Jan. 2, 1940. O. FROLAND 2,185,729

ELECTRICAL SWITCH

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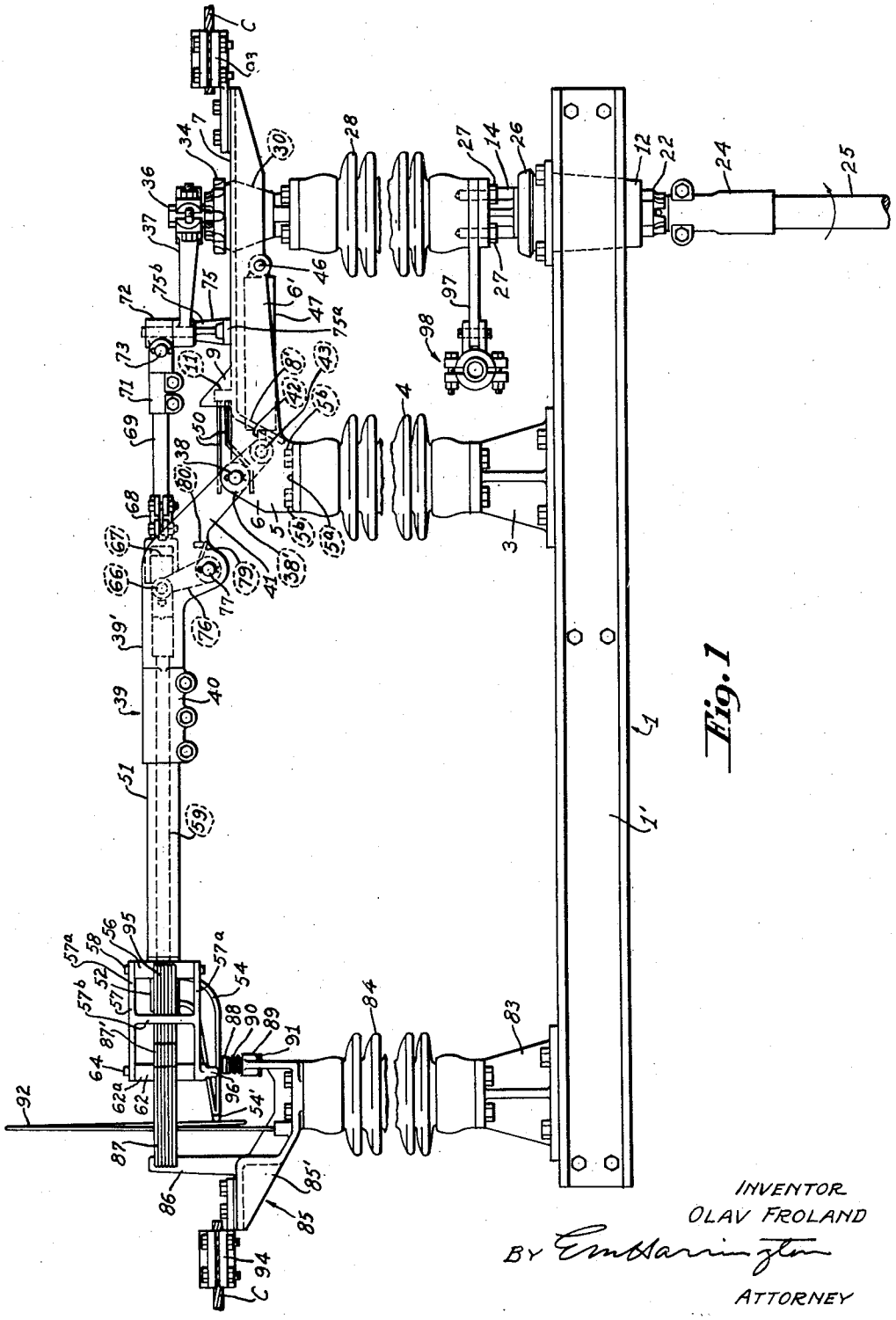


Fig. 1

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ELECTRICAL SWITCH

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Fig. 2

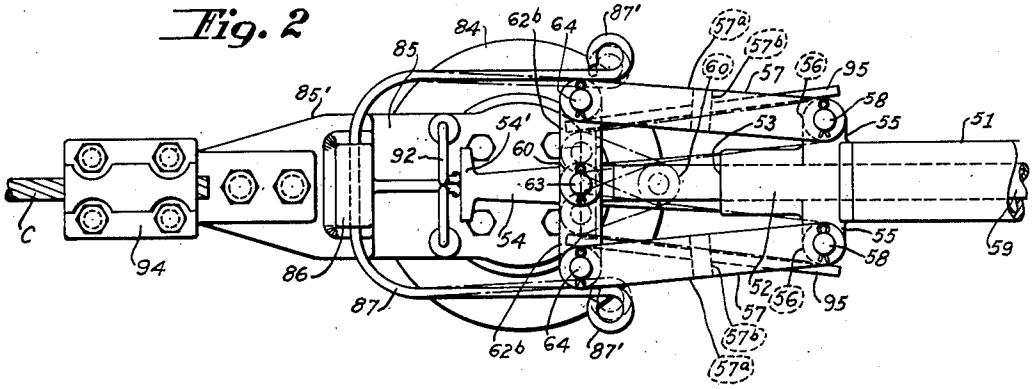


Fig. 3

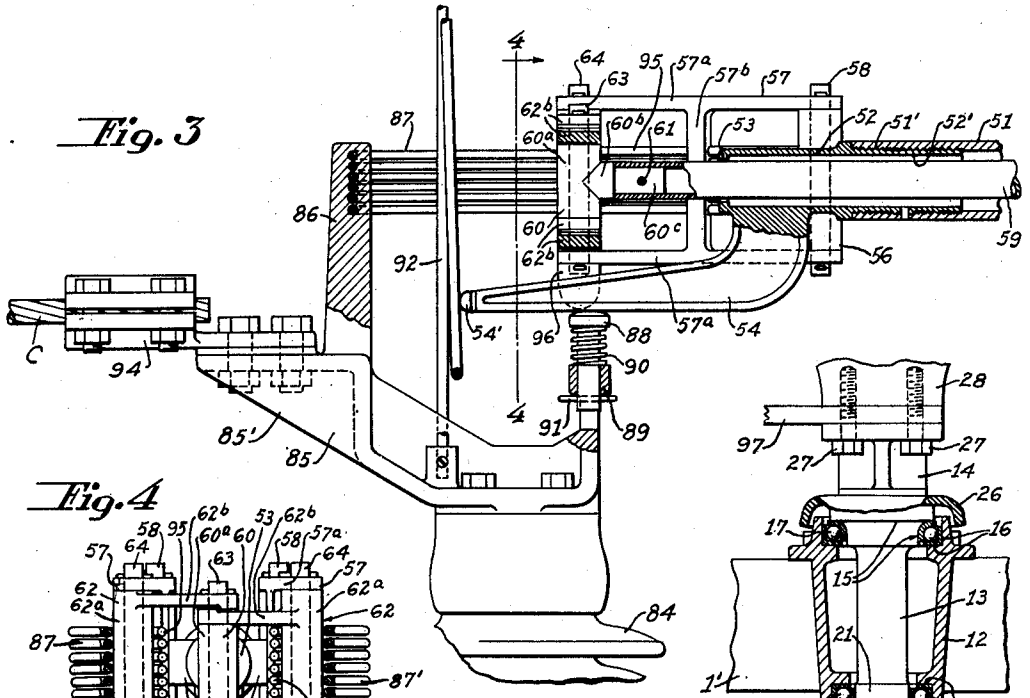


Fig. 4

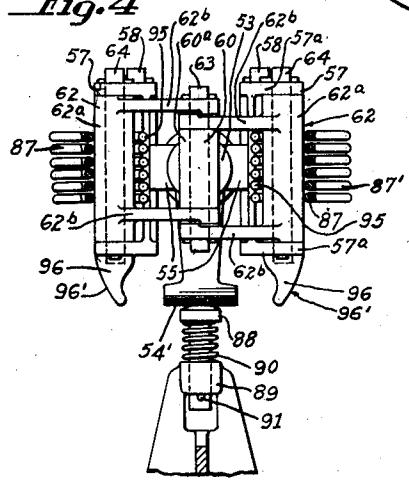


Fig. 8

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ELECTRICAL SWITCH

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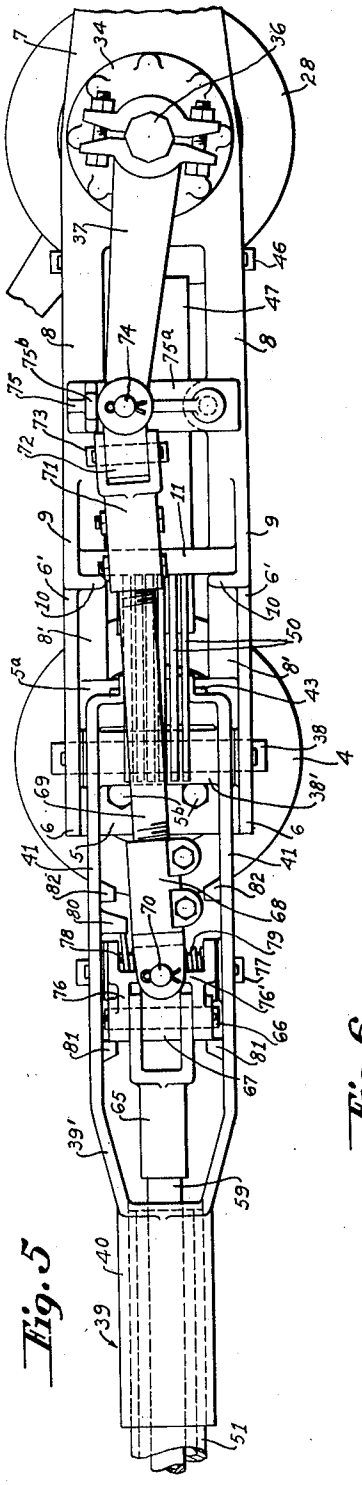


Fig. 5

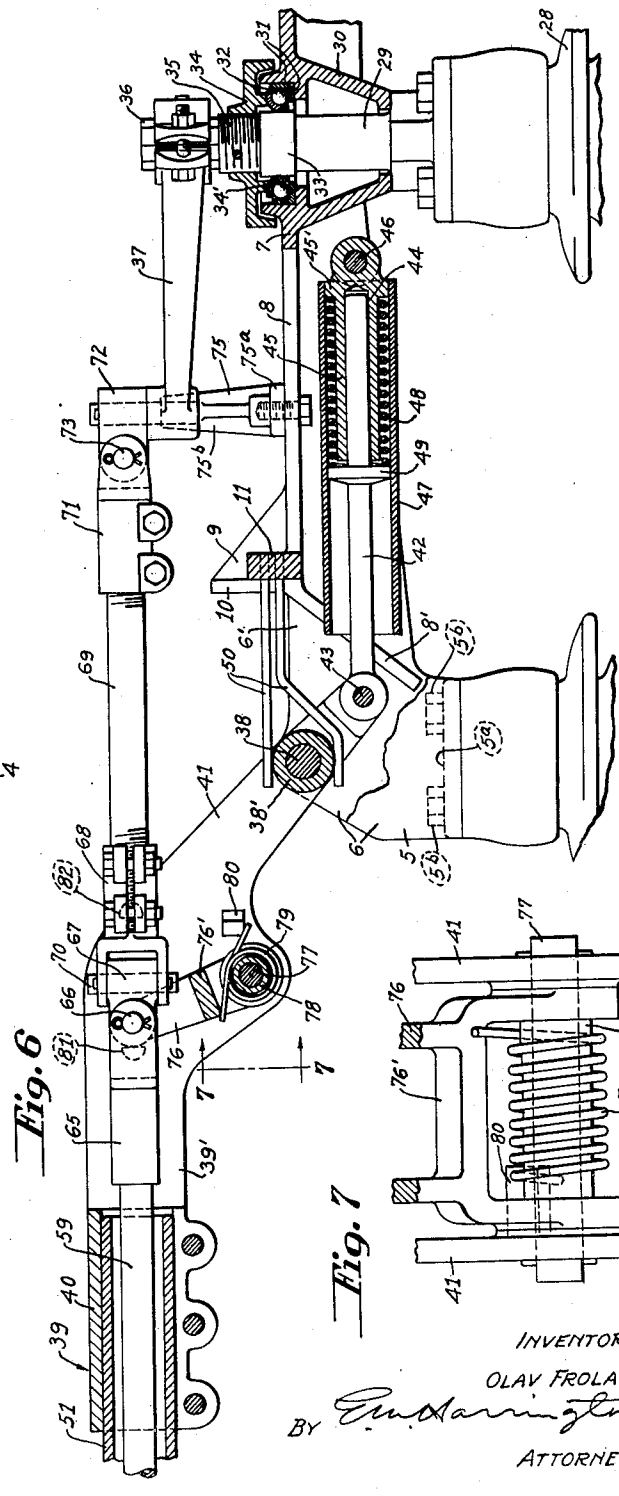


Fig. 6

Fig. 7

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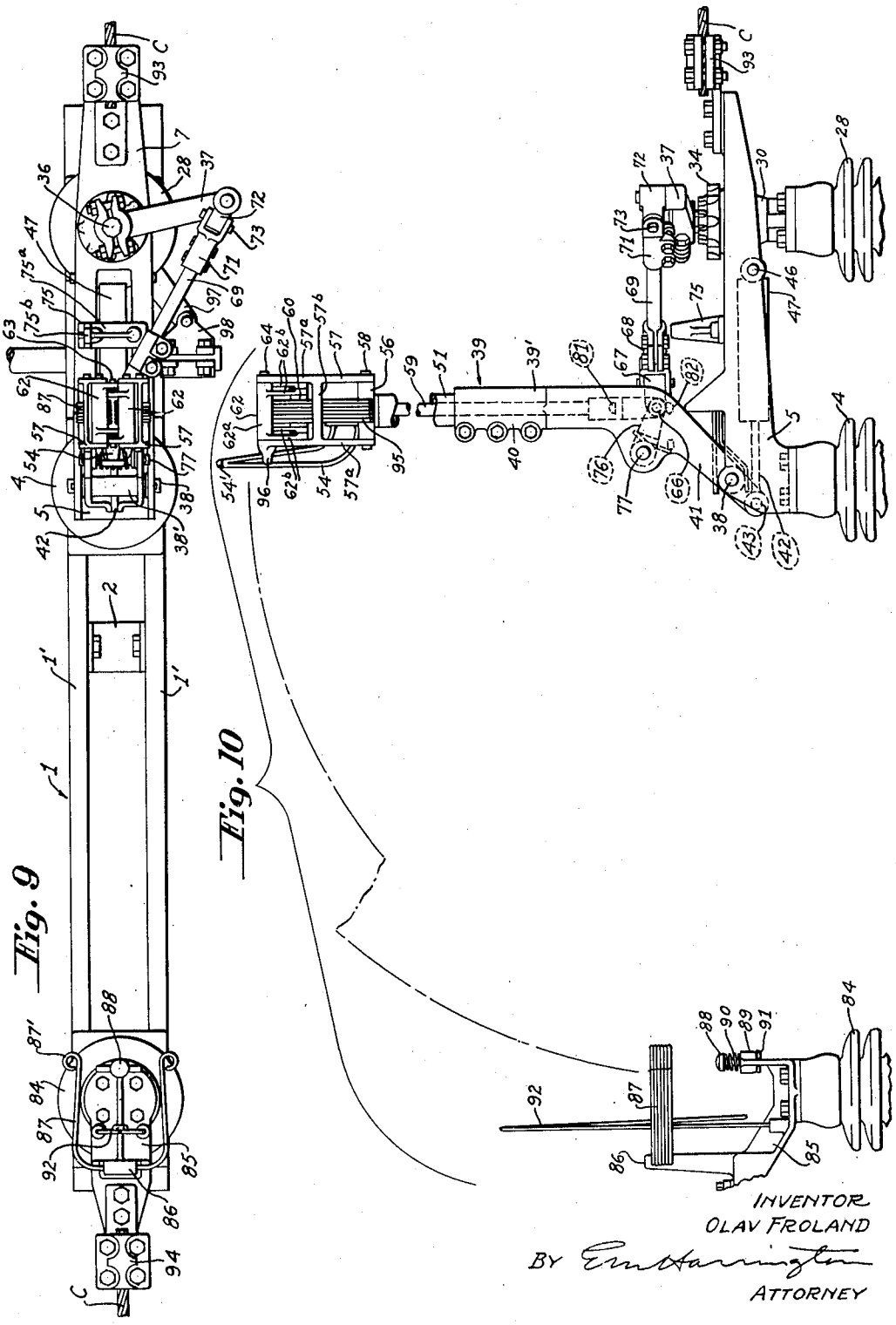


Fig. 9

Fig. 10

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UNITED STATES PATENT OFFICE

2,185,729

ELECTRICAL SWITCH

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Application January 22, 1938 Serial No. 186,322

9 Claims. (Cl. 200—48)

This invention relates generally to electrical disconnect switches and more specifically to switches of this general type which are intended for outdoor use, for instance, on pole tops, and which are preferably, though not necessarily, gang operated, the predominant object of the invention being to provide an improved switch of the type mentioned which is of extremely simple construction and arrangement and is capable of performing its intended function in a highly efficient manner.

An important feature of the invention is that a wiping action is obtained when the contacts of the switch are moved into and out of electrical contacting relation. This wiping action results in the actual contacting faces of the contacts being wiped clean of corrosion and accumulated foreign matter by the movement of the contacts into and out of the contacting position, and it serves also to readily break ice which forms on the contacts of the switch under adverse weather conditions.

Fig. 1 is a side elevation of the improved switch with the lower portion of the operating element of the switch broken away.

Fig. 2 is an enlarged fragmentary plan view of the portion of the switch at which the contacts are located.

Fig. 3 is a view partly in side elevation and partly in vertical section of the portion of the switch illustrated in Fig. 2.

Fig. 4 is a vertical fragmentary section taken on line 4—4 of Fig. 3 and looking in the direction indicated by the arrow.

Fig. 5 is a fragmentary plan view of the rear or operating portion of the switch.

Fig. 6 is a view partly in side elevation and partly in vertical section of the portion of the switch illustrated in Fig. 5.

Fig. 7 is a fragmentary elevation taken on line 7—7 of Fig. 6.

Fig. 8 is a fragmentary view partly in vertical section and partly in elevation of a part of the operating mechanism of the switch.

Fig. 9 is a plan view of the improved switch showing same in the open position.

Fig. 10 is a side elevation of the switch showing same in the open position illustrated in Fig. 9.

In the drawings, wherein is shown for the purpose of illustration, merely, one embodiment of the invention, 1 designates the base of the improved switch, said base preferably, though not necessarily being made up of a pair of spaced channel beams 1' connected together at a plurality of points by suitable means such as the cross element 2 illustrated in Fig. 9. The switch base 1 is adapted to be supported by suitable supporting means to locate the switch in a desired position for use.

Secured to the base 1 and extended upwardly therefrom is a supporting member 3 which supports a stationary insulator 4. The insulator 4 has fixed thereto at its top a member 5 which at its forward end is provided with a horizontal wall 5a through which suitable fastening devices 5b are extended for the purpose of securing the member 5 to the insulator 4. The member 5 is provided with spaced apart side walls 6 which extend upwardly a slight distance from the horizontal wall 5a and continuations 6' of these walls extend horizontally in a rearward direction. The extreme rearward portion of the member 5 is provided with a solid top wall 7 and forwardly of this solid top wall the member 5 is provided with relatively narrow, horizontal top flanges 8 which extend inwardly toward each other from the side walls of the member. The flanges 8 extend along the top edges of the side walls of the member 5 to points adjacent to the forward end of the member from which points the flanges are inclined downwardly as illustrated at 8' in Fig. 6. Extended upwardly from the flanges 8 are opposed, upwardly projected extensions 9, said extensions being provided with inwardly projected flanges 10 as shown to the best advantage in Fig. 5. At the locations of the extensions 9 and the flanges 10 thereof the member 5 includes a transverse bar 11 which serves a purpose to be hereinafter set forth.

Supported by and fixed to and between the spaced channel members of the base 1 is a bearing member 12, the construction of which is shown to the best advantage in Fig. 8. Disposed vertically and extended through the bearing member 12 is a rotary spindle 13 which constitutes a downward continuation of a connecting element 14. The spindle 13 at its upper end includes complementary rectangular shoulders 15 and the bearing member 12 is provided with similar shoulders 16, and interposed between the shoulders of the spindle and the shoulders of the bearing member is an annular ball bearing assembly 17. Likewise at its lower end the bearing member 12 is provided with complementary rectangular shoulders 19 and a ball bearing assembly 20 is interposed between these shoulders and a raised annular face 21 on the spindle 13. The ball bearing assembly 20 is supported from the bottom by a jamb nut 22 which is mounted on a screw-threaded portion 23 of the spindle and is

pinned thereto. Secured to the lower end portion of the spindle 13, by means of a suitable coupling element 24, is an operating element 25, said operating element being adapted to rotate the spindle with respect to the bearing member and the ball bearing assemblies serving to reduce friction during such rotation of the spindle. At its upper end the spindle 13 is provided with an annual hood 26 which overlies and covers the upper end of the bearing member 12.

Mounted on and secured to the connecting element 14 by means of fastening elements 27 is an insulator 28 which rotates with the spindle 13 and the connecting element 14. Extended upwardly from the upper end of the insulator 28 is a spindle 29 (Fig. 6) which passes through a bearing member 30 which forms a part of the solid top wall portion of the member 5 heretofore described. The bearing member 30 is provided with complementary rectangular shoulders 31 which support a ball bearing assembly 32, said ball bearing assembly contacting also with a raised, annular face 33 formed on the spindle 29. The ball bearing assembly 32 is maintained in position by an annular flange 34' of a member 34, said member being mounted on and pinned to a screwthreaded portion 35 of the spindle 29 and being so shaped and arranged that it overlies and closes the upper end of bearing member 30. The extreme upper end portion 36 of the spindle 29 is preferably non-circular in horizontal section and this spindle portion has clamped or otherwise secured to it an arm 37.

Pivoted to the member 5 through the instrumentality of a pivot element 38 is a movable switch arm which is designated generally by the reference character 39. The arm 39 includes a rear portion 39' provided with a forward clamping portion 40 from which rearwardly extended, spaced apart portions 41 are projected. The rear end portions of the spaced apart portions 41 of the arm portion 39' incline downwardly as illustrated in Fig. 6 and these inclined portions 41 are provided with sleeve portions 38' through which the pivot element 38 passes. At the extreme rear ends of the inclined arm portions 41 a rod 42 is pivotally attached thereto through the instrumentality of a pivot pin 43. The portion of the rod 42 at the end of said rod remote from the end thereof which is pivoted to the inclined arm portions 41 is slidingly disposed in an opening 44 formed in a member 45 which is pivoted at 46 to the rear portion of the member 5. This member 45 is provided with an enlarged head portion 45' to which is fixed a tubular element 47 which extends forwardly from said head portion in a manner to embrace the greater part of the length of the rod 42. An annular space is provided between the outer face of the member 45 and the inner face of the tubular element 47 and a coil spring 48 is arranged under compression in this space, one end of the coil spring contacting with the forward face of the head 45' of the member 45 and the opposite end of said coil spring contacting with the rear face of an annular flange 49 formed on the rod 42. The compressed coil spring 48 tends to move the rod 42 in the forward direction for a purpose which will hereinafter be apparent.

In order to provide for good electrical contact between the member 5 and the switch arm 39 a pair of resilient rods 50 are employed. These resilient rods are supported by the transverse bar 11 of the member 5 (Fig. 6) and extend forwardly therefrom into contact with the sleeve portions 38' and because the forward end portions of the rods 50 tend to move toward each other close electrical contact between said rods and the sleeve portions 38' will be obtained.

The forward portion of the switch arm 39 includes a tube 51 whose rear end portion is engaged by the clamping portion 40 of the rear portion of the switch arm previously described herein, said tube being extended forwardly from said clamping portion 40 and being internally screwthreaded at its forward end as shown at 51' in Fig. 3. At its forward end the tube 51 has attached thereto an end member 52 which is provided with a screwthreaded extension 52' which is screwed into and pinned to the screwthreaded forward portion of the tube 51. The end member 52 is hollow and is provided with an end wall 53 through which an opening is formed, said end member being provided also with an extension 54 which projects downwardly and forwardly from said end member as shown to the best advantage in Fig. 3 and is provided with oppositely extended flanges 54' at its forward end to provide said extension 54 with a broad forward face (Fig. 2).

Extended horizontally in opposite directions from the end member 52 are rigid extensions 55 each of which has formed thereon an upwardly and a downwardly extended bearing 56, each extension 55 and its associated bearings 56 having a continuous opening formed therethrough from top to bottom. Pivoted to each extension 55 is an arm structure 57 which comprises a pair of vertically spaced arms 57*a* which are rigidly connected at the approximate longitudinal center of the arm structure by an integrally formed bar 57*b*. Pivotal connection between rear ends of the arm structures 57 and the extensions 55 is obtained by means of vertical pins 58 which are retained in place by cotter pins or otherwise.

The tube 51 has extended longitudinally thereof a tube 59 of smaller diameter and secured to this tube 59 at its forward end is a head 60. When viewed in side elevation the head 60 includes a vertically disposed portion 60*a* which has an opening formed longitudinally therethrough and a shorter horizontal portion 60*b* which projects from the approximate longitudinal center of the portion 60*a*. The outer face of the portion 60*b* abuts against the forward face of the tube 59 and this portion 60*b* has extended therefrom a stud 60*c* which is disposed within the forward portion of the tube 59. In order to secure the head 60 to the tube 59 a pin 61 is extended through alined openings formed in opposed portions of the tube and in the stud 60*c*.

Associated with the head 60 is a pair of link structures 62, each of which includes a vertical portion 62*a* from which is extended a pair of rigid substantially parallel arms 62*b* (Fig. 4). The outer ends of the arms 62*b* of the link structures 62 are pivotally connected to the head 60 by a vertical pin 63 which passes through alined openings in the associated pairs of arms 62*b* and in the vertical portion 60*a* of the head 60, it being noted from an inspection of Fig. 4 that the arms of the opposed link structures are so located with respect to each other that their end portions may overlap so as to bring the alined openings of the arms into alinement with each other and with the opening formed through the portion 60*a* of the head. Because of this arrangement it is obvious that the arms of the link structures 62 are pivotally attached to the head 60. The vertical portions 62*a* of the link struc-

tures are in turn pivotally attached to the forward end portions of the arm structures 57, such pivotal attachment being obtained through the use of vertical pins 64 which pass through alined openings formed through the forward end portions of the arms 57a of the arm structures and through openings formed in the portions 62a of the link structures, which portions 62a are interposed between said arms 57a of the arm structures 57.

At its rear end the tube 59 has fixedly attached thereto a member 65 which is bifurcated at its rear end as shown to the best advantage in Fig. 5. The bifurcated portion of the member 65 has pivoted thereto through the instrumentality of a pivot pin 66 a link 67, the forward end portion of said link being disposed between the spaced legs of said bifurcated portion and the pivot pin 66 being extended through alined openings formed in the legs of the bifurcated portion and through the forward portion of the link. The rear portion of the link 67 is similarily connected to a member 68 which is clamped, or otherwise secured, to a tube 69. In other words the member 68 includes a bifurcated forward portion between the spaced legs of which the rear portion of the link 67 is disposed and a pivot pin 70 is extended through alined openings formed through the legs of the bifurcated portion of the member 68 and through the rear portion of the link. Clamped or otherwise fixed to the rear end of the tube 69 is a member 71 which is provided with a bifurcated rear end portion between the spaced legs of which the forward portion of a link 72 is arranged. The forward end portion of the link 72 is pivoted to the member 71 by a pivot pin 73 which passes through alined openings formed through the link and through the legs of bifurcated portion of said member 71. Additionally the link 72 is pivotally attached by means of a pivot pin 74 to the outer end of the arm 37 previously described herein (Figs. 1, 5, 6, and 9).

As will presently appear herein the arm 37 is swung in an arc of a circle to move the tube 59 longitudinally of the tube 51 and to arrest such movement of the arm 37 when the tube 59 reaches the limit of its forward movement an upstanding abutment 75 is provided. This abutment includes a horizontal portion 75a which is rigidly secured to the member 5, which has been previously described herein, and a vertical portion 75b which extends upwardly from said horizontal portion at one end thereof. When the arm 37 has reached the position where the tube 59 is in its forwardmost position the outer end of said arm contacts with the vertical portion of the abutment to prevent further movement of said arm in the direction which moves the tube 59 forwardly. In this connection it is to be noted that the arm 37 and the assembly of parts which includes the tube 69 and the members 68 and 71 associated with said tube 69, provide a toggle which is locked when the pivot pin 74 passes dead center defined by an imaginary line drawn from the center of the portion 36 of the spindle 29 to the center of the pivot pin 70. Therefore the abutment 75 is so located as to arrest movement of the arm 37 when the locked condition of the toggle is attained.

In order to assist and insure the movement of the tube rearwardly when the arm 37 is swung from the position in which it is shown in Fig. 5 to the position in which said arm 37 is shown in Fig. 9 a bifurcated arm 76 is provided (Figs. 6 and 7). This arm 76 is pivotally attached at its lower end to the rear portion of the arm 39 by a pivot element 77, and at its upper end said arm is pivotally attached by means of the pivot pin 66 to the bifurcated portion of the member 65 associated with the tube 59. Arranged in embracing relation with respect to the pivot element 77 is a sleeve 78 and arranged about said sleeve is a torsional coil spring 79, one extended end portion of said coil spring being located in contact with a lug 80 formed on a portion of the switch arm 39 and the opposite extended end portion of said coil spring contacting with a connecting bar 76' of the arm 76. The torsional coil spring 79 tends to move the upper end of the arm 76 rearwardly and therefore when the toggle of which the arm 37 forms a part is broken by movement of said arm in a direction to move the tube 59 rearwardly, the torsional coil spring will assist such movement.

In connection with the arm 76 it is to be noted that the switch arm 39 is provided with opposed pairs of lugs 81—81 and 82—82 which extend inwardly from opposed portions of the rear portion of said switch arm (Figs. 5 and 6). The lugs 81—81 serve as abutments which limit forward rotating movement of the upper portion of said arm 76 about its pivot 77, while the lugs 82—82 limit rearward rotating movement of the upper portion of the arm 76 about its pivot. Additionally contact of the arm 76 with the lugs 82—82 serves the function of cooperatively connecting the switch arm 39 to the arm 37 so that said switch arm may be moved from the lowered closed switch position in which it is shown in Fig. 1 to the raised open switch position in which it is shown in Fig. 10 when said arm 37 is swung about to move the switch to the open switch position. This will be explained later herein wherein the operation of the switch is described.

Secured to the base 1 of the switch is a supporting element 83 which supports a fixed insulator 84. The insulator has fixed to it a member 85 which includes an upwardly and forwardly extended portion 85' which is provided with a solid top wall from which a vertical extension 86 is projected. The vertical extension 86 has anchored therein a contact 87 which is comprised of a plurality of relatively heavy parallel wires which when viewed in plan are bent in approximately U-shape and are provided with eyes formed in the rear end portions of the rearwardly extended legs thereof (Fig. 2). The wires of which the contact 87 is composed are possessed of resiliency so that when the rearwardly extended legs thereof spread apart said legs will return to their original conditions when the force which spread them is removed.

The member 85 is provided with a buffer 88 which comprises a headed pin supported for vertical movement by a bearing element 89 forming a part of the member 85, said headed pin having a coil spring 90 associated therewith which urges same in an upward direction. The coil spring 90 is interposed between the under face of the head of the buffer and the top face of the bearing element 89, and a cotter pin 91 is employed to limit upward movement of the buffer in response to expansive action of the coil spring. When the switch arm 39 is lowered from the raised position in which it is shown in Fig. 10 to the lowered position in which it is shown in Fig. 1 the extension 54 of the end member 52 of said switch arm strikes the head of the buffer

and the coil spring of the buffer absorbs the shock incident to the sudden stoppage of the downward movement of the switch arm. Also the member 85 supports an arcing horn 92 which functions in an obvious manner as the broad face at the end of the extension 54 moves into and out of contact therewith when the switch arm 39 is moved into and out of the closed switch position.

The improved switch is provided with a terminal 93 which is fixed to the rear end portion of the member 5, and a similar terminal 94 which is fixed to the member 85. These terminals have secured to them conductors C forming parts of the electrical line in which the switch is interposed.

In explaining the operation of the improved switch it will be assumed that the switch is in the open switch position, as shown in Figs. 9 and 10, and that it is desired to operate the switch to cause it to assume the closed switch position. Such operation of the switch is produced by the person operating it rotating the operating element 25 so as to impart like rotary movement to the assembly of parts made up of the spindles 13 and 29, the member 14 and the insulator 28 and thereby swinging the arm 37 in an arc of a circle from the position in which said arm 37 is shown in Fig. 9 toward the position of the arm 37 as it is shown in Fig. 5. As rotary movement is imparted to the arm 37 as described forward acting force is imparted to the switch arm 39 through the connecting assembly which includes the tube 69, such force being transmitted from the assembly mentioned, to the switch arm 39 through the arm 76 and pivot pin 77. It is to be noted that at the time the forward and downward movement of the switch arm is started the arm 76 is positioned, as shown in Fig. 10, in contact with the lugs 82—82 with the pivot pin 66 located in a lower plane than the pivot pin 77, and therefore the arm 76 constitutes a rigid connection between the switch arm 39 and the assembly of which the tube 69 forms a part through which movement is imparted to the switch arm until said switch arm reaches an overbalanced position from which it will move by gravity to its lowered position. As movement of the arm 37 continues toward the position in which said arm 37 is shown in Fig. 5 the switch arm moves toward its lowered position, said movement of the switch arm being controlled by the person operating the switch restraining rotation of the operating element 25, and eventually the switch arm 39 reaches its lowered position where the extension 54 at the forward end of the switch arm contacts with and rests upon the buffer 88.

During downward movement of the switch arm toward its lowered position the tube 59 is drawn to its rearward position by reason of the fact that the arm 76 is in its rearward position and in contact with the lugs 82—82. The result of such rearward position of the tube 59 is that the head 60 at the forward end of said tube 59 is likewise in its rearward position as shown by dotted lines in Fig. 2. Also with the head 60 drawn rearwardly the link structures 62 assume the contracted positions in which they are shown by dotted lines in Fig. 2 and the arm structures 57 which are pivoted at their forward ends to the link structures 62 are drawn to the contracted and convergent positions in which these arm structures are shown by dotted lines in Fig. 2.

When the switch arm 39 reaches its lowered position in contact with the buffer 88 the link structures 62 and the arm structures 57 are in the contracted positions described and a portion of the arcuate stroke of the arm 37 still remains to be traversed. During this additional movement of the arm 37 the tube 59 is moved forwardly with respect to the switch arm 39, the arm 76 moving forwardly with the tube 59 away from the lugs 82—82 against the force of the torsional coil spring 79. Forward movement of the tube 59 results in like forward movement of the head 60 which moves the link structures 62 and the arm structures 57 to the expanded positions in which they are shown by full lines in Fig. 2. This forces the portions 62*a* of the link structures, which serve as contacts of the switch, into close electrical contact with the opposed portions of the contact 87, spreading said opposed portions of said contact 87 to insure the desired close electrical contact. When the contact has been made between the portions 62*a* of the link structures 62 and the opposed portions of the contact 87 the arm 76 is in contact with the lugs 81—81 as shown by dotted lines in Fig. 6 and the tube 59 is held in its forward position by the locked condition of the toggle produced by the arm 37 and the assembly of which the tube 69 forms a part. Also the head 60, link structures 62 and the forward portions of the arm structures 57 provide a toggle which is locked when the portions 62*a* of the link structures are expanded into contact with the opposed portions of the contact 87.

When the switch arm 39 is to be drawn upwardly and rearwardly from the closed switch position to the open switch position the sequence of operations just described are reversed. That is to say the initial portion of the arcuate stroke of the arm 37 from the position in which said arm is shown in Fig. 5 toward the position of said arm as illustrated in Fig. 10 moves the tube 59 and the head 60 rearwardly to draw the portions 60*a* of the link structures 60 inwardly away from the opposed portions contact 87 to their contracted positions as shown by dotted lines in Fig. 2. Such initial movement of the arm 37 likewise moves the arm 76 into contact with the lugs 82—82 formed on the rear portion of the switch arm 39, and continuation of the rotary stroke of the arm 37 after contact of the arm 76 with the lugs 82—82 results in the switch arm 39 being swung upwardly about the pivot 38 to its raised open switch position as shown in Fig. 10. In connection with the action of raising the switch arm 39 to elevated open switch position it is pointed out that the coil spring 48 (Fig. 6) serves to counterbalance the weight of the forward portion of the switch arm. In other words the coil spring 48 is under compression and as the upward movement of the forward portion of the switch arm is started the coil spring 48 exerts a forwardly directed force against the lower end of the switch arm which assists an operator to raise the switch arm. Likewise the presence of the coil spring 48 prevents the forward end portion of the switch arm from being dropped down with violence when the switch arm is lowered as the gradually increased compression which is built up in the coil spring as the forward end of the switch arm is lowered serves to prevent too rapid lowering of the switch arm. When the switch arm has been raised to the open switch position it is in a balanced perpendicular position and portions of said switch arm rests upon the top edges of the flanges

10 of the extensions 9 so that said switch arm is maintained in its elevated position.

When the portions 62a of the link structures 62 are expanded into contact with the opposed portions of the contact 87 by forward movement of the head 60 at the forward end of the tube 59 said portions 62a are being rotated while contact is being made with said opposed portions of the contact 87. This produces a wiping action which serves to keep the contacting faces clean and free from corrosion. Additionally the rotary movement mentioned serves to break ice which may form under adverse weather conditions at the points where contact is made. In order to provide for efficient transfer of electrical energy to the positions 62a of the link structures groups of resilient rods 95 are provided which are supported by the portions 57b of the arm structures 57 and contact with considerable force with portions of the end member 52 and with said portions 62a of the link structures. Also at the front ends of the lower portions 57a of the link structures 57 downward projections 96 are provided which have curved faces 96' formed thereon (Fig. 4). These projections serve to spread the opposed portions of the contact 87 if an attempt should be made to lower the forward end of the switch arm with the link structures 62 in their expanded condition.

In Figs. 1 and 8 an arm 97 is shown secured to and extended from the rotary insulator 28. This arm together with the parts 98 associated therewith serve to cooperatively connect the switch to an adjacent switch when a plurality of the switches are arranged for gang operation.

All of the important parts of the switch, other than the insulators 4, 28, and 84, are preferably formed of metal which will conduct electrical energy. However to insure good electrical connections between the member 5 and the switch arm 39, and between the end member 52 and the link structures 60, the conducting elements 50 and 95 are employed. By employing the rod-like conducting elements 50 and 95 the use of loose flexible conductors as parts of the switch is eliminated.

I claim:

1. A switch comprising a fixed contact, an arm supported for swinging movement relative to said fixed contact, and toggle means supported by said arm which includes arcuate contact faces that rotate when the toggle means is operated and are adapted to be moved transversely with respect to said arm when the toggle means is operated into and out of mechanical and electrical contact with said fixed contact, and means supported by said arm for operating said toggle means so as to move said arcuate contact faces outwardly into contact with said fixed contact and inwardly out of contact with said fixed contact while the arcuate contact faces are simultaneously rotated.

2. A switch comprising a fixed contact, an arm supported for swinging movement relative to said fixed contact, and means supported by said arm for providing for electrical contact between said arm and said fixed contact, said means comprising rotary contact elements provided with arcuate contact faces that rotate with said rotary contact elements, means for supporting said contact elements for rotary movement, toggle means for moving said contact elements transversely of the arm outwardly to bring the arcuate contact faces thereof into contact with said fixed contact and inwardly to move the arcuate contact faces thereof out of contact with said fixed contact while said arcuate contact faces are being rotated, and means for actuating said toggle means.

3. A switch comprising a fixed contact, an arm supported for swinging movement relative to said fixed contact, and means supported by said arm for providing for electrical contact between said arm and said fixed contact, said means comprising rotary contact elements provided with arcuate contact faces that rotate with said rotary contact elements, means for supporting said contact elements for rotary movement, toggle means for moving said contact elements transversely of the arm outwardly to bring the arcuate contact faces thereof into contact with said fixed contact and inwardly to move the arcuate contact faces thereof out of contact with said fixed contact while said arcuate contact faces are being rotated, and reciprocatory means for actuating said toggle means.

4. A switch comprising a fixed contact, an arm supported for swinging movement relative to said fixed contact, and means supported by said arm for providing for electrical contact between said arm and said fixed contact, said means comprising contact elements provided with arcuate contact faces, pivotally supported arms for supporting said contact elements for rotary movement to rotate said arcuate contact faces and swinging movement transversely of the arm, toggle means for moving said contact elements outwardly to bring the arcuate contact faces thereof into contact with said fixed contact and inwardly to move the arcuate faces thereof out of contact with said fixed contact, while said arcuate contact faces are being rotated, and means for actuating said toggle means.

5. A switch comprising a fixed contact, an arm supported for swinging movement relative to said fixed contact, and rotary means supported by said arm and adapted for movement transversely of said arm which includes arcuate contact faces adapted to be rotated when said rotary means is actuated to contact mechanically and electrically with said fixed contact, and means for actuating said rotary means to move said arcuate contact faces outwardly into contact with said fixed contact and inwardly out of contact with said fixed contact while the arcuate contact faces are simultaneously rotated, said fixed contact being provided with opposed portions adapted to yield when said arcuate contact faces are moved outwardly into contact therewith.

6. A switch comprising a fixed contact, an arm supported for swinging movement relative to said fixed contact, and rotary means supported by said arm and adapted for movement transversely of said arm which includes arcuate contact faces adapted to be rotated when said rotary means is actuated to contact mechanically and electrically with said fixed contact, and means for actuating said rotary means to move said arcuate contact faces outwardly into contact with said fixed contact and inwardly out of contact with said fixed contact while the arcuate contact faces are simultaneously rotated, said fixed contact being of substantially U-shaped formation and opposed legs thereof being adapted to yield when said arcuate contact faces are moved outwardly into contact therewith.

7. A switch comprising a fixed contact, an arm supported for swinging movement relative to said fixed contact, and rotary means supported by said arm and adapted for movement transversely of said arm which includes arcuate contact faces

adapted to be rotated when said rotary means is actuated to contact mechanically and electrically with said fixed contact, and means for actuating said rotary means to move said arcuate contact faces outwardly into contact with said fixed contact and inwardly out of contact with said fixed contact while the arcuate contact faces are simultaneously rotated, said fixed contact comprising a plurality of resilient elements of substantially U-shaped formation having opposed legs which are adapted to yield when said arcuate contact faces are moved outwardly into contact therewith.

8. A switch comprising a fixed contact, an arm supported for swinging movement relative to said fixed contact, and means supported by said arm for providing for electrical contact between said arm and said fixed contact, said means comprising rotary contact elements provided with arcuate contact faces which are rotated when said rotary contact elements are rotated, means for supporting said contact elements for rotary movement, toggle means for moving said contact elements transversely of the arm outwardly to bring the arcuate contact faces thereof into contact with said fixed contact and inwardly to move the arcuate contact faces thereof out of contact with said fixed contact while simultaneously rotating said contact elements, said fixed contact being provided with portions adapted to yield when said arcuate contact faces are moved outwardly into contact therewith, and means for actuating said toggle means.

9. A switch comprising a fixed contact, an arm supported for swinging movement relative to said fixed contact, means including an element supported for pivotal movement by said arm which is provided with a portion that moves transversely of said arm, an arcuate contact face formed on said transversely movable portion of said element which rotates when said portion of said element moves transversely of said arm, and means supported by and movable relative to said arm which subjects said element to such pivotal movement that the arcuate contact face thereof is moved transversely of the arm into and out of mechanical and electrical contact with said fixed contact while said arcuate contact face is being simultaneously rotated.

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