

April 15, 1930.

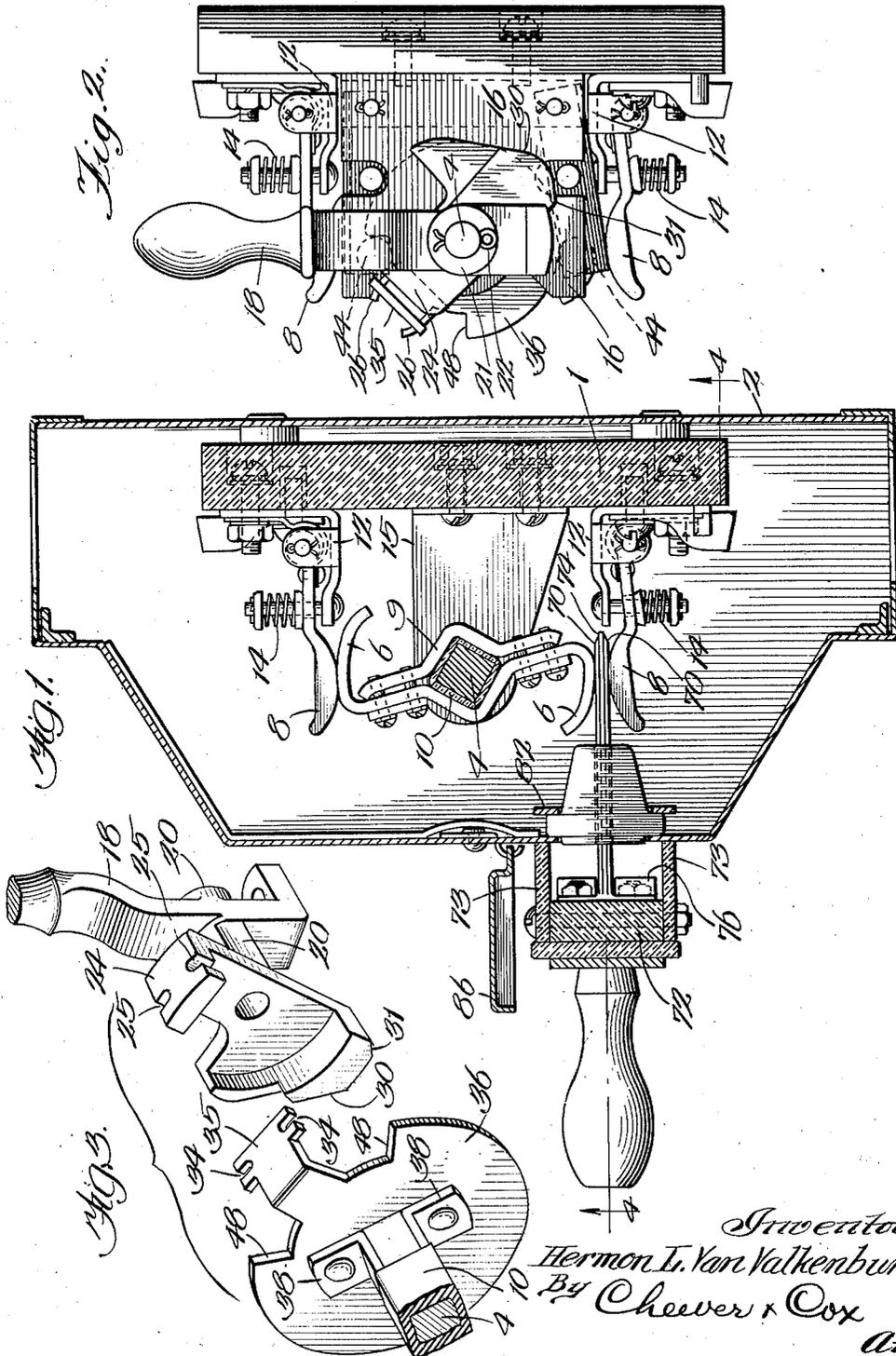
H. L. VAN VALKENBURG

1,754,585

ELECTRIC SWITCH

Filed June 4, 1924

4 Sheets-Sheet 1



Inventor:
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April 15, 1930.

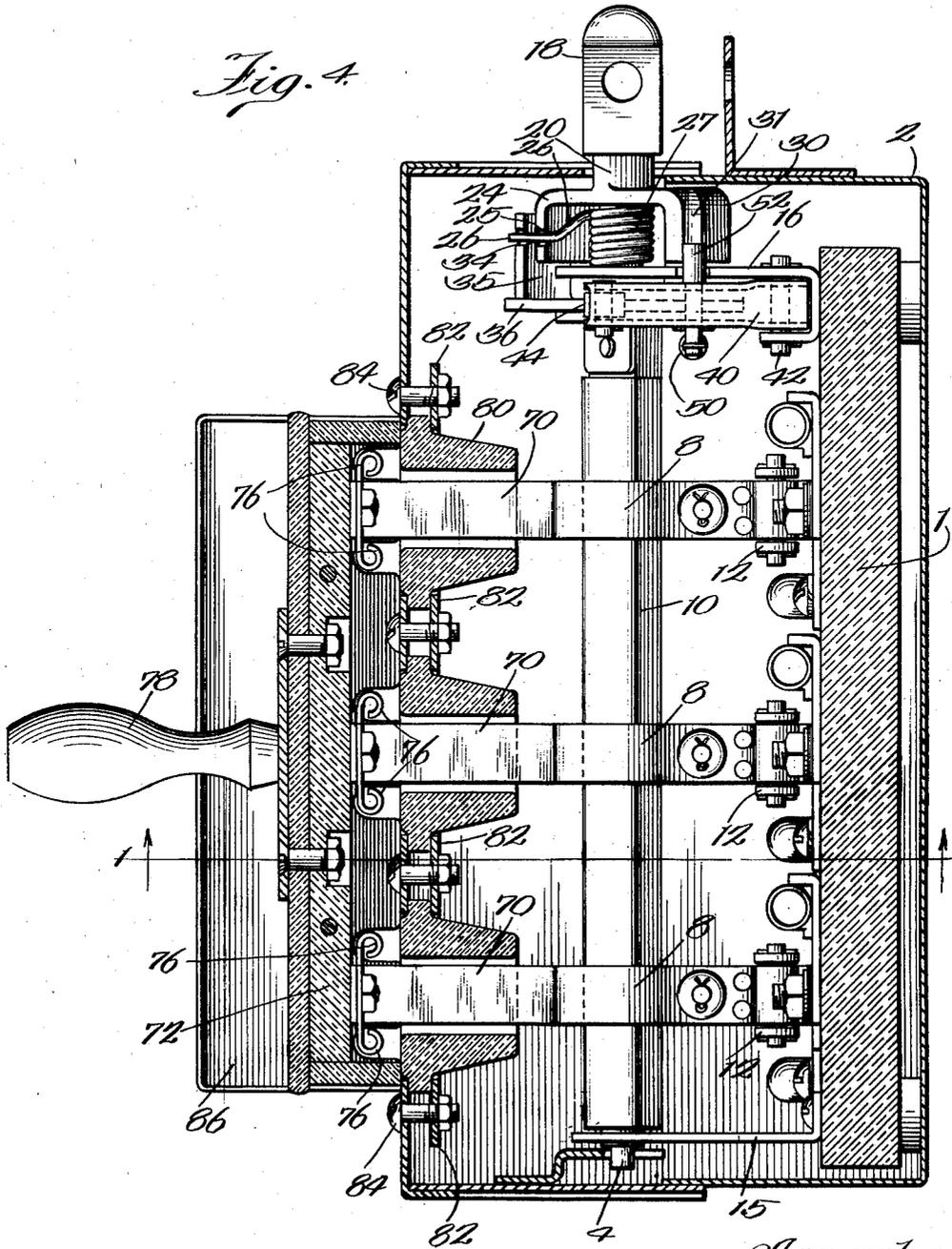
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ELECTRIC SWITCH

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4 Sheets-Sheet 3

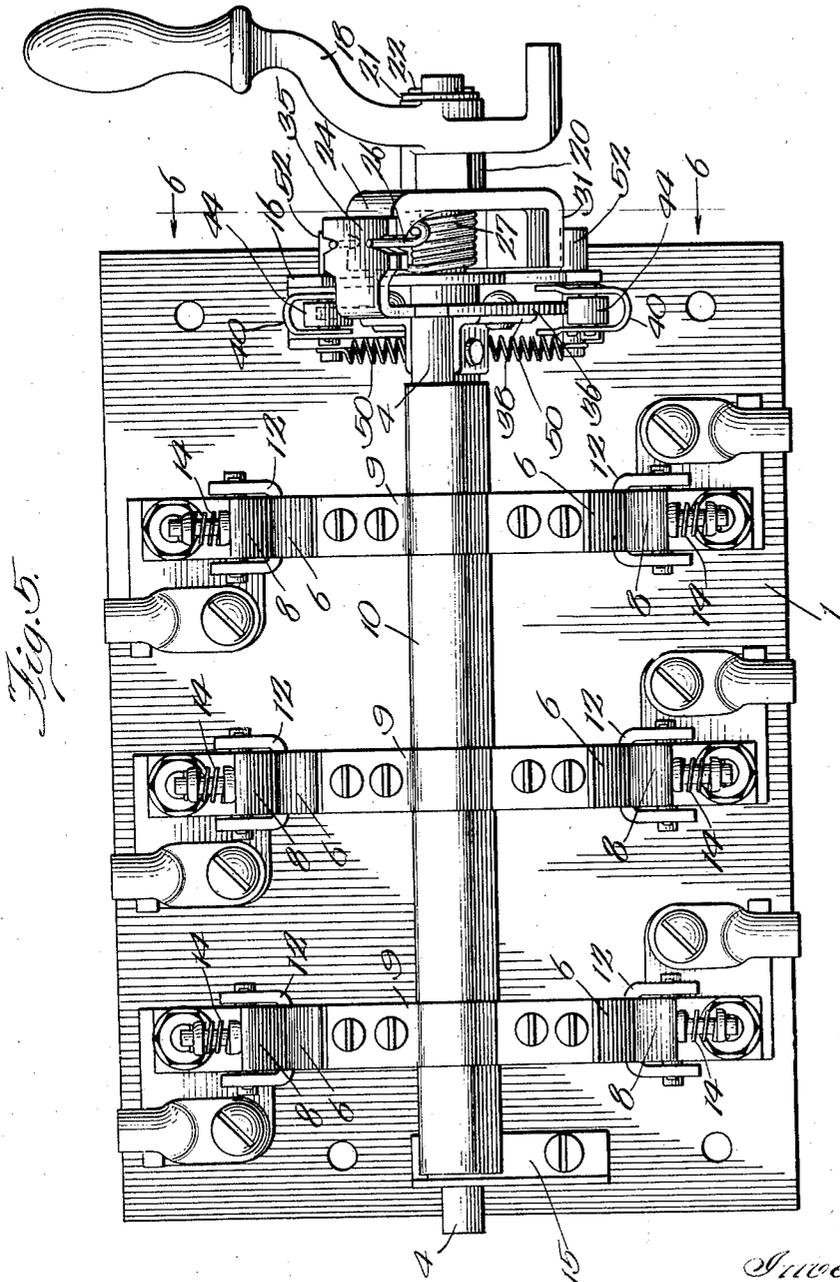


Fig. 5.

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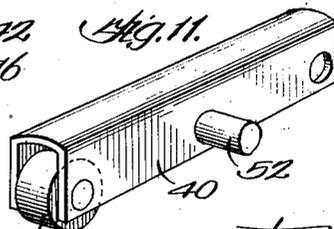
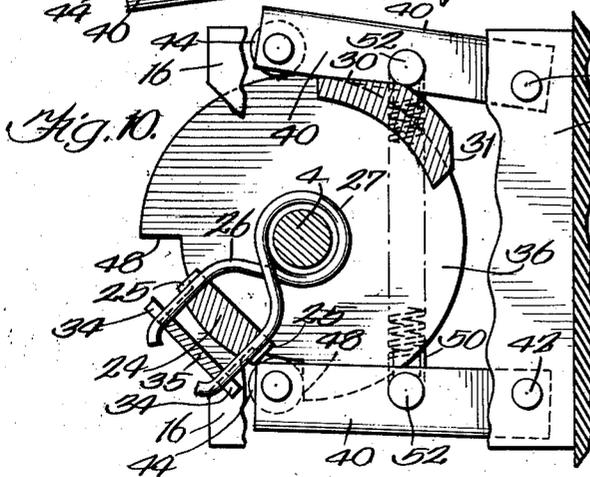
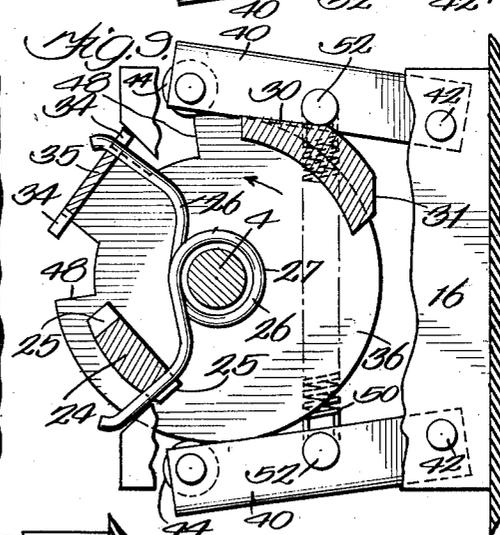
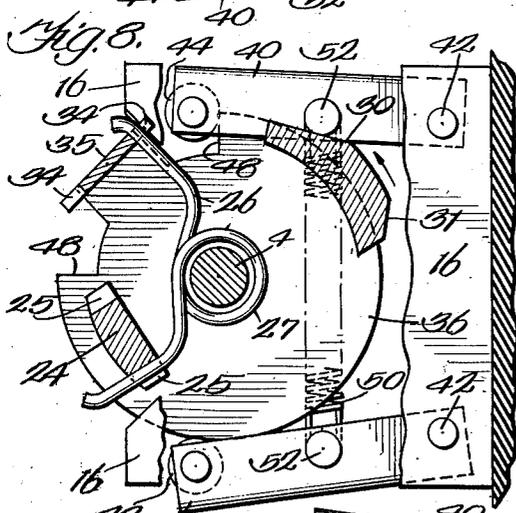
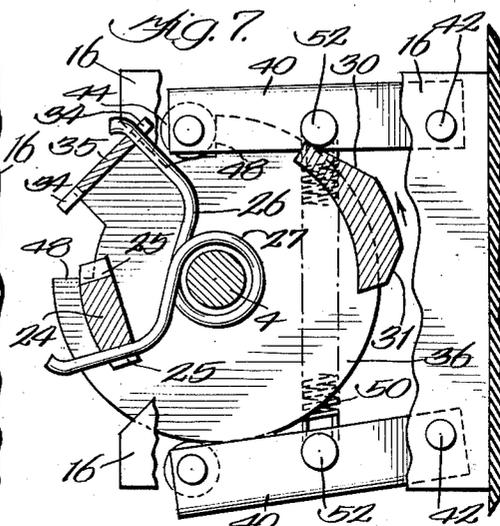
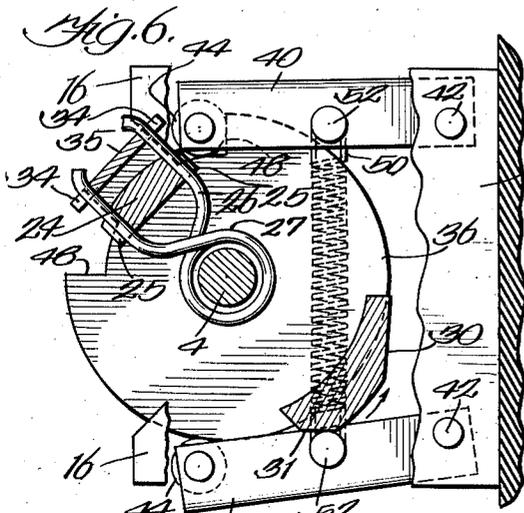
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH

Application filed June 4, 1924. Serial No. 717,677.

My invention relates to circuit closers and consists especially of a snap switch. One of the objects of the invention is to provide a rugged, durable, quick-acting switch whereby a quick make and break may be effected, thus preventing arcing and enabling the parts to stand the shock and jar for an indefinite period. Another object is to provide a type of switch which lends itself readily to the insertion, between contacts, of the blades of a test jack. Contributory objects dealing with the specific structures illustrated will become apparent as the description proceeds.

I obtain my object by the mechanism illustrated in the accompanying drawings in which

Figure 1 is a sectional elevation of the apparatus on the line 1—1 Figure 4.

Figure 2 is an end elevation of the apparatus looking toward the left in Figure 5, the casing being removed.

Figure 3 is a fragmentary perspective view showing a portion of the switch operating lever with its associated cam and spring tensioning arm. This view also shows, adjacent to said arm but at a slight distance for clearness, the shaft operating disc and a portion of the shaft which operates the switch arms.

Figure 4 is a sectional view of the apparatus on a horizontal plane showing the test jack in operating position.

Figure 5 is a front elevation of the apparatus with the housing removed. In this view the test jack is absent.

Figure 6 is a sectional view on the line 6—6 Figure 5. It shows the coaction between the parts which operate and control the switch-operating shaft.

Figures 7, 8, 9 and 10 are similar to Figure 6 but show the sequence of operation of the parts.

Figure 11 is a perspective view of one of the detents which temporarily delays the rotation of the switch-operating shaft.

Like numerals denote like parts throughout the several views.

In the particular form chosen to illustrate the principle of the invention the chief operating parts are mounted upon a panel 1 of slate or other insulating material. This panel

is mounted within a casing 2 which consists preferably of sheet metal and may assume various shapes. The main shaft 4 carries the switch arms 6, the ends whereof are bent over into arcuate form to readily cooperate with the fingers 8 which form the cooperating contacts. These switch arms are fastened by means of clip 9 or other suitable elements and are of substantial dimensions to render them rugged. They are curved at the ends for smooth cooperation with the contact fingers 8 and are insulated from the shaft by means of an insulating sleeve 10. The type of switch illustrated has three pairs of switch arms and three pairs of cooperating fingers, although the number may be varied to suit requirements. The fingers are mounted upon brackets 12 secured to the front of the panel and are urged by compression springs 14 to make close contact with the switch arms.

The main shaft 4 is journaled at one end upon a bracket 15 mounted on the front of the panel as shown in Figure 1 and elsewhere. The other end of the shaft is journaled in a bracket 16 secured to the front of the panel and shown in Figures 2, 4 and 5. According to the illustrated design the bracket 16 is of special configuration to adapt it to cooperate with the shaft-operating part which will now be described.

The shaft 4 projects through one end of the housing and supports an external operating lever or handle 18. This handle has a hub or sleeve 20 which is shown in perspective in Figure 3. It is loosely mounted upon the shaft so as to rotate independently of it, and is kept in place by a washer 21 and cotter pin 22 shown at the right end of Figure 5 and elsewhere. At the inner end of the sleeve is an integral arm 24 which comes within the housing. Arm 24 has notches 25 to receive the ends of the main spring 27. The purpose of this arm is to tension the spring. The sleeve also has two integral cams 30, 31 which are shown in perspective in Figure 3 and in section in Figures 6 to 10. These cams are for lifting or representing the detents to release the shaft-operating disc as will presently appear.

The ends 26 of the main spring 27 project beyond the arm 24 and seat at times in notches

34 formed in an arm 35 projecting from the shaft-operating disc 36 shown in perspective in Figure 3. This disc is mounted upon shaft 4 and is secured to it by means of brackets 38 or other appropriate devices. The spring ends, when permitted to do so, rotate the disc rapidly with considerable force, thus causing rapid rotation of the main shaft and of the switch arms 6. The detents hold the operating disc until the main spring is sufficiently tensioned and until the operating handle has moved far enough ahead to prevent interference by the arm 24. Said detents are formed as illustrated in perspective in Figure 11. There is a pair of them and each consists of a U-shaped piece 40. At the inner end they are pivoted to the bracket 16 by pins 42. At the outer end these detents carry anti-friction rollers 44 which roll upon the periphery of the operating disc 36 and when the disc has rotated sufficiently drop into engagement with the shoulders 48 formed on said disc. The detents are constantly urged toward the disc by a tension spring 50 which extends from one to the other of said detents at points between their ends. One of these shoulders 48 corresponds to the closed position of the switch arms, and the other to the open position thereof. In the construction illustrated the spring 50 is connected to the detents between the sides of the detents by pins 52. These pins project at one side of the detents so as to lie in the path of the cams 30, 31 to be lifted thereby to release the operating disc 36.

In operation, let it be assumed that the handle stands in upright position as shown in Figures 2, 3 and 5. This corresponds to the closed position of the switch as shown in Figure 1. When the switch is thus closed, the shaft-operating parts occupy the position shown in Figure 6. When it is desired to open the switch the operator, standing in front of the apparatus, that is, at the left of Figures 1 and 2, and 6 to 10, pulls the handle toward him, thus rotating cam 30 in a counter clockwise direction from the normal closed position shown in Figure 6. The rotation of the handle accomplishes two things, which will be readily understood by comparing Figure 6 with Figure 7. It moves the lower end of the main spring 28 downward and also moves cam 30 into contact with the pin 52 on the upper detent 40. If now the operator continues the movement of the operating handle the cam 30 will lift pin 52 until the center of the upper roller 44 is past the point of the shoulder 48. Thereupon the point of the shoulder will complete the lifting of the detent because the disc 36 is urged forward under the tension of the spring 26. As soon as the disc has thus been released the main spring 26 will forcibly rotate it forward to the position shown in Figure 10, in which position the switch arms will be in open po-

sition out of engagement with the contact fingers 8. When this position has been reached the opposite shoulder 48 will have passed the lower anti-friction roller 44, thus permitting the latter to drop behind the shoulder as shown in Figure 10. Thus the switch arms become locked in open position.

When it is desired to close the switch, the reverse operation takes place. The operator rotates the handle in the opposite direction (clockwise from the position shown in Figure 10) thus causing cam 31 to engage the pin 52 on the lower detent, which forces said detent back until the point of the lower shoulder 48 comes above the center of the roller which engages it. Thereupon the roller will be forced away by the shoulder acting under the force of the main spring 26, and as the disc is thus released it will return to original position under the force of the main spring. Simultaneously with the closing of the switch the upper anti-friction roller 44 drops in behind the shoulder 48 which is now at the upper part of the disc and consequently the switch will be locked by the detent in closed position.

Now referring to the test jack and the cooperating parts of the switch mechanism:

The test jack in the present case has three pairs of blades 70 to correspond to the number of switch arms in the apparatus. These blades are rigidly secured to a box-like frame 72 made chiefly of insulating material. The frame includes side members 73 which engage the front of the casing when the jack is inserted and serve to limit the distance to which the blades may be inserted. The blades are insulated from each other by a strip 74 of insulating material in the known manner. The blades are provided with eyes or lugs 76 by which they may be electrically connected to conductors leading to the testing instrument (not shown). The frame 72 is provided with a handle 78 to afford means whereby the jack may be manipulated. The blades are introduced into the casing through guides 80 mounted in suitable openings in the front of the casing as shown in Figures 1 and 4. These guides are of porcelain or other suitable insulating material, thus preventing the blades from coming into electrical contact with the casing. The guides are of considerable length, extending, according to the illustrated form, almost to the switch arms 6 and contact fingers 8 shown in Figure 1. Their length is greater than their width or thickness to firmly support and guide the test jack. This is of advantage because it enables the operator to insert the blades between the switch contacts without exercising any skill or judgment. All that is necessary is to insert the blades into the porcelain guides 80 and then push in the jack until the frame thereof contacts the front of the casing. By reference to Figure 1 it will be seen that both

the switch arms and spring contact fingers flare at the ends and hence the ends of the test jack blades enter between them readily, the spring contacts yielding downward in the manner illustrated. According to the illustrated construction the porcelain guides are readily removable, being retained in clips 82 secured by bolts 84 as shown in Figure 4. Thus the guides are rugged and firmly support the test jack but if by any accident a guide should be broken it may be readily replaced.

A drop cover 86 is hinged to the front of the casing as shown in Figure 1 in position to normally close the opening in the casing through which the blades of the test jack are inserted. When the jack is to be inserted the cover is swung up out of the way and as soon as the jack is withdrawn the cover will automatically drop to closed position.

The specific features of the test jack form the subject of a separate application, Serial Number 246,704, filed by me on the 14 day of January, 1928.

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

1. In a snap switch mechanism having a shaft, a rotary switch arm coaxial therewith, a rotary disc rigidly connected to the shaft for rotating it and having two shoulders facing in opposite directions, a single spring operative upon said disc in either of two directions and making one way engagement contact therewith, a rotary handle for tensioning said spring, two detents, each having a fixed pivot at one end and at the other end adapted to engage one of the shoulders on the disc for temporarily holding the latter, and two rotary cams arranged on the handle and having acting surfaces which are eccentric to the handle axis and adapted to engage the respective detents between their ends for lifting them from the shoulders release the disc and switch arm, said spring having a coil encircling said shaft and being supported by it.

2. In a snap switch mechanism having a switch arm, a shaft for operating it, a rotary disc rigidly connected to the shaft for rotating it, a spring having a coil surrounding the shaft and being supported by it, the ends of the spring being extended and each end of the spring making one way engagement contact with the disc for rotating it clockwise or counter clockwise, a rotatable operating handle having an arm interposed between the ends of the spring and making one-way engagement contact with it on both sides for tensioning it in either of two directions, and means comprising yielding detents having normal locking engagement with the disc, said detents being shiftable upon predetermined movement of the handle to release the disc for rotation.

3. Snap switch mechanism having a switch arm, a shaft for operating it, a plate rigidly connected to said shaft and having two shoulders facing in opposite directions, a coiled spring having its coil loosely encircling said shaft and having its ends extending approximately radially, said ends making one way engagement contact with the plate for urging it in opposite directions, a rotatable operating lever having a projection interposed between the ends of the spring, a pair of detents having fixed pivots and at the ends engaging the shoulders on the plate, and cams on the operating lever engaging the detents between the ends thereof to lift them from said shoulders.

4. Snap switch mechanism having a switch arm, a shaft for operating it, a circular disc rigidly connected to said shaft and having two shoulders facing in opposite directions, a coiled spring having ends making one-way engagement contact with the disc for urging it in opposite directions, a rotatable operating lever having a projection interposed between the ends of the spring, a pair of detents having fixed pivots and at the ends having rollers engaging the shoulders on the disc, a tension spring connecting the detents and fastened at points between the ends thereof, and cams rigidly connected to the operating lever engaging the detents between the ends thereof.

5. In a snap switch mechanism having a shaft for operating a switch arm, the combination of a disc having opposed shoulders and a driving arm formed in the periphery thereof, a detent adapted to movably engage said shoulder to prevent rotation of the disc, a manual operable sleeve loosely journaled on the shaft and having an outwardly extending arm and a cam element formed thereon, said cam element being adapted upon rotation of the sleeve to disengage said detent to allow rotation of the disc, and a spring having a portion encircling said shaft between said sleeve and disc and reacting between said arms to impart a relative urge to said disc upon rotation of the sleeve.

6. In a snap switch mechanism, a frame, a shaft rotatably mounted to the frame for operating the switch, a movable switch element mounted to the shaft, a disc having a shoulder and a drive arm formed in its periphery adjacent the shoulders mounted to the shaft, a detent resiliently mounted to the frame and extending to normally engage the shoulder, whereby to latch the disc against rotation in one direction, a manually operable sleeve loosely journaled to the shaft and having an outwardly extending arm and a cam element formed therein, said cam being adapted upon rotation of the sleeve, to disengage the detent to permit the drive disc to rotate, and resilient means actuated by the outwardly extending arm of the sleeve for actuating

said resilient means to rotate the drive disc.

7. In a snap switch mechanism, a frame, a shaft rotatably mounted to the frame for operating the switch, a movable switch element mounted to the shaft, a disc having a shoulder and a drive arm formed in its periphery adjacent the shoulders mounted to the shaft, a detent resiliently mounted to the frame and extending to normally engage the shoulder, whereby to latch the disc against rotation in one direction, a manually operable sleeve loosely journaled to the shaft and having an outwardly extending arm and a cam element formed therein, said cam being adapted, upon rotation of the sleeve, to disengage the detent to permit the drive disc to rotate, and a spring having a portion encircling said shaft between said sleeve and the drive disc and reacted between the drive disc and the outwardly extending arm of the manually operable sleeve to rotate said disc upon rotation of said sleeve and release of said detent.

8. In a snap switch mechanism having a shaft for operating a switch arm, the combination of a rotary disc secured on the shaft and having a shoulder formed therein, a spring operating upon said disc in either of two directions, a manually rotatable device for tensioning said spring in either of said directions, a detent engaging the shoulder of the rotary disc to normally prevent rotation thereof, said manually rotatable means having an integral formed portion adapted to engage the detent and release it from said shoulder after the spring has been tensioned whereby to release the disc for rotation under the impetus of the spring.

9. In a snap switch mechanism having a shaft for operating a switch arm, the combination of a rotary disc secured on the shaft and having opposed shoulders formed therein, detents normally engaging said shoulders to prevent rotation of the disc in either direction, spring means operated upon said disc to cause same to rotate in either of two directions, and shiftable means for tensioning said spring means in either direction to impart a rotary motion to said disc, said manually shiftable means having an integral formed portion adapted to engage one or other of said detents to disengage same from said disc whereby to release the disc for rotation under the impetus of said tensioned spring means.

In witness whereof, I have hereunto subscribed my name.

HERMON L. VAN VALKENBURG.