July 3, 1934. R. WILKINS 1,965,272

ELECTRIC SWITCH

Filed June 2, 1932 4 Sheets-Sheet 1

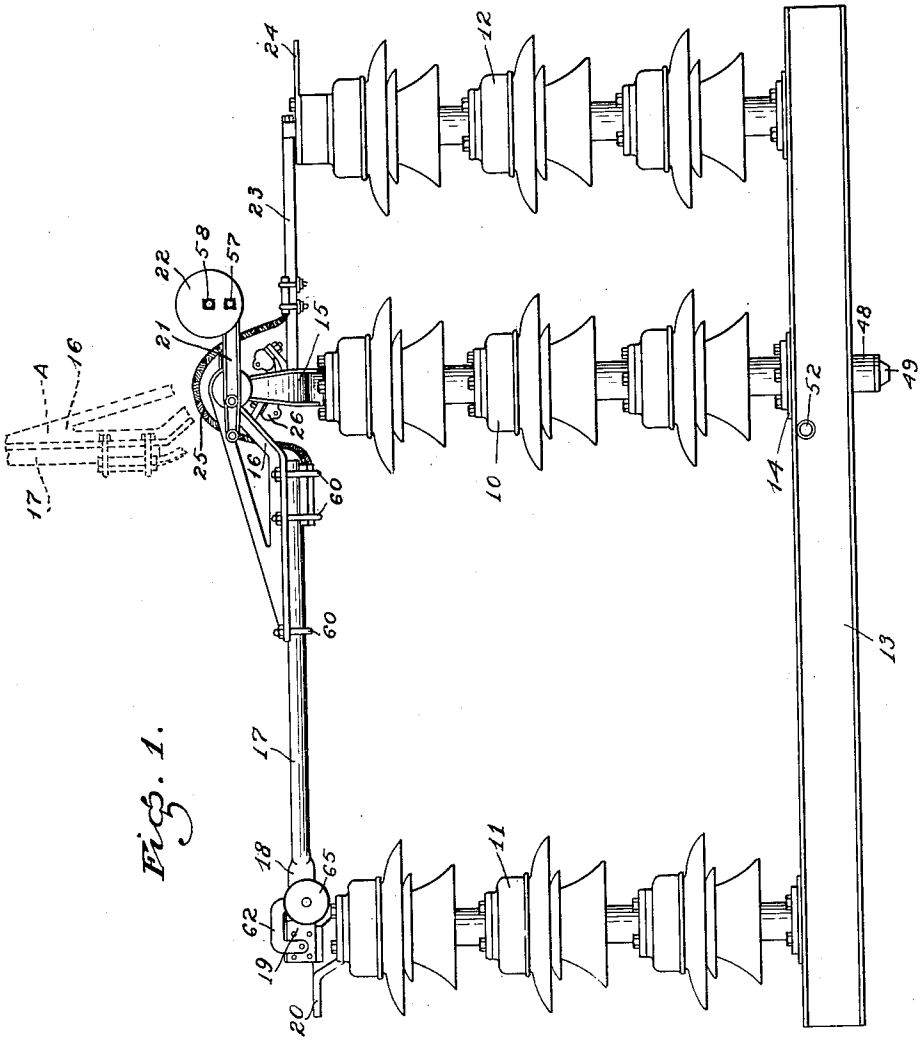


Fig. 1.

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Fig. 2.

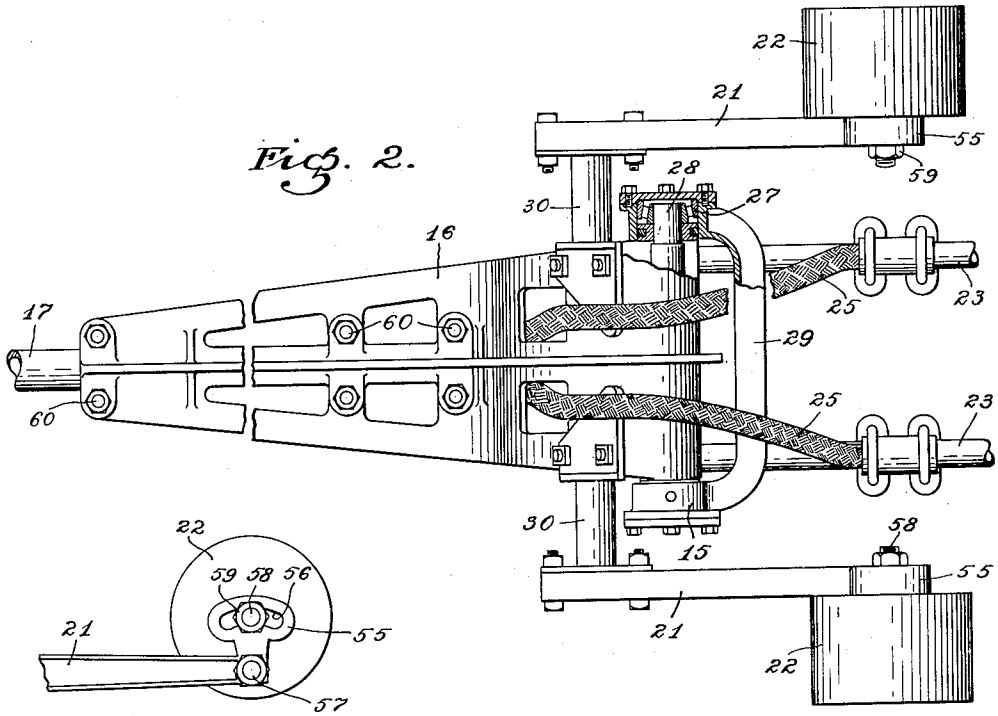
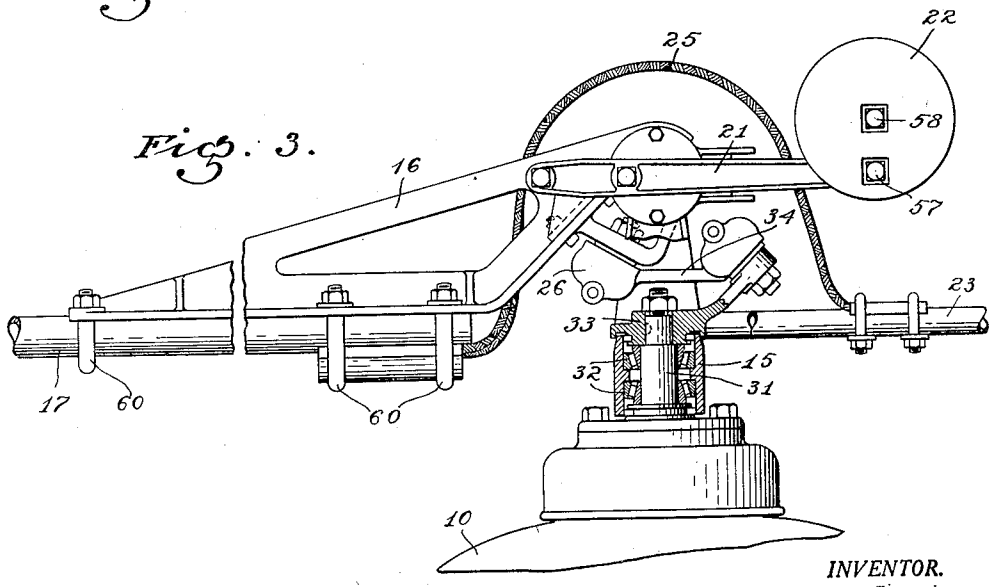


Fig. 8.

Fig. 3.



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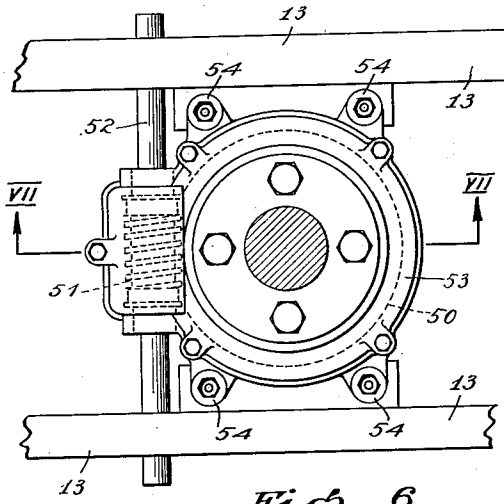


Fig. 6.

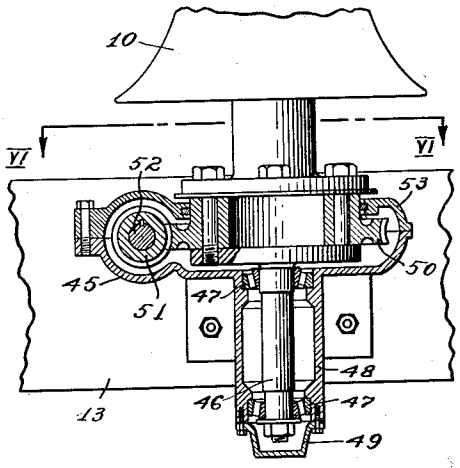


Fig. 7.

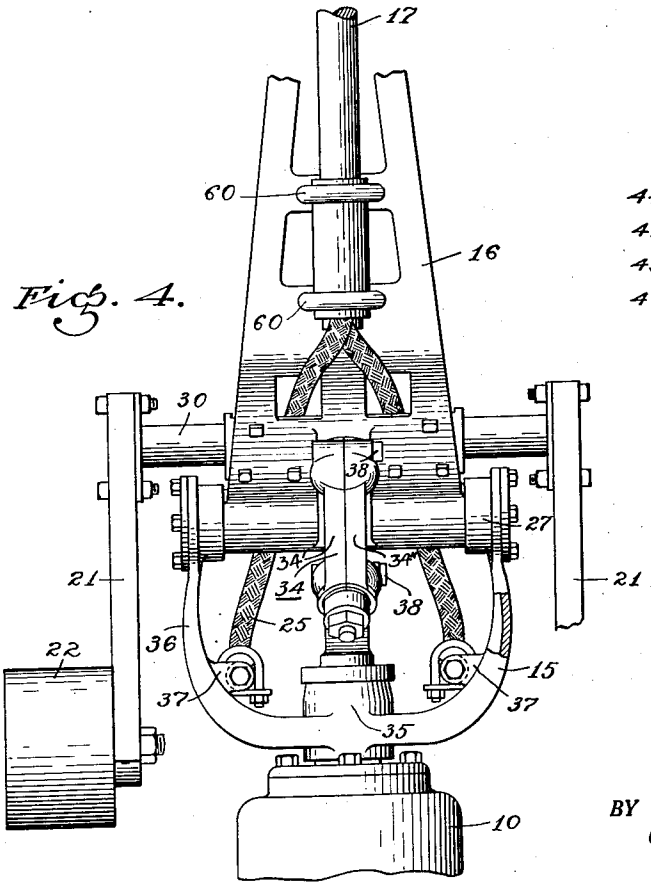


Fig. 4.

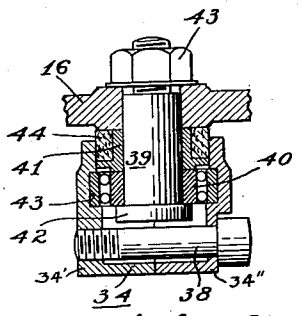


Fig. 5.

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ELECTRIC SWITCH

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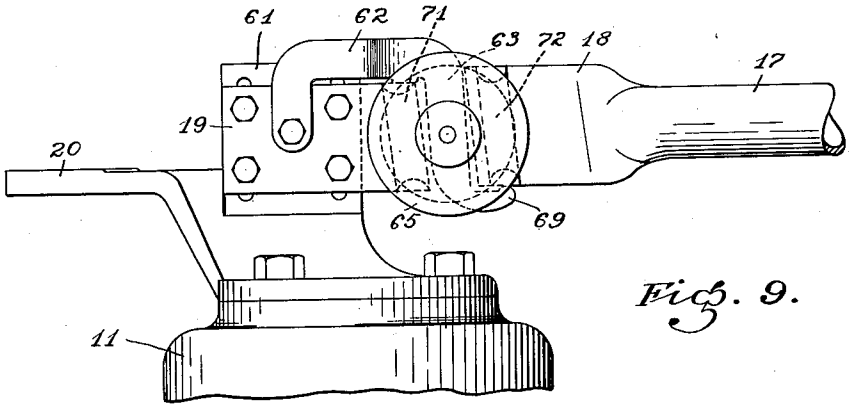


Fig. 9.

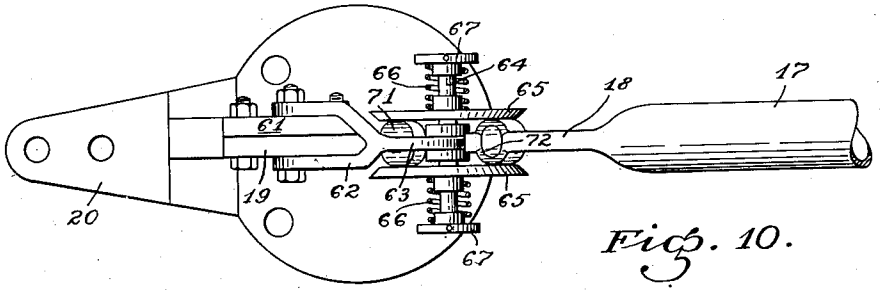


Fig. 10.

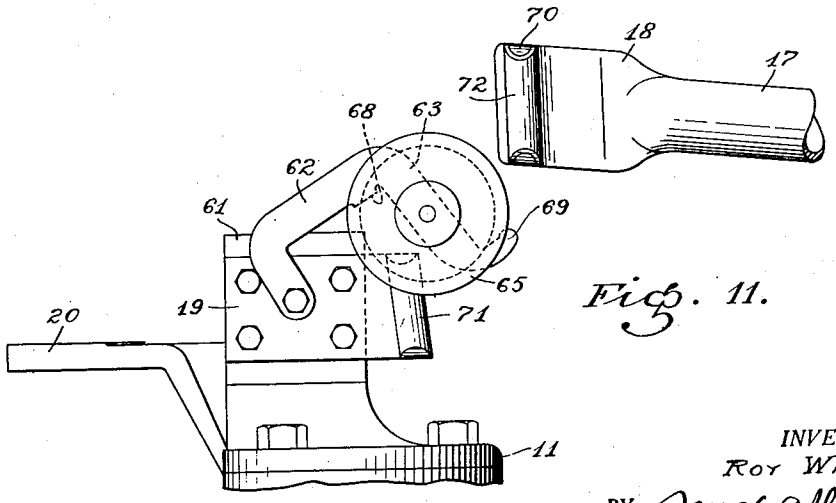


Fig. 11.

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Patented July 3, 1934 1,965,272

UNITED STATES PATENT OFFICE

1,965,272

ELECTRIC SWITCH

Roy Wilkins, San Francisco, Calif.

Application June 2, 1932, Serial No. 614,897

21 Claims. (Cl. 200—48)

My present invention relates to electrical switch apparatus, and more particularly to disconnecting switches of the type used in sectionalizing and interrupting high tension electrical transmission lines.

An object of my invention is to provide an efficient switch and operating means which is adapted to use in connection with either single or multiphase circuits, where it is necessary to sectionalize a power transmission line or to open or close a branch circuit at the point of intersection with the main line, or for the protection of any other electrical equipment that may be operated from electrical high voltage transmission lines.

Another object of my invention is to provide a switch and operating means therefor which can be easily and positively operated under all conditions of use.

A further object of my invention is to provide a counterbalancing means for an electric switch of the type employing a relatively long blade which moves in a vertical plane.

Switches of the character contemplated by my invention are generally mounted in the open where they are subjected to all conditions of weather, and as a result it is necessary to provide cooperating contacts which can be easily opened and closed under normal and abnormal weather conditions. Therefore, it is another object of my invention to provide an improved switch than can be operated under all weather conditions, and also provide a positive contact between the stationary terminal and the movable switch blade.

Another object of my invention is to provide a contact clip for an electric switch which will make a wiping contact with the switch blade as the latter engages the contact clip and thus insure a good electrical contact under both normal and abnormal operating conditions.

A further object of my invention is to provide a stationary contact and moving switch blade of special construction which will produce a high contact pressure between the parts and also provide for the dissipation of heat.

With the above and other objects in view which will appear as the description proceeds, my invention resides in the construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims.

For a better understanding of my invention reference should be had to the following specification taken in connection with the accompanying drawings, wherein I have shown by way of illustration and not of limitation a preferred embodiment thereof.

In the drawings;

Figure 1 is a side elevation showing my improved switch in its circuit closing position.

Figure 2 is an enlarged fragmentary plan view of a portion of the switch,

Figure 3 is an enlarged fragmentary side elevation of the switch with a portion in section to disclose a detail of construction,

Figure 4 is an enlarged fragmentary end view with the switch blade raised,

Figure 5 is a fragmentary sectional view showing a detail of the switch,

Figure 6 is a plan view taken along line VI—VI of Figure 7,

Figure 7 is a partial sectional view taken along line VII—VII of Figure 6 showing the movable insulator supporting bearing and turning means,

Figure 8 is a side elevation showing the manner of securing the balance weight upon its supporting arm,

Figure 9 is a side elevation showing my improved switch contact in its closed position,

Figure 10 is a plan view of the switch contact illustrated in Figure 9, and

Figure 11 is a partial side elevation showing the position assumed by my improved contact as the switch blade is withdrawn therefrom.

In disconnecting or high tension switches, particularly those which are used infrequently or which are placed in the open and exposed to the elements, it is quite necessary that the operating parts be constructed so that they will not become inoperative owing to lack of lubrication or because of the contacts sticking or freezing due to poor contact.

The sticking of the switch in opening or closing is likely to be occasioned by corrosion of the contacts, ice and snow in the winter or an accumulation of dirt in the summer. These cause an increase in the coefficient of friction, both at the contacts and in the operating mechanism.

In the present invention, the switch is so made that the accumulation of dirt, corrosion, ice and snow, or loss of lubricant, affects the opening or closing of the switch but little. In addition, the switch is such that a very high pressure is permissible between the cooperating contacts without the necessity of causing the component parts of the switch to engage or disengage.

The construction of my switch actuating mechanism is such that it can be operated with a very small effort and the cooperating contact making

elements are so designed that a perfect wiping and high pressure contact can be made without adding any additional load upon the operating means. A further advantage obtained by my improved contact is that lighter insulators and actuating means are required than is the case where the switch contact pressure is produced by a final movement of the switch actuating means.

I have found by experience that, contrary to older views, a large contact surface is not necessary between the blade and the jaws, provided the contact pressure is very high and the heat conducting characteristics of the jaws are such that heat may be rapidly carried away and dissipated. This requirement is generally satisfied by jaws of copper or other metal of high electric conductivity which have a correspondingly high heat conductive capacity. The low working temperature of a switch under severe conditions depends more upon the pressure than upon the area of contact. This is due to the fact that the path of the current flows away from the point of contact. On switch parts having large areas of contact, the current is frequently carried at a few points and not over the whole surface, as the air or lubricating field may only be broken down at a few points unless excessive pressure is used.

This invention makes use of the high pressure in establishing contact, does away with the necessity of lubricant, and makes it possible to construct a switch which can be readily operated at all times.

In Figure 1 of the drawings, for the purpose of illustrating my invention, I have shown a single pole switch. It is to be understood, however, that my invention may be made applicable to multiphase circuits by merely mounting any number of the single pole switches side by side upon a suitable support.

As here shown, the switch blade is mounted upon a central insulator post 10 and the stationary contact of the switch is mounted upon a similar insulator post 11. A third insulator post 12 is also provided for the purpose to be hereinafter described. The insulator post 10 is mounted to rotate about its vertical axis and the posts 11 and 12 are securely fixed in spaced relation upon a structural iron support. In the drawings this support is illustrated as comprising two parallel channel beams designated by the numeral 13. The insulator post 10 is disposed in line with and between the insulator posts 11 and 12 and is journaled upon a suitable bearing 14, to be described in more detail hereinafter. At the top of the insulator post 10, I provide a saddle 15 having oppositely disposed bearings between which a switch blade carrying member 16 is journaled.

Projecting from the member 16, I provide a tubular switch blade 17 which has a beaver-tail 18 formed at this end. The beaver-tail end 18, when in its lower position as here illustrated, is adapted to engage a special form of contact 19 carried by the stationary terminal 20 secured at the upper end of the insulator post 11.

In order to counterbalance the weight of the switch blade 17 and its supporting member 16, and to insure ease of operation, I also provide a rearwardly projecting arm 21, upon the end of which there is adjustably secured a counterbalance weight 22. The saddle 15, upon which the switch blade 17 pivots, is journaled upon the projecting end of a shaft carried by the insulator post 10 and it is held against rotation, when the insulator post 10 is turned, by a pair of rearwardly projecting conducting members or stays 23 which are secured to a terminal 24 mounted at the upper end of the insulator post 12.

In order to insure a low resistance circuit between the switch blade 17 and the conducting stay members 23, I provide a flexible braided cable 25 which is secured in clamped engagement at its ends with these members. In this figure of the drawings the dotted outline, designated by the letter A, illustrates the position taken by the carrying member 16 and the switch blade 17 when the switch is fully open.

The above briefly describes the general arrangement of the several parts of my invention. At this point it is only necessary to state that, as a means for operating the switch, I provide an articulate connection 26 between the upper end of the insulator post 10 and the switch blade 17. This connection imparts a vertical movement to the blade 17 as the insulator post 10 is rotated in one direction or the other.

By referring to Figure 2 of the drawings it will be seen that the saddle 15 is provided with a pair of spaced and axially aligned roller bearings 27. These bearings 27 are disposed centrally over the axis of the insulator post 10 and carry a shaft 28 upon which the switch blade carrying member 16 is mounted. The saddle 15 is also shown as having an additional web or brace 29 between the bearings 27 which serves to strengthen the saddle. The switch blade supporting member 16 is also shown as having a pair of outwardly projecting supports 30, upon the ends of which the counterbalance weight supporting arms 21 are mounted. This figure of the drawings also very clearly illustrates the flexible cable 25, previously referred to, as passing over and threaded through openings in the blade supporting member 16.

In Figure 3 of the drawings it will be seen that the insulator post 10 is provided with an upwardly extending shaft 31 which is journaled in the saddle 15 by means of roller bearings 32. Keyed upon the end of the shaft 31 there is also shown a crank arm 33 which is adapted to gyrate with respect to the saddle 15 when the insulator post 10 is rotated. At the end of the crank arm 33 there is mounted a stub shaft having its axis disposed at an angle of 90 degrees with a similar but oppositely disposed stub shaft carried by the switch blade supporting member 16. Mounted upon and carried by the above referred to stub shafts, I show a connecting link or member 34 which is to be described in more detail hereinafter.

Figure 4 of the drawings shows the switch blade 17 and its supporting member 16 in the vertical or open position. As here illustrated, the saddle 15 has a central body portion 35, from the sides of which project outwardly and upwardly extending horns or arms 36. These arms 36 carry the oppositely disposed bearings 27 which support the member 16. Each of the horns or arms 36 of the saddle 15 carries an inwardly projecting ear 37, to which the ends of the conducting members or stays 23 are affixed in any suitable manner. As at present constructed, each of the stays 23 consists of a tubular conductor which is held under compression between the ears 37 upon the saddle 15 and similar ears upon the terminals 24 by means of a solid conductor passing therethrough. The solid conductor is provided with nuts at each end which securely hold the stays 23 in position.

When the switch blade is in its full open position it will be noted that the connecting link 34 will take a substantially vertical position and

therefore in moving from its horizontal position, as illustrated in Figure 3 of the drawings, it will float or gyrate through an angle of 90 degrees as the insulator post 10 makes a half revolution.

In order to facilitate an assembly of the link 34 upon the oppositely disposed stub shafts carried by the switch member 16 and the crank member 33, I have formed the link in two similar halves 34' and 34'' which are secured together by screws 38, as illustrated in Figures 4 and 5 of the drawings. In Figure 5 of the drawings the stub shaft upon the switch blade carrying member 16, which I shall designate by the numeral 39, is shown as having a roller bearing 40 comprising an inner and outer ball race secured at the end thereof between a spacing collar 41 and an enlarged head 42 upon the end of the stub shaft. The stub shaft 39, together with the bearing 40 and the collar 41, is then secured upon the member 16 by means of a nut 43. When the stub shaft 39 and the similarly equipped stub shaft carried by the crank arm 33 are assembled in their proper relation, it is a simple matter to mount the link 34 there between. The halves 34' and 34'' of the link 34 are provided at both ends with suitable recesses 43 which are adapted to engage the outer race of the roller bearings 40. When the halves of the link 34 are thus placed in position upon the stub shafts referred to above, the connection is easily completed by securing the halves together with the screws 38. The collar 41 is provided with a felt dust excluding ring 44 which serves to prevent the entrance of water and dust into the interior of the connecting link 34.

By referring to Figures 6 and 7 of the drawings which show the supporting bearing and driving means for the rotatable insulator post 10, it will be noted that I have provided a supporting housing 45 which, in addition to providing a support for the insulator post 10, also completely encloses the bearing and driving means. As here illustrated, the insulator post 10 is provided with a downwardly extending central shaft 46 which is journaled upon a pair of vertically disposed thrust bearings 47. The bearings 47 are mounted in spaced relation in an outwardly projecting sleeve 48 carried by the lower half of the supporting housing 45, and at the lower end of the sleeve 48 there is provided a cover 49 which permits the housing 45 to be completely filled with a suitable lubricating grease.

Secured upon the insulator post 10, immediately above the shaft 46, there is provided a worm gear 50 which engages with a horizontally disposed worm 51. The worm 51 is mounted upon a transversely extending shaft 52 journaled upon the supporting housing 45.

Cooperating with the lower half of the supporting housing 45, I also provide an upper half or cover member 53 which is adapted to complete the enclosure of the worm gear 50, the worm 51, and the bearings 47.

In order to provide for a mounting of the supporting housing 45 upon a structural support, I provide outwardly projecting ears 54 which extend therefrom any convenient distance to engage a foundation.

By referring back to Figure 3, it will be noted that the counterbalancing weight 22 is not only disposed opposite to the switch blade 17 on a vertical plane but is also disposed above the axis of the switch blade supporting shaft 28. With this disposition of the weight 22 it will be seen that the switch blade 17, because of its offset arrangement with respect to the axis, will be counterbalanced in both its horizontal and vertical positions. In order to permit an adjustment of the weight 22 upon its supporting arm 21, I provide a means for securing the weight in its proper position, as illustrated in Figure 8. In this figure of the drawings the arm 21 is shown as having an upwardly extending flange 55 which has an arcuate slot 56. The weight is secured to the arm 21 at a point removed from its center of gravity by means of a bolt or stud 57 and the arcuate slot 56 is so disposed that it will lie substantially adjacent the center of gravity of the weight 22. A stud 58 carried by the weight 22 projects through the arcuate slot 56. With this arrangement the weight 22 can be pivoted about the bolt 57 to any desired position within the limits of the slot 56 and there be secured firmly upon the arm 21 by means of a nut 59 threaded upon the stud 58.

When my invention is embodied in a single pole switch the shaft 52 will project from only one side of the housing 45, but where a number of these switches are arranged in parallel the shaft 52 can be made common to all of the poles of the switch.

The adjustability of the counterweight 22, referred to above, is of special utility because of the fact that in the present invention it is contemplated that the switch blade 17 may be of different lengths and/or adjustable upon its supporting member 16 to adapt the switch to any spacing of the insulator posts 10 and 11, as determined by the voltage to be interrupted. In order to provide for this interchange or adjustment in the length of the blade 17, I have secured it to the blade support 16 by U bolts 60 which, when loosened, will permit a change of blades or an axial adjustment thereof.

By referring now to Figures 9, 10 and 11 of the drawings it will be seen that my invention also embodies an improved contact making clip in which a positive wiping contact will be made when the switch blade 17 is moved into and out of alignment with the stationary contact 19.

As here illustrated, the stationary contact 19 is mounted in alignment with the end of the switch blade 17 upon a vertically disposed flange 61 carried by the terminal 20. Pivotally mounted upon the contact 19 and/or the flange 61, I show a yoke or support 62 having a downwardly depending portion 63 that is adapted to normally lie between and in alignment with the ends of the contact 19 and the switch blade 17. As illustrated in Figure 10 of the drawings, the downwardly depending portion 63 of the support 62 carries a transversely extending shaft 64, upon which a pair of laterally movable and oppositely disposed contact making discs 65 are mounted. The discs 65 are adapted to rotate about the shaft 64 and also move outwardly there along when the contact 19 and/or the blade 17 are forced there between. On the outer side of each of the discs 65 there is provided a spring or other pressure producing means 66 which is held in operative relation with the discs 65 by means of a flanged collar 67. At this point it should be stated that the spring 66 may be secured upon the shaft 64 by other suitable means, and that a spring washer of the type commonly used in switch construction may be substituted for the springs 66 when desired.

In order to limit the lateral movement of the contact making discs 65 with respect to the stationary contact 19 and also stop the switch blade

17 when in proper alignment with these discs, I provide a stop 68 upon the yoke 62 which is adapted to engage the top of the stationary contact 19. A similar stop 69 is located at the lower end of the downwardly depending portion 63 which will be engaged by the switch blade 17 when the latter moves downwardly and into engagement with the contact making discs 65. With this arrangement it will be seen that both the yoke 62 and the switch blade 17 will be limited in their downward movement when the contact making discs 65 have assumed a position in alignment with the switch blade 17 and the contact 19. In the particular embodiment here illustrated, the contact 19 and the beaver-tail end 18 of the switch blade 17 are provided with oppositely disposed contact making surfaces which are to be described hereinafter, and the edges of the discs 65 are chamfered so that the raised contacting surfaces upon the switch blade 17 may easily spread the discs 65 when moved into engagement therewith.

In forming the oppositely raised contacting surfaces upon the terminal 19, I may solder or otherwise secure suitable elements thereupon or where this contact is made of tubular material I may form these surfaces in accordance with the procedure followed in forming the end of the switch blade 17, as will now be described.

In forming the beaver-tail end 18 of my improved switch blade 17, I first drill or otherwise provide a substantially transversely extending hole through the tubular switch blade before it is flattened. Into the hole thus formed through the blade I place a round or other shaped rod 70 of conducting material and then flatten the blade on each side of this rod to thus secure it in place. The ends of the rod 70 are then ground off to provide any desired chamfering at the edges of the contacting surfaces thus formed.

A contact having improved heat dissipating qualities can also be constructed by substituting for the rod 70 a mandril which can be withdrawn after the end of the blade 17 has been flattened down there around. When thus formed the contact will have a central opening therethrough which will provide additional heat radiating surface.

As illustrated in the drawings, the raised contact making surfaces upon the stationary contact 19 and upon the end of the blade 17, which I shall designate respectively with the numerals 71 and 72, are disposed at a slight angle from a vertical position. This disposition of the contact surfaces 71 and 72, in addition to providing for the arcuate movement of the discs 65, also improves the wiping action of the contact.

The operation of my improved switch may be described as follows:

When the switch is in its closed position, as illustrated in Figure 1 of the drawings, it may be opened by applying a torque to the shaft 52. This will cause the worm 51 to rotate the worm gear 50 and turn the insulator post 10 about its vertical axis. As the insulator post 10 is thus turned, the crank member 33 will be carried around with the insulator string and transmit this movement to the switch blade supporting member 16 through the floating or connecting link 34 which connects the stub shaft upon the crank 33 with a similar but oppositely disposed stub shaft 39 upon the blade supporting member 16.

When the crank 33 carries its stub shaft through an arcuate path located along a horizontal plane the stub shaft 39 upon the supporting member 16 will be moved through an arc located along a vertical plane. As a result the switch blade supporting member will be caused to move about the axis of the bearings 27 carried by the saddle 15 and the switch blade 17 will move upward and out of engagement with the contact carried by the terminal 20.

During the above movement of the switch blade 17 the saddle 15 will be held against rotation by the conducting stays 23 which extend over and connect with the terminal 24 of the switch. In addition to preventing rotation of the saddle 15, the stays 23 also serve to hold the upper bearings 32 and the shaft 31 of the insulator post 10 in proper alignment with the supporting bearings 47 at the lower end of the rotatable insulator post.

The operation of my improved contact may be described as follows:

When the switch blade 17 starts to move upwardly, from the position illustrated in Figures 1 and 9 of the drawings, it will cause the contact making discs 65 to rotate upon their supporting shaft 64 and move upwardly, with a rolling action, over the stationary contact 19 until the blade 17 has moved out of engagement therewith. When the switch blade 17 disengages with the discs 65 the latter will remain in substantially the position illustrated in Figure 11 of the drawings.

From the above it will be seen that the discs 65 will wipe across the contact making surfaces 71 and 72 and, because of the spring pressure exerted thereupon by the springs 66, produce a good electrical contact between the parts.

It should also be pointed out that by forming and disposing the contact making surfaces 71 and 72, as here illustrated, the discs 65 will make a uniform contact therewith throughout their length.

When the switch blade 17 moves into its final circuit closing position the raised surfaces 72 carried thereby will first engage the discs 65 and cause them to rotate about the shaft 64 and at the same time move downwardly over the stationary contact surfaces 71. During the final closing movement of the switch the discs 65 in rotating will cause the lower edge of the switch blade 17 to engage the stop 69 at substantially the same time as the stop 68 engages the top of the stationary contact 19.

In this latter movement of the blade 17 the stop 69 merely serves to insure a proper alignment of the contacts. This is because the operating link 34 cannot exert any further downward pressure upon the blade 17 after it has moved into its horizontal position, as illustrated in Figure 3 of the drawings.

In practice it is contemplated that means will be provided at the operating station to indicate the position of the switch blade 17 and when this is provided it will be possible to open or close the switch by turning the operating shaft 52 in either direction. In fact the switch may be both opened and closed by rotating the shaft 52 always in the same direction and therefore it may be controlled by a unidirectional motor if desired.

While I have, for the sake of clearness and in order to disclose my invention so that the same can be readily understood, described and illustrated a specific device and arrangement, I desire to have it understood that this invention is not limited to the specific means disclosed but

may be embodied in other ways that will suggest themselves, in view of this broad disclosure, to persons skilled in the art. It is believed that this invention is broadly new and it is desired to claim it as such so that all such changes as come within the scope of the appended claims are to be considered as part of this invention.

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

1. In a disconnecting switch, the combination of a switch blade support having a pair of oppositely and horizontally disposed bearings, a switch blade pivotally mounted between said bearings, a rotatable shaft disposed between said bearings having its axis intersecting and extending at a right angle to the axis of said bearings, an eccentrically disposed stub shaft secured to the end of said rotatable shaft, a second stub shaft carried by said switch blade, the axes of said rotatable shaft and said first and second stub shafts converging to a common center in line with and between said horizontally disposed bearings, and a floating link connected between said stub shafts for imparting an operating movement to said switch blade as said rotatable shaft is turned.

2. An articulated link connection for a disconnecting switch of the type having a blade that moves about an axis disposed at a right angle to its operating shaft, comprising a pair of stub shafts disposed in opposed relation to each other with their axes converging to a common center located along the axis of the operating shaft and the axis about which the switch blade moves, one of said stub shafts being secured to the switch blade and the other being carried as a crank upon the switch operating shaft, and a link having oppositely disposed bearings connected between said stub shafts.

3. In a disconnecting switch, the combination of a rotatable post of insulators, a switch blade support mounted upon said rotatable post of insulators, a switch blade pivotally mounted upon said support, an eccentrically disposed stub shaft secured to the end of said rotatable post of insulators, a second stub shaft secured to said switch blade and extending at a right angle to said first stub shaft, the axes of said rotatable post of insulators and said first and second stub shafts converging to a common center, and an articulate connection between said stub shafts for imparting an operating movement to said switch as said rotatable post of insulators is turned.

4. In a disconnecting switch, the combination of an insulated switch blade support, a switch blade pivotally mounted upon said support and adapted to move into and out of engagement with a stationary contact, a rotatable shaft for operating said switch blade disposed at a right angle to the axis about which said switch blade moves, an articulated driving connection between said switch blade and said rotatable shaft, said driving connection comprising a pair of stub shafts disposed in opposed relation to each other with their axes converging to a common center located along the axis of the rotatable shaft and the axis about which the switch blade moves, one of said stub shafts being secured to the switch blade and the other being carried by a crank upon the rotatable shaft, and a link connected between said stub shafts.

5. A full wiping contact for an electric switch, comprising a stationary blade, a movable switch blade disposed in alignment with said stationary blade when in its closed position, a pair of spaced rotatable conducting discs disposed with their opposed sides adjacent the end of said stationary blade, and a movable support for said conducting discs adapted to carry said discs in an arcuate path about the end of said stationary blade when the switch blade is moved into engagement therewith, whereby each of said blade members will engage the opposed sides of said discs with a wiping action to establish a circuit across said discs from said stationary blade to said movable switch blade.

6. A full wiping contact for an electric switch, comprising a stationary blade, a movable switch blade adapted to move into spaced end to end alignment with said stationary blade, a pair of spaced and axially aligned rotatable contact making discs disposed one on each side and adjacent the end of said stationary blade, and a support for said contact making discs adapted to move about the end of said stationary blade and assume a position between the ends of said stationary blade and said movable switch blade when the switch is in its closed position, whereby the rotatable discs will engage the stationary blade and the movable switch blade with a wiping action when the two blade members are moved there between and into end to end alignment.

7. A full wiping contact for an electric switch, comprising a flat stationary blade member having contact making surfaces on its opposite sides, a switch blade adapted to move into alignment with the end of said stationary blade member, two spaced and oppositely disposed discs each one of which is adapted to engage a contact surface upon the corresponding sides of said stationary blade member and said switch blade, and a support for said oppositely disposed discs adapted to permit them to rotate and move with a wiping action into and out of engagement with the sides of said stationary blade member and said switch blade when the switch blade is moved into and out of engagement therewith.

8. A full wiping contact for an electric switch, comprising a flat stationary member having a contact surface on each side, a movable switch blade having similarly disposed contact surfaces, a pair of spaced discs adapted to engage the contact surfaces upon the sides of said stationary member and said switch blade and form a conducting path there between, and a support for said spaced discs adapted to permit them to move in an arcuate path over the sides of said stationary member and engage the sides of the switch blade with a turning movement as the switch blade is moved into and out of engagement there between.

9. In a high voltage switch, the combination of a stationary blade member having contact surfaces on each side thereof, a movable switch blade adapted to align with said stationary blade member having similar contact surfaces on its sides, a conducting member disposed along each side of said stationary blade member and said movable switch blade adapted to engage the corresponding contact surfaces and form an electrical circuit across said conducting members between said stationary blade member and said movable switch blade, pressure means for forcing said conducting members into engagement with the contact surfaces upon said stationary blade member and said movable switch blade, and a support for said conducting members adapted to permit rotation and a transitory movement thereof with the switch blade as the latter moves into and out of engagement there-

with, whereby a wiping action will be produced between said conducting members and the contact surfaces of said stationary blade member and said movable switch blade.

10. In a high voltage switch, the combination of a stationary blade member having a raised and transversely extending contact surface formed on each side thereof, a movable switch blade having similar surfaces formed thereupon and extending substantially parallel with those formed on said stationary blade member when the movable switch blade is in its circuit closing position, a pair of oppositely disposed conducting members between which said stationary blade member and said movable switch blade may lie in end to end alignment, means for holding said conducting members in close engagement with the contact surfaces upon said stationary blade member and said movable switch blade, and a support for said conducting members adapted to permit rotation and a transitory movement thereof as the switch blade moves into and out of engagement there between.

11. In an electric switch, the combination of a blade like terminal contact, a movable blade adapted to align with said terminal contact when in its circuit closing position, a support pivotally mounted adjacent said terminal contact, and two oppositely disposed rotatable conducting discs between which said terminal contact and said movable blade may be disposed, each one of said discs being adapted to engage an adjacent and corresponding side of said terminal contact and said movable blade with a rolling movement as the blade is moved into alignment with said terminal contact.

12. In an electric switch, the combination of a blade like stationary contact, a moving switch blade adapted to align with said stationary contact when in its circuit closing position, a support pivotally mounted upon said stationary contact, and a pair of oppositely disposed members rotatably mounted upon said support and adapted to engage the sides of said switch blade and move in an arcuate path over the sides of said stationary contact, whereby they will engage said stationary contact and said moving switch blade with a wiping movement as the blade is moved into alignment with said stationary contact.

13. A blade for high tension switches of the character described, comprising a pivotally mounted tubular blade member having its contact making end flattened, and a transversely extending member of conducting material disposed within the flattened end of the tubular blade member to thereby form raised contact surfaces which extend transversely across the surfaces of the flattened end of the blade and in the plane of its movement.

14. A blade for high tension switches of the character described, comprising a pivotally mounted tubular member having its contact making end flattened, and a transversely extending cylindrical member of conducting material disposed between the sides of the flattened end of said tubular member to thereby form a semi-cylindrical contact surface on each side of the flattened end of the blade.

15. In a high tension switch of the character described, the combination of a pair of relatively movable blade like current conducting members having contact making surfaces on their opposite sides and adapted to be moved into alignment with each other, a conducting disc extending along each side of said current conducting members and bridging the adjacent contact surfaces thereof, and means for supporting and holding said discs in contact making engagement with said surfaces when said current conducting members are moved into alignment.

16. In an electric switch, the combination of a pair of relatively movable current conducting members adapted to move into spaced and end to end relation when in their circuit closing position, a pair of rotatable discs disposed one on each side of said conducting members and mounted upon a shaft extending transverse to the direction of relative movement of said members, and means for supporting said shaft and permitting a limited movement thereof adjacent the end of one of said relatively movable members, whereby said discs will rotate with a wiping movement into full contact with the sides of said relatively movable members and provide a current conducting path therebetween when said members are moved into their circuit closing position.

17. In an electric switch, the combination of a pair of relatively movable current conducting members adapted to move into spaced and end to end relation when in their circuit closing position, a pair of rotatable discs mounted in spaced relation upon a shaft extending transverse to the plane of movement of said members and between which said members may move, and means supporting said shaft and discs permitting a limited movement thereof adjacent the end of one of said members, whereby said discs will rotate with a wiping movement into full contact with the sides of said relatively movable members and provide a current conducting path there between when said members are moved into their circuit closing position.

18. In an electric switch, the combination of a pair of relatively movable blade like current conducting members adapted to move into spaced and end to end relation when in their circuit closing position, a pair of spaced rotatable discs disposed one on each side of said conducting members and mounted upon a shaft extending transverse to the direction of relative movement of said members, means extending between said discs and between the ends of said conducting members for supporting said discs and permitting a limited movement thereof adjacent the end of one of said blade like members, whereby said discs will rotate with a wiping movement into full contact with the sides of said relatively movable blade like members, and means for preventing further relative movement of said blade like members when they have come into full contact with said discs.

19. In an electric switch, the combination of a pair of relatively movable blade like current conducting members adapted to move into spaced and end to end relation when in their circuit closing position, a pair of spaced rotatable discs disposed in overlapping relation with the adjacent ends of said conducting members, and means for supporting said discs and permitting a limited movement thereof as the adjacent ends of said members are moved into engagement therewith, whereby said discs will rotate with a wiping movement into full contact with the sides of said relatively movable blade like members and provide a current conducting path therebetween when said blade like members are moved into end to end relation with each other.

20. A terminal clip for an electric switch of the knife blade type, comprising a stationary conducting member, a disc supporting shaft dis-

posed transversely adjacent the end of said stationary member, a pair of oppositely disposed discs rotatably mounted upon said shaft engaging opposite sides of said stationary member and projecting outwardly in spaced parallel relation to provide a clip into which the end of a switch blade may be moved, and means for supporting said shaft and permitting a limited movement thereof about the end of said stationary member as the switch blade is moved into and out of contact with said discs, whereby said discs will engage and disengage both said stationary member and said switch blade with a rolling and transitional movement as the switch blade is moved into and out of its circuit closing position.

21. A terminal clip for an electric switch of the knife blade type, comprising a flat stationary conducting member having a cross section corresponding substantially to the cross section of the blade cooperating therewith, a movable supporting member having a portion extending over the end of said flat stationary conducting member, a pair of oppositely disposed current conducting discs rotatably mounted upon said movable supporting member engaging opposite sides of said flat stationary conducting member and projecting outwardly beyond said movable supporting member in parallel relation to provide a clip into which the end of a switch blade may be moved, spring means for urging said discs into contact with said flat stationary conducting member and the end of the switch blade, and stop means carried by said movable supporting member to prevent further movement thereof when the switch blade has moved into its circuit closing position between said discs.

ROY WILKINS.