

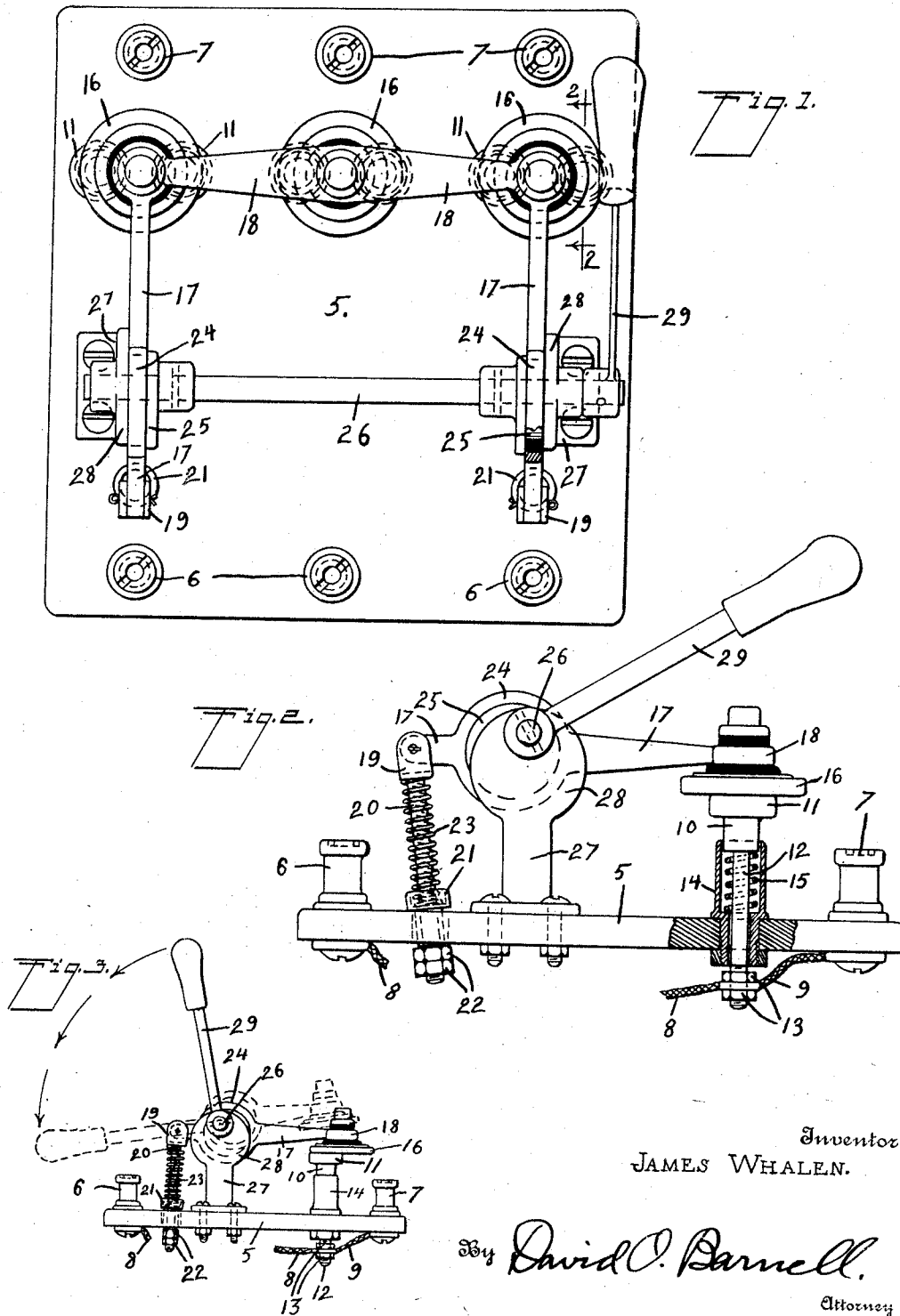
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ELECTRIC SWITCH

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ELECTRIC SWITCH

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My invention relates to electric switches for use in circuits transmitting heavy current at moderately high voltage, wherein arcing occurs upon separation of the switch-contacts, and in which pitting and burning of the contacts is likely to result from the arcing. It is the object of my invention to provide a simple and inexpensive switch structure, suitable for use under the conditions above named, and wherein the switch is actuated by a rotating member movable in alternating directions to effect the opening and closing movements of the switch, wherein the engaging portions of the contacts are open plane surfaces readily accessible for inspection and for smoothing or replacement should irregularities of such surfaces be developed, wherein a rubbing or wiping engagement of the contacts occurs during each opening and closing movement, thus tending to grind and maintain the surfaces in perfect engagement throughout the contacting areas thereof, wherein the opening and closing movements which separate and bring together the contact surfaces may be made rapidly without the use of springs or other devices for producing a snap action, and wherein a firm and uniform pressure between the contacts at the closed position of the switch may be maintained without causing excessive friction and requiring the application of a correspondingly large actuating force to effect the switch movements.

In the accompanying drawings Fig. 1 is a plan view of a switch embodying my invention, Fig. 2 is a side view of the same, with a portion thereof in section on the vertical plane of the line 2—2 of Fig. 1, and Fig. 3 is a side view showing operating positions of the switch-lever and actuating means.

In the illustrated embodiment of my invention, the switch is adapted for control of a three-phase circuit, and it will be understood that the mechanism is adaptable for control of a circuit having any number of branches, by the provision of a suitable number of contact-plates to be operated by the same switch-lever. In the structure

shown, I provide a base-plate 5 of insulating material, having mounted thereon binding-posts 6 and 7 adjoining, respectively, its front and rear edges, and each opposite pair of said binding-posts being connected with the terminals of one branch of the controlled circuit. From each pair of the binding-posts 6 and 7, flexible conductors 8 and 9 are extended beneath the base-plate to connect respectively with a pair of contact-members, each comprising a plunger 10 having a cylindrical head portion 11 and a stem 12, the latter being threaded at its lower end and provided with nuts 13 for securing thereto said flexible conductors. Said plungers fit loosely within tubular posts 14 mounted fixedly upon the base-plate, and coil springs 15 are disposed about the stems 12 beneath the plungers to press upwardly thereon, upward movement of the plungers being limited by the nuts 13 engaging the lower ends of the tubular posts. For each pair of the contact-members there is provided a contact-plate 16 which is mounted upon the switch-lever to be moved thereby into and out of engagement with the heads 11 and thus close and open the respective branch of the controlled circuit. In the structure shown, the switch-lever comprises a pair of parallel arms 17 united at their rear ends by an integral cross-bar 18, beneath which the contact-plates 16 are secured fixedly, and from which said plates are suitably insulated, as shown. Each of the arms 17 is connected pivotally at its front end with the head 19 of a push-rod 20 which extends downwardly therefrom and passes slidably through a spring-cup 21 seated loosely in an opening in the base-plate. The lower end of each push-rod is threaded to receive lock-nuts 22, and a coil spring 23 is disposed about the rod between the cup 21 and head 19, said spring tending to push the rod upwardly, and the nuts 22 serving to limit upward movement thereof. Each arm 17 has near its front end an annular portion 24 within which is fitted revolvably an eccentric 25. Said eccentrics are secured fixedly upon a shaft 26 mounted revolvably in bearing-standards 27 extended

up from the base-plate. Said standards have circular head-portions 28 adjoining the sides of the eccentrics and of the annular portions 24 of the lever-arms, and at the inner sides of said arms the eccentrics are flanged to prevent lateral movement of the lever.

The shaft 26 may be actuated by any suitable means, and the switch is especially adapted for automatic operation by means of the oscillating motor shown in connection therewith in my application Serial No. 430,221, filed Feb. 21, 1930. For manual operation, the shaft carries a handle 29, secured upon a projecting end portion of the shaft as shown, and said handle is movable between the positions shown in Fig. 2 and by dotted lines in Fig. 3, whereby to rotate the shaft approximately a half-revolution in each direction. In the closed position of the switch, at which the contact-plates 16 each electrically connect the heads 11 of a pair of the plungers 10, the switch-lever is in balance about a fulcrum coinciding with the axis or centers of the eccentrics 25, the upward pressure of the push-rod springs 23 being opposed to the pressure of the plunger-springs 15, and the pressure between the contacting faces of the members 11 and 16 being equal to the compression of said springs 15. The fit of the plungers 10 and their stems 12 in the tubular posts 14 is made loose enough to allow a slight lateral movement or tilting of the plungers, whereby to insure uniform contact of the plates 16 over the entire upper surfaces of the heads 11.

In the closed position of the switch, shown in Fig. 2, the center of the eccentrics 25 is below and in front of the center or axis of the shaft 26, and when the handle 29 is pulled forwardly to the position shown in full lines in Fig. 3, whereby the shaft is turned approximately a quarter-revolution, the centers of the eccentrics are moved rearwardly and cause a corresponding rearward movement of the switch-lever, the slight downward component of the movement of the eccentrics and switch-lever during this quadrant of their motion being accommodated by yielding of the springs 15 and 23. By said rearward movement of the switch-lever, the contact-plates 16 are caused to slide or rub across the engaged faces of the heads 11, remaining in contact therewith, however, and slight variations in the plane of the contacting surfaces being accommodated by tilting of the plungers. During said movement, also, the push-rods 20 swing from a forwardly inclined position to a rearwardly inclined position, as shown respectively in Figs. 2 and 3. By a further forward movement of the handle 29, from the full-line position to the dotted-line position thereof shown in Fig. 3, the shaft 26 is turned approximately another quarter-revo-

lution, during which the principal movement of the eccentrics is upward, although of course the actual path of movement has a slight rearward curvature. During this phase of the movement, upward motion of the push-rods, to follow the rise of the eccentrics, is prevented by the nuts 22, so that the switch-lever is caused to move pivotally about the end thereof which is connected to the heads 19 of the push-rods, and the contact-plates 16 are thus rapidly lifted out of engagement with the plunger-heads 11, of which upward movement is limited by the nuts 13. By reverse movement of the handle 29 the shaft and eccentrics are turned to cause engagement of the contact-plates with the heads 11, at approximately the end of the first quadrant of the movement, and to then move said plates slidingly forward across the heads 11 during the remainder or second quadrant of the movement.

From the foregoing it will be seen that my invention provides a simple and inexpensively constructed electric switch, in which a wiping or rubbing engagement of the contact-faces occurs at each opening and closing movement, in which the pressure maintained between the sliding contact-faces may remain substantially uniform and be such as to afford efficient electrical connection without causing a large frictional resistance to the operating movements and requiring a correspondingly large operating force, in which the opening and closing movements of the parts may be made rapidly under either automatic or manual control, and in which the contact-faces are readily accessible for inspection or restoration.

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

1. In an electric switch, a contact-member having a substantially horizontal upper face, a contact-plate having a lower face engageable with said upper face of said contact-member, a switch-lever carrying said contact-plate, an actuating member on which said switch-lever is fulcrumed at a point spaced horizontally from said contact-plate, said actuating member being movable arcuately in a vertical plane, an element pivotally connected with the switch-lever and spaced horizontally from said actuating fulcrum member, said element being movable horizontally to accommodate horizontal movement of the switch-lever imparted thereto by said actuating member, means for moving said element vertically and tending to move the switch-lever about said actuating fulcrum member whereby to press said contact-plate toward said contact-member, and means limiting vertical movement of said element whereby the same may form a fulcrum for the switch-lever during movement of said actuating member to lift said

contact-plate from said contact-member.

2. A structure as set forth in claim 1, wherein the contact-member is mounted yieldingly for limited vertical movement.

5 3. A structure as set forth in claim 1, wherein the contact-member is mounted yieldingly for limited vertical movement and for lateral tilting to accommodate variations in the plane of the engaged faces of
10 the same and the contact-plate.

4. In an electric switch, an actuating member movable arcuately, a switch-lever mounted on said actuating member and movable about the same as a fulcrum, an element pivotally connected with said switch-lever and
15 controlling tilting movements thereof about said actuating member, a contact-plate secured upon the switch-lever in spaced relation to said element and actuating member,
20 and contact-members engageable by said contact-plate; said switch-lever being movable to slide said contact-plate across said contact-members during a portion of the travel of the actuating member, and during the
25 remainder of the travel of the actuating member the switch-lever being tilted about the actuating member by said controlling element to move said contact-plate toward and from said contact-members.

30 5. In an electric switch, an actuating-shaft having eccentrics thereon, a switch-lever mounted on said eccentrics and extending oppositely laterally therefrom, elements pivotally connected with said switch-lever
35 at one end thereof and movable in a direction longitudinal of said lever, contact-plates carried at the opposite end of said lever, yieldingly mounted contact-members engageable by said contact-plates, means for
40 moving said elements in a direction tending to tilt the switch-lever about the eccentric-axis to engage said contact-plates with said contact-members, means for rotating said
45 shaft to move the switch-lever longitudinally while the contact-faces of said plates and members are engaged, and means for limiting movement of said elements to control
50 tilting movements of the switch-lever about the eccentric-axis during a portion of the travel thereof to effect movement of the contact-plates toward and from said contact-members.

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