

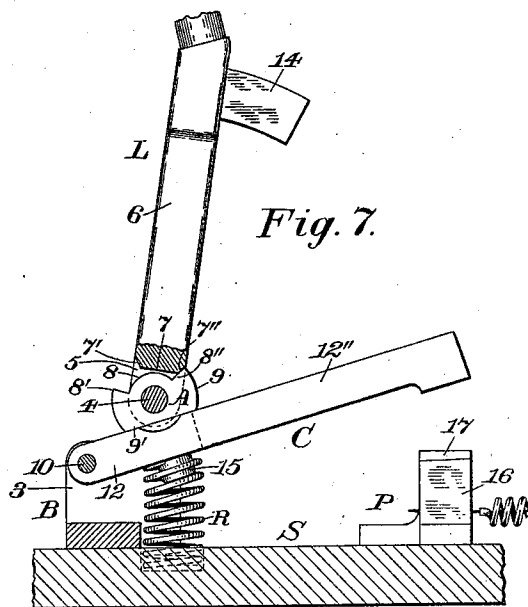
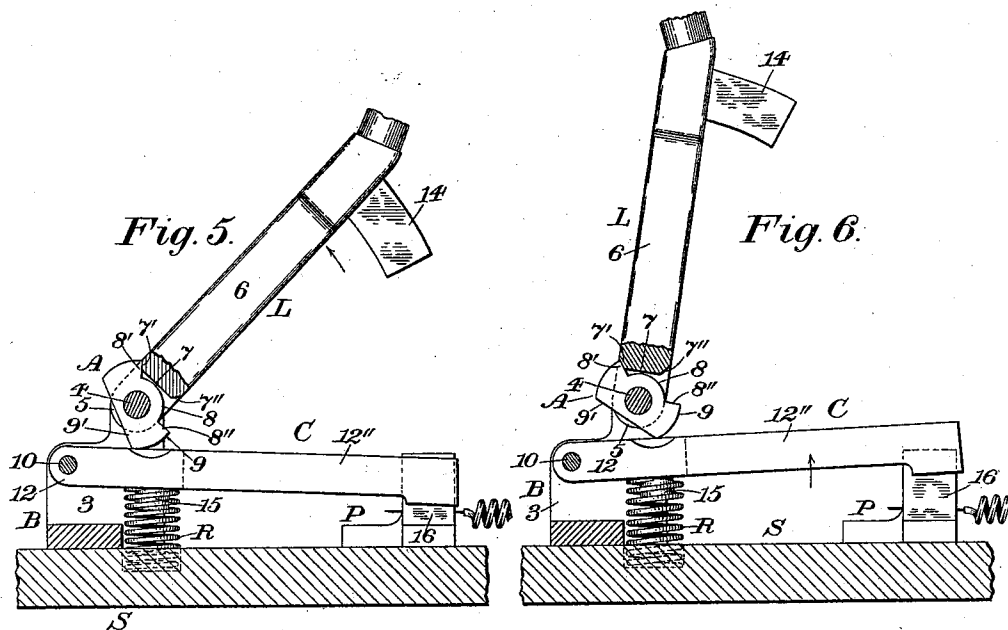
(No Model.)

2 Sheets—Sheet 2.

J. E. CRIGGAL.
ELECTRIC SWITCH.

No. 551,203.

Patented Dec. 10, 1895.



Witnesses:

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UNITED STATES PATENT OFFICE.

JOHN E. CRIGGAL, OF SPRINGFIELD, MASSACHUSETTS.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 551,203, dated December 10, 1895.

Application filed January 15, 1895. Serial No. 534,946. (No model.)

To all whom it may concern:

Be it known that I, JOHN E. CRIGGAL, a subject of the Queen of the Kingdom of Great Britain, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

This invention relates to electric switches, and especially to switches of that class adapted for controlling circuits conveying high-tension currents, and in which class of switches the making and breaking of the circuit are effected by means of a pivoted actuating-lever, the object being to furnish a device of this class especially adapted for rapidly springing the arc on the separation of the contact-faces of the switch.

In the drawings accompanying and forming a part of this specification, Figure 1 is a plan view of an electric switch and actuating mechanism therefor embodying my present invention and showing the switch closed. Fig. 2 is a side elevation of the apparatus shown in Fig. 1. Fig. 3 is an end elevation of the same as seen from the right hand in Figs. 1 and 2, the actuating-handle being broken away and showing the switch closed. Fig. 4 is a similar view showing the switch opened to the point where the breaking of the contact occurs, the switch-arms having passed upward beyond the principal contacting faces of the pole-pieces and only engaging said pole-pieces at the edges of the switch-arms. Fig. 5 is a sectional side elevation taken in line *xx*, Fig. 1, and showing the actuating-lever raised to the point where the switch-actuating cam begins to move to release the switch-arms. Fig. 6 is a similar view showing the switch-actuating lever and the actuating-cam drawn back to the point where the switch will begin to open and the switch-arms begin to disengage from the co-operating faces of the pole-pieces; and Fig. 7 is a similar view showing the switch-actuating lever in the same position as in Fig. 6 and the circuit broken by the release of the switch-arms from engagement with the pole-pieces.

Similar characters designate like parts in all the figures.

My invention comprises in part and in com-

bination with a suitable supporting-base a circuit-controller movable with the actuating member and pivotally mounted on said base and having a reactive connection therewith, and preferably in the form of a pair of spring-held switch-arms, and an actuating member which is adapted for closing the circuit-controller and for normally holding said circuit-controller against free reactive movement, and is also adapted to release such circuit-controller at a predetermined point in the backward or switch-opening movement of the actuating member, so that when the actuating member is operated to break the circuit the circuit-controller has a sudden and multiplied releasing or circuit-breaking movement in the direction and independently of the backward movement of the actuating member.

My invention also comprises, in combination with an actuating member and with a pair of circuit terminals or pole-pieces a circuit-controller governed by said member and in position and adapted to have a clamping engagement with one of said circuit-terminals or pole-pieces, and means connected with the actuating member and in operative relation with the other circuit-terminal for engaging the circuit-controller and forcing the same into locked engagement with its pole-piece, to thereby augment the clamping effect of said circuit-controller upon this terminal or pole-piece.

The reactive circuit-controller is shown herein in the form of a pair of connected switch-arms, which, when the circuit is closed, are normally spring-held and tend to react by the expansive force of a compression-spring connected therewith when released by the actuating member. This actuating member may be of any suitable construction, capable of permitting a partial releasing movement of the circuit-controller, and a subsequent release of said circuit-controller, which subsequent release will permit a determined, free, reactive movement of the same. I have shown such an actuating member herein as comprising an actuating arm or lever, and an actuator proper movable therewith and relatively thereto, and which actuator, at a predetermined point, will release the circuit-con-

troller and permit a free reactive movement thereof irrespective of the continued movement of such actuating-lever.

In the preferred embodiment thereof herein shown and described the operative parts of my improved switch are shown mounted in any suitable or usual manner upon an insulating body or medium, such as the base or switchboard S. A bracket, designated in a general way by B, is shown herein as mounted upon said switchboard and as adapted for carrying the operative parts of the switch member and its actuated devices. This bracket may be secured to the base-board in any suitable manner, as by screws, and is preferably formed with a flanged base, the flanges 2 of which are adapted to form means for holding said bracket upon the switchboard or base, and said bracket is also provided with a pair of uprights or arms, which are shown at 3 3 as disposed in parallelism with each other, and as having correspondingly parallel inner bearing-faces substantially perpendicular to the plane of said switchboard. The switch-lever proper, which is designated herein in a general way by L, is shown as pivotally mounted upon and within the arms of said bracket, a pivot-pin 4 being shown as passed through the upper portions of said arms, at the sides thereof, adjacent to the handle of the lever, so as to form a pivot for said switch-lever in transverse direction. This lever is also shown as bifurcated at its rear end to form two longitudinally-ranging arms 5 5, which arms are bored transversely to form two journals in alignment with each other, and adapted to engage the pivot-pin 4, carried by the bracket B. The end wall of the bifurcation in the switch-lever is substantially perpendicular to the longitudinal axis of the conducting-arm 6 of the switch-lever throughout the major portion of its length, as shown at 7, but at the extreme ends thereof is provided with beveled or sloping walls 7' and 7'', which are adapted to engage a switch-arm actuator, as will be hereinafter more fully described. It is not, however, essential that the end wall of this bifurcation should be formed in the manner described, or that it should serve as the means for controlling such switch-arm actuator, as any means operative with the lever may be employed, which will control the movements of said actuator.

The switch-arm actuator, which is designated in a general way by A, is shown herein as a cam device pivotally supported upon the pin 4 and between the shoulders 5 5 of the switch-lever, so as to be capable of oscillatory movement upon said pin, and also so as to be in position for engagement by the operating members or shoulders 7' and 7'' of said lever. At the side thereof which is adjacent to and adapted to co-operate with these operating members of the lever the actuator is formed with a curved bearing-surface 8, which is shown herein as described by an arc of a

circle struck from the axis of the pivot-pin 4 as a center, and this bearing-surface is also shown as intersected by the stop-walls of abutments 8' and 8'', lying in the path of movement of the actuating members or shoulders 7' and 7'' of the switch-lever. These stop-walls are preferably formed with their faces in planes which intersect each other at the axial center of the pivot-pin 4 when said actuator is in position upon said pin. This actuating-cam A is also shown as formed with a cam-face at 9, which cam-face is adapted to engage the switch arm or arms through which the circuit to the electrical terminals of the circuit is made and broken, and as will be hereinafter more particularly described. This cam-face 9 is also preferably described by an arc of a circle struck from the axis of the pivot-pin 4 as a center, the radius of the arc being, however, greater than that forming the arc describing the cam-face 8.

The arms 3 3 of the bracket B are also provided, preferably in the rear of the pivot-pin 4, relatively to the switch-lever and below said pivot-pin, with a second pair of transverse openings, in alignment with each other, for receiving a second pivot-pin 10. Upon this pivot-pin the circuit-controller of the switch is adapted to be supported for pivotal movement into and out of contact with the corresponding pole-piece or pole-pieces. This circuit-controller, which is designated in a general way by C, is preferably formed as a transversely-bored block or main member 12, substantially filling the space between the inner faces of the arms 3 3 of the bracket, and as having diverging arms extending forward of said pivot, substantially in the longitudinal plane of the switch-lever. This circuit-controller is preferably of copper, and may be formed in a single piece, as shown, or the diverging switch-arms, which are designated herein by 12' and 12'', may be formed separately from the block 12 and rigidly secured thereto. This organization, however, is not essential, as any electrically-connected means, pivotally mounted upon the pin 10 and movable substantially in the plane of movement of the switch-lever, may be employed. The switch-arms 12' and 12'' are also preferably provided upon their inner faces and at the forward ends thereof, where they are adapted to engage the pole pieces P and P' of the switch, with rounded portions or buttons 13 and 13', the rounded bearing-faces of which are in position for engagement by a locking member or wedge 14, carried by the switch-lever. These buttons are preferably of steel, in order to prevent unnecessary wear, and thereby preserve perfect bearing-faces for co-operating with said wedge.

At the under side thereof the circuit-closer C is shown provided with a depending lug 15, inclosed by the coils of a strong spiral spring, designated herein by R, and which spring is fixedly secured at its opposite end, relatively to said lug, against longitudinal movement.

This spring is preferably held in place by the abutment of its lowermost coil against the rear wall of a circular recess in the base-board S, as shown in dotted lines in Figs. 2, 5, 6, and 7. Said spring R, when the switch-arms 12' and 12'' are in locked engagement with the pole-pieces P and P', is held under strong compression, so that when released it will react and force the switch-arms rapidly upward and out of engagement with the pole-pieces with a swinging releasing movement. The pole-pieces or circuit-terminals P and P' are provided with switch-arm-engaging contact-faces, which are substantially perpendicular throughout the major portions of their lengths, the distance between said contact-faces being considerably less than that between the outer faces of the free ends of the switch-arms 12' and 12''. At the upper or releasing ends of the contact-faces of the pole-pieces the main contact-faces 16 and 16' of said pole-pieces are beveled off to form diverging faces 17 and 17', adjacent to the points of release of the switch-arms, the upper edges of said beveled contact-faces being preferably at a slightly-greater distance apart than the distance between the outer free ends of the switch-arms 12 and 12' when said switch-arms are clear of the pole-pieces.

It will be apparent from the foregoing that when the switch is to be closed the bearing-face 7'' of the actuator-operating means or portion of the switch-lever L will engage the shoulder or stop-face 8'' of the actuator, when the parts are in the position shown in Fig. 7, and will revolve the actuator upon its supporting-pin 4, upon the continuation of the closing movement of the lever, and will thereby cause the cam-faces 9' and 9 to successively engage the upper face of the circuit-closer of the switch to force said circuit-closer and the switch-arms carried thereby toward the pole-pieces P and P', and thereby carry the bearing-faces of the switch into engagement with the bearing-faces 17 and 17' of the pole-pieces. When the switch is thus brought into contact with said pole-pieces, the actuator continues to revolve on the continued movement of the lever, and the circuit-controller-engaging contact-arm or wedge 14 of the switch-lever passes between the switch-arms 12' and 12'' and engages the abutments or rounded bearing-faces 13 and 13' to force said switch-arms outward against the pole-pieces.

It will be understood, of course, that the diverging switch-arms, after engaging the beveled contact-faces 17 and 17', are forced toward each other upon the continuation of their closing movement, said arms being sufficiently resilient to permit of this relative lateral movement thereof, and hence a multiplied locking effect between said switch-arms and the pole-pieces is obtained, a portion of this locking action being due to the outwardly-expansive tendency of the switch-

arms, while the main locking action is produced by the wedging of the switch-arm-engaging member 14 against the inner bearing-faces of said switch-arms, and the consequent wedging of the outer contact-faces of said switch-arms against the main contact-faces of the pole-pieces. It will be observed also that the actuator A will carry the circuit-closing means or switch-arms of said switch to the extreme limit of the pivotal closing movement of the circuit-closer before the beginning of the action of the wedge 14 upon said switch-arms, and hence the only action exerted upon such switch-arms will be in a direction transversely thereof and outwardly against the contact-faces of the pole-pieces.

To break the circuit, the handle 6' is actuated to withdraw the wedge 14 from engagement with the switch-arms, the movement being continued until the parts are in the position shown in Fig. 6. The first result of this movement of the switch-lever is, as stated, to withdraw the wedge from engagement with the switch-arms until the lever engages the stop-face or retracting abutment 8' of the actuator when the parts will be in the position shown in Fig. 5. Up to this point the switch-arms have not been moved, owing to the fact that they are held in place by the positive stop between the pin 4, which stop is formed by the interposed portion of the actuator, and said switch-arms are also held against disengagement from the co-operating faces of the pole-pieces by the lateral contact of the outwardly-expansive switch-arms with said pole-pieces. Upon the continued movement of the switch-lever the actuator is engaged thereby and retracted to the position shown in Fig. 6, at which point said actuator is about to let go of the switch-lever and the switch-arms are about to be disengaged from the beveled contact-faces 17 and 17' of the pole-pieces. On retracting the actuator, by the switch-lever, beyond the position shown in Fig. 6 the force of the relatively powerful spring R causes the switch-arms or circuit-breaking means to be suddenly thrown outward and the switch-arms to be quickly disengaged from the beveled walls of the pole-pieces, and an arc thereby rapidly formed and sprung. By this rapid movement of the circuit-closing means the actuating-cam A is also operated, and said cam is oscillated upon its pivot-pin 4 to the position shown in Fig. 7, and this without any further movement necessarily of the actuating-lever itself.

While I have described my improved switch as having a pair of spring-actuated switch-arms adapted to be thrown into and out of engagement with the pole-pieces, it is evident that the same result might be obtained by a single movable switch-arm, and that the other arm might be rigidly connected with one pole-piece and in contact with the movable switch-arm or with the oscillatory member 12, to which such movable arm is secured.

In Fig. 1 I have shown in dotted lines a fixed connection between the pole-piece P' and the bracket B.

Having thus described my invention, I claim—

1. In an electric switch, the combination with a supporting-base; of a circuit-controller movable with the actuating-member, and pivotally mounted on said base; a spring between said circuit-controller and the base, and normally held under compression by the circuit-controller; and an actuating-member pivoted on said base for closing the circuit-controller, and normally holding said circuit-controller against free, reactive movement, and adapted to release the same, at a predetermined point in the backward movement of the actuating-member, whereby said circuit-controller has a sudden and multiplied releasing movement, in the direction and independent of such movement of the actuating-member, substantially as described.

2. In an electric switch, the combination with a supporting-base; of a circuit-controller movable with the actuating-cam, and pivotally mounted on said base, and having a reactive connection with the base; an actuating-cam operative with the actuating-lever, and adapted for closing the circuit-controller, and normally holding said circuit-controller against free, reactive movement, and also in position and adapted to release the same, at a predetermined point in the releasing movement of the actuating-cam; and a vertically-swinging actuating-lever controlling said actuating-cam, and adapted for normally holding the same in its closed position, and also adapted to release said actuating-cam at a predetermined point in the backward movement of the actuating-lever, whereby said circuit-controller and actuating-cam have a sudden and multiplied releasing movement in the direction and independently of such movement of the actuating-lever, substantially as described.

3. In an electric switch, the combination with a supporting-base; of a pole-piece having a contact-face substantially in the path of movement of the circuit-controller; a circuit-controller having a reactive connection with said base, and movable with the actuating-lever, and transversely resilient toward the contact-face of the pole-piece, and having its contact-face movable substantially in the plane of said contact-face of the pole-piece; and an actuating-lever pivoted on said base for closing the circuit-controller, and normally holding said circuit-controller against free, reactive movement, and also adapted to release the same, at a predetermined point in the backward movement of the actuating-lever, whereby said circuit-controller has a sudden and multiplied releasing movement in the direction and independently of such movement of the actuating-lever, substantially as described.

4. In an electric switch, the combination

with a supporting-base; of a pole-piece having a contact-face, one portion of which is substantially in the path of movement of the circuit-controller, and the circuit-breaking portion of which diverges from the contact-face of said circuit-controller; of a circuit-controller movable with the actuating-lever, and pivotally mounted on said base, and having a reactive connection with the base, and transversely resilient toward the contact-face of the pole-piece, and having its contact-face movable substantially in the plane of said contact-face of the pole-piece; and an actuating-lever pivoted on said base for closing the circuit-controller, and normally holding said circuit-controller against the reactive movement, and adapted to release the same, at a predetermined point in the backward movement of the actuating-lever, whereby said circuit-controller has a sudden and multiplied releasing movement, in the direction and independently of such movement of the actuating-lever, substantially as described.

5. In an electric switch, the combination with an actuating-lever; of a pair of pole-pieces having contact-faces substantially in parallel planes; a pair of switch-arms operative with said lever, and intermediate of, and movable into and out of, engagement with the contact-faces of the pole-pieces, and having their contact-making ends relatively remote from each other; and a switch-arm-engaging member carried by the actuating-lever, and movable in a path intermediate of said contact-ends of said switch-arms, and having a subsequent movement to that of the switch-arms for engaging and spreading said switch-arms, to force the same into locked engagement with the contact-faces of the pole-pieces when said switch-arms are in their closed position, substantially as described.

6. In an electric switch, the combination with a supporting-base; of a pair of pole-pieces having contact-faces substantially in parallel planes; a pair of switch-arms pivotally mounted on said base, and having a reactive connection with the base, and movable with the actuating-lever, and intermediate of, and movable into and out of engagement with, the contact-faces of the pole-pieces, and having their contact-making ends relatively remote from each other; an actuating-lever pivoted on said base for closing the switch-arms, and normally holding said switch-arms against free, reactive movement, and adapted to release the same, at a predetermined point in the backward movement of the actuating-lever, whereby said switch-arms have a sudden and multiplied releasing movement, in the direction and independently of such movement of the actuating-lever; and a switch-arm-engaging member carried by the actuating-lever, and movable in a path intermediate of the contact ends of said switch-arms, and having a subsequent movement to that of the switch-arms for engaging and spreading said switch-arms, to force the same into locking

engagement with the contact-faces of the pole-pieces, when said switch-arms are in their closed positions, substantially as described.

7. In an electric switch, the combination
 5 with a supporting-base; of a pair of pole-pieces having contact-faces substantially in parallel planes; a circuit-controller having a reactive connection with said base, and movable with the actuating-cam, and into and out
 10 of engagement with the contact-face of one of said pole-pieces, and having a contact-making end intermediate of said pole-pieces; an actuating-cam operative with the actuating-lever, and adapted for closing the circuit-controller, and normally holding said circuit-
 15 controller against free, reactive movement, and also in position and adapted to release the same, at a predetermined point in the movement of the actuating-cam; an actuating-lever controlling said actuating-cam, and
 20 normally holding the same in its closed position, and adapted to release said actuating-cam, at a predetermined point in the backward movement of the actuating-lever, whereby
 25 by said circuit-controller and actuating-cam have a sudden and multiplied releasing movement, in the direction and independently of such movement of the actuating-lever; and a circuit-controller-engaging member carried
 30 by the actuating-lever, and movable in a path intermediate of the contact-end of the circuit-controller and the relatively-remote pole-piece, and having a subsequent movement to that of the circuit-controller for engaging said
 35 contact end and the contact-face of the relatively-remote pole-piece, and forcing said con-

tact end into locked engagement with the contact-face of its contact-making pole-piece, when said circuit-controller is in its closed position, substantially as described.

8. In an electric switch, the combination
 40 with a pair of pole-pieces having contact-faces which diverge at the contact-breaking portions thereof; of a pair of reactive switch-arms movable with the actuating-lever, and
 45 intermediate of, and movable into and out of engagement with the contact-faces of the pole-pieces, and having diverging contact-making ends relatively remote from each other, and transversely resilient toward the contact-
 50 faces of said pole-pieces; an actuating-lever adapted for closing the switch-arms and normally holding said switch-arms against free reactive movement, and also adapted to re-
 55 lease the same at a predetermined point in the backward movement of the actuating-lever, whereby said switch-arms have a sudden and multiplied releasing movement in the direction and independently of such move-
 60 ment of the actuating-lever; and a switch-arm-engaging member carried by the actuating-lever, and movable in a path intermediate of the contact-ends of said switch-arms, and adapted to engage and spread said switch-
 65 arms to force the same into locked engagement with the contact-faces of the pole-pieces, when said switch-arms are in their closed position, substantially as described.

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