

July 31, 1923.

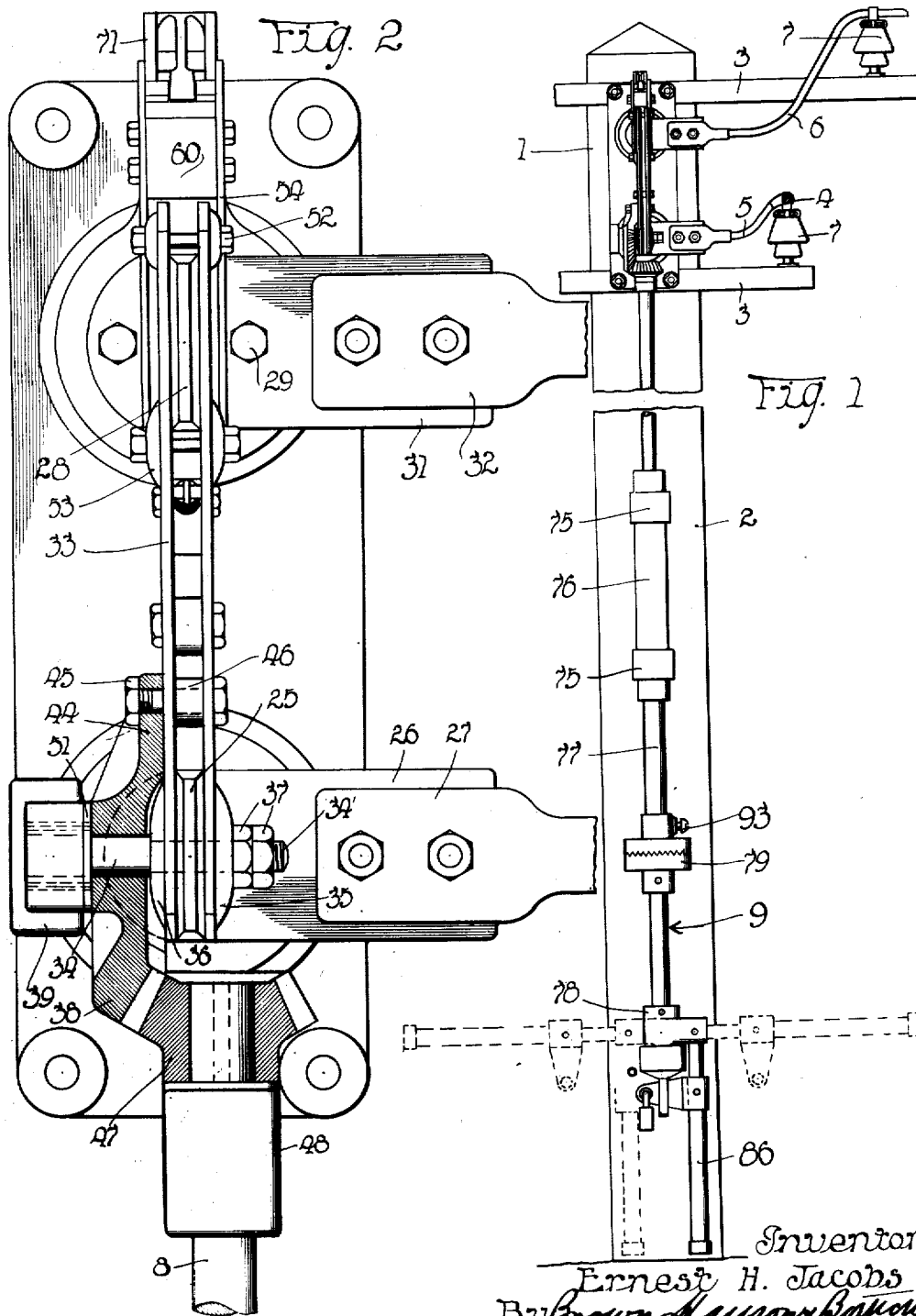
1,463,320

E. H. JACOBS

SWITCH

Filed June 20, 1918

4 Sheets-Sheet 1



Inventor
Ernest H. Jacobs
By *Brown & Hanson*
Attorneys

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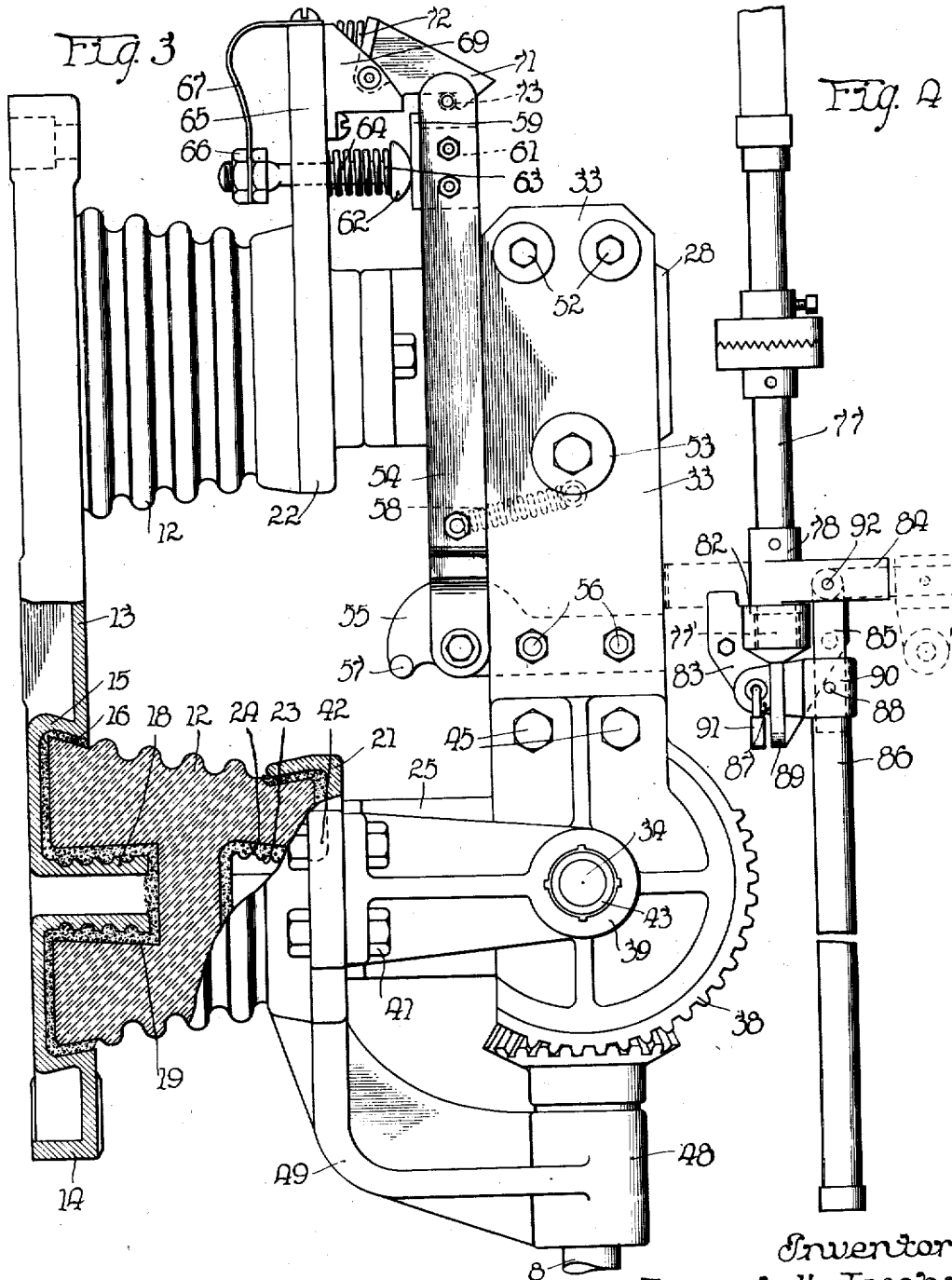
E. H. JACOBS

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SWITCH

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4 Sheets-Sheet 2



Inventor
Ernest H. Jacobs
By Brown & Sons
Attorneys

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E. H. JACOBS

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4 Sheets-Sheet 3

Attorneys

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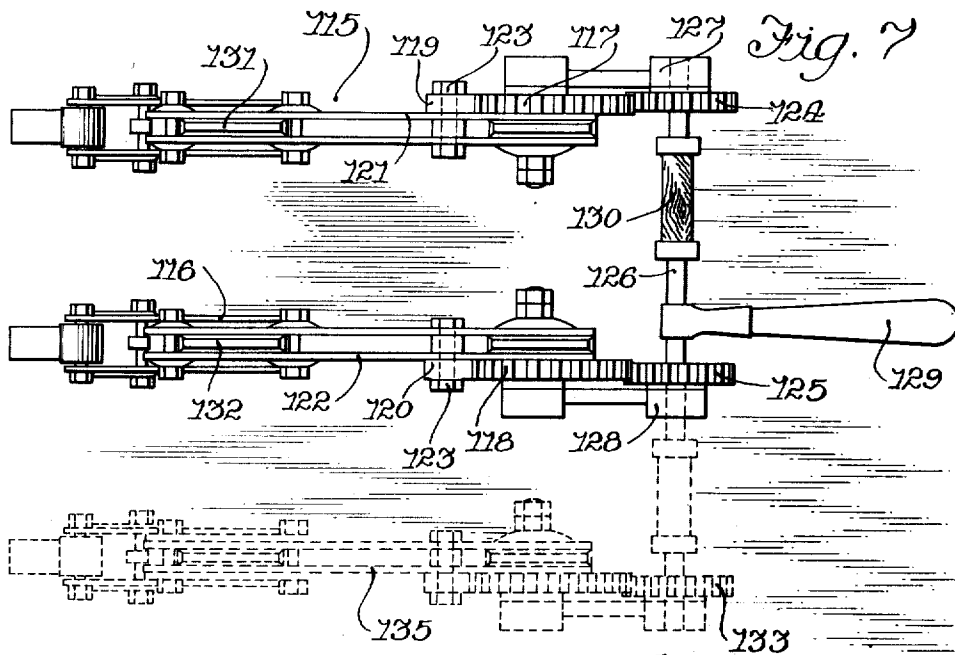
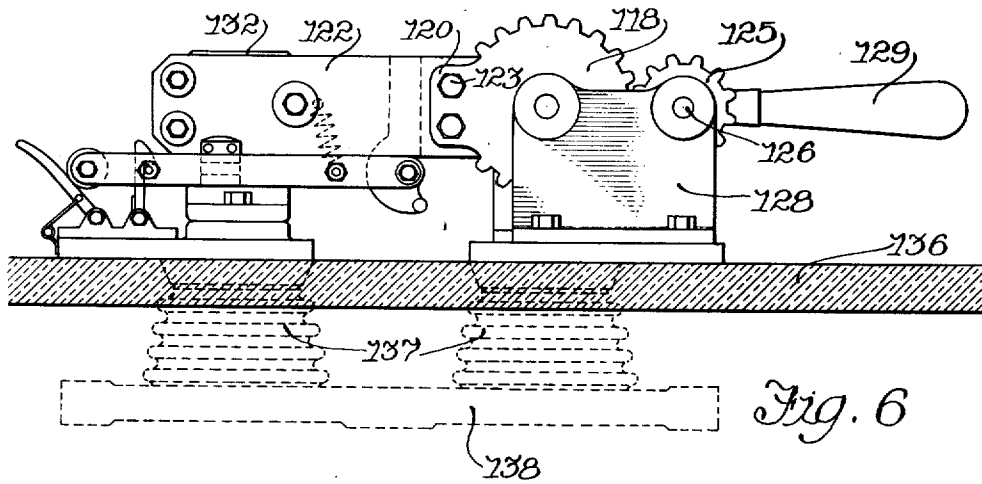
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E. H. JACOBS

SWITCH

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4 Sheets-Sheet 4



Inventor
Ernest H. Jacobs
By *Brown & Hanson* Attorneys

UNITED STATES PATENT OFFICE.

ERNEST H. JACOBS, OF CHICAGO, ILLINOIS, ASSIGNOR TO ELECTRICAL ENGINEERS EQUIPMENT COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SWITCH.

Application filed June 20, 1918. Serial No. 240,942.

To all whom it may concern:

Be it known that I, ERNEST H. JACOBS, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Switches, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to switches.

The particular switch which I shall hereafter illustrate and describe in detail is adapted for use in electric railway work for connecting and disconnecting sections of the trolley or overhead from the feeder or for disconnecting feeders. I do not intend to limit the invention to such use as it will be obvious from the following specification that the invention is widely applicable.

I have observed that the manual operation of switches of large capacity is arduous and difficult. If the switch is placed in a vertical position (when closed) at a convenient height with respect to the operator, a straight outward pull by the operator to open the switch is about the only feasible way to mount the switch so that it may be manually operated.

When a current of high or fairly high voltage is carried by the switch it is necessary to mount the switch at a point remote from the operator so that no danger from accidental contact can be had.

The operation of the switch by means of an insulator handle or pole becomes inconvenient, particularly when the switch is of large carrying capacity.

I have solved this difficulty by providing an insulated operating shaft which is connected thru a gear reduction to the blade of the switch. To make the work of the operator convenient and easy I have placed the operating handle at a suitable height in such position that it may be readily and conveniently operated.

As the present switch is intended for railway work and would be installed at points along the line outside of the power house, I have provided suitable means for locking the switch in either open or closed position.

For convenient mounting of the switch and operating shaft I employ a bevel pinion and gear sector. As I find it convenient to give the handle a throw of 180° and as the

switch need be thrown only 90° to secure maximum opening, I find it possible to secure a gear reduction of 2:1, thus greatly reducing the effort required to throw the switch.

A further object of my invention is a novel arcing or quick break contact. In quick break switches of the prior art, the release of the quick break or auxiliary contact depends upon friction. I find this to be unreliable. According to my invention the quick break element is not released until the main switch blade has reached a predetermined position and then the quick break element is positively released and is then thrown by a spring. Thus uniformity and reliability of action are secured.

In the particular switch which I shall describe the auxiliary or quick break blade is pivoted to the main blade and when the main blade is closed the auxiliary blade is caught under a detent which springs back to catch the end of the auxiliary blade. When the main blade opens, the pivot of the auxiliary blade is moved with the main blade and when the main blade has swung far enough it will withdraw the end of the auxiliary blade from under the detent. A spring then snaps the auxiliary blade away from a stationary auxiliary contact, drawing the arc between the auxiliary and not between the main switch parts. In closing the switch the auxiliary parts are first closed and thereafter the main switch parts are closed.

Other and more specific objects will be apparent from the following detailed description.

In the accompanying drawings I have illustrated one preferred embodiment of my invention to apprise those skilled in the art how to make and use the same.

Figure 1 is an elevational view of my improved switch and operating mechanism installed on a pole;

Figure 2 is a plan view of the switch;

Figure 3 is a side elevational view of the switch;

Figure 4 is an elevational view of the switch operating mechanism;

Figure 5 is a side elevation of a modification;

Figure 6 is a side elevation of a further modification;

Figure 7 is a plan view of the same.

Figure 8 is a fragmentary cross sectional view taken on the line 8—8 of Figure 5; and Figure 9 is an end view partly in section of a modified form of contact member.

5 In Figure 1 I have illustrated my improved switch as installed on a pole which also supports the feeder for an electric traction system. The switch is designated 1
10 2 in its entirety, and is mounted upon the pole 2 in any suitable manner as by being bolted to the cross arms 3. In this instance, the switch controls the connection between the feeder wire 4 and a section of trolley (not shown). The tap 5 from the feeder wire
15 has connection with the lug of the lower switch terminal, and the lead 6, extending out to the trolley, has connection with the lug of the upper switch terminal. The feeder 4 and the lead 6 are supported on
20 suitable insulators 7. It will be noted that the vertical disposal of the switch on the pole facilitates its connection in the circuit by avoiding looping and crossing of the leads. The switch is enclosed by a suitable
25 housing (not shown) to protect it from the weather.

The operating mechanism consists primarily of a shaft 8 extending down along the pole 2, and lever mechanism 9 at the foot
30 of the pole for rotating the shaft 8. Rocking motion of the shaft 8 is translated by gearing at the switch into opening and closing movement of the movable switch member.

35 Considering first the detailed construction of the switch, it will be noted from Figure 3 that the terminals and other switch elements are supported on insulators 12—12 which are mounted in the base 13. This
40 base is constructed in the form of a plate having marginal flanges 14 and depressed pockets 15 in which are cemented the insulators 12. The bolts for attaching the base to the cross arms 3 pass thru bosses 15
45 formed in the corners of the base.

The insulator 12 is annularly corrugated and frusto conical in form. The depressed pocket 15 is also tapered and it will be apparent that the cement 16 will wedge between the tapered surfaces and will prevent
50 disengagement of the insulator. The insulator is also internally braced by a grooved tapered core 18 cemented in the tapered socket 19 in the insulator.

55 The upper ends of the insulator 12 have cemented thereto the insulator caps 21 and 22 which constitute the main switch terminals. These caps also have grooved tapered cores 23 which are cemented in tapered
60 sockets 24 in the insulators. The lower insulator cap 21 has bolted thereto the hinge contact 25. The outline of the base of this contact is shown in dotted lines in Figure 2. This contact has a terminal lug 26 extending
65 laterally from the main portion and

adapted for connection to the connector lug 27 on the end of the feeder tap 5. (See Figure 1.) The upper contact 28 is similar in form to the lower contact and is bolted to the upper insulator cap 22 by the cap screws
70 29. This contact also has a terminal lug 31 extending from its base portion, adapted for connection with the connector lug 32 on the end of the lead 6.

The movable switch member comprises a
75 pair of parallel switch blades 33 which are hinged at the lower hinge contact 25 upon a pivot stud 34'. The blades are disposed on opposite sides of the contact 25 and are retained in resilient contact therewith under
80 the tension of the spring washers 35 and 36. It will be noted that the stud end 34' is a reduced extension of the main pivot stud 34. The spring washer 36 bears against the shoulder formed by the enlarged shank 34
85 and by adjusting the lock nuts 37, tension can be imposed upon both washers.

The stud portion 34 extends thru a gear sector 38 and has its end journaled in a bearing bracket 39. The base of this bearing
90 bracket is attached by bolts 41 (Figure 3) to an extending portion 42 of the insulator cap 21. The stud 34 is journaled in a bushing 43 which is babbitted or set in any suitable manner in the head of the
95 bracket 39. The bevel gear sector 38 has a portion 44 extending along the switch blades 33 to which it is bolted, by bolts 45. Spacing washers 46 are disposed on the shanks of these bolts, between the blades 33 to retain the parallel spacing of the blades.

The bevel gear sector 38 meshes with a bevel pinion 47, which is keyed to the end of the switch operating shaft 8. The shaft
100 8 is supported in a bearing 48 which is formed integral with the insulator cap 21 thru the bearing bracket 49. Obviously, rotation of the shaft 8, thru actuation of the lever mechanism 9 at the foot of the pole, will operate thru the gears 47 and 38
105 to revolve the switch blades 33 into or out of contact with the upper contact clip 28. The thrust of the gear sector 38 is borne by the bearing support 39, thru the collar 51 of the brass bushing 43.

The free ends of the spaced blades 33 are pressed against the sides of the upper contact 28 by bolts 52 and cooperating spring washers 53.

I have designed the switch to carry a relatively large current flow. To prevent burning of the main blade and main contact on the break, I have provided auxiliary quick break contacts arranged to remain in contact until the main contacts have separated
120 a pre-determined distance and then to open with a snap motion. This arrangement is embodied in the pair of auxiliary blades 54 which are pivoted on opposite sides of a pivot block 55. This pivot block is bolted
130

between the main blades 33 by bolts 56 and at its end is formed with laterally projecting stop pins 57. The auxiliary blades 54 are normally retained in engagement with the main blades 33 under the tension of the spring 58, disposed between the blades and attached to shouldered studs passing thru each pair of blades. The blades 54 are offset outwardly slightly, adjacent the spring 58, to cause their free ends to clear the main contact 28. Between these free ends is bolted a block member 60 which is provided with an extending contact plate 59, abutting against the back sides of the blades 54.

The surface of the contact plate 59 engages a spring pressed auxiliary contact provided with a cylindrical contact head 62 and a compression spring 63, which tends to retain the contacts in engagement. The front shank portion 64 of the plunger contact is square and is guided in a square opening in the upwardly extending portion 65 of the insulator cap 22. The rear end of the plunger shank is threaded for the nuts 66, which clamp the ribbon conductor 67 to the auxiliary contact. This provides good electrical connection with the terminal cap 22.

A bracket 69 is secured to the upper end of the extension 65 and has a latch 71 pivoted between its two side wings. A compression spring 72 normally tilts the latch 71 downward so as to retain its hooked portion engaging over the shoulder pin 73 which is mounted between the ends of the auxiliary blades 54.

In the opening movement of the switch, the pivot of the auxiliary blades follows the main blades in their rotation away from the upper clip. This action is similar to the breaking of a toggle. The upper ends of the auxiliary blades will be held positively by the latch 71 until the main blade is opened to a predetermined extent, the latch and arcing contact 62 moving slightly to adjust themselves to the different inclinations of the auxiliary blade as the angle of divergence between the main and auxiliary switch blades increases. As soon as the main blade has cleared the upper clip a substantial distance, the pin 73 will be withdrawn from beneath the latch 71 and will be released. The auxiliary contact follows outwardly so as to take the arc of the break. The tension spring 58 will immediately draw the auxiliary blades against the main blade, quickly breaking the arc between the contacts 59 and 62. On the closing movement the pin 73 cams the latch 71 out to clear it and the parts resume the position illustrated. The bracket 69 is preferably adjustably attached to the extension 65, whereby it may be shifted to have the latch 71 release the pin 73 earlier or later in the opening movement of the main switch blades.

The pins or studs 57 are positive follow-

ing means to insure opening of the auxiliary contacts. In case the spring 58 should break the studs 57 would positively move the arcing blade 54 outwardly and as soon as the blade 54 was moved beyond center it would snap up against the main blade 33 by its own weight.

Considering now the switch operating mechanism it will be observed in Figure 1 that the shaft 8 extends down the pole 2 and has connection in a union 75 which has a square socket for the reception of the upper end of a bar or link of wood or other suitable insulation. The lower end of this link is supported in another union 75 which is connected to an extension 77 of the main shaft. This shaft extends down through the hub 78 of the switch operating device 9 and projects into a bearing in the hub 82 of the bracket 83. The shaft is divided into two sections between the link 76 and hub 78, which sections are coupled together by flanges 79 having opposing serrated faces for securing angular adjustment. The lower end of the hub 78 seats in a recess in the boss 82, integrally formed on the bracket 83. This bracket is bolted in any suitable manner to the pole 2.

A laterally extending handle socket 84 integral with the hub 78, is open along its lower side to receive the pivoted rod 85. The rod 85 extends into the end of a tubular arm or lever 86 which forms an operating handle. The handle 86 is provided with a locking tongue 87. The tongue is mounted on a sleeve 90 which embraces and is pinned to the handle 86. The bracket 83 is formed with a raised or rib flange 89, below the boss 82. The rib 89 is slotted for the lateral insertion of the tongue 87 as indicated by the dotted lines. A padlock 91, or the like may be inserted in a hole in the end of the tongue 87 to prevent withdrawal of the tongue from the slot in the flange 89. Thus the operating mechanism is locked to prevent throwing of the switch.

To operate the switch the tongue is unlocked and the operating lever 86 is revolved upward about its pivot 92 into the right hand dotted line position (Figure 4). The lever 86 is now revolved horizontally about the axis of the shaft 77 into the left hand dotted position. This is coincident with the open position of the movable switch member. When the arm 86 is moved down the tongue passes through the slot in the bracket, as indicated in dotted lines in Figure 1.

The serrated flanges 79 are provided to insure that the open and the closed positions of the movable switch member are coincident with the limit of angular movement of the operating lever 86. One of the flanges 79 is pinned to its respective shaft and the other is fastened with a set screw 93, whereby the flanges may be separated and their

shaft portions adjusted angularly relative to each other. It should be noted that the general mode of actuating the lever 86 is very similar to that of operating the lever of a railroad track switch. This is advantageous in the present installation in that railway employes familiar with the latter motion will have no difficulty in operating the switch.

In Figure 5 I have illustrated a modified arrangement of auxiliary arcing contacts and adjustable latching mechanism.

In this form the arcing contact on the auxiliary switch blades 54 consists of a roller 93 which is journaled on a shouldered bolt 94 extending between the ends of the auxiliary switch blades. This roller is arranged to contact with a curved contact finger 95 which is pivoted on a bolt 96 passing between lugs formed on the base plate 97. A spring 98, coiled about the bolt 96, tends to press the auxiliary contact finger 95 against the roller 93. This movement of the contact 95 is limited by an adjustable screw 99 which threads through an extension 101 on the finger and engages the base plate 97. This screw is adjusted so that on the closing movement of the switch blades the roller 93 will engage the tip of the finger 95 and cam the same slightly upward. The finger 95 is preferably provided with a conducting ribbon or wire 102 which has connection with the extension 65 and which carries the greater part of the current drawn in arcing. The base plate 97, which supports the contact finger 95 and the adjustable latch, is secured to the extension 65 by screws 103.

The auxiliary blades are latched in their closed position by a latch member 104 which is pivoted on a bolt 105 extending between lugs formed on the base plate 97. The hook end of the latch engages over a pin or bolt 106 which extends between the spaced blades 54. This latch is also held against the pin 106 by a coiled spring 107. An adjusting screw 108, threaded through the extension 109, is adapted to engage the base plate 97 to limit the follow-up motion of the latch member during the opening movement of the main switch. During the initial part of this opening movement the latch 104 follows the pin 106 and retains the auxiliary blades latched. When the main switch blades reach a predetermined open position the screw 108 strikes the base plate 97 stopping the latch 104 and the toggle motion of the auxiliary blades withdraws the pin 106 from beneath the hooked end of the latch. The quick break motion of the auxiliary blades wipes the roller 93 off of the tip of the finger 95, quickly extinguishing the arc drawn therebetween. The release of the pin 106 from the latch 104 can be made to occur at different degrees of opening of the main

switch by adjusting the screw 108. The release of the auxiliary contacts is always positive, and thus a uniformity and reliability of operation is assured.

In this form I have illustrated abutment blocks 110 screwed to the outer sides of the main switch blades 33 for receiving the impact of the auxiliary blades upon their release. Inwardly projecting spring tongues 111 are interposed between the abutment blocks 110 and the switch blades 33, as shown in Figure 8, for sliding the auxiliary blades into position. The abutment blocks 110 provide projecting shoulders 112 against which the auxiliary blades strike.

In Figures 6 and 7 I have shown a double pole switch comprising two switch blades operated by the same handle through intermediate gears. Double pole switches are widely used in various systems, particularly in systems of incandescent lighting to insure the thorough separation of the circuit from the main conductor or leads when cut out and to diminish the spark.

The form of switch shown in Figures 6 and 7 which may be mounted on a slab 136 of marble, slate or other suitable insulating material, although it may be mounted by means of insulators 137 on a base plate 138, as shown in dotted lines, comprises two separate switches 115 and 116. The detailed construction of each being substantially the same as that described in connection with Figure 5. In this form, spur gear sectors 117 and 118 have portions 119 and 120 extending along the switch blades 121 and 122 respectively, to which they are suitably secured by bolts 123. The spur gear sectors 117 and 118 mesh with a pair of pinions 124 and 125, these pinions being suitably splined upon a switch operating shaft 126. The opposite ends of the shaft 126 are supported in bearing brackets 127 and 128 respectively. The studs forming pivotal mountings for the switch blades 121 and 122 have their ends journaled in the brackets 127 and 128. An operating handle 129 is splined upon the switch operating shaft 126, this shaft being divided into two sections which sections are coupled together by a link 130 of wood or other suitable insulating material.

It will now be apparent that rotation of the shaft 126 through actuation of the operating handle 129 will operate through the pinions 124 and 125 to revolve the switch blades 121 and 122 into or out of contact with the upper contacts 131 and 132.

As shown in dotted lines in Figure 7 this form of switch is equally as well adapted for a three phase system. In this case the shaft 126 is extended and a third pinion 133 is provided thereon, this pinion operating upon actuation of the handle 129 through a spur gear sector 134 provided on the switch blade 135 to open or close the same.

In Figure 9 I have shown a modified form of contact member. The essential difference between this type of contact and that shown in Figure 2 is that a terminal socket 141 instead of a terminal lug, extends laterally from the main portion of the contact member 140. In this case a connector lug is not needed, the end of the feeder trap 5 being received and soldered or otherwise metal-

lically secured into the socket 141. I intend that the various modifications and rearrangements of parts apparent to those skilled in the art shall come within the scope of the appended claims.

I claim:

1. In combination, a vertical switch base, a fixed and a movable switch member on said base, said movable member moving in a vertical plane, a bevel gear connected to the movable member, a vertical shaft having a bearing on said base, a bevel gear on the upper end of said shaft and meshing with the first bevel gear, a handle at the lower end of the shaft movable in a horizontal plane, and an insulating section in the shaft.

2. In a switch, a terminal clip; a stud extending thru said clip, a switch blade pivoted on said stud, a gear sector secured to said switch blade, a frame having a bearing, said stud extending thru said gear sector and engaging in said bearing, a pinion meshing with said gear sector, a shaft having a bearing in said frame and extending thru said pinion and operating means for rotating said shaft.

3. In combination, a switch, a shaft for operating said switch, gears connecting said shaft to said switch, an insulating segment in said shaft, a lever pivoted on said shaft for rotating the same, said lever being movable to positions parallel to said shaft, and means for locking said lever in one of said parallel positions.

4. In combination, a switch, a shaft for operating said switch, gears connecting said shaft to said switch, a lever pivoted to said shaft for rotating the same, said lever adapted to be swung into positions substantially parallel to said shaft when said switch is either open or closed, and means for locking said lever in said parallel positions.

5. In combination, a switch, a shaft for operating said switch, gears connecting said shaft to said switch, a supporting bracket, a hub member secured to said shaft, a bearing in said bracket, an operating lever pivoted to said hub member, a tongue on said lever adapted to pass thru an opening in said bracket, and means for locking said tongue in said opening.

6. In combination, a switch, a shaft for operating said switch, gears connecting said shaft to said switch, a locking lever for rotating said shaft, and means for permitting

relative angular adjustment between said lever and said gears.

7. In combination, a switch, a shaft for operating said switch, gears connecting said shaft to said switch, an operating lever on said shaft, said operating lever being movable into locking positions corresponding to the open and closed positions of said switch, and an adjustable coupling interposed in said shaft.

8. In a switch, a pair of switch terminals, a switch blade pivoted on one of said terminals, a bevel gear secured to said switch blade, a bevel pinion meshing with said bevel gear, a shaft for rotating said bevel pinion, an insulating section in said shaft, a bracket, a hub member secured to said shaft and pivoted in said bracket, an operating lever pivoted to said hub member, said operating lever adapted for horizontal movement for rotating said shaft and adapted for vertical movement to permit locking of said lever to said bracket.

9. In a switch, a pair of insulators, terminals mounted on said insulators, switch clips on said terminals, a pivot stud in the hinge clip, a switch blade provided on said stud, a bearing extending from said hinge terminal for supporting said stud, a bevel gear between the hinge clip and bearing, said bevel gear being secured to the switch blade, a second bearing extending from said hinge terminal, a shaft in said latter bearing, a bevel pinion on said shaft meshing with said bevel gear, and means for rotating said shaft.

10. In a switch, a pair of insulators, terminals mounted on said insulators, switch clips on said terminals, a switch blade pivoted on the hinge clip, a bearing support, a bevel gear pivoted in said bearing support, said bevel gear being secured to said switch blade, a bevel pinion meshing with said bevel gear, a shaft for said bevel pinion, and means for rotating said shaft.

11. In a switch, a switch terminal, a movable switch member adapted to contact with said terminal, a pair of auxiliary contacts, one of said contacts comprising a rigid blade pivotally mounted on said movable switch member, latch means for holding said auxiliary contacts together, said latch means adapted to release said auxiliary contacts after said movable switch member has broken contact with said switch terminal, initial opening movement of said auxiliary contact blade being away from its co-operating auxiliary contact.

12. In a switch, a switch terminal, a switch blade adapted to contact with said terminal, an auxiliary contact connected to said switch terminal, another auxiliary contact pivoted to said switch blade, means for separating said auxiliary contacts, latch

means for resisting said separating means, the release of said latch means being effected before the initial separating movement of said auxiliary contacts is started.

13. In a switch a switch terminal, a main switch blade adapted to contact with said terminal, an auxiliary contact on said terminal, an auxiliary blade pivoted to said main switch blade and engaging said auxiliary contact, a spring latch for holding said auxiliary blade in engagement with said auxiliary contact, a spring connection between main and said auxiliary blades for withdrawing the auxiliary blade from the auxiliary contact after the latch has been released, and a stop pin on said main blade for positively withdrawing the auxiliary blade in case of failure of the spring.

14. In combination, an electric switch having a movable blade, an operating shaft, gears connecting the shaft and the switch blade, an operating lever pivoted to the shaft, said lever having a pivot lying at right angles to the plane determined by the handle and the shaft.

15. In combination, a switch, an operating shaft, gears connecting the shaft and the switch, an operating lever pivoted to the shaft, said lever having a pivot lying at right angles to the plane determined by the handle and the shaft, and means for locking the lever at either end of its stroke when moved on said pivot to a position substantially parallel with the shaft.

16. In combination, a switch, an operating shaft, gears connecting the shaft and the switch, an operating lever pivoted to the shaft, said lever having a pivot lying at right angles to the plane determined by the handle and the shaft, means for locking the lever at either end of its stroke when moved on said pivot to a position substantially parallel with the shaft, and an angularly adjustable coupling connected in said shaft.

17. In combination, a switch having a pivoted blade, a shaft for operating the blade, gears connecting the blade and the shaft, an angularly adjustable coupling connected in said shaft and a handle for the shaft

18. In combination, a main movable switch member, a main switch contact, an auxiliary or quick break member, an auxiliary or quick break contact and means for positively holding said auxiliary parts in engaging position independently of the main switch parts.

19. In combination, a main movable switch member, a main switch contact, an auxiliary or quick break movable member pivoted to the main member and an auxiliary or quick break contact independent of the switch contact and means for holding the auxiliary parts positively in engagement.

20. In a switch, a main movable member,

a main contact, an auxiliary member, an auxiliary contact, means comprising a rigid latch hook independent of the main switch parts for holding the auxiliary parts in engagement until the main member is opened a predetermined distance from the main contact.

21. In a switch, a main movable member, a main contact, an auxiliary member, an auxiliary contact, means for separating the auxiliary parts and a positive latch member independent of the main switch parts for holding said parts in engagement until a predetermined position in the opening of the main member is reached.

22. In a switch, a main blade, a main contact, an auxiliary blade pivoted to the main blade, an auxiliary contact independent of the main switch parts, a latch for holding the auxiliary blade in engagement with the auxiliary contact, said auxiliary blade being releasable only after the main blade has been moved to a predetermined open position, and a spring for the auxiliary blade to separate it from the auxiliary contact.

23. In a switch, a main blade, a main contact, an auxiliary blade electrically connected to the main blade and pivoted thereupon, a spring connecting the main and the auxiliary blades, an auxiliary contact independent of the main switch parts, a spring means for pressing the auxiliary contact against the auxiliary blade, said auxiliary contact being electrically connected to the main contact and a latch for positively holding the auxiliary blade.

24. In combination, a main blade, a contact for the blade, an auxiliary arcing blade for sustaining the arc caused by opening the main blade, a spring for the auxiliary blade, said auxiliary blade being pivoted to the main blade and a movable detent for holding the auxiliary blade until the opening motion of the main blade withdraws the auxiliary blade laterally from beneath the detent.

25. In combination, a main blade, a contact for the blade, an auxiliary or arcing blade, a spring for moving the auxiliary blade to open position, said auxiliary blade having a co-operating contact, a detent adapted to overhang the auxiliary blade to hold the same in closed position, said detent and blade being disengaged by lateral motion with respect to each other, one of said parts being moved laterally by opening movement of the main blade.

26. In combination, a stationary switch clip, a pair of switch blades lying against opposite faces of said clips for making electrical contact therewith, said blades being connected together, a co-operating contact switch clip adapted to be inserted between said blades when the switch is in

closed position. a stationary bracket arm independent of the first switch clip, a shaft passing through the arm and through the first switch clip, a gear member mounted concentrically on said shaft and secured to the blades, and a co-operating gear meshing with said gear member for operating the switch blades.

27. In combination. an insulator, a base member mounted on the top of the insulator, a stationary switch clip on said member, a switch blade, a bracket on said base member, a shaft passing through the bracket and the switch clip, said bracket serving as a pivot for the blade, a gear member mounted on the shaft and secured to the blade, a gear meshing with the gear member, a shaft for the gear and a bearing for said latter shaft mounted on said base member.

28. In a switch, a base, a pair of switch terminals mounted on the base, a switch blade mounted on one terminal for pivotal movement to open and close the switch, a shaft for operating said blade and extending substantially in alignment with the blade when in closed position, and gearing operatively connecting the shaft and said blade.

29. In a device of the kind described, a base, a pair of switch terminals mounted on the base, and insulated therefrom, a switch blade pivotally mounted on one terminal for movement in a vertical plane for opening and closing the switch, the pivotal terminal arranged below the other terminal, a shaft for operating said blade extending vertically, and substantially in alignment with said blade, when in closed position, and gearing operatively connecting said shaft and blade.

30. In a device of the kind described, a switch terminal rigidly secured in position, a switch blade pivotally mounted on the switch terminal for pivotal movement for opening and closing the switch, a gear sector secured to the blade, a bearing rigid with said terminal, a shaft extending through said bearing, a pinion on said shaft meshing with said gear, said shaft extending in substantial alignment with the blade when in closed position, shaft operating means fixed to the shaft at a distance from said terminal, and an insulation section in said shaft.

31. A rigid post, a make and break switch mounted on the post adjacent to its top, a shaft rotatively mounted on the post and extending down the post from said switch, gearing operatively connecting the shaft with said switch, an operating handle pivotally connected to the lower end of the shaft, means for locking the handle in substantial alignment with the shaft, the handle movable to a position substantially

at right angles to the shaft for rotating same.

32. In a switch, a pair of insulators, caps fixed on said insulators, terminals mounted on said caps, switch clips on said terminals, one thereof being a hinge clip, a pivot pin in said hinge clip, a switch blade mounted on said pin, a rigid bearing extending from the hinge clip terminal for supporting said pin, a bevel gear between the hinge clip and the bearing said bevel gear being secured to the switch blade, a second bearing extending from said hinge terminal, a shaft in said latter bearing, a bevel pinion on said shaft meshing with said bevel gear, and means permanently attached to said shaft for rotating same.

33. In a switch, a pair of insulators, caps rigidly mounted on said insulators, terminals mounted on said caps, switch clips on said terminals, one thereof being a hinge clip, a switch blade pivoted on the hinge clip, a bearing support carried by the hinge terminal cap, a bevel gear pivoted on said bearing support, said bevel gear being secured to said switch blade, a bevel pinion meshing with said bevel gear, a shaft for said bevel pinion, and means carried by the shaft for rotating same.

34. In an electric switch, a switch terminal, a main switch blade for contact with the terminal, an auxiliary switch blade pivoted to the main blade, a follow-up contact member mounted on the terminal and yieldingly held in engagement with the auxiliary blade, a latch for retaining the auxiliary blade in contact with the follow-up member until the main blade has separated from the terminal, the follow-up member arranged to have contact with the auxiliary blade after release from the latch and until the main blade has separated from the terminal sufficiently to prevent the drawing of an arc at this point.

35. In an electric switch, a switch terminal, a main switch blade for contact with the terminal, an auxiliary blade pivotally mounted on the main blade, an auxiliary contact member movably mounted on the terminal, means for holding the auxiliary contact member yieldingly in contact with the auxiliary blade, a latch for retaining the auxiliary blade in engagement with the contact member as the main blade is moved to open the switch until the auxiliary blade has separated sufficiently from the terminal to prevent arcing therebetween, and means carried by the blade for withdrawing the auxiliary blade out of contact with the auxiliary contact member after being released from said latch.

36. In a switch, a switch terminal, a main switch blade, an auxiliary blade pivotally mounted at one end of the main blade and auxiliary contact pivotally mounted on the

terminal and means for holding it in yielding contact with the auxiliary blade, a latch for retaining the auxiliary blade in engagement with the auxiliary contact during the initial opening movement of the main blade, the auxiliary blade adapted to be released from the latch by the continued opening movement of the main blade, and means for continuing the engagement between the auxiliary blade and the auxiliary contact after the release of the auxiliary blade from the latch to cause the final breaking arc to be drawn between the auxiliary blade and the auxiliary contact.

37. In a switch, a pair of terminals, a main switch blade pivotally mounted on one terminal and adapted to contact with the other terminal, an auxiliary blade pivotally mounted on the main blade at one end, the pivot arranged between the ends of the main blade and the free end of the auxiliary blade extending in the direction of the free end of the main blade, an auxiliary contacting finger yieldingly held in engagement with the free end of the auxiliary blade, a

latch for retaining the auxiliary blade in contact with said finger, the auxiliary blade adapted to be withdrawn from the latch by the opening movement of the main blade and to be released therefrom after the main blade has separated from the terminal, the yielding contact finger adapted to follow the free end of the auxiliary blade and maintain contact therewith after release from the latch to cause the final breaking arc to be drawn between the auxiliary blade and the contact finger and not between the auxiliary blade and the terminal.

38. In combination, a main blade, a main contact for the blade, an auxiliary arcing blade for sustaining the arc caused by opening the main blade, a spring for the auxiliary blade, said auxiliary blade being pivoted to the main blade, and means independent of the main contact for holding the auxiliary blade until the opening motion of the main blade withdraws the auxiliary blade.

In witness whereof, I hereunto subscribe my name this 15 day of June, A. D. 1918.

ERNEST H. JACOBS.