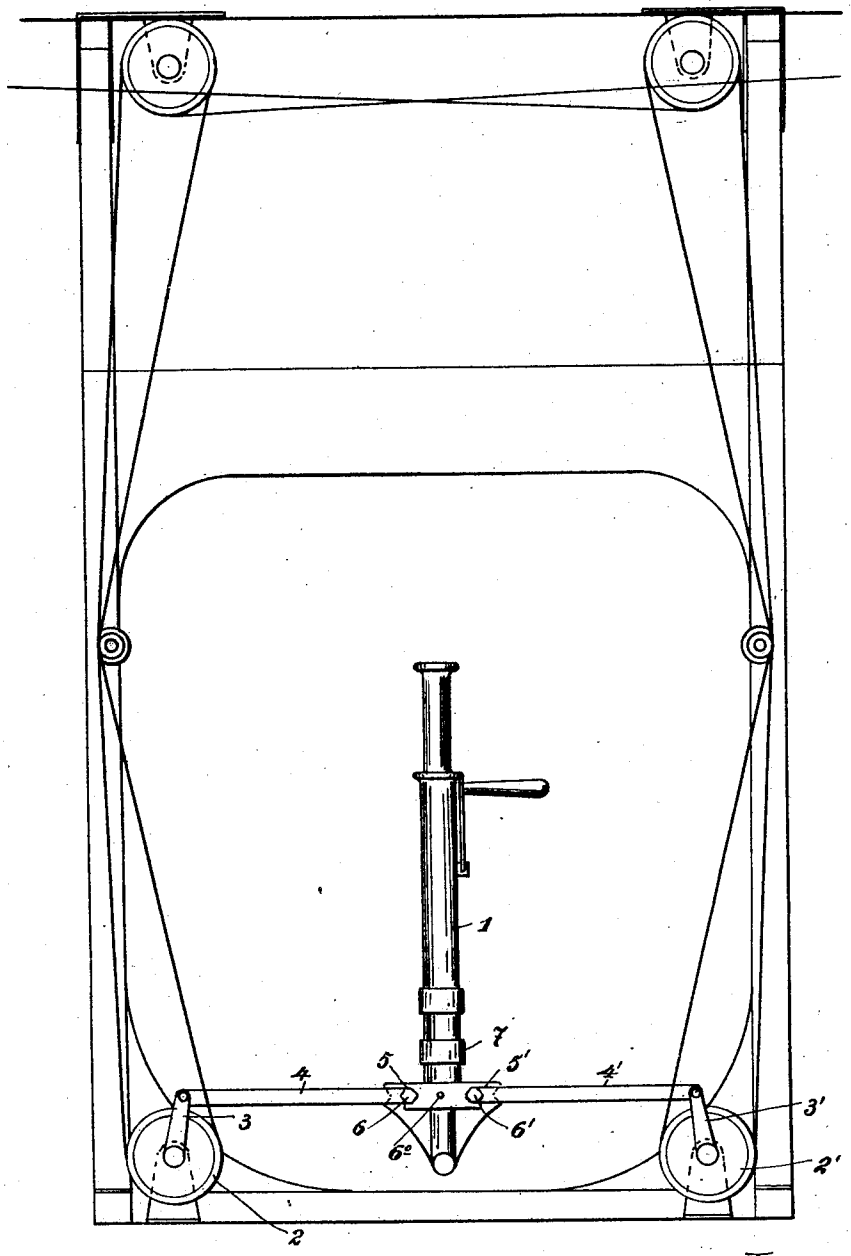
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ADJUSTMENT OF AEROPLANE AILERONS

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CESARE PALLAVICINO, OF MILAN, ITALY, ASSIGNOR TO SOCIETÁ ITALIANA ERNESTO BREDA PER COSTRUZIONI MECCANICHE, OF MILAN, ITALY

ADJUSTMENT OF AEROPLANE AILERONS

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In those aeroplanes in which movable ailerons are employed to obtain lateral control of the line of flight, the controls by means of which the position of the said ailerons is regulated are ordinarily made and arranged in such a way as to render it impossible for one aileron to move in one direction unless the other moves synchronously and symmetrically in the opposite direction. The defect of this arrangement is that it interferes with the manœuvre and renders it impossible to execute special evolutions that in certain circumstances would be opportune.

A type of control has been proposed that would render the displacement of the ailerons, which form a couple, asymmetrical by means of the use of connecting rods arranged on the ailerons at angles other than right angles; the proportion of the differential displacements thus obtaned being, however, always fixed and invariable.

The present invention has for its object a new arrangement whereby the movements of the ailerons forming a couple are rendered independent of one another, although allowing them to be engaged with one another at will so that the whole of the desired variations in the proportions between their displacements can be obtained, by means of simple operations which can be effected even during flight. The essential characteristic of this new arrangement is that each of the ailerons forming a couple is connected in a manner which varies according to requirements, with the control stick at the pilot's disposal by means of a mechanical system of transmission which is independent of the system relative to the other aileron of the same couple, the connections being formed in such a way as to allow the amplitude and the direction of one aileron as regards the amplitude and the direction of the other, as well as the position of the same in respect to the middle position of the said control stick, to be changed at will.

This new arrangement permits new and important possibilities of manœuvre. In fact, in case of breakage of any one of the control transmissions, the lateral control of the aeroplane can be maintained the same by means of said arrangement because one of the two ailerons is always available. On the other hand, the arrangement itself allows the pilot to modify at will the relative positions of the ailerons; it is possible, for example, to depress both ailerons without losing lateral control of the aeroplane, in such a way as to confer greater buoyancy on the body. This is especially useful in certain conditions of flight as well as during the operation of landing.

Moreover, it is easy to establish the connections in such a way that the movement of elevation of one aileron will be greater than the movement of depression of the other; this being most useful in piloting the aeroplane because the use of the tail planes is rendered less necessary. The proportion or ratio between the angle of elevation and that of depression is greater proportionally to the degree of depression given to both ailerons, which is most useful because the potentiality of lateral control increases when the speed of the aeroplane is low, that is to say, when the need for lateral control is greatest.

The attached drawing gives a front view outline, of the central part corresponding to the cock-pit, which represents one way of realizing practically the present invention. It is given as an example.

In the construction shown, the two ailerons, port and starboard, forming a couple, are connected with the control stick 1 by means of flexible cable transmission. These cables are guided by suitable pulleys and form two separate devices, each consisting of an outward cable and a return cable. These two devices are carried by two pulleys or levers 2—2′ respectively which are arranged at a suitable distance on both sides of the control stick 1 and which can be rotated by means of the cranks 3—3′ respectively, which are rigidly fixed to said pulleys, and of the connecting rods 4—4′, which latter can be turned respectively by their pivoted extremities 5—5′ on a suitable plate 7 carried by the movable control stick. The pivots 5—5′ can be placed at different and variable points 6°—6—6′; . . . on plate 7.

In order that the operation of displacing the pivots may be effected easily, even during flight, many different methods of con-

nection can be used. Each of these may prove to be more or less suitable according to the case and the results which it is desired to obtain. For example, the pivots 5—5′ may be rigidly connected with two wing nuts, lodged in a horizontal box (not shown) arranged on the plate 7 and furnished with slits such as to allow the passage of the pivots themselves, the said wing nuts being screwed on a rod having a right and left hand thread mounted axially in the box itself in such a way that it can rotate in said box, by means of any type of external control.

If the various parts of the transmission connections are proportioned and arranged in such a way that, when the control stick is in the middle position, the pivots 5—5′ both coincide in point 6° of the plate 7, on rotating the control stick the two controls, starboard and port, go through the same movement and the ailerons forming a couple make synchronous and symmetrical rotations. If the two pivots are then displaced outwardly, the two ailerons assume a downwardly inclined position; and when the control stick is rotated, synchronous and opposite but no longer equal, rotations of the ailerons themselves are produced.

If instead, the two transmissions are adjusted in such a way that by keeping the two pivots 5—5′ at a suitable distance apart, the ailerons forming a couple are in a horizontal position, then when the control stick is rotated disymmetrical or differential rotations of the ailerons themselves are produced. If the pivots be kept at a still greater distance apart, the depression of the two ailerons forming a couple is produced, in which case rotation of the control stick produces inverse rotations of the ailerons themselves, the amplitude of which rotations is still more differentiated, the differentiation increasing with the increase in the reciprocal distance between the two pivots. Inverse effects are produced by lessening the distance between the pivots.

The arrangement here described evidently allows the operation of displacement of the connection to be effected in any position whatsoever of the control stick, and also during flight. Analogous results could also be obtained by making the position of the pivots of the pulleys 2—2′ variable, in any suitable way and which technicians know well. The structure of the transmission devices for the controls, their arrangement and their method of attachment to the control stick, may be varied; but such variation is clearly within the scope of this invention.

What I claim is:

A system of control for the couple-forming ailerons of an aeroplane, comprising a pivoted control stick; an endless cable associated with each aileron and connected to actuate the same, said cables being disposed at opposite sides of said stick; oppositely-arranged pairs of pulleys whereon the cables are mounted, one pair located adjacent the control stick; a crank secured to the axle of each pulley of said pair; a plate secured to said stick to move therewith; and a pair of oppositely-arranged rods adjustably pivoted at their inner ends to said plate at different points thereon, and at their outer ends to said cranks, thereby to enable variations at will in the amplitude and direction of the displacements of one aileron with relation to those of the other aileron, as well as their position corresponding to the central position of the control stick.

In testimony whereof I affix my signature.

CESARE PALLAVICINO.