J. ETCHELLS AND C. H. STEDMAN.

SWITCH FOR CONTROLLING ELECTRIC MOTORS.

APPLICATION FILED APR. 25, 1919.

1,318,737.

Patented Oct. 14, 1919.

2 SHEETS—SHEET 1.

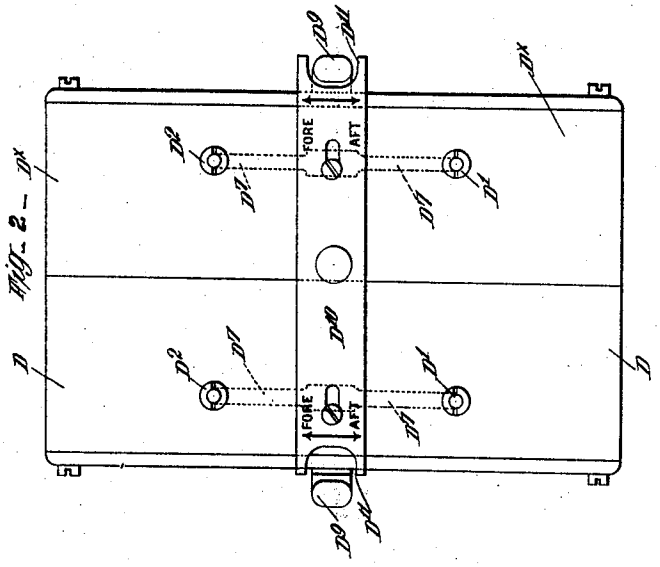


Fig. 2.

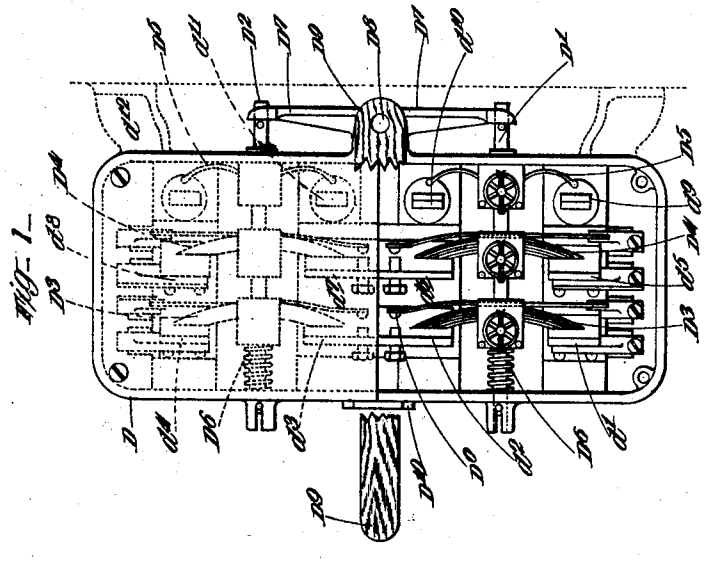


Fig. 1.

James Etchells,
Clifford Henry Stedman,
Inventors.
Pennie, Davis, Marvin & Edmonds,
Attorneys.

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

J. ETCHELLS AND C. H. STEDMAN.

SWITCH FOR CONTROLLING ELECTRIC MOTORS.

APPLICATION FILED APR. 25, 1919.

1,318,737.

Patented Oct. 14, 1919.

2 SHEETS—SHEET 2.

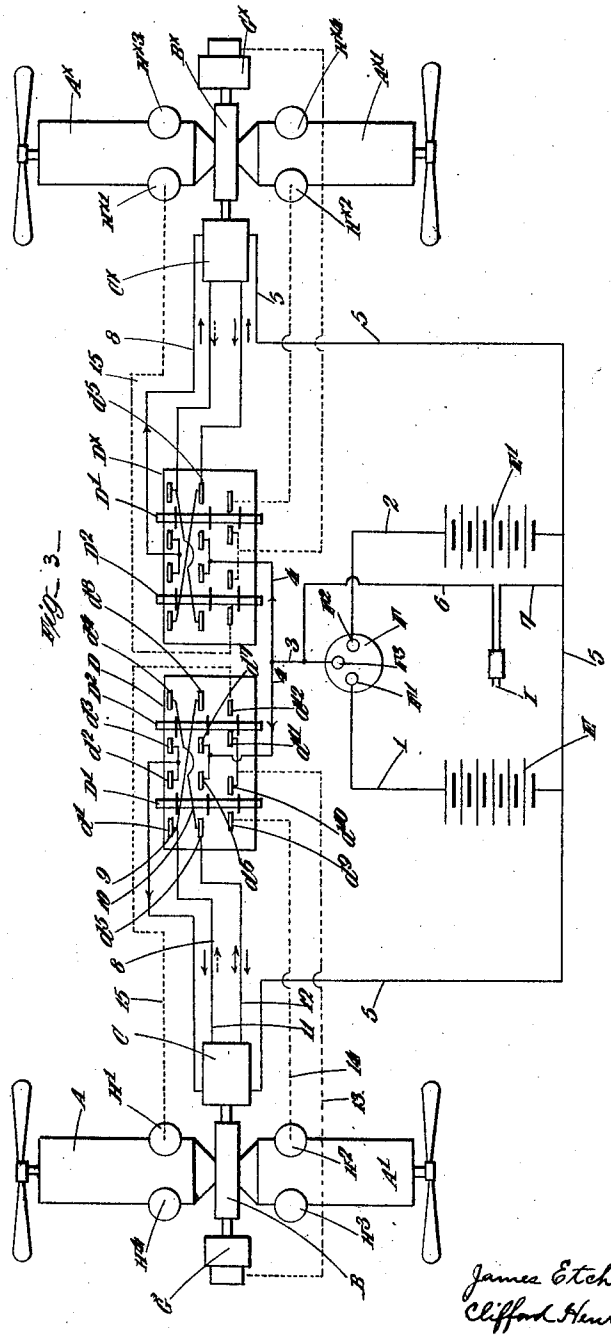


Fig. 3.

James Etchells,
Clifford Henry Stedman,
Inventors.
Pennie, Davis, Marvin & Edmonds,
Attorneys.

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JAMES ETCHELLS AND CLIFFORD HENRY STEDMAN, OF WESTMINSTER, LONDON, ENGLAND, ASSIGNORS TO VICKERS LIMITED, OF WESTMINSTER, LONDON, ENGLAND.

SWITCH FOR CONTROLLING ELECTRIC MOTORS.

1,318,737. Specification of Letters Patent. Patented Oct. 14, 1919.

Application filed April 25, 1919. Serial No. 292,724.

To all whom it may concern:

Be it known that we, JAMES ETCHELLS and CLIFFORD HENRY STEDMAN, both subjects of the King of Great Britain, residing at Vickers House, Broadway, Westminster, in the county of London, England, have invented certain new and useful Improvements in or Relating to Switches for Controlling Electric Motors, of which the following is a specification.

This invention relates to switches for controlling electric motors and has general reference to the type of switch in which an operating handle is moved in one direction to move one switch member, and in the opposite direction to move another switch member.

According to this invention, the switch comprises two endwise movable members or plungers each carrying one or more brushes for engaging with suitably disposed contacts, and a centrally pivoted rocking member, the two ends of which are connected to the said plungers in such a manner that when the said rocking member is rocked in one direction it moves one of the plungers, and when rocked in the opposite direction moves the other plunger. The improved switch is especially intended for starting and reversing an electric motor, the rocking member being operated in one direction for starting the motor and in the opposite direction for reversing the motor.

The invention is particularly suitable for use in connection with the starting of aircraft engines by means of an electric motor operating a clutch which engages with the engine shaft as set forth in the specification of certain concurrent applications.

The said specifications set forth starting means for use on aeroplanes carrying four engines arranged in pairs having coaxial shafts driving tractor and pusher propellers, an electric starting motor being provided for each pair of engines for operating the clutch which engages with either of the coaxial shafts according to the direction of rotation of the starting motor. The improved switch may be employed for starting the motor by operating its handle in one direction and for reversing the motor by operating the said handle in the opposite direction and it may also be designed for controlling auxiliary ignition circuits from a supplementary starting magneto, operated by the electric motor or by hand.

In order that the said invention may be more clearly and readily carried into effect, we will describe the same more fully with reference to the accompanying drawings in which:—

Figure 1 is a part sectional view of one construction of the starting and reversing switch for use with the system of starting aircraft engines as aforesaid.

Fig. 2 is a front view showing two of the switches constructed as a single unit.

Fig. 3 is a diagram showing the electrical connection to the starting switches when employed in the starting system for aircraft engines above referred to.

The starting system illustrated in Fig. 3 is illustrated to show one example of the use of the improved switch, but it will be understood however that the said switch can be used in any other or analogous system. The system illustrated in Fig. 3 is fully described in the specification of our concurrent application and therefore will only be briefly described herein.

A, A′ represent one pair of engines and A^x $A^{x'}$ represent the other pair of engines, the engines A, A^x driving tractor air screws or propellers and the engines A′ $A^{x'}$ driving pusher air screws or propellers. B and B^x represent the clutch mechanisms interposed between the pair of engines A, A′ and the pair of engines A^x, $A^{x'}$ respectively; C, C^x represent the electric starting motors for the pair of engines A A′ and the pair of engines A^x, $A^{x'}$ respectively. D and D^x represent the starting switches for the motors C and C^x respectively. E, E′ represent two batteries carried on the aeroplane and F represents the battery selecting switch. G, G^x represent supplementary or starting magnetos for the pair of engines A, A′ and the pair of engines A^x, $A^{x'}$ respectively and H′, H^2, H^3, H^4, represent the main distributers for the pair of engines A, A′ and $H^{x'}$, H^{x2}, H^{x3}, H^{x4}, represent the main distributers for the pair of engines A^x, $A^{x'}$.

In Fig. 1, D represents one of the switches and in Figs. 2 and 3 D, D^x represent the two

switches which in practice are constructed as a single unit. Each switch may comprise twelve contacts numbered d' to d^{12} and arranged in three lines or rows of four, see Figs. 1 and 3, each row being fixed on suitable supports as shown in Fig. 1; the two middle contacts of each row are connected together, or constructed in one piece, and the other contact d' in the top row is connected by a conductor 9 to the outer contact d^8 in the second row while the outer contact d^4 in the top row is connected by a conductor 10 to the outer contact d^5 in the second row. Between the outer pairs of contacts on the right and left hand sides, slidable plungers D′, D^2 are disposed each plunger carrying three brushes D^3, D^4, D^5 for engaging with the three respective pairs of contacts (see Figs. 1 and 3). The two brushes D^3 D^4 are of laminated structure and supplementary contacts D^9 are provided to prevent sparkling at the laminated brushes. The plungers D′, D^2 are each normally maintained by a spring D^6 in a position in which the brushes do not engage with the contacts (see Fig. 1). A rocking lever D^7 is centrally pivoted between the two rods D′ D^2 by being keyed on a rocking spindle D^8 and its ends engage with the said plungers D′, D^2 in such a manner that by rocking the spindle D^8 and the lever D^7 in one direction by a suitable operating handle or arm D^9 one of the plungers say D′ can be slidably moved against its spring D^6 to press the brushes D^3 D^4 D^5 thereon into engagement with their respective contacts and on moving the handle D^9 and rocking the lever D^7 in the opposite direction the plunger D′ is returned to its normal position by its spring to break the contact while the other rod D^2 is moved against its spring by the lever D^7 so that its brushes D^3 D^4 D^5 make contact with their respective contact pieces. On releasing the operating handle D^9 connected to the lever D^7 the spring D^6 of the second plunger D^2 returns the latter in its original position in which the contacts are broken, and the springs D^6 maintain the two plungers in the "off" or inoperative position.

In the diagram shown in Fig. 3 the middle pair of contacts d^6, d^7 in the second row can be connected to one terminal (preferably the positive) of an accumulator, battery or other suitable source of electric supply E, E′ through a battery selecting switch F and conductors 1, 2, 3, 4 or to an exterior or ground battery through the plug I and conductor as explained in the specification of one of said concurrent applications. The other terminals of the batteries E, E′ are connected by conductors 5 to one end of the field winding of the starting motor C, the other end of which winding is connected by conductors to the two center contacts d^2, d^3 in the top row. The two outer contacts d' d^5 in the top and second rows are connected by conductors 11, 12 to the brushes of the motor and the contacts d' d^3 d^4 d^5 are connected by cross conductors 9 and 10 as above explained.

Thus on bringing the brushes of the plunger D′ into engagement with their respective contacts, the circuits will be closed so that the current passes through the armature coils of the motor in one direction, as shown by the arrows in full lines and by bringing the other brushes on the other plunger D^2 into engagement with their respective contacts the current will pass through the armature in the opposite direction as shown by the arrows in dotted lines, the current through the field winding of the motor being the same in either case. Hence by moving the operating handle D^9 of the switch in one direction the motor is caused to rotate in one direction to start one engine, and by moving the lever D^9 in the other direction the motor is caused to rotate in the opposite direction and so start the other engine.

The two center contacts d^{10} d^{11} in the bottom row are connected to the high tension circuit of the starting magneto G, and the two outer contacts d^9 d^{12} in that row are each connected to the distributer of the main magneto on each engine A, A′ in such a manner that when either engine is started by means of the starting motor, the starting magneto is connected up to one of the main distributers on that engine, the speed of rotation of the engine being naturally too low to admit of the correct functioning of the main magneto. By this means, in the case where the starting magneto is driven from the motor, either engine may be started at will by a mere movement of the switch lever. The other switch D^x is of similar construction to the switch D and it is similarly connected to the source of supply and to the motors and magnetos as shown in Fig. 3.

Any number of pairs of engines may be started by providing a starting motor and switch as described above, and the said switches may be grouped together to constitute a unit as shown in Fig. 2 wherein the two switches D D^x are combined together; a slidable interlocking bar D^{10} having slotted ends D^{11} may be provided for coöperating or engaging with either of the handles D^9 to lock one or other of them and leave the other free and thus prevent the source of power being overloaded by starting more than one engine at a time.

When two switch units are combined and interlocked for the purpose of starting any one of four engines at will the engines are grouped in pairs with a starting motor and starting switch for each pair, and a starting

magneto may be driven from each motor or one hand driven starting magneto may be used for the four engines.

What we claim and desire to secure by Letters Patent of the United States is:—

1. A switch comprising a plurality of plunger rods, each of said plunger rods provided with contact brushes adapted to engage with suitably disposed contacts, springs for normally retaining the brushes out of engagement with said contacts, a pivoted rocking lever normally in contact with the ends of said plunger rods and a handle rigidly fixed to said lever whereby said lever may be rocked in either direction to actuate some of said plunger rods without actuating other of said plunger rods, said lever when the handle is released adapted to be returned to its normal position by the said springs.

2. A switch comprising a casing, two sets of contacts each comprising two rows of contacts, mounted on a plate within said casing, a plunger rod disposed between each two rows of contacts constituting a set of contacts, said rod provided with contact brushes adapted to engage with said contacts, springs adapted to normally retain said brushes out of engagement with said contacts, and a rocking lever pivoted outside of said casing having its extremities normally in contact with the heads of the plunger rods which extend through the casing, and a handle rigidly fixed to said lever whereby said lever may be rocked to actuate either plunger rod, said lever when the handle is released adapted to be returned to its normal position by the said springs.

In testimony whereof we affix our signatures.

JAMES ETCHELLS.
CLIFFORD HENRY STEDMAN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."