

Dec. 31, 1940.

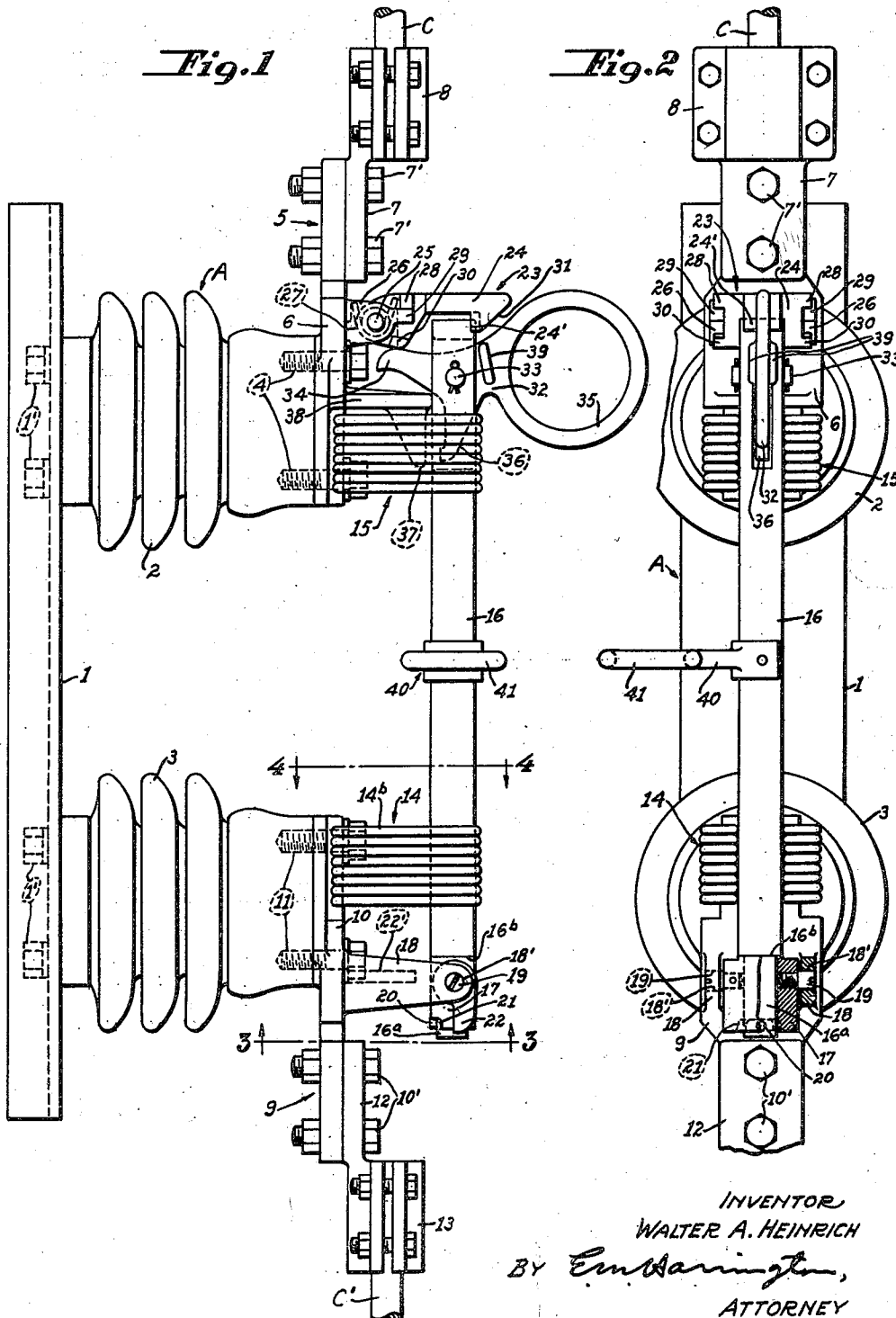
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2,226,818

ELECTRICAL SWITCH

Filed Oct. 16, 1939

4 Sheets-Sheet 1



Dec. 31, 1940.

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ELECTRICAL SWITCH

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4 Sheets-Sheet 2

Fig. 3

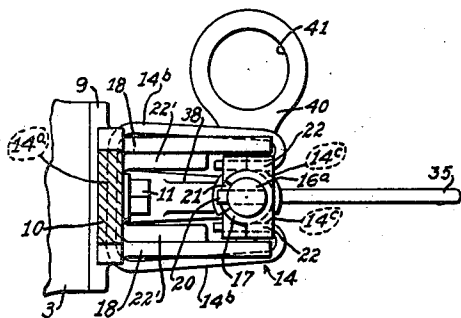


Fig. 4

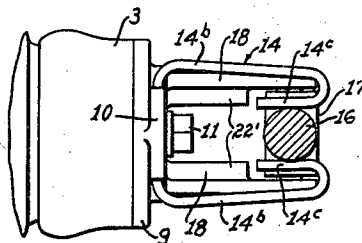


Fig. 5

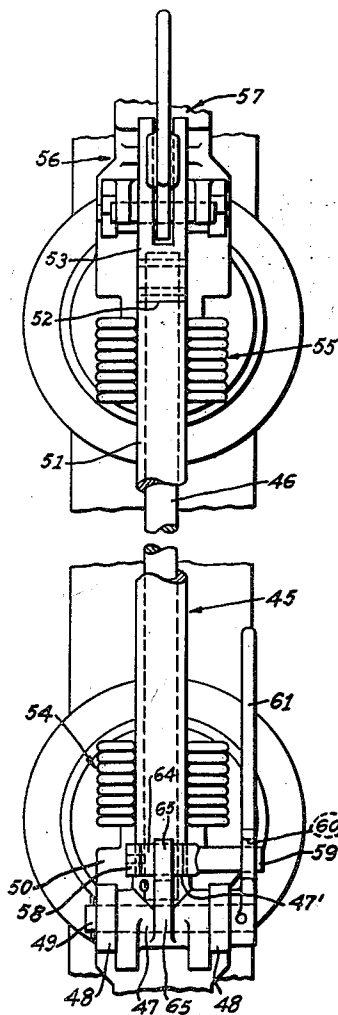


Fig. 6

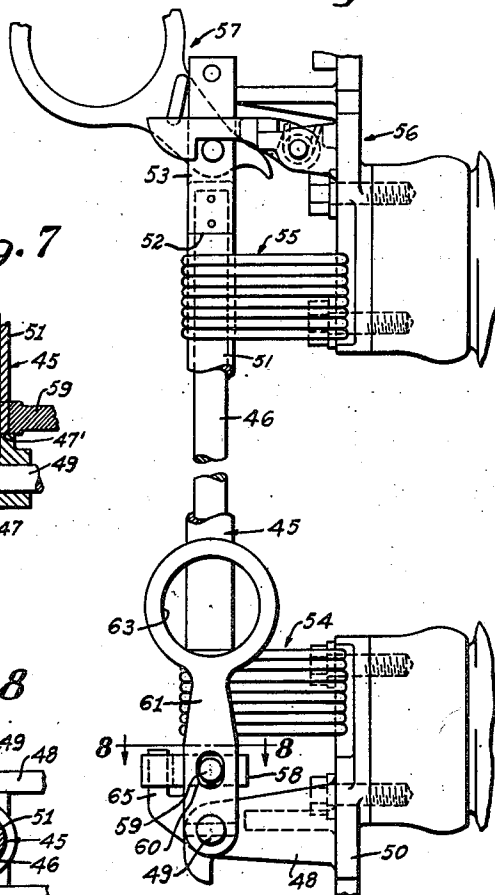


Fig. 7

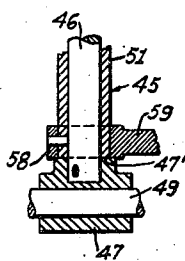
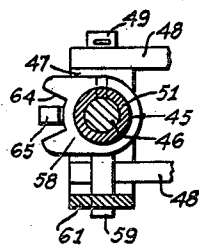


Fig. 8



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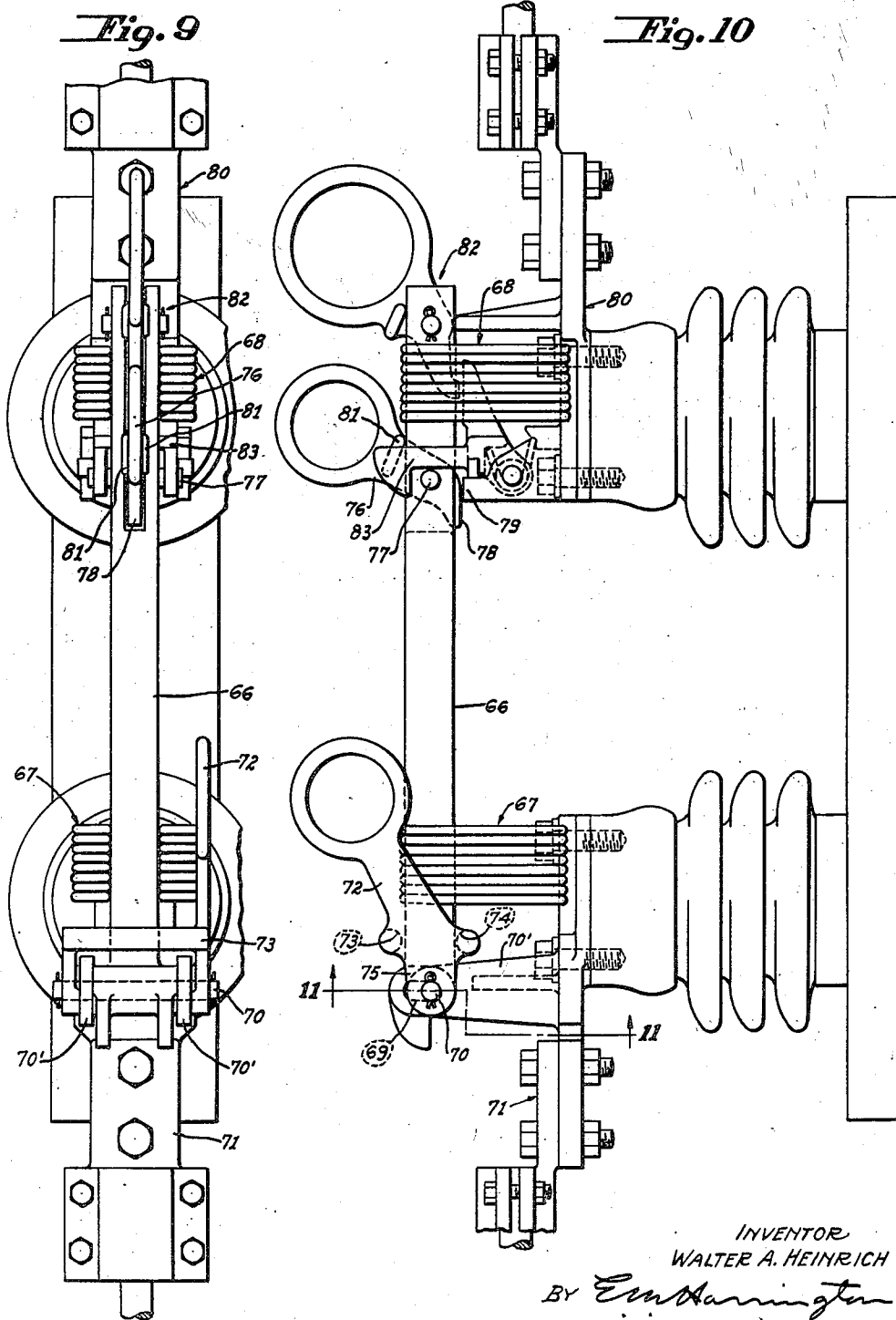
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4 Sheets-Sheet 3



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ELECTRICAL SWITCH

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4 Sheets-Sheet 4

Fig. 11

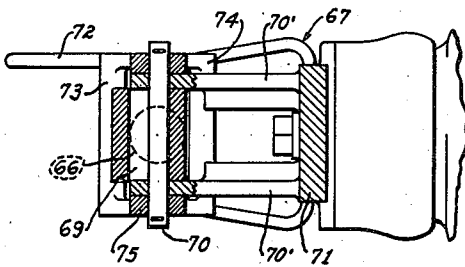


Fig. 12

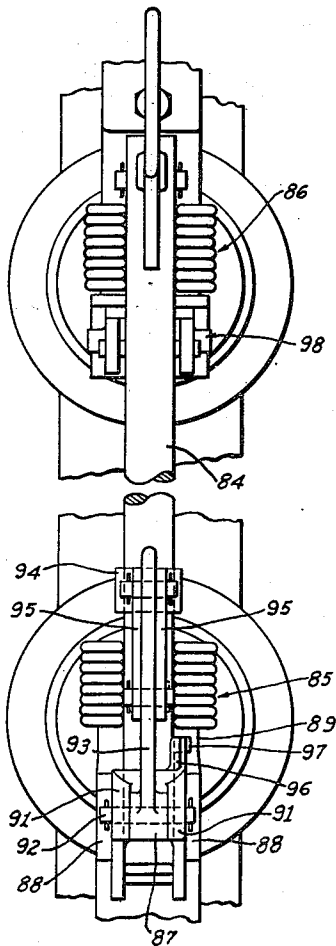


Fig. 14

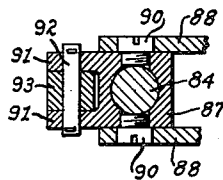
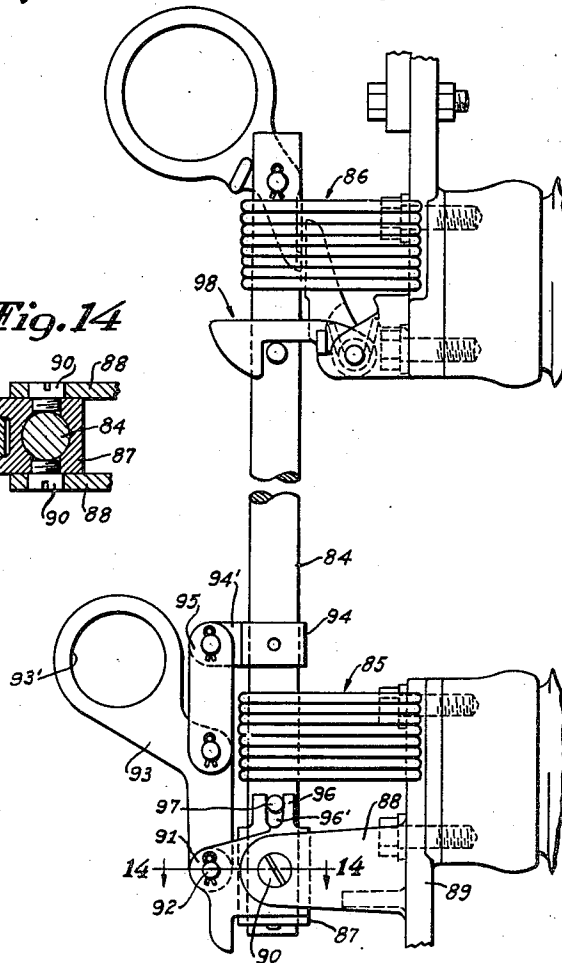


Fig. 13



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2,226,818

ELECTRICAL SWITCH

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Application October 16, 1939, Serial No. 259,602

7 Claims. (Cl. 200—162)

This invention relates generally to electrical switches of the type employed in systems for transmitting electrical energy for power, lighting, and other purposes, and more specifically to such switches which generally comprise spaced terminals and associated contact means into and out of contact with which contact means an element is moved to complete or interrupt a circuit of which the switch forms a part, the predominant object of the invention being to provide such a switch which is so constructed and arranged that the element which is movable into and out of contact with the contact means to complete and interrupt the circuit, may be moved slightly relative to the contact means, while said movable element remains in electrical contact with said contact means, so as to break and remove corrosion which forms at the point of contact of said movable element and said contact means.

Switches of the type to which this invention relates are frequently susceptible to the formation of corrosion at the points where the movable elements of the switches contact with the contact means thereof, and as a result of such formation of corrosion the efficiency of the switches is very materially affected. In other words, it has been found that the presence of corrosion at the points mentioned effects the current-carrying capacities of the switches to the extent that they are reduced far below the rated capacities of the switches, whereby the capabilities of the switches to function in the desired efficient manner is very greatly interfered with and the switches are subjected to overheating.

The predominant feature of the present invention resides in the fact that the improved switch is so constructed and arranged that the movable element of the switch is capable of slight movement relative to the contact means of the switch while said movable element remains in electrical contact with said contact means. This slight movement is sufficient to break loose any corrosion that has formed and reestablish clean contacting surfaces between the movable element and the contact means which will return the switch to its rated current-carrying capacity. Also an important feature of the present invention is that the movement of the movable element of the switch relative to the contact means thereof which serves to break loose any corrosion which has formed at said switch parts is produced while the switch is in a closed condition and without interrupting the circuit. This

is important because in most cases interruption of the circuit for the purpose of freeing the switch parts from corrosion would be undesirable.

Fig. 1 is a side elevation of one form of the improved switch disclosed herein.

Fig. 2 is a front elevation of the switch shown in Fig. 1, with a portion shown in section and a part broken away.

Fig. 3 is a horizontal section taken on line 3—3 of Fig. 1.

Fig. 4 is a horizontal section taken on line 4—4 of Fig. 1.

Fig. 5 is a fragmentary front elevation of another form of the improved switch disclosed herein.

Fig. 6 is a fragmentary side elevation of the switch shown in Fig. 5.

Fig. 7 is a fragmentary section of a lower portion of the switch shown in Figs. 5 and 6.

Fig. 8 is a horizontal section taken on line 8—8 of Fig. 6.

Fig. 9 is a front elevation, with parts broken away, of still another form of the improved switch.

Fig. 10 is a side elevation of the switch shown in Fig. 9.

Fig. 11 is a horizontal section taken on line 11—11 of Fig. 10.

Fig. 12 is a fragmentary front elevation of yet another form of the improved switch.

Fig. 13 is a side elevation of the switch shown in Fig. 12.

Fig. 14 is a horizontal section taken on line 14—14 of Fig. 13.

Referring now to the drawings, wherein are shown for the purpose of illustration, merely, several embodiments of the invention, and particularly to Figs. 1, 2, 3, and 4, thereof, A designates one form of the improved switch generally. The switch A of the views mentioned includes a suitable supporting member 1 on which is rigidly mounted, by means of suitable fastening means 1', a pair of vertically spaced insulators 2 and 3. The upper insulator 2 has secured thereto by means of suitable fastening devices 4 a terminal 5, said terminal 5 comprising a terminal member 6 which is secured directly to the insulator 2 by means of the fastening devices 4, and a terminal member 7 which may be secured by bolts 7', or otherwise, to said terminal member 6. The terminal member 7 includes as a part thereof a conductor-clamping portion 8 which serves to mechanically and electrically secure to the ter-

terminal 5 a conductor C which is a portion of the electrical circuit of which the switch A forms a part.

In like manner the lower insulator 3 has secured thereto a terminal 9 which comprises a terminal member 10 that is secured directly to said insulator 3 by means of suitable fastening devices 11, and a terminal member 12 which may be secured by bolts 10', or otherwise, to said terminal member 10. Also the terminal member 12 includes as a part thereof a conductor-clamping portion 13 which serves to mechanically and electrically secure to the terminal 9 a conductor C' which constitutes a portion of the electrical circuit of which the switch A forms a part.

Forming a part of the terminal 9 associated with the lower insulator 3 is a contact 14 which is comprised of a plurality of lengths of relatively heavy, resilient wire arranged in parallel relation, as shown in Figs. 1 and 2. The lengths of wire which produce the contact 14 are shaped, when viewed in plan, as shown in Figs. 3 and 4; that is to say, each length of wire includes a rear portion 14a which is suitably anchored to the terminal member 10 of the terminal 9 and from the opposite ends of which opposed forwardly extended portions 14b are extended, the portions 14b at their outer ends being provided with portions 14c which are bent rearwardly with respect to said portions 14b in inwardly spaced relation with respect thereto and in spaced relation with respect to each other. The terminal 5 of the upper insulator 2 is provided with a contact 15 which is similar in construction and arrangement to the contact 14 just described, said contact 15 being suitably anchored to the terminal member 6 of said upper terminal 5.

Supported by the lower terminal 9 is the switch blade 16 of the switch A illustrated in Figs. 1 to 4, inclusive, which constitutes the movable element hereinbefore referred to. Obviously the switch blade 16 may be of any suitable type, the particular switch blade illustrated being in the form of a rod which is circular in cross-section as shown in Fig. 4. At its lower end the switch blade is provided with a portion 16a of reduced diameter, at the upper end of which a shoulder 16b is provided, and this reduced switch blade portion is disposed in a sleeve 17 for rotary movement with respect thereto with the shoulder 16b of the switch blade contacting with the top face of said sleeve 17.

The sleeve 17 is located between a pair of outstanding ears 18 that are formed on the terminal member 10 of the lower terminal 9, and in order to pivotally secure said sleeve, and the associated switch blade 16, to the pair of ears 18 a pair of trunnion elements 19 are fixed to the sleeve and extend into apertures 18' formed in the ears, as shown in Fig. 2. Preferably, though not necessarily, each trunnion element comprises a stud bolt which includes a screwthreaded portion of reduced diameter that is screwed into a screwthreaded opening formed in the sleeve 17, and a smooth portion of larger diameter that is disposed in the aperture 18' of one of the ears 18.

As will be presently explained in detail herein, the main portion of the switch blade is subjected to rotation with respect to the sleeve 17, and to limit said rotary movement of said switch blade a pin 20 is fixed to the switch blade so that it extends therefrom into an opening 21 formed in the sleeve as shown to the best advantage in Figs.

1, 2 and 3. Because of this arrangement rotation of the switch blade is limited to a portion of a circle, merely, as rotary movement of the switch blade is arrested at the opposite limits of its rotary movement by the pin 20 coming in contact with the opposite end walls of the opening 21 in the sleeve.

When the switch blade 16 is in the open switch position an extension 22 formed on the sleeve 17 contacts with a fixed portion 22' to maintain said switch blade in a substantially horizontal position, and from this position the upper end of the switch blade is movable in an arc of a circle to the closed switch position in which said switch blade is shown in Fig. 1. When the switch blade 16 is moved to the closed switch position it is forced between the inwardly turned portions of the contacts 14 and 15 (see portions 14c of Fig. 3) to bridge the space between said contacts and establish electrical connection between the terminals 5 and 9, and to maintain the switch blade in such closed switch position a latching mechanism 23 is provided.

The latching mechanism 23 includes a latch 24 which is pivoted by means of a pivot pin 25 between a pair of ears 26 that extend forwardly from the terminal member 6 of the upper terminal 5, said pivot pin having arranged thereabout a torsional coil spring 27 which coacts with the latch 24 in a manner to urge the outer end thereof downwardly. The latch 24 is provided with opposed lugs 28 which contact with extensions 29 formed on the ears 26 to limit downward movement of the outer end portion of said latch, and said latch is provided, also, with lugs 30 which are adapted to contact with the extensions 29 of the ears 26 to limit upward movement of the outer portion of said latch. The latch 24 includes a downwardly extended portion 24' adjacent to its outer end which engages the upper end portion of the switch blade 16 to hold said switch blade in the closed switch position where it is in electrical connection with the contacts 14 and 15, there being an inclined face 31 formed at the outer end of said latch against which the upper end portion of the switch blade moves, when it is being moved to the closed switch position, to cam the outer portion of the latch upwardly so that said upper portion of said switch blade may move beneath the portion 24' of the latch so as to be latched by same when the torsional coil spring has restored the latch to its lowered latching position as shown in Fig. 1.

In order to provide for raising the outer portion of the latch to permit the switch blade 16 to be withdrawn from the closed switch position a latch-operating member 32 is provided. This latch-operating member is pivotally supported on the switch blade 16 by a pivot pin 33, and said latch-operating member includes an extension 34 at its inner end which contacts with a lower face of the latch 24, and an eye 35 at its outer end adapted to receive a suitable tool. Also the latch-operating member 32 is provided with a downwardly projected extension 36 which, as will presently appear herein, is adapted to engage an extension 37 which is projected downwardly from a forwardly directed portion 38 of the terminal member 6 of the terminal 5. The latch-operating member 32 is provided with a pair of opposed lugs 39 which limit movement of said latch-operating member about its pivot 33 because of portions of said lugs moving in contact with the

switch blade when opposite limits of movement of said latch-operating member are reached.

The switch blade has fixed thereto an arm 40 which extends outwardly therefrom. Preferably this arm is provided at its outer end with a tool-receiving portion 41, an eye, for instance, which may be engaged by a suitable tool for the purpose of subjecting the switch blade to slight rotary movement with respect to the contacts 14 and 15.

In the operation of the switch illustrated in Figs. 1 to 4, inclusive, the switch blade is moved from the open switch position to the closed switch position with the aid of a switch stick, or other suitable tool, a portion of which is introduced into the eye portion 35 of the latch-operating member 32, the upper end portion of the switch blade being moved until said upper end of said switch blade has contacted the inclined face 31 of the latch 24 and has raised said latch so as to permit the upper end of the switch blade to ride thereunder, after which the torsional coil spring 27 moves the outer end of the latch 24 downwardly to latch the switch blade in the closed switch position. If, after the switch has been in use for some time, corrosion forms at the points where the switch blade 16 and the contacts 14 and 15 contact, a suitable tool, a switch stick, for instance, is engaged with the eye portion 41 of the arm 40, and while the switch blade remains in the closed switch position, the switch blade is rotated back and forth several times through an arc of a circle to the extent permitted by travel of the pin 20. This will break loose the corrosion and will clean the contacting points of the switch blade and contacts whereby clean, intimate, and good electrical contact will again be provided between said parts of the switch.

When it is desired to move the switch blade from the closed switch position to the open switch position, a switch stick, or other suitable tool, is engaged with the eye portion 35 of the latch-operating member 32 and said eye portion is pulled downwardly. This will raise the outer portion of the latch 24 and will move the extension 36 of the latch-operating member against the extension 37 of the terminal member 6. Continued downward and outward pull on the eye portion of the latch-operating member 32 will draw the upper end portion of the switch blade outwardly thereby eventually freeing the switch blade from the contacts 14 and 15, the outward movement of the upper end portion of the switch blade being aided by a fulcrum action produced as the extension 36 of the latch-operating member is forced against the extension 37 of the terminal member 6 by the downward pull on the eye portion of said latch-operating member.

In Figs. 5, 6, 7, and 8, a slightly different form of the improved switch is illustrated. The switch of Figs. 5, 6, 7, and 8 includes a switch blade 45 that comprises an inner rod 46 which is secured to a member 47 that is pivotally supported between a pair of ears 48 by a pivot pin 49, said ears being extended from a lower terminal 50. Surrounding the rod 46 is a tubular element 51 which contacts at one end with a shoulder 47' of the member 47, and at its opposite end said tubular element contacts with a shoulder 52 formed on the top portion 53 of the switch blade. The switch blade is movable to the closed switch position where the tubular element 51 thereof is forced between opposed portions of contacts 54 and 55 which are suitably anchored respectively to the lower terminal 50

and the upper terminal 56, and the switch of Figs. 5 and 6 is provided with suitable latching means 57, which, because it resembles the latching means of the switch illustrated in Figs. 1 and 2 need not be described in detail herein. The tubular element 51 has pinned or otherwise secured thereto a member 58 from which a pin 59 is extended and this pin is extended into an elongated opening 60 formed in an arm 61 which is pivotally mounted on the pivot pin 49. The arm 61 is provided at its upper end with an eye 63, and the member 58 is provided with a cutaway portion 64 into which an extension 65 formed on the member 47 is projected.

When the switch illustrated in Figs. 5, 6, 7, and 8 is in the closed switch position, as shown in Figs. 5 and 6, and it is desired to break loose and remove corrosion which has formed at the points where the tubular element 51 makes contact with the contacts 54 and 55, a suitable tool, a switch stick, for instance, is introduced into the eye 63 of the arm 61 and the upper end portion of said arm is moved rapidly backwardly and forwardly several times. Such movement of the arm 61, because of the connection provided by the pin 59, will rotate the tubular element through short rotary movements in opposite directions about the rod 46 and with respect to the contacts 54 and 55, whereby the corrosion will be effectively removed and clean contacting points between the switch blade and the contacts will be restored. The rotary movement of the tubular element 51 in response to movement of the arm 61 is limited by the opposite walls of the cutaway portion 64 of the member 58 coming in contact with the fixed extension 65.

In Figs. 9, 10, and 11 is illustrated still another form of the improved switch wherein the switch blade 66 is moved inwardly and outwardly relative to the contacts 67 and 68 in order to remove corrosion from the contacting points of said switch blade and contacts. In this form of the invention the lower portion of the switch blade has formed therein an opening 69 which extends through said lower portion of the switch blade from side to side and which is elongated from front to back of said blade portion, as shown in Figs. 10 and 11. Extended through said opening 69 is a pivot pin 70 which is supported by spaced, outwardly extended ears 70' which form parts of the lower terminal 71, and supported on said pivot pin for rotary movement with respect thereto is an arm 72 which is provided with an eye portion at its outer end. The arm 72 is provided with elongated bars 73 and 74 between which the switch blade is extended, said elongated bars at the ends thereof opposite to the location of the arm 72 being joined by a hub portion 75 which is mounted for rotation on the pivot pin 70 as shown in Fig. 11.

Adjacent to the upper end of the switch illustrated in Figs. 9, 10, and 11, an element 76, which includes an eye portion at its outer end, is pivoted to the upper portion of the switch blade 66 through the instrumentality of a pivot pin 77. This element 76 includes also a rearwardly and downwardly projected extension 78 which is disposed in close proximity to a switch portion 79 which is fixed to the upper terminal 80 of the switch. Also the element 76 has formed on its opposite faces lugs 81, portions of which are adapted to contact with the outer face portion of the switch blade 66.

The switch illustrated in Figs. 9, 10, and 11, includes latching means 82 for securing the

switch blade 66 in the closed switch position as shown in Figs. 9 and 10. However, because this latching mechanism closely resembles the latching mechanism illustrated in Figs. 1 and 2, which has already been described herein, it will not be necessary to describe the latching mechanism of Figs. 9 and 10 in detail.

When the switch illustrated in Figs. 9, 10, and 11 is in the closed switch position and it is desired to free the switch blade and the contacts from corrosion at the points where these parts make electrical contact, a switch stick, or other suitable tool is engaged with the eye portion of the arm 72 and the outer end portion of said arm is moved rapidly back and forth about its pivot 70. During such movement of the arm 72 one and then the other of the bars 73 and 74 will engage the lower portion of the switch blade 66, said lower portion of the switch blade being moved inwardly by the bar 73 and being moved outwardly by the bar 74 and the elongated opening 69 in the lower portion of the switch blade permitting said inward and outward movement of the switch blade with respect to the pivot pin 70. As a result of the described inward and outward movement of the lower portion of the switch blade 66, the portion of said switch blade which makes contact with the contact 67 will be moved with respect to said contact 67 so as to break loose any corrosion which has formed between the switch blade and said contact whereby clean contact between said switch parts will be restored.

In like manner the eye portion of the element 76 will be engaged by a suitable tool and will be moved rapidly upwardly and downwardly in an arc about its pivot. On downward movement of the eye portion of the element 76 the portion 78 of said element moving against the fixed portion 79 will cam the upper portion outwardly with respect to the contact 68, while on upward movement of the eye portion of said element 76 the lugs 81 will move into contact with the switch blade and continued upward movement of the eye portion of the element will move the upper portion of the switch blade inwardly with respect to the contact 68. Obviously, the outward and inward movement of the upper portion of the switch blade relative to the contact 68 will break loose corrosion formed at the points of contact between the switch blade and said contact 68 and restore clean, contacting points between said parts. It is to be noted that there is sufficient looseness between the latch element 83 and the opposite end portions of the pin 77 to permit the inward and outward movement of the upper portion of the switch blade 66 described above, yet said latch element 83 will prevent accidental movement of the switch blade out of the closed switch position.

In Figs. 12, 13, and 14, yet another form of the improved switch construction is illustrated in accordance with which the switch blade 84 is moved upwardly and downwardly with respect to the contacts 85 and 86 to free the contacting surfaces of the switch blade and contacts from corrosion. In accordance with the form of the invention shown in Figs. 12, 13, and 14, the switch blade is in the form of a rod of circular cross-section whose lower end portion is disposed in a bearing member 87 for vertical sliding movement with respect thereto. The bearing member 87 is supported for pivotal movement between a pair of ears 88 which extend outwardly from a lower terminal 89, such pivotal movement being obtained

through the use of trunnions 90 whose inner end portions are screwthreadedly seated in screwthreaded openings formed in the bearing member, and whose headed outer end portions are disposed in openings formed in the spaced ears 88.

Pivoted between a pair of ears 91 extended from the bearing member 87 by means of a pivot pin 92 is an arm 93 which is provided at its upper end with an eye portion 93'. Fixed to the switch blade 84 is a collar 94 which is provided with an outwardly projected extension, and pivotally attached to the extension 94' of the collar 94 and to the arm 93 is a link 95. The bearing member 87 is provided with an upwardly extended portion 96 in which a vertical slot 96' is formed, as shown in Fig. 13, and extended into this slot is a pin 97 which is fixed to the switch blade 84.

The switch illustrated in Figs. 12, 13, and 14, is provided with a suitable latching mechanism 98 of the general type of the latching mechanism shown in Figs. 1 and 2 and previously described herein, and when it is desired to free the switch blade and contacts of corrosion while said switch blade is held in the closed switch position by said latching mechanism, as shown in Figs. 12 and 13, the eye portion of the arm 93 is engaged by a suitable tool and the upper portion of said arm is swung back and forth about its pivot. Because of such movement the switch blade will be subjected to upward and downward movement relative to the contacts 85 and 86, the switch blade moving upwardly and downwardly within the bearing member 87 and being guided during such movement by the slot and pin connection 96-97 between the bearing member and said switch blade. Obviously the described upward and downward movement of the switch blade relative to the contacts of the switch will free the contacting surfaces of the switch blade and contacts of corrosion and will restore the contacting surfaces of said switch parts to their original clean condition.

I claim:

1. An electrical switch comprising a contact, an elongated movable element movable into and out of closed switch position with respect to said contact, a portion of said elongated movable element being supported for rotation relative to said elongated movable element and being adapted to contact mechanically and electrically with said contact when the elongated movable element is in closed switch position, and means for rotating said rotatable portion of said elongated movable element in maintained electrical and mechanical contact with said contact and without removing said rotatable portion from electrical contact with said contact throughout the entire rotary movement of said rotatable portion, said elongated movable element being adapted to be drawn out of closed switch position relative to said contact by movement thereof which is independent of the rotary movement of said rotatable portion of said elongated movable element.

2. An electrical switch comprising spaced contacts, an elongated movable element movable into and out of closed switch position with respect to said contacts, a portion of said elongated movable element being supported for rotation about the longitudinal axis of said elongated movable element and being adapted to contact mechanically and electrically with said contacts when the elongated movable element is in closed switch position, and means for rotating said rotatable portion of said elongated movable element in maintained electrical and mechanical contact with

with said contacts and without removing said rotatable portion from electrical contact with said contacts throughout the entire rotary movement of said rotatable portion, said elongated movable element being adapted to be drawn out of closed switch position relative to said spaced contacts by movement thereof which is independent of rotary movement of the rotatable portion of said elongated movable element.

3. An electrical switch comprising spaced contacts, an elongated pivotally movable element movable into and out of closed switch position with respect to said contacts, a portion of said elongated movable element being supported for rotation about the longitudinal axis of said elongated movable element and being adapted to contact mechanically and electrically with said contacts when the elongated movable element is in closed switch position, and means for rotating said rotatable portion of said elongated movable element in maintained electrical and mechanical contact with said contacts and without removing said rotatable portion from electrical contact with said contacts throughout the entire rotary movement of said rotatable portion, said elongated movable element being adapted to be drawn out of closed switch position relative to said spaced contacts by movement thereof which is independent of rotary movement of the rotatable portion of said elongated movable element.

4. An electrical switch comprising spaced contacts, an elongated pivotally movable element movable into and out of closed switch position with respect to said contacts, a portion of said elongated movable element being supported for rotation about the longitudinal axis of said elongated movable element and being adapted to contact mechanically and electrically with said contacts when the elongated movable element is in closed switch position, means for rotating said rotatable portion of said elongated movable element in maintained electrical and mechanical contact with said contacts and without removing said rotatable portion from electrical contact with said contacts throughout the entire rotary movement of said rotatable portion, said elongated movable element being adapted to be drawn out of closed switch position relative to said spaced contacts by movement thereof which is independent of rotary movement of the rotatable portion of said elongated movable element, and latch means for latching said elongated movable element in closed switch position relative to said contacts.

5. An electrical switch comprising spaced contacts, an elongated pivotally movable element movable into and out of closed switch position with respect to said contacts, a portion of said elongated movable element being supported for rotation about the longitudinal axis of said elongated movable element and being adapted to contact mechanically and electrically with said contacts when the elongated movable element is in closed switch position, means for rotating said rotatable portion of said elongated movable ele-

ment in maintained electrical and mechanical contact with said contacts and without removing said rotatable portion from electrical contact with said contacts throughout the entire rotary movement of said rotatable portion, said elongated movable element being adapted to be drawn out of closed switch position relative to said spaced contacts by movement thereof which is independent of rotary movement of the rotatable portion of said elongated movable element, and manually releasable latch means for latching said elongated movable element in closed switch position relative to said contacts.

6. An electrical switch comprising spaced contacts, an elongated pivotally movable element movable into and out of closed switch position with respect to said contacts, a portion of said elongated movable element being supported for rotation about the longitudinal axis of said elongated movable element and being adapted to contact mechanically and electrically with said contacts when the elongated movable element is in closed switch position, means for rotating said rotatable portion of said elongated movable element in maintained electrical and mechanical contact with said contacts and without removing said rotatable portion from electrical contact with said contacts throughout the entire rotary movement of said rotatable portion, said elongated movable element being adapted to be drawn out of closed switch position relative to said spaced contacts by movement thereof which is independent of rotary movement of the rotatable portion of said elongated movable element, and manually releasable latch means for latching said elongated movable element in closed switch position relative to said contacts, said latch means being adapted to retain said elongated movable element in latched closed switch position when said rotary portion of said elongated movable element is being rotated.

7. An electrical switch comprising spaced contacts, an elongated movable element movable into and out of closed switch position with respect to said contacts, a portion of said elongated element being supported for rotation about the longitudinal axis of said elongated movable element and being adapted to contact mechanically and electrically with said contacts when the elongated movable element is in closed switch position, and means including an element adapted for rotary movement for rotating said rotatable portion of said elongated movable element in maintained electrical and mechanical contact with said contacts and without removing said rotatable portion from electrical contact with said contacts throughout the entire rotary movement of said rotatable portion, said elongated movable element being adapted to be drawn out of closed switch position relative to said spaced contacts by movement thereof which is independent of rotary movement of the rotatable portion of said elongated movable element.

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