July 17, 1928. 1,677,509

M. S. WRIGHT

ELECTRIC SWITCH

Filed Oct. 3, 1921 3 Sheets-Sheet 1

Fig. 1.

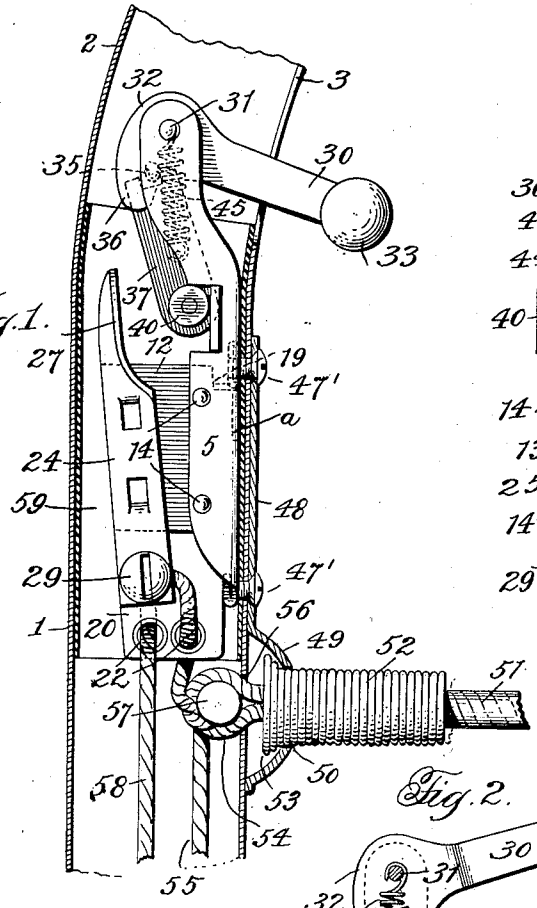


Fig. 3.

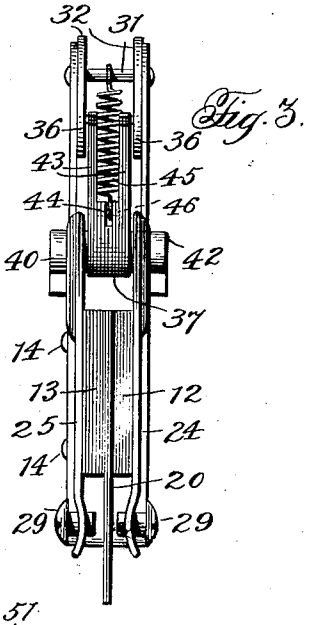


Fig. 2.

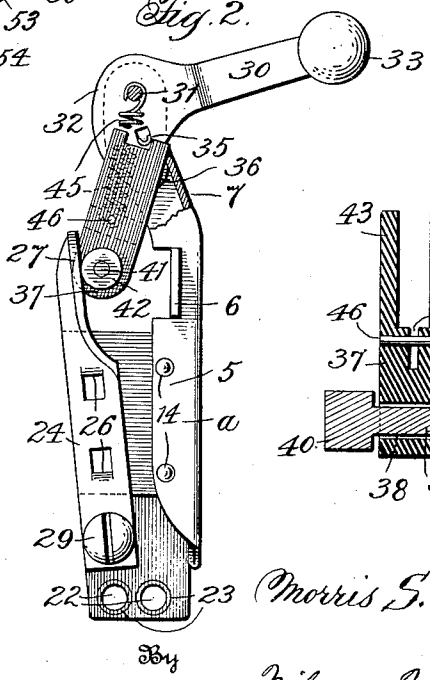


Fig. 4.

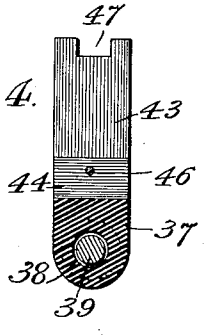


Fig. 5.

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Inventor:

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Attorneys:

July 17, 1928.

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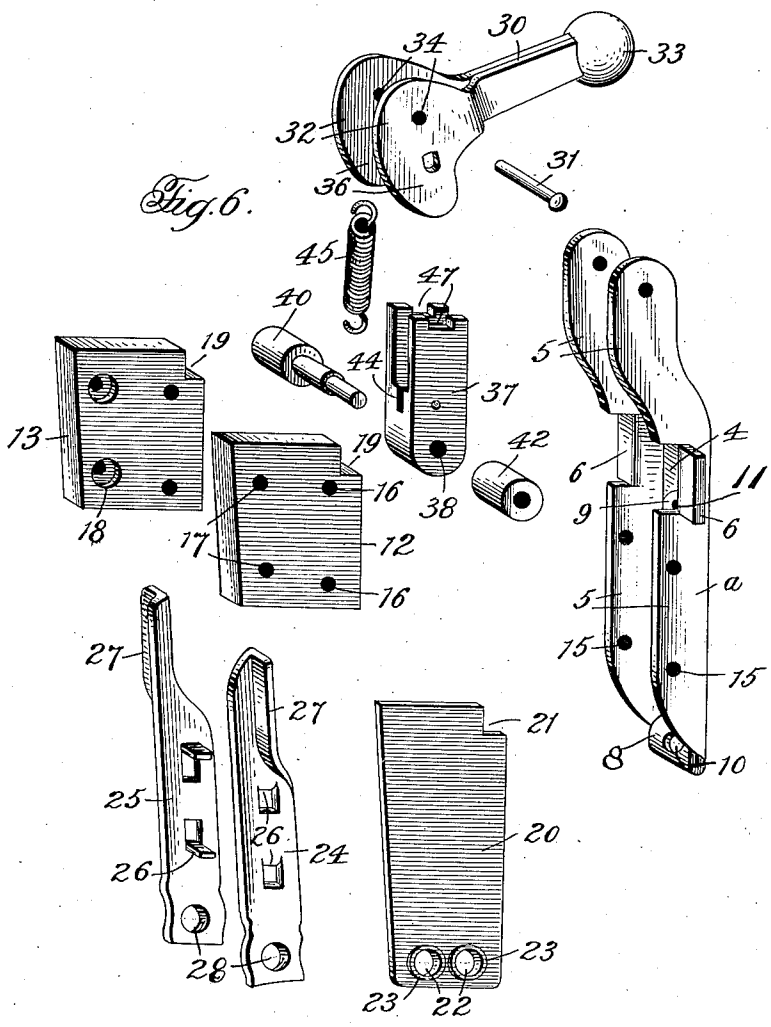
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3 Sheets-Sheet 2

Fig. 6.



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ELECTRIC SWITCH

Filed Oct. 3, 1921 3 Sheets-Sheet 3

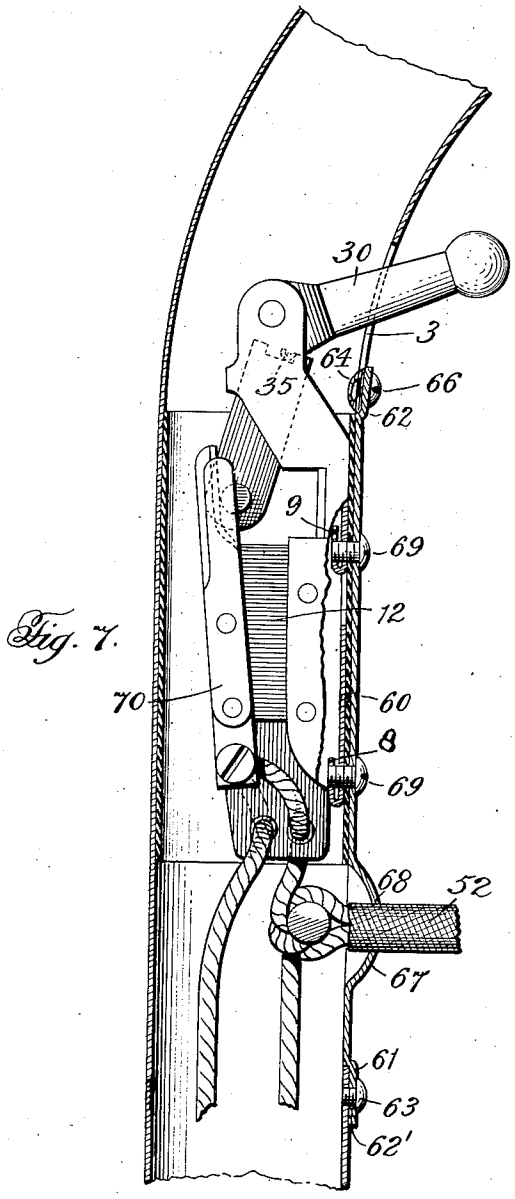


Fig. 7.

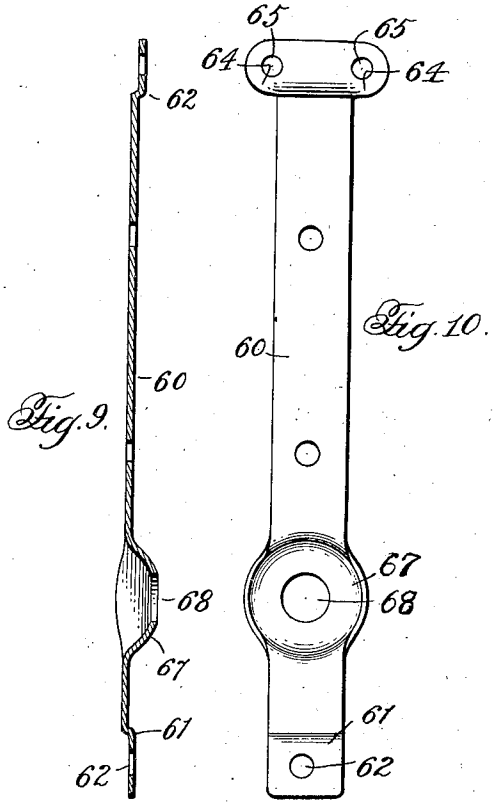


Fig. 9.

Fig. 10.

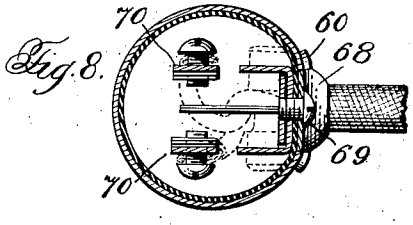


Fig. 8.

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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

Application filed October 3, 1921. Serial No. 505,069.

My invention relates to new and useful improvements in electric switches and while primarily intended for use in the tubular handles of vacuum cleaners may be used for various other purposes where a switch of compact form is required.

The principal object resides in constructing the switch in such a manner that the movable contact will, when operating to complete the circuit, first engage the stationary contact at one point and then be drawn to a different point for permanent engagement and, when operating to break the circuit will be moved to its first engaging position, before the break of contact, the movable contact also being provided with a rotatable contact point which is rotated upon each operation of the switch lever, so that a new contact surface is presented upon each movement of the switch to complete the circuit, the sliding of the movable contact and the rotation of the contact point preventing the accumulation of carbon, at the point of permanent engagement, due to the arc at the time of make and break, which impairs the usefulness of the switch.

Another object consists in constructing the switch so that it may be inserted into the handle, or removed therefrom, as a unit, and is secured in the handle to prevent longitudinal or rotatable movement, the lever of the switch projecting through an opening in the handle to be within easy reach of the operator.

A further object resides in connecting the wires to the switch in a novel manner so that the connection therebetween will not be easily broken and the feed wire, which passes through the tubular handle, will not be withdrawn from the handle even though a severe pull or strain is applied thereto.

The invention has for still another object the construction of the switch in such a manner that at no time is any part of the switch body or trigger charged with electricity.

With the above and other objects in view, which will appear as the description proceeds, my invention consists in the novel details of construction and arrangement of parts, described in the following specification and illustrated in the accompanying drawings, and while I have illustrated and described the preferred embodiments of the invention it will be understood that such changes may be made as will fall within the scope of the appended claims.

In the drawings:

Fig. 1 is a longitudinal vertical section through a portion of the tubular handle with the switch and wires connected thereto, shown in side elevation.

Fig. 2 is a side elevation of the switch with a portion shown in section.

Fig. 3 is a top plan of the switch.

Fig. 4 is a side elevation, particularly in longitudinal vertical section of the movable contact arm.

Fig. 5 is a horizontal section through the movable contact arm.

Fig. 6 is a perspective group showing in detail a number of the separate parts going forward to make up my invention.

Fig. 7 is a longitudinal vertical section through the tubular handle showing a side elevation of the switch, and a modified form of means for securing the switch in the handle.

Fig. 8 is a transverse vertical section through the handle and switch shown in Fig. 7.

Fig. 9 is a longitudinal vertical section through the switch securing plate, and,

Fig. 10 is a top plan of the switch securing plate.

In the drawings 1 indicates a portion of the tubular handle of an electrically operated vacuum cleaner the outer end of the handle being curved as shown at 2, in the usual manner, and provided in the bottom with the longitudinally extending opening 3, said opening extending to the outer end of the handle. My improved form of switch is adapted to be inserted into the handle as a unit and to be secured therein against longitudinal or rotatable movement, the operating lever of the switch projecting through the openings 3 within easy reach of the operator.

My switch consists of a base or support *a* formed with the bottom 4, and the up-turned sides 5, each of said sides having an outer extending flange or lip 6 struck therefrom and extending on a plane below the upper edges of the sides. The base or support *a* is provided at one end with the upwardly extending portion 7 and at the opposite end is folded inwardly to provide the overlying lip or tongue 8, said lip or tongue lying between the side flanges 5. A lip or tongue 9 is

struck from the base 1, intermediate the ends thereof, and is folded back over the base as more particularly shown in Fig. 7. Longitudinally spaced threaded openings 10 and 11 are formed in the base 1 and the in-turned lips or tongues 8 and 9 respectively to receive securing screws to be later described.

Blocks 12 and 13 of insulating material are secured to the base or support *a*, between the side flanges 5, by means of the transversely extending rivets or bolts 14 which pass through openings 15 formed in the side flanges 5 and openings 16 formed in the blocks adjacent the lower edges thereof. Openings 17 are formed in each of the blocks 12 and 13, adjacent the upper edges thereof, and these openings, at the inner faces of the blocks, are enlarged as shown at 18 for a purpose to be later described. The lower edge of each of the blocks 12 and 13 are cut away at one end to form a recess 19 said recess receiving the in-turned lip or tongue 9 formed on the base as more particularly shown by dotted lines in Fig. 1 of the drawings. A plate 20 of the insulating material is secured between the blocks 12 and 13, this plate extending beyond one end of the blocks as quite clearly shown in the drawings, the inner end of the plate being cut away to form the recess 21, corresponding to the recess 19 in the blocks and the outer end formed with vertically spaced openings 22 having outwardly extending flanges 23 at each side thereof. Secured to the blocks 12 and 13 respectively are the stationary contact arms 24 and 25, of brass or similar material, and each of these arms has struck therefrom the longitudinally spaced inwardly extending tongues 26 which are adapted to extend through the openings 17 of the blocks and have there inner ends bent to be received in the enlarged portions 18 on the inner faces of the blocks. At one end the contact arms are bent to form the outwardly extending flanges 27 and adjacent the opposite ends the arms are formed with the openings 28, said openings being threaded to receive the binding screws 29 for connecting the wires, to be later described. A lever 30 is pivotally connected to the outer end of the base or support *a*, between the side flanges 5, by means of the transversely extending pin 31, the inner end of the lever being forked to form the spaced plates 32 and the outer end formed with a ball 33 or other enlargement. The plates 32 are provided with the aligned openings 34 for receiving the pivot pin 31 and struck from each of said plates 32 is an inwardly extending lip 35 which, in cross section, is concavo-convex, as more clearly illustrated in Figs. 1, 2 and 7 of the drawings. The plates 32 are formed with the projections 36 which overlie the end of the base 4 of the support *a* to limit the movement of the lever, in one direction, as more clearly illustrated in Fig. 2 of the drawings.

A movable contact arm 37, of insulating material, is adapted to be operated by the lever 30, said contact arm having, adjacent one end, the transversely extending opening 38 to receive the shaft 39 one end of which is enlarged as shown at 40 and the opposite end of which is reduced as shown at 41 to receive the ring 42. As will be noted the ring 42 is of the same diameter as the enlargement 40 and said enlargement and ring form the contact points for engaging the undersurface of the flanges 27 of the stationary contact arms 24 and 25. The shaft 39, its enlargement 40, and the ring 42, may be made of brass or other similar material and as quite clearly shown in Fig. 5 of the drawing the opening 38 is of greater diameter than the shaft 39 so that the shaft may easily rotate therein for a purpose and in a manner which will be later described. The end of the contact arm 37, opposite to that carrying the shaft 39, is formed with a longitudinally extending vertical slot providing the spaced arms 43 and extending inwardly a short distance from the end of the slot referred to is a recess 44 for receiving the inner end of a coil spring 45 which is received between the arms 43. The inner end of said spring is secured to the arm by means of the transversely extending pin 46 and the opposite end of the spring is connected to the pivot pin 31 of the lever. Notches 47 are formed in the ends of the arms 43 and receive the in-turned lips or projections 35 of the lever, as quite clearly shown in Fig. 2 of the drawings. It will be seen that as the lever is operated the lips or projections 35 will engage opposite faces of these notches so as to swing the contact arm 37, the coil spring 45 serving to draw the inner end of the contact arm into raised or lowered position after the pin 46 has passed the center line of the pivot pin 31, this spring serving to make a quick contact. When the contact arm 37 is in the position shown in Fig. 1, the enlargement 40 and ring 42 on the shaft 39 engage the flanges 6 of the base or support *a* and the circuit is broken. When the contact arm is swung into the position shown in Fig. 2 the enlargement 40 and ring 42 engage the flanges 27 of the contact arms 24 and 25 and the circuit is made. When the parts are in the position shown in Fig. 1, with the circuit broken, and it is desired to complete the circuit the lever 30 is swung towards the end of the handle. This movement of the lever causes the projections 35 to engage the bottom of the notches 47 of the arm 37 to swing the opposite end of the arm upwardly and as the lever is swung the arm will be pushed towards the insulating blocks 12 and 13 of the switch and the shaft 39 will be rotated. After the end of the arm has

been raised to such position that the pin 46 is beyond the center line of the pivot pin 31, the coil spring 45 will snap the end of the arm upwardly so that a quick contact is made between the enlargement 40 and ring 42 and the contact arms 24 and 25. After first engaging the contact arms the enlargement 40 and ring 42 will be drawn along the arms a short distance to have permanent engagement at a different point than the first contact. It will thus be seen that the point of make and break is at a different position on the arms than the first contact and any accumulation of carbon due to the make and break will be at the point of the original contact or engagement. When it is desired to break the circuit the lever 30 is swung into the opposite direction and the initial movement of the lever will slide the contact point and roll the shaft 39 until the enlargement 40 and ring 42 leave the flanges 27. The point of break is at the original point of contact after the pin 46 has passed the center line of the pivot pin 31 the contact arm will be snapped downwardly. By this it will be seen that upon each movement of the lever the shaft 39 will be rotated so that a new surface will be presented to the arms 24 and 25 at each making of the circuit. There is a greater rotating of the shaft along the flanges 6 than there is along the contact arms 24 and 25 so that although the shaft rotates in opposite directions upon the operation of the lever in making and breaking the circuit never-the-less a new contact surface will be presented at each making of the circuit. In the past considerable difficulty has been experienced in forming a switch, for the purpose described, which will operate successfully at all times, it being found that no matter how quick the make and break occur there will be a slight arc and therefore an accumulation of carbon on the contact points. I prevent this accumulation of the carbon by the rotation of the contact points and by presenting a new surface at each making of the circuit.

As previously stated my improved form of switch is adapted for insertion into the tubular handle 1, as a unit, and is secured therein by means of the screws 47′ which pass through threaded openings in the handle and into the threaded openings in the base 1 and the inturned tongues 8 and 9 of the base. With the switch secured in the manner described it will be seen that longitudinal and rotatable movement with respect to the handle is prevented, but that simple means has been provided whereby when desired the switch may be disconnected. In the construction shown in Fig. 1, to position the switch within the handle, it is inserted from the outer end of the handle with the lever 30 extending through the slot 3. A plate 48 is carried by the screws 47′ and engages the outer face of the bottom of the handle. This plate is provided with longitudinally spaced openings, as quite clearly shown in Fig. 1, for the reception of the screws 47′ and one end of the plate is formed with the semicircular enlargement 49 having a central opening 50 through which the feed wire 51 passes. The opening 50 is of sufficient diameter to also receive the wire wrapping 52 around the end of the feed wire 51 said wrapping 52 being of slightly larger diameter at the upper end as shown at 53, the enlarged portion 53 being received within the semicircular portion 49 of the plate 48 and this connection preventing a movement of the wire wrapping 52 upon the wire 51. The wrapping 52 prevents cutting of the feed wire 51 and being flexible does not interfere with the movement of the sweeper. At the upper end the feed wire 51 is separated into the wires 54 and 55 which extend through an opening 56 in the handle and are wrapped around a wooden pin 57 which extends transversely of the opening 56. The wire 54 passes through the lower opening 22 in the plate 20 of insulating material and is connected to the binding screw 29. The wire 55 passes to the electric motor connected to the handle in any usual manner. A wire 58 passes through the upper opening 22 of the plate 20, is connected at one end to the binding screw 29 on the side of the switch opposite to that to which the wire 54 is connected, and the opposite end extends to the electric motor.

A sleeve of insulating material 59 is placed in the barrel between the barrel and switch. This sleeve 59 prevents a short circuit between the switch and barrel.

If desired the sleeve may be inserted with the switch or may be inserted into the handle to receive the switch.

In Figs. 7, 8, 9 and 10 I have shown a slightly modified form of my invention, in which the switch is inserted into the handle through an opening in the bottom thereof instead of from the end as described in the preferred form. In this form of the invention the slot 3 does not extend to the end of the handle, but terminates at the point where the handle is curved. The slot will be made of sufficient width to allow the insertion of the switch therethrough and after the switch has been placed in position the slot, for substantially its entire length, will be closed by the plate 60 which is of sufficient width to be received in the slot and has its ends off set as shown at 61 and 62 to extend beyond the ends of the slot and engage the outer face of the handle. The off set portion 61 is provided with a single opening 62′ to receive the screw 63 which engages a threaded opening in the handle for connecting this end of the plate in position. The off set portion 62 has an ear 64 on each side

thereof and these ears extend beyond the sides of the slot 3. Each of the ears 64 is provided with an opening 65 to receive the screws 66 which engage in threaded openings of the handle. As quite clearly shown in Fig. 7 a sufficient of the slot 3 is left open to receive the operating lever 30 for throwing the switch. The plate 60, adjacent that end having the off set 61 is provided with the semicircular enlargement 67 having the opening 68 through which the feed wire 51 extends. Screws 69 extend through the plate 60 and engage the opening in the base 4 of the switch for securing the switch against longitudinal or rotatable movement with respect to the handle.

In all other respects the construction of the switch shown in the modified form of the invention is the same as that described for the preferred form except that a plate 70 is secured to the outer faces of each of the contact arms 24 and 25, as quite clearly shown in Fig. 7, and forms a guide for the movable contact arm 37 which slides therebetween.

From the above detail description it will be seen that I have provided a switch, particularly adapted for use in connection with vacuum cleaners, which is compact in form, takes up little space in the handle, and may be assembled in position or removed from the handle as a unit. In other words the several parts of the switch, with the connecting wires, may be assembled and connected and then inserted into the handle. It will readily be appreciated that the small space within the handle would make it very hard, if not entirely impossible, to connect the parts after the insertion. At the same time I have provided a novel form of contact which is rotated upon each operation of the switch lever so that a new contact surface is presented at the making of the circuit. I also provide the wooden pin 57 which prevents the feed wire from being pulled out of the handle and the wires disconnected from the binding screw 29 or from the motor connection. At no time is any part of the switch body or trigger charged with electricity. The only current that can possibly be in the switch when it is on is in the two stationary contact arms and the roller of the movable contact arm.

Having fully described my invention what I claim as new and desire to secure by Letters Patent is:

1. An electric switch comprising a base, having horizontal flanges extending therefrom, stationary contacts carried by the base, a lever connected to the base, a movable arm operable by the lever, and rotatable contact points carried by the movable arm and adapted to engage the horizontal flanges of the base when the circuit is broken and the stationary contacts when the circuit is made, the contact points being rotated upon each operation of the lever.

2. An electric switch comprising a base, stationary contacts carried by the base, a forked lever connected to the base, a movable contact arm operable by the lever and having a recess therein, and an inwardly extending projection struck from each arm of the forked lever for reception in the recess of the movable arm.

3. An electric switch comprising a base, stationary contacts carried by the base, a lever pivotally connected to the base, a movable contact arm, a spring having one end connected to the movable contact arm and the opposite end to the pivot of the lever, and means carried by the lever for engagement with the contact arm for swinging said contact arm upon each operation of the lever.

4. An electric switch comprising a base, stationary contacts carried by the base, a lever pivotally connected to the base, a movable contact arm, rotatable contact points carried by the movable arm and adapted to engage the base when the circuit is broken and the stationary contacts when the circuit is made, a spring connected to the movable contact arm and to the pivot point of the lever, and means carried by the lever for swinging the movable contact arm upon each operation of the lever, said spring drawing the contact points into contact position after the outer end of the arm has passed the center line of the lever pivot.

5. An electric switch comprising a base, an insulating block carried by the base and having transversely extending openings terminating in enlarged openings, stationary contacts having projections adapted to extend through said openings and to be bent to engage the enlarged openings, a lever connected to the base, and a movable contact arm operable by the lever for engaging the stationary contacts.

6. An electric switch comprising a base, insulating blocks secured to the base, each of said blocks having openings extending therethrough and terminating in enlarged openings at the inner ends, a stationary contact secured to the outer face of each insulating block, said contacts having projections extending through the openings in the blocks and bent to be received in the enlarged openings, a lever pivotally connected to the base, and a movable contact arm operable by the lever for engaging the stationary contacts.

7. An electric switch comprising a base, insulating blocks secured to the base, an insulating plate secured between the blocks and extending beyond one end thereof, stationary contacts secured to the insulating blocks and extending beyond each end thereof, a lever connected to the base, a movable

contact arm operable by the lever for engaging one end of the stationary contacts, and electric wires extending through openings in the insulating plate and connecting to the stationary contacts.

8. In combination with a hollow handle, a switch adapted for insertion in the handle, electric wires extending into the handle and connected to the switch, and a detachable plate secured to the outside of the handle and engaging the wires for positioning the same with respect to the handle.

9. In combination with a hollow handle, a switch adapted for insertion into the handle, a detachable plate secured to the outer face of the handle, and electric wires extending through said plate and into the handle and connected to the switch, said plate positioning the wires with respect to the handle.

10. In combination with a hollow handle, a switch adapted for insertion into the handle, electric wires extending into the handle and connected to the switch, a wire protecting covering surrounding the wires adjacent the outer face of the handle, and a plate secured to the handle, said plate having a semicircular portion to receive the end of the wire protecting covering.

11. In combination with a hollow handle, a switch adapted for insertion into the handle, wires extending into the handle and connected to the switch, a plate, on the exterior of the handle, for positioning the wire with respect to the handle, and means extending through said plate for securing the same to the handle and for engaging and securing the switch in the handle.

12. In combination with a hollow handle having an opening in the wall thereof, a switch adapted for insertion in the handle, electric wires extending through the opening in the handle and connected to the switch, and a pin carried by the wires, on the inside of the handle, for engaging the inner wall of the handle, to prevent the disconnecting of the wires from the switch.

13. In combination with a hollow handle having an opening in the wall thereof, a switch adapted for insertion into the handle, wires extending through the opening and connected to the switch, and a transversely extending pin carried by the wires, and overlying the edges of the opening in the wall of the handle, to prevent the withdrawal of the wires from the handle.

14. In combination with a hollow handle having an elongated opening in the wall thereof, a switch adapted for insertion into the handle through the opening, a removable plate for closing the opening, said plate having a concavo-convex portion intermediate its ends, means carried by the plate for positioning the switch within the handle, and wires extending through the concavo-convex portion of the plate and connected to the switch.

15. An electric switch comprising a base, a stationary contact carried by the base and spaced therefrom, a pivoted lever, a movable contact arm operable by the lever, and a rotatable contact member carried by the movable arm, said rotatable contact member normally being engaged with the base but adapted to be swung into engagement with the stationary contact upon operation of the lever, said rotatable contact being rotated along the base upon initial movement of the lever and rotated upon the stationary contact after engagement therewith.

16. An electric switch comprising a base, a stationary contact carried by the base and spaced therefrom, a pivoted lever, a movable contact arm operable by the lever, and a rotatable contact member carried by the movable arm, said rotatable contact member normally being engaged with the base but adapted to be swung into engagement with the stationary contact upon operation of the lever, the initial movement of the lever and contact arm rotating the rotatable contact upon that member with which it is engaged and further movement thereof swinging the rotatable contact into engagement with the other member and rotating the same thereon.

17. An electric switch comprising a base, a stationary contact carried by the base and spaced therefrom, a pivoted lever, a movable contact arm operable by the lever, and a rotatable contact member carried by the movable arm and adapted for engagement with either the base or stationary contact upon operation of the lever and movable contact arm, the initial movement of the lever and contact arm rotating the rotatable contact upon that member with which it is engaged and further movement thereof swinging the rotatable contact into engagement with the other member and rotating the same thereon.

18. An electric switch comprising a base, a stationary contact carried by the base and spaced therefrom, a pivoted lever, a movable contact arm operable by the lever, and a rotatable contact member carried by the movable arm and adapted for engagement with either the base or stationary contact upon operation of the lever and movable contact arm, the initial movement of the lever and contact arm rotating the rotatable contact upon that member with which it is engaged and further movement thereof swinging the rotatable contact into engagement with the other member and rotating the same thereon, the rotatable movement of the contact along the base being greater than the rotatable movement along the stationary contact.

In testimony whereof I hereunto affix my signature.

MORRIS S. WRIGHT.