J. F. VERNER.

AEROPLANE CONTROL.

APPLICATION FILED AUG. 30, 1918.

**1,304,420**

Patented May 20, 1919.

2 SHEETS—SHEET 1.

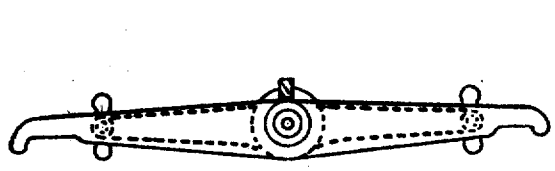


FIG. 5.



FIG. 1.



FIG. 3.

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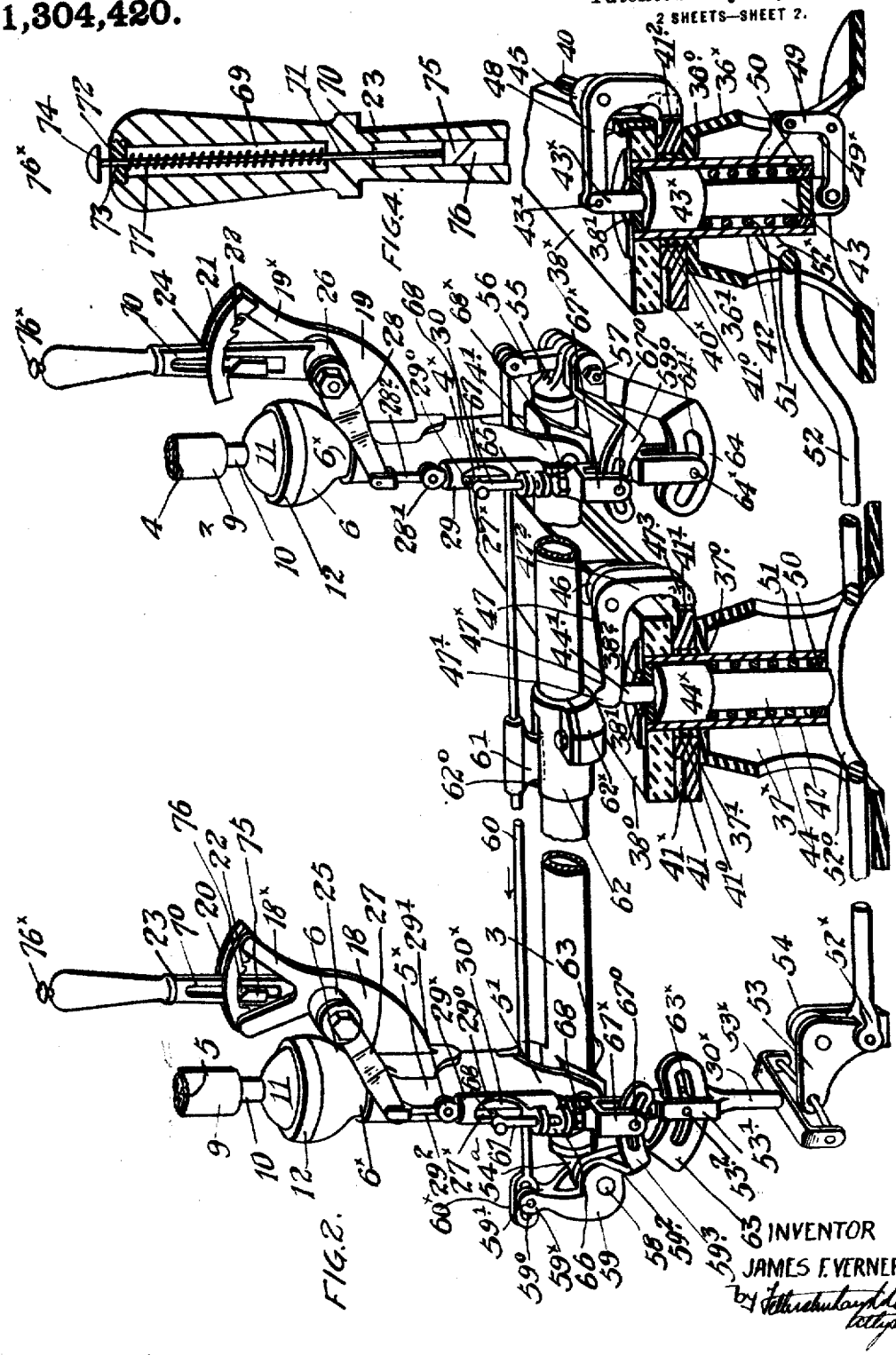


FIG. 2.

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# UNITED STATES PATENT OFFICE.

JAMES FREDERICK VERNER, OF TORONTO, ONTARIO, CANADA, ASSIGNOR TO HERMAN CLARK ANDERSON, OF TORONTO, ONTARIO, CANADA.

## AEROPLANE CONTROL.

1,304,420. Specification of Letters Patent. Patented May 20, 1919.

Application filed August 30, 1918. Serial No. 252,078.

*To all whom it may concern:*

Be it known that I, JAMES FREDERICK VERNER, of the city of Toronto, in the county of York, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Aeroplane Controls, of which the following is the specification.

My invention relates to improvements in aeroplane controls and the object of the invention is to devise means whereby one control, either front or rear, may be rendered operative or inoperative by the other control operator and to produce this result without the employment of other cable connections than those ordinarily used in an aeroplane and it consists essentially of the following arrangement and construction of parts as hereinafter more particularly explained.

Figure 1, is a general perspective view of my device.

Fig. 2, is an enlarged perspective detail of the principal parts of my operating mechanism, such mechanism being broken away intermediately of its length, the parts being in section.

Fig. 3 is a sectional detail of the plunger and operating mechanism adjacent thereto for connecting and disconnecting the stick or hand control lever.

Fig. 4, is an enlarged sectional view of the upper portion of the supplemental lever for breaking the controls.

Fig. 5, is a plan view of one of the foot control levers.

In the drawings like characters of reference indicate corresponding parts in the various figures.

1 and 2 indicate front and rear bearing brackets suitably secured to the bottom of the fuselage and $2^0$ an intermediate bracket. 3 indicates a rocking shaft journaled in the bearings 1, 2 and $2^0$. 4 indicates the front manually operated control lever which is swung at its lower end upon the forward end of the rocking shaft 3. 5 indicates the rear manually operated control lever which is swung at its lower end upon the rear end of the rocking shaft 3. Each lever 4 and 5 is broken intermediately of its length, the lower portions being provided with tubular portions $4^x$ and $5^x$ formed integral with the forks 4′ and 5′. 6 indicates a socket member provided with a depending tubular portion $6^x$, a socket portion 6 and tubular portion $6^x$ being provided for each front and rear lever, a tubular portion $6^x$ fitting into each of the tubular portions $4^x$ and $5^x$ and suitably secured therein. Each of the portions $4^x$ and $5^x$ is provided with a closure member $6^2$ (see Fig. 3) provided with a central orifice $6^3$. 7 indicates a plunger provided with an enlargement $7^x$ fitting freely the tubular portion $6^x$ of each socket member. 8 indicates a compression spring extending between such enlargement and the closure member $6^2$. The lower end of the plunger 7 is provided with a longitudinal slot $7^0$. Each control lever 4 and 5 fits into a sleeve member 9 and is suitably secured therein. Each sleeve member 9 is provided with a depending stem 10 terminating in a ball 11 which fits into the socket 6. 12 indicates a ring cap which fits over the upper portion of the ball 11 and has a screw connection or other suitable means for securing it to the socket 6 so as to hold the ball 11 freely within the socket. $11^x$ indicates a recess formed in each ball 11 diametrically opposite the stem 10 and into which the plunger 7 fits when either lever 4 or 5 is in its neutral position.

18 indicates a bracket carried by the lower portion of the lever 5 and 19 indicates a similar bracket carried by the lower portion of the lever 4, both of such brackets being carried in front of its respective lever 4 or 5. The brackets 18 and 19 extend upwardly and are formed into V-shaped heads $18^x$ and $19^x$ carrying arc-shaped guides 20 and 21, each provided with ratchet notches 22. 23 and 24 indicate levers which are journaled in the apexes of the bracket heads $18^x$ and $19^x$ and extend upwardly through the guides 20 and 21. The lower ends of the levers 23 and 24 are provided with stems 25 and 26 from which extend arms 27 and 28. 29 and $29^x$ indicate cylindrical bearings carried by the portions $4^x$ and $5^x$, each bearing being provided with an open front $29^0$.

30 indicates a vertically movable rod held in the bearing sleeve 29. $30^x$ indicates a vertically movable rod held in the bearing sleeve $29^x$. The upper end of the rod 30 is provided with jaws 28′ connected by a link rod $28^2$ to the end of the arm 28. The upper end of the rod $30^x$ is provided with jaws 29′ connected by a link rod $29^2$ to the arm 27. Each rod 30 and $30^x$ is provided with a longitudinal slot $27^x$ for a purpose which will

hereinafter appear, such slot being located opposite the open face $29^0$ of the bearing sleeves 29 and $29^x$. 31 indicates a link rod provided with forked ends 32 and 33 pivotally connected to the lower portions $4^x$ and $5^x$ of the levers 4 and 5. The lower portion $5^x$ of the lever 5 is provided with rearwardly extending lug 34 from which extends a cable 35 connected to control the elevators of the aeroplane.

36 indicates an arm carried by the rocking shaft 3 and to which are connected cables 37 and 38 connected to the ailerons. $36^x$ and $37^x$ indicate conical supporting standards secured to the bottom of the fuselage and on which the rudder control levers $38^x$ and $38^0$ are mounted. Beneath the control levers $38^x$ and $38^0$ are located supplemental levers 40 and 41.

On referring to Fig. 2 it will be seen that the upper ends of the conical bearings $36^x$ and $37^x$ are provided with orifices $36^0$ and $37^0$ surrounded by annular bearing flanges 36′ and 37′. The levers 40 and 41 are provided with central circular portions $40^x$ and $41^x$, each having a central orifice $41^0$ into which extend the bearing flanges 36′ and 37′. The forward portion of each central portion $40^x$ and $41^x$ is provided with a peripheral notch $41^2$.

42 indicate sleeves which depend centrally through each of the bearings $36^x$ and $37^x$ and extend upwardly through the foot control levers $38^x$ and $38^0$, the upper end of each sleeve being provided with a closure 38′ having a central orifice $38^2$.

43 and 44 indicate plungers provided with enlargements $43^x$ and $44^x$ fitting the sleeves 42 and normally bearing against the lower face of the closure 38′. The plunger 43 is provided with an upward extension $43^x$ provided with a jawed upper end 43′. The plunger 44 is provided with an upward extension 44′ provided with a rounded upper end, such projection extending through the orifice $38^2$ so as to project upwardly above the level of the foot control lever $38^0$. Each lever $38^x$ and $38^0$ is provided with bearing brackets 45 and 46 located centrally of the front portion of the corresponding foot control lever and, therefore, above the notches $41^2$ and 41′. 47 indicates a locking lever which is pivoted in the bracket 46 and is provided with a horizontal arm $47^x$ resting at its extreme end upon the upper end of the projecting portion 44′ of the plunger 44, the upper portion of such arm at its extreme end being provided with a rounded projection 47′ for a purpose which will hereinafter appear. The lever 47 is also provided with a depending arm $47^2$ provided with an inwardly extending portion $47^3$ at its lower end designed to normally enter the notch 41′ thereby locking the foot control lever $38^0$ and supplemental lever 41 together.

48 indicates a similar lever journaled in the bracket 45 carried by the forward foot control lever 38′. The lever 48 is similar in construction to the lever 47 with the exception that the extreme end of the horizontal arm $48^x$ thereof extends into the jaw 43′ and is pivotally secured therein.

49 indicates a bell crank lever located within the conical bearing $36^x$, being pivotally mounted on a suitable projecting lug $49^x$. The horizontal arm of the bell crank 49 is pivotally connected to the lower end of the plunger 43. Each sleeve 42 is provided at its lower end with a closure 50 having a central orifice through which the plungers 43 and 44 freely extend. 51 indicate compression springs extending between the closures 50 and the lower face of the enlargements $43^x$ and $44^x$ of the plungers 43 and 44. 52 indicates a pull bar which is provided with a looped portion $52^x$ extending around the depending portion 42 within the conical bearing $36^x$, the forward end of the looped portion being pivotally connected to the upwardly extending arm of the bell crank 49. The pull bar 52 preferably extends through the orifices formed in the conical bearings $36^x$ and $37^x$ and is provided intermediately of its length with a looped portion $52^0$ located beneath the plunger 44 so as to allow of freedom of movement of such plunger. 53 indicates a bell crank pivotally mounted in a bracket 54, the depending arm of which is pivotally connected between the jaws $52^x$ of the pull bar 52. The lower end of the vertically movable rod $30^x$ is provided with a jaw $53^x$ into which the horizontal arm of the bell crank 53 extends, and in which such horizontal arm is pivotally connected. The rod $30^x$ intermediately of its length is provided with an enlargement 53′ having a vertical slot through which a cross pin $53^2$ extends for a purpose which will hereinafter appear.

The rear end of the rocking shaft 3 is provided with a bearing lug $54^a$. The forward end of the rocking shaft is provided with bearing jaws 55. 56 indicates a lever arm swung on a cross bolt 57 extending through the jaws 55. 58 indicates a bolt extending through the lug $54^a$ and on which is swingably mounted a crotch member 59 having an upwardly extending arm $59^x$ provided with a forked end $59^0$ through which extends a cross pin 59′. 60 indicates a link rod pivotally connected at one end to the arm 56 and provided at its opposite end with a slotted enlargement $60^x$ through which the cross pin 59′ extends. 61 indicates a depending member secured to the rod 60 intermediately of its length. 62 indicates a sleeve slidably held upon the rocking shaft 3, the lower portion of the sleeve being provided with a semi-cylindrical cam portion $62^x$, the forward portion of which

is tapered, such tapered portion being held in such position as to engage with the rounded portion 47′ of the locking lever 47. The upper portion of the sleeve 62 is provided with a longitudinal slot $62^0$ into which the projection 61 extends, the forward end of the slot being closed and the rear end open for a purpose which will hereinafter appear.

Upon the bolts 57 and 58 are secured arms 63 and 64, the arms 63 being preferably secured at each end of the bolt 58 and an arm 64 at each end of the bolt 57. The arm 63 extends through the slotted opening of the enlargement 53′, the pin $53^2$ passing through an arc-shaped slot $63^x$ formed in the arm. The arm 64 passes through the jaw formed at the lower end of the rod 30, a pin $64^x$ passing through such jaws and through the arc-shaped slot 64′ formed in the arm. The arc-shaped slots $63^x$ and 64′ are so formed that when the arms are swung upon the bolts 57 and 58 they will not impart movement to the rods 30 and $30^x$, the pins $53^2$ and $64^x$ passing freely longitudinally of the slot. The sleeve bearings 29 and $29^x$ are each provided with supplemental bearings 65 and 66 in which is slidably held a vertical rod 67.

As will be noted on referring to Fig. 3 the bearing 66 and vertically movable rod 67 are located on each side of each control lever, the upper ends of the rods 67 being connected together by a cross rod 68 extending through the open portions of the bearing sleeves $29^x$, slots $27^x$ and through slots $6^0$ formed in the portion 5′ and through the longitudinal slots $7^0$ formed in the spring plunger 7. The lower end of each rod 67 is provided with a jaw $67^x$ through which extends a cross pin $67^0$. The lower portion of the cross member 59 is provided with outwardly extending arms $59^2$ terminating in upwardly arc-shaped inwardly directed ends $59^3$ provided with arc-shaped slots through which the cross pin $67^0$ extends. Arms 64 having slots $64^x$ similar to the arms 63 are secured to the bolts 57. The lower portions of the rods 30 and $30^x$ between the bearings 29 and $29^x$ and the enlargement 53′ of the rod $30^x$ and the lower jawed end of the rod 30, are surrounded by a spiral compression spring 68 for a purpose which will hereinafter appear. The handles of the levers 23 and 24 hereinbefore described are provided with longitudinal bores 69 and the body of the lever with a longitudinal slot 70, an intermediate portion being connected by an orifice 71. The upper end of the bore 69 is provided with a closing cap 72 provided with a central orifice 73 in alinement with the orifice 71.

74 indicates a rod extending through orifices 73 and 71 and provided at its lower end with a block 75 having ratchet portions 76 designed to engage the teeth 22 of the arc-shaped guides 20 and 21. The upper end of the rod 74 is provided with a pressure knob $76^x$. 77 indicates a compression spring extending between the closure 72 and the bottom of the bore 69 and surrounding the rod 74.

The supplemental levers 40 and 41 are connected together by cables 80 and 81, the supplemental lever 41 being connected by cables 82 and 83 to the rudder mechanism.

Having described the principal parts involved in my invention I will briefly describe the operation of the same.

I will first describe the operation of breaking the forward stick control lever 4 and foot control lever $38^x$ by the operator of the stick control 5.

When the operator of the stick control 5 desires to break connection he strikes the supplemental lever 23 so as to force it forwardly and carry the dog 76 into engagement with the teeth 22. By this means the arms 27 are raised pulling the rod $30^x$ vertically against the tension of the surrounding spring 68. By this means the bell crank 53 is tilted pulling upon the pull rod 52 which thereby draws the vertical arm of the bell crank 49 rearwardly and the horizontal arm downwardly pulling upon the spring held plunger 43 which is thereby drawn downwardly against the compression of the spring 51, tilting the locking lever 48 so as to carry the depending arm thereof outwardly out of engagement with the notch $41^2$. By this means the foot control lever $38^x$ is thrown out of engagement with the supplemental lever 40 and is free to swing independently of the supplemental lever 40 around its bearing formed by the sleeve 42. By the same operation the arms 63 are carried upward by the cross pin $53^2$ passing through the slot $63^x$ thereby forcing the upper end of the crotch lever 59 rearward and carrying the link rod 60 in the same direction. The link rod 60 being connected at its opposite end to the lever arm 56 throws such lever arm rearward carrying the arms 64 and arms $59^0$ downward thereby pulling the vertical rod 67 carried by the stick control lever 4 downward so that the cross rod 68 engages the lower end of the slot $7^0$ of the plunger 7 thereby drawing it out of engagement with the ball 11 of the stick control 4, allowing the ball to turn freely within the socket and thereby breaking the connection between the upper portion of the stick control 4 with the lower portion rendering the upper portion inoperative.

When the operator of the stick control 5 desires to reëngage the forward controls so that they may be again operative all he has

to do is to press upon the knob $76^x$ forcing the rod 74 downward against the compression of the spring 77 and thereby carrying the ratchet dog 76 out of engagement with the ratchet teeth 22. As soon as this operation has been effected the pressure spring 68 forces the rod $30^x$ downward carrying the lever 23 back to its normal position and at the same time releasing the bell crank 49 allowing the plunger 43 to rise and carry the locking lever 48 back to the position to engage the notch $41^2$ thereby again rendering the foot lever $38^x$ operative. At the same time the arm 63 is forced downward by the spring 68 thereby carrying the arm $59^3$ in a similar direction so as to carry the corresponding cross pin 68 again into the bottom of the slot $7^0$ of the plunger 7 of the mechanism locking the stick control 5. By the same operation the link rod 60 is carried in a direction reverse to arrow, the arm 56 being thrown outward and the arms 64 and $59^0$ upward, the pin $64^x$ passing freely longitudinally of the slot $64^0$ and the slot of the arm $69^0$ engaging the pin extending through the jawed lower end of the vertical rod 67 carried by the stick control lever 4 thereby carrying the corresponding cross pin 68 upward in the slot $7^0$ and thereby releasing the spring plunger 7 allowing it to reëngage with the orifice $11^x$ of the ball 11 of the control lever 4 when the control lever is brought to the vertical position.

I will now describe the operation by which the stick control lever 5 and foot control lever $38^0$ are thrown out of operation by the operator of the stick control 4.

To effect this the operator strikes the supplemental lever 24 so as to force it forwardly carrying the arms 28 upward and pulling upon the link rods $28^2$ connected to the rod 30 so as to pull the arm 64 upward. By this operation the lever arm 56 is thrown outward pulling upon the link rod 60 so as to carry it in the reverse direction to arrow, carrying the forward end of the depending projection 61 against the closed end of the slot $62^0$ forcing the sleeve 62 reversely to direction of arrow and carrying the cam portion $62^x$ into engagement with the rounded projection $47'$ of the locking lever 47. As the cam $62^x$ rides upon the projection the projection is depressed, forcing the spring plunger 44 downward, the opposite end of the locking lever being carried outward out of engagement with the notch $41'$. By this means the foot control lever $38^0$ is disconnected from the supplemental lever 41 and is free to revolve upon its supporting bearings so as to be inoperative. By the same operation the link rod 60 pulls the upper end of the crotch lever 59 forward, depressing the arm $59^3$ which pulls upon the rod 67 carrying the cross rod 68, which cross rod engages with the lower end of the slot $7^0$ of the spring plunger 7 so as to draw it out of engagement with the recess $11^x$ of the ball 11 of the stick control 5, thereby rendering the upper portion of the stick control 5 free to move in any direction without affecting the lower portion of the mechanism.

When it is desired to restore normal conditions all the operator has to do is to press upon the knob $76^x$ of the lever 24 carrying the corresponding ratchet dog 76 out of engagement with the ratchet 22 thereby freeing the mechanism which is forced back to the normal position by the spring $68^x$. As the mechanism is carried to the normal position the link rod 60 is carried in the direction of arrow thereby carrying the depending projecting portion 61 out of engagement with the closed end of the slot $62^0$ thereby freeing the sleeve 62 which is forced rearwardly by the pressure of the spring plunger 44 exerted upwardly against the free end of the lever 47 thereby simultaneously forcing the sleeve 62 back to its normal position and carrying the depending end of the locking lever into position to reëngage with the notch $41'$.

From this description it will be seen that I have devised a very simple device whereby the front or rear operator may throw the stick control or foot control of the other operator out of engagement so as to leave the machine entirely in his hands, accomplishing this result by compact mechanism which does not necessitate the use of any other cable connections than those which are commonly employed in an aeroplane.

What I claim as my invention is.

1. In an aeroplane control mechanism, the combination with a manually controlled lever and a foot controlled lever and rocking shaft on which the manually controlled lever is carried, a rod carried by and extending longitudinally of the rocking shaft, and means operated by the longitudinal movement of the rod for disengaging the control levers from the control mechanism.

2. In an aeroplane control mechanism, the combination with manually controlled levers and a foot controlled lever and a rocking shaft on which the manually controlled levers are mounted, of a supplemental lever carried by one of the manually controlled levers, a rod carried by and extending longitudinally of the rocking shaft, mechanism for imparting longitudinal movement to the rod by the operation of the supplemental lever, and mechanism operated by the longitudinal movement of the rod for disengaging the other manually controlled lever and the foot controlled lever from the control mechanism.

3. In an aeroplane control mechanism, the combination with a manually controlled lever and a foot controlled lever and a rocking shaft on which the manually controlled lever

is mounted, of a supplemental hand lever carried by the manually controlled lever, a supplemental foot lever located beneath the foot controlled lever, releasable locking means for connecting the foot controlled and supplemental foot lever together, and means carried by the rocking shaft and operated by the hand lever for releasing such locking means.

4. In an aeroplane control mechanism, the combination with a manually controlled lever, a foot controlled lever and a rocking shaft on which the manually controlled lever is mounted, of a supplemental hand lever, a supplemental foot lever, means for locking the foot levers together, and a releasing cam carried by the rocking shaft and operated by the supplemental hand lever, and means for simultaneously disengaging the manually operated lever from the control mechanism.

5. In an aeroplane control mechanism, the combination with the manually controlled lever and the foot controlled lever and a rocking shaft on which the manually controlled lever is mounted, of a supplemental hand lever, a supplemental foot lever having a central edge notch, a locking lever carried by the foot lever, resilient means for forcing it into engagement with the notch, a cam member carried by the rocking shaft operated by the hand lever to force the cam into engagement with the locking lever to carry the lever out of the notch, and means for simultaneously disengaging the manually controlled lever.

6. In an aeroplane control mechanism, the combination with the manually controlled lever, the foot controlled lever and the rocking shaft, of a supplemental foot lever located beneath the foot controlled lever having a notch radial to its center of swing, a spring plunger located in the foot controlled lever, a bell crank carried by the foot controlled lever having one end in the aforesaid notch and the other end resting on the plunger, and a cam member carried by the rocking shaft for operating the bell crank, and means for disengaging the manually controlled lever from the control mechanism, and for operating the cam member.

7. In an aeroplane control mechanism, a pair of manually controlled levers one of which is divided into two portions, a ball and socket joint connecting such portions, a locking plunger held in the socket and engaging the ball, a supplemental hand operated lever carried by the other manually controlled lever, a rocking shaft on which the levers are carried, lever arms swung on each end of the rocking shaft, a link rod connecting the arms together, a rod depending from the supplemental hand operated lever and connected to one of the lever arms, and a rod extending from the other lever arm and connected to the lock for operating the same.

8. In an aeroplane control mechanism, a pair of manually controlled levers formed in two portions, a ball and socket connection between the portions, a spring locking plunger engaging each ball, a longitudinally movable rod, suitably mounted arms forming bell crank members having one arm connected to each end of the rod, means for linking the other arms to the spring plungers, and means for imparting longitudinal movement to the rod to alternately withdraw the spring plungers.

9. In an aeroplane control mechanism, a pair of manually controlled levers formed in two portions, a ball and socket connection between the portions, a spring locking plunger engaging each ball, a longitudinally movable rod, suitably mounted arms forming bell crank members having one arm connected to each end of the rod, means for linking the other arms to the spring plungers, means for imparting longitudinal movement to the rod to alternately withdraw the spring plungers, a pair of foot control levers and connections to the rudder, and means for breaking the connection between the foot control lever and rudder connections corresponding to the manually controlled lever having its plunger withdrawn.

10. In an aeroplane dual control, a foot control lever under the control of one operator and mounted centrally upon suitable bearings, a supplemental lever mounted on the same bearing and to which the rudder controls are connected and having a central edge notch, a bell crank locking lever pivotally mounted on the foot control lever and engaging the notch of the supplemental lever, resilient means for holding the locking lever in engagement, and means operated by the other operator for lifting the locking lever clear of the notch.

11. In an aeroplane dual control, a foot control lever operated by one operator and mounted centrally on bearings, a supplemental lever mounted on the same bearings and to which the rudder controls are connected and having a central edge notch, a bell crank lever mounted on the foot control lever and held in resilient engagement with the notch, a manually controlled lever for each operator, control mechanism operated thereby, and means operated by one operator for breaking the connection of the manually controlled lever of the other operator with the control mechanism and withdrawing the locking lever of the foot control out of engagement with the notch.

12. In an aeroplane control mechanism, the combination with a pair of manually controlled levers and a pair of foot controlled levers and a rocking shaft on which the manually controlled levers are carried, a rod carried by and extending longitudinally of the rocking shaft, and means operated by

the longitudinal movement of the rod for alternately disengaging a manually controlled lever and a foot lever simultaneously.

13. In combination a pair of hand operated control levers, one for each operator, a rock shaft on which the said levers are mounted to be operated by said levers, one of said levers being formed in sections with means for locking said sections in alinement, a rod extending parallel with the rock shaft, a connection from said rod extending upwardly along the sectional hand operated control lever for operating the lock when the said rod is moved, a supplemental hand lever connected to said rod for operating it, a pair of foot levers, one for each operator, rudder connections to be operated as a consequence of the operation of the foot levers, a supplemental lever interposed between one of the main foot levers and the rudder connections, locking means for connecting the supplemental foot lever with said main foot lever and means for controlling said lock from the movement of said rod, substantially as described.

14. In combination a pair of hand operated control levers, one for each operator, a rock shaft on which the said levers are mounted to be operated by said levers, one of said levers being formed in sections with means for locking said sections in alinement, a rod extending parallel with the rock shaft, a connection from said rod extending upwardly along the sectional hand operated control lever for operating the lock when the said rod is moved, a supplemental hand lever, connected to said rod for operating it, a pair of foot levers, one for each operator, rudder connections to be operated as a consequence of the operation of the foot levers, a supplemental lever interposed between one of the main foot levers and the rudder connections, locking means for connecting the supplemental foot lever with said main foot lever and means for controlling said lock from the movement of said rod, said rod being movable lengthwise, a bell crank lever between one end of said rod and the said connection which operates the lock of the sectional hand operated control lever and a second bell crank lever between the other end of said rod and the supplemental hand lever connection, substantially as described.

15. In combination a pair of hand operated control levers, one for each operator, a rock shaft on which the said levers are mounted to be operated by said levers, one of said levers being formed in sections with means for locking said sections in alinement, a rod extending parallel with the rock shaft, a connection from said rod extending upwardly along the sectional hand operated control lever for operating the lock when the said rod is moved, a supplemental hand lever connected to said rod for operating it, a pair of foot levers, one for each operator, rudder connections to be operated as a consequence of the operation of the foot levers, a supplemental lever interposed between one of the main foot levers and the rudder connections, locking means for connecting the supplemental foot lever with said main foot lever and means for controlling said lock from the movement of said rod, said rod being movable lengthwise, a bell crank lever between one end of said rod and the said connection which operates the lock of the sectional hand operated control lever and a second bell crank lever between the other end of said rod and the supplemental hand lever connection, said rod with its connections being supported to move laterally about the axis of the rock shaft as the hand operated control levers are moved laterally, substantially as described.

16. In combination in a dual control mechanism for aeroplanes, a rock shaft, a pair of hand operated control levers, one for each operator mounted thereon, to turn said shaft in its bearings when swung laterally, a pair of main foot levers, rudder connections controlled thereby, a supplemental foot lever interposed between one of the main foot levers and the rudder connection, detachable locking means between the supplemental foot lever and its main foot lever, one of said hand operated control levers having a detachable locking means whereby it may be rendered ineffective, a rod extending along the rock shaft and connected at one end with the said last mentioned detachable locking means, means operable by the other operator to move said rod for releasing said lock, and means operated by the movement of the rod for operating the lock of the supplemental foot lever, substantially as described.

17. In combination in a dual control mechanism for aeroplanes, a rock shaft, a pair of hand operated control levers, one for each operator mounted thereon to turn said shaft in its bearings when swung laterally, a pair of main foot levers, rudder connections controlled thereby, a supplemental foot lever interposed between one of the main foot levers and the rudder connection, detachable locking means between the supplemental foot lever and its main foot lever, one of said hand operated control levers having a detachable locking means whereby it may be rendered ineffective, a rod extending along the rock shaft and connected at one end with the said last mentioned detachable locking means, means operable by the other operator to move said rod for releasing said lock, and means operated by the movement of the rod for operat-

ing the lock of the supplemental foot lever, said last mentioned means including a cam mounted to move on the rock shaft, substantially as described.

18. In combination in a dual control mechanism for aeroplanes, a rock shaft, a pair of hand operated control levers, one for each operator mounted thereon, to turn said shaft in its bearings, when swung laterally, a pair of main foot levers, rudder connections controlled thereby, a supplemental foot lever interposed between one of the main foot levers and the rudder connection, detachable locking means between the supplemental foot lever and its main foot lever, one of said hand operated control levers having a detachable locking means, whereby it may be rendered ineffective, a rod extending along the rock shaft and connected at one end with the said last mentioned detachable locking means, means operable by the other operator to move said rod for releasing said lock, and means operated by the movement of the rod for operating the lock of the supplemental foot lever, said last mentioned means including a cam slidable on the rock shaft and turning with the rock shaft while maintaining its effective relation to the detachable locking means of the foot lever, substantially as described.

19. In combination a rock shaft, a pair of hand operated control levers mounted thereon to turn the same, a pair of foot levers, one for each operator, a detachable lock for freeing one of the hand control levers, rudder connections, a detachable lock for freeing one of the foot levers, a rod extending substantially parallel with the rock shaft, bell crank levers carried by the rock shaft at its ends, to which the rod is connected, a connection between one bell crank and the detachable locking means of the hand control lever, a supplemental hand lever mounted on the other hand control lever, a connection from the other bell crank thereto to be operated thereby and means connected with the rod for releasing the detachable connection of the foot lever, substantially as described.

20. In combination a rock shaft, a hand operated control lever at each end of the same, a pair of foot levers, rudder connections extending therefrom, a supplemental foot lever interposed between one of the foot levers and the rudder connections, said supplemental foot lever and its companion main foot lever being mounted to turn about a pivot centrally under the rock shaft, a locking device between the supplemental foot lever and the main foot lever having a contact portion located substantially over the pivot of said levers, a cam member slidably mounted on the rock shaft to engage the contact portion of the locking device in all angular positions of the rock shaft, a supplemental hand lever mounted on one of the hand control levers and a connection between the same and the said cam for operating the latter, substantially as described.

21. In combination with a hand operated control lever made in upper and lower sections with a spring pressed locking plunger for holding the sections in alinement, said plunger having a vertical slot, a pin passing transversely through the slot, a rod on each side of the control lever connected with the cross pin, a bell crank lever having arms connected with the rod and means for positively operating the bell crank lever in one direction to move the pin and withdraw the plunger, said bell crank lever when operated in the other direction moving the cross pin upwardly in the slot of the plunger to allow the spring to force the plunger to locking position when the upper section of the hand control lever assumes normal position in relation to the lower section and a rock shaft carrying all of said parts, substantially as described.

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Witnesses:
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