

J. B. HELLER.
ELECTRIC SWITCH.

(Application filed Sept. 23, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1

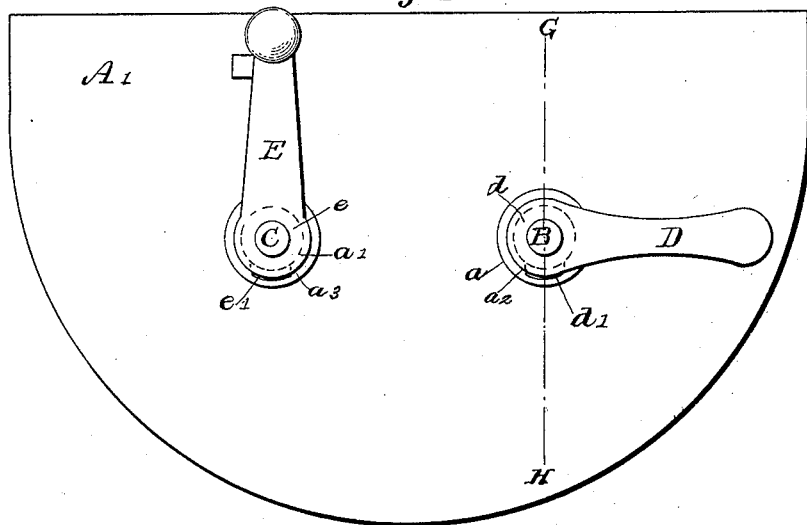
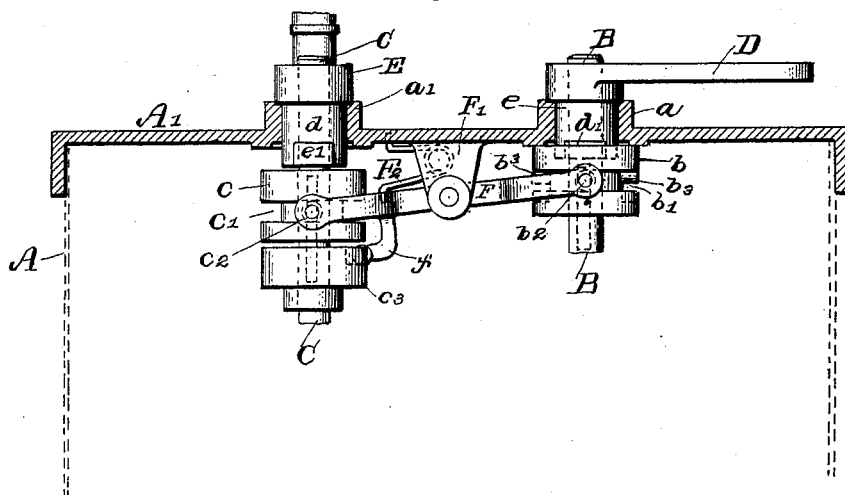


Fig. 2.



Witnesses.

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2 Sheets—Sheet 2.

Fig. 3.

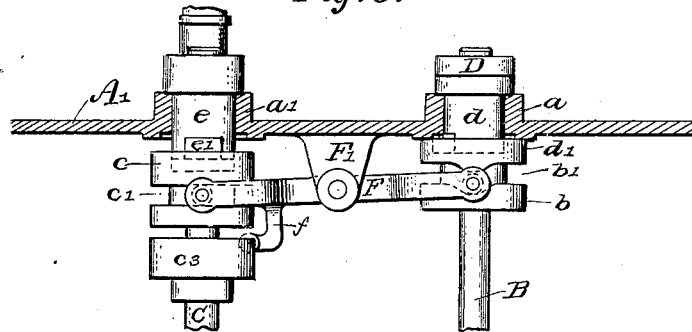


Fig. 4.

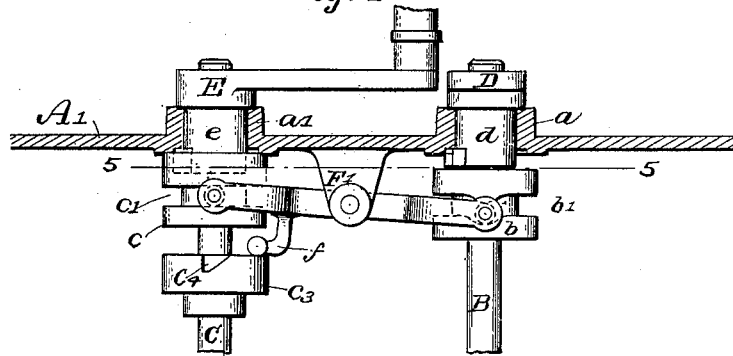
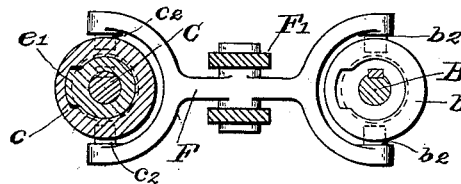


Fig. 5.



Witnesses.

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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 650,010, dated May 22, 1900.

Application filed September 23, 1899. Serial No. 731,476. (No model.)

To all whom it may concern:

Be it known that I, JESSE B. HELLER, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Electric Switches, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to means for controlling the operation of interrelated electric switches, and is designed to provide devices of simple and efficient character whereby it is made an absolute prerequisite to the operation of each one of two interrelated switches that the other switch shall be in a certain predetermined position.

The invention is applicable to interrelated rotary switches of various types and for various purposes, and is especially valuable in connection with the switches which are employed for the control of a plurality of electric motors, commonly known as "controllers," and which employ one or more rotary drums having a plurality of contacts for effecting certain predetermined changes in the motor-circuit and in conjunction therewith a separate drum used as a reversing and cut-out switch. These drums are operated by means of independent lever-handles fitted to the extended end portions of the drum-shafts, and in the absence of some preventive means either drum may be operated by the motor-man without regard to the position of the other and the condition of the motor-circuit following therefrom, and such operation may result in serious injury to or destruction of the motors. Similar conditions exist in other types of interrelated switches, and in all such cases it is desirable to provide means for preventing indiscriminate operation of the two switches.

My invention consists, broadly, in the combination, with a pair of rotary switches, of independent operating handles or levers therefor and means whereby operative connection of said levers with the switches depends upon the positions of the switches themselves, so that any attempt to operate either switch at a time when the circuit conditions are such as to render its operation injurious will sim-

ply result in a loose or free movement of the lever about the switch-shaft, which in no way affects the switch or the circuit.

My invention also consists in the novel construction, arrangement, and combination of parts, all as hereinafter described, and pointed out in the appended claims.

Referring to the accompanying drawings, Figure 1 is a plan view of a controller with the handle-levers in "off" positions; Fig. 2, a vertical section through the top of the controller-casing and showing the parts embodying my invention, the position of the handle-levers being the same as in Fig. 1. Figs. 3 and 4 are similar views with the levers in different positions, and Fig. 5 is a section on the line 5 5 of Fig. 4.

A is the controller-casing; A', the top or cover, having bosses *a a'*, formed with circular orifices for the respective shafts B and C of the reversing and controlling drums. (Not shown.)

D is the handle-lever for the reversing-drum, and E the handle for the controlling-drum. Each of these levers has a sleeve portion *d* or *e*, which fits loosely over the upper portion of the shaft B or C and extends through the orifice in the top A' a short distance within the casing. Each of said sleeve portions has a laterally-projecting clutch-lug *d'* or *e'*, which in assembling the parts drops through a cut-away portion *a²* or *a³* in the boss *a* or *a'*. Mounted on the shaft B within the controller-casing is a female clutch member *b*, which has a key-and-groove or other equivalent connection with the said shaft, whereby it is caused to rotate therewith, but may slide vertically thereon. Mounted in a similar manner on the shaft C is a similar clutch member *c*. In the member *b* is an annular groove *b'*, and in the member *c* is a similar groove *c'*.

F is a lever which is fulcrumed within the upper portion of the case A intermediate the clutch members *b* and *c* upon a switch-bracket F, which depends from the top A'. The end portions of this lever (see Fig. 5) are forked to loosely embrace the respective clutch members *b* and *c*, and the arms of the forks are provided with studs or pins *b²* and *c²*, which respectively engage the grooves *b'* *c'*. The upper wall of the groove *b'* is formed

with cam surfaces or projections b^3 , and rigidly secured to the shaft C, below its clutch member c , is a cam c^3 , having the depression c^4 . Projecting from the lever F is an arm f ,
 5 whose lower end engages the cam c^3 .

F², Fig. 2, is a spring which is interposed between the lever F and the controller-top A'. This spring may, however, be omitted, as in Figs. 3 and 4.

10 It will be seen from Fig. 2 that when the levers are in the off position shown in Figs. 1 and 2 the clutch member c is disengaged from the clutch-lug c' on the handle-lever E, while the clutch member b is in engagement
 15 with the clutch-lug d' of the lever D. There is therefore no operative connection between the handle E and the shaft C, and the handle, if moved, will turn freely on the said shaft without moving the switch. The handle
 20 D, however, is mechanically connected to the shaft B, and the reversing-switch can be moved to the desired position to run the motors either forward or back. When said lever D has been moved to the position
 25 shown in Fig. 3, (corresponding to the point H in Fig. 1,) the engagement of one of the cams b^3 rocks the lever F on its fulcrum and slides the clutch member c upward on the shaft P into engagement with the clutch-lug
 30 e' . The shaft C and its drum can now be moved to any desired position; but as soon as said shaft C has been rotated a sufficient distance to cause the arm f to ride out of the depression c^4 of the cam c^3 the lever F is
 35 rocked in the opposite direction, thereby disengaging the clutch member b from the clutch-lug d' . (See Figs. 4 and 5.) Therefore the reversing-switch cannot be operated until the lever E has been returned to off
 40 position and the cam notch or depression c^4 is in position to receive the end of the arm f under the action of the spring F² or of gravity if no spring be employed. If gravity alone is relied upon to return the lever F to its first
 45 position, the clutch member c should have sufficient weight to overcome the gravity of the clutch member b , or the two arms of the lever F should be of unequal length. I prefer to employ a spring, as it makes the action
 50 more positive.

From the foregoing it will be clear that the controlling-drum cannot be operated when the reversing and cut-out drum is in off position and that the reversing and cut-out
 55 drum cannot be operated unless the controlling-drum is in off position, so that I provide a perfect safeguard against improper operation of either switch. As this is effected solely by want of operative connections between the handle-levers and the drum-shafts, except in certain predetermined positions
 60 of the drums, I avoid the possibility of injury to the mechanism by any attempt, made through ignorance or otherwise, to force the movement of either drum, such as might occur were the drums in any way locked, as
 65 has been customary hitherto, to prevent their

improper operation. Furthermore, the drums are freely rotatable at all times, so that in repairing the drums it is unnecessary to manipulate them in a predetermined order. 70

It is obvious that various forms of clutches may be employed for the purpose of connecting the lever-handles to their respective shafts and that the particular embodiment of my invention which I have herein shown and described may be varied in other particulars without departing from the spirit and scope of such invention. I therefore do not wish to limit myself to the particular construction
 75 and arrangement shown and described. 80

Having thus described my invention, what I claim, and desire to protect by Letters Patent, is—

1. The combination with two rotary inter-related electrical switches, of independent levers therefor and means whereby operative connection of each of said levers with its respective switch is dependent upon the positions of the switches themselves. 85 90

2. The combination with two switch-shafts, of levers for operating the same and means whereby each of said levers is operatively connected to and disconnected from its respective shaft by predetermined movements
 95 of the said levers.

3. The combination with two switch-shafts and independent operating handles or levers therefor, of connected clutch devices controlled by the movements of said levers whereby the latter are operatively connected to and disconnected from the said shafts. 100

4. The combination of two switch-shafts, an operating handle or lever loosely sleeved on each shaft, clutch devices for effecting an operative engagement between each lever and its shaft, and means whereby the action of the clutch devices is controlled by the movements of the said handles or levers. 105

5. The combination of two switch-shafts, independent handles or levers loosely sleeved on said shaft, a clutch device for connecting each of said handles or levers to its respective shaft, and a connection between the two clutch devices whereby each is operated
 110 by certain predetermined movements of the other shaft. 115

6. The combination of two switch-shafts, independent handles or levers for operating the same, clutches for connecting the said handles or levers to their respective shafts, and a connection between said clutches whereby a predetermined movement of one shaft effects the clutch engagement between the other shaft and its lever. 120 125

7. The combination of two switch-shafts, independent operating handles or levers therefor, clutches for connecting said handles or levers to their respective shafts, and clutch-shifting devices operated by the movements of said shaft and controlling the clutch connections between the same and their handles or levers. 130

8. In a controller for electric motors, the

combination with the shafts which carry the controlling and the reversing and cut-out drums, and handles for operating said shafts and drums, of means whereby the handle of the controlling-drum is operatively disconnected from its shaft when the reversing-drum is in off position, and is operatively connected thereto when the reversing-drum is moved to an on position.

9. In a controller for electric motors, the combination with the shafts which carry the controlling and the reversing and cut-out drums, and the operating-handles therefor, of means whereby the handle of the controlling-drum is operatively disconnected from its shaft when the reversing-drum is moved to off position, and whereby the handle of the reversing-drum is operatively disconnected from its shaft when the controlling-drum is in on position.

10. The combination with two switch-shafts and their operating handles or levers, of clutches for connecting the handles or levers to their respective shafts, and clutch-shifting devices operated by the movement of said shafts to disconnect one of said handles from its shaft upon a predetermined movement of the other shaft and to effect a reconnection of the same by a return movement.

11. The combination with two switch-shafts, the handles therefor, and clutches for connecting the handles to their respective shafts, of a clutch-shifting lever engaging a member of both clutches and cam devices on the shafts for moving the said lever.

12. The combination with two switch-shafts, the handles therefor and clutches for connecting the handles to their respective shafts, of an intermediately-pivoted clutch-shifting lever engaging by its opposite arms one member of each of said clutches, and cams on the shafts for actuating said lever.

13. The combination with two switch-shafts, the handles therefor, and the clutches for connecting the handles to the respective shafts,

of a clutch-shifting lever engaging one member of both clutches, cams on one of said clutches adapted to engage one arm of said lever and a cam on the opposite shaft engaging another arm of said lever.

14. The combination with two adjacent switch-shafts, of handles loosely sleeved on the respective shafts and forming each the fixed member of a clutch, a movable cooperating clutch member rotatively mounted on each shaft, a clutch-shifting lever engaging by opposite arms the said movable members, cams on one of said clutches for engagement with one arm of the said lever, a cam on the opposite shaft engaging an opposite arm of said lever and a spring acting upon said lever in opposition to the said cams.

15. The combination with two adjacent switch-shafts and a grooved clutch member movably but rotatively mounted on each shaft and provided with means for engagement with the adjacent clutch member, a clutch-shifting lever having forked end portions which engage the grooved clutch members, a cam fixed to one of the said shafts and engaging an arm of said lever, and cams on the clutch member of the opposite shaft for engagement with an opposite arm of said lever.

16. The combination with the shaft B having the grooved clutch and cam member *b* and the shaft C having the grooved clutch member *c* and cam *c*³, of the handles D and E loosely sleeved upon the respective shafts B and C and having lugs for engagement with the clutch member and the intermediately-pivoted lever F having forked end portions embracing and engaging the said clutch members, and also having the arm *f* which engages the said cam *c*³.

In testimony whereof I have affixed my signature in presence of two witnesses.

JESSE B. HELLER.

Witnesses:

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M. F. ELLIS.