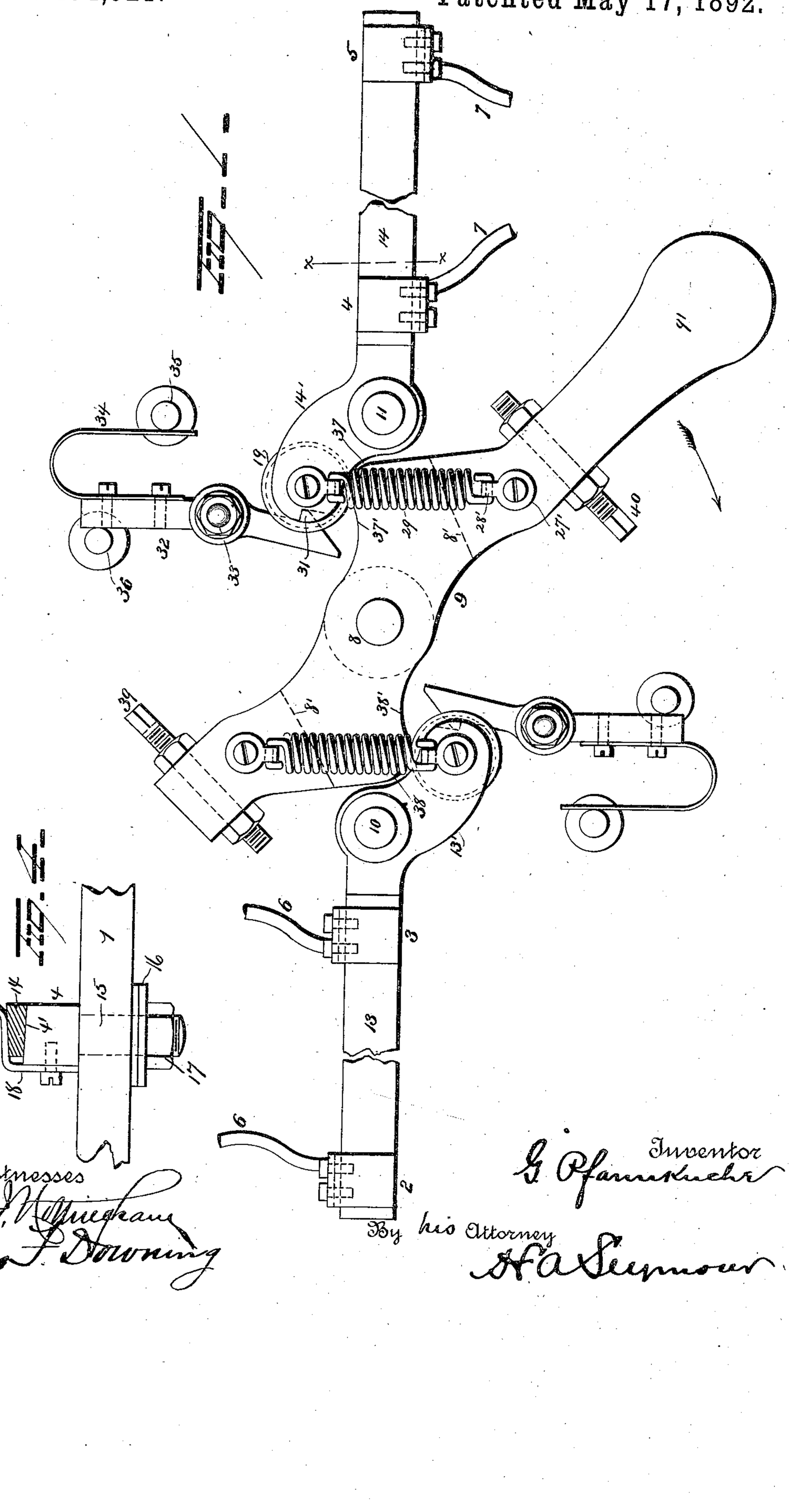
(No Model.)

2 Sheets—Sheet 1.

G. PFANNKUCHE.

ELECTRIC SWITCH.

No. 474,921. Patented May 17, 1892.



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(No Model.)

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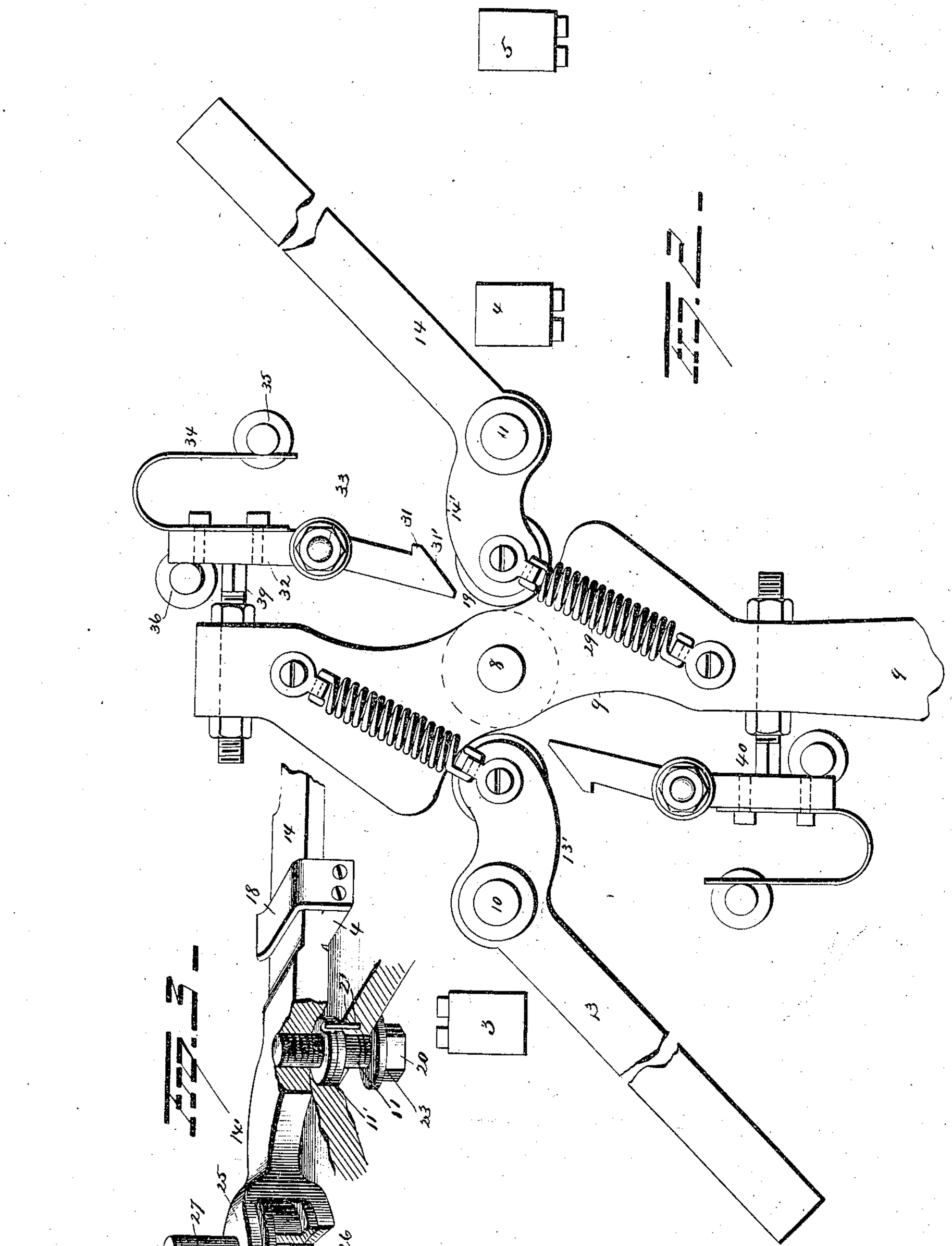

UNITED STATES PATENT OFFICE.

GUSTAV PFANNKUCHE, OF CLEVELAND, OHIO, ASSIGNOR TO THE BRUSH ELECTRIC COMPANY, OF SAME PLACE.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 474,921, dated May 17, 1892.

Application filed March 1, 1890. Serial No. 342,199. (No model.)

To all whom it may concern:

Be it known that I, GUSTAV PFANNKUCHE, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Electric Switches; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has reference to improvements in electric switches of the character known in the art as "snap-switches;" and the object of the invention is to produce a switch by means of which a circuit carrying a current of high electro-motive force can be broken with great rapidity and the contacts so widely separated that the destructive sparking which in other switches occurs is in a great measure reduced.

In the accompanying drawings I have illustrated one practical form which my invention may assume without limiting myself to the exact details shown and described.

Figure 1 represents a plan view of my improved switch constructed as a duplex switch for opening and closing the circuit at two points simultaneously, the circuit being shown as closed. Fig. 2 is a like view showing the circuit open. Fig. 3 is a perspective view of one of the switch-arms with portions broken away to more clearly exhibit the construction of its parts, and Fig. 4 is a section on line $x\,x$, Fig. 1.

Like numerals of reference indicate like parts all throughout the drawings.

Referring to these drawings, my switch is shown as mounted upon a base-board 1, which is made of insulating material, and preferably of slate, stone, glass, earthenware, or other like refractory substance. Upon this base-board are mounted the contact-blocks 2 3 4 5, preferably arranged in a straight line, as shown, the contact-blocks 2 and 3 being the terminals of one branch 6 6 of the circuit, and the contact-blocks 4 5 the terminals of the other branch 7 of the circuit. In the straight line marked by the contact-blocks and midway between the blocks 3 4 is the pivot 8 of the switch-lever 9, which latter is of insulating material and the construction of which will hereinafter more fully appear, and in the same straight line are mounted upon the base-board the pivots 10 11 of the metallic switch-arms 13 14, the pivot 10 being between the contact-block 3 and the pivot 8 of the switch-lever and the pivot 11 intermediate between the contact-block 4 and the said pivot 8.

The contact-blocks 2, 3, 4, and 5 are constructed and mounted in the manner shown in Fig. 4, the blocks themselves being, essentially, cubical in form with their upper faces 4′ slightly inclined, while from the lower end of each block extends a bolt 15 through the base-board 1. This bolt is screw-threaded at its lower end, as shown, and the circuit-wire 7 is looped around the bolt. A washer 16 is then placed upon the looped wire, and the contact-block and wire are tightly clamped by a nut 17.

To one side of each contact-block is screwed an angular piece 18 of spring metal which rises above and passes over the inclined upper surface 4′ of the contact-block, being there inclined oppositely to the inclination of the face 4′, as shown, so as to form, with the latter, a slightly wedge-shaped seat for the reception of one of the switch-arms 13 or 14, which are also wedged-shaped in cross-section.

The switch-arms are, in effect, bell-crank levers, the long branches of which are straight and wedge-shaped in cross-section, as stated, while the shorter branches 13′ 14′ are curved and forked at their ends, as shown and in these forks are mounted grooved anti-friction rollers 19, of insulating material. These switch-arms are pivoted in the manner clearly shown in Fig. 3. Each pivot is formed by a screw-bolt which in Fig. 3 is marked by the reference-numeral 11 and which is clamped to the base-board by a nut 20, there being a collar 11′ formed on the bolt, from which collar a locking-pin 21 passes into the base-board, whereby the bolt 11 is prevented from turning. Washers 22 23 are preferably interposed between the collar and the base-board and between the nut and the base-board, respectively.

The screw-threaded portion of the bolt 11, which projects above the base-board, constitutes the pivot of the switch-arm, which for this purpose has a nut formed at the enlarged

juncture of its two branches 14 14′. Thus it will be seen that when the switch-arm is turned in one direction or the other it will screw up or down upon its pivot; but the extent of this up or down movement is small, and the contacts may easily be arranged so that the vertical movement of the arm in closing the switch has no effect in making the contact lighter. On the contrary, by a suitable arrangement the said vertical movement may be utilized to put increased pressure on the contact. Thus, as shown, the switch-arm being arranged to enter between a contact-block, as 4, and a spring-plate, as 18, Fig. 4, the vertical motion tends to bring it more firmly against one of said parts. This screw-threaded pivotal connection is very convenient, since it is easily manufactured, and gives a smooth movement to the switch-arm, without wabbling, and requires no adjustment. The same pivotal connection, by means of a screw-bolt, is also used for the switch-lever 9, so that without further description it will be understood that the pivot 8 is in all respects like the pivots 10 and 11.

For a purpose which will hereinafter more fully appear the lower prong 24 of the fork on the switch is rounded off at its end, and for convenience of construction the upper prong 25 is similarly shaped. Upon the pintle or shaft 26 of the grooved anti-friction roller 19, where it extends above the upper fork 25, is mounted a sleeve 27, provided with an ear 28 for the attachment thereto of one end of the actuating-spring 29, the other end of which is secured to a like sleeve and eye 27′ 28′, mounted on the switch-lever 9. As shown, the sleeve 27′, or point of attaching the spring to the switch-lever, is at a greater distance from the pivot 8 than is the sleeve 27 from the pivot 11, so that the switch-arm has the larger angular motion. In the lower prong 24 is formed a notch 30 for the engagement therewith of the hooked end 31 of a locking lever or detent 32, pivoted at 33 to the baseboard and actuated by a spring 34, secured to the detent and abutting with its free end against a stud 35. The movement of this detent in one direction is limited by a stud 36.

The switch-lever 9, as before stated, is made entirely of insulating material, such as vulcanized fiber, and the pivotal screw-threads may be cut in the body of the lever; but for greater security against undue wear the central portion of the lever may be faced on each side with brass plates, as indicated by dotted lines 8′ 8′. On one side of the pivot 8 one edge of the lever 9 is expanded, so as to form a protuberance 37, and a like protuberance 38 is formed on the lever on the other side of the pivot 8 on the opposite edge. As will presently appear, these protuberances act as cams in my switch and each of them merges into a curved concavity 37′ 38′, respectively, toward the pivotal point of the lever. By preference, although not necessarily so, the portions of the edges of the lever embracing the protuberances and concavities are chamfered, as indicated, so as to loosely fit the grooves in the anti-friction rollers 19. At equal distances from the pivot 8 there are mounted on the switch-lever 9 the trigger-pins 39 40, so located upon the lever that when the said lever is moved from the position shown in Fig. 1, in the direction of the arrow indicated, to the position shown in Fig. 2 the trigger-pins will come into contact with the upper arms of the detent-levers 32, as is clearly shown in Fig. 2.

The operation of a switch thus constructed will now be easily understood, and since the operation is the same for each of the switch-arms 13 and 14 it will only be necessary to describe this operation with reference to one of these arms, and I shall therefore confine myself to the operation of the switch-arm 14. In the condition shown in Fig. 1 the contact-blocks 4 5 are bridged by the straight portion of the switch-arm 14, which is wedged between the inclined upper faces 4′ of the contact-blocks and the inclined extensions of the spring-plates 18. The fork of the switch-arm is then in such position that the notch 30 in its lower prong 24 is engaged by the hook 31 of the detent-lever 32. The actuating helical spring 29 in this condition of the apparatus is under no perceptible strain. It is practically entirely relaxed, while the trigger-pin 39 is far removed from the detent-lever 32. If it is now desired to break the circuit, the handle portion 9′ of the switch-lever is moved in the direction of the arrow indicated, whereby, the switch-arm 14 being locked, the protuberance 37, which lightly bears upon the anti-friction roller 19, is moved away from said roller, while the spring 29 is forcibly extended and thus put under considerable strain. While this movement continues the trigger-pin 39 approaches the upper arm of the detent-lever 32 until it finally touches the same, when by a slight additional movement of the switch-lever in the same direction the trigger-pin 39 impinges upon the upper arm of the detent 32, moving said detent about its pivot 33, against the tension of the spring 34, whereby the locked lower end of said detent is disengaged from the notch 30 in the lower prong 24 of the fork of the switch-arm 14. As soon as this is effected, and while the switch-lever is held by hand in the new position shown in Fig. 2, the switch-arm 14, being now released and forcibly acted upon by the strained spring 29, will suddenly and with great rapidity be turned about its pivot 11 to the position shown in Fig. 2, thus breaking the circuit at the contact-blocks 4 5. By this operation the spring 29 again completely relaxes, so that there is no strain upon any part of the apparatus while the circuit is open, while at the same time there is no liability of an accidental closing of the circuit. After the switch-arm has been released from the detent and while it is turning to its open position (shown in Fig. 2) the lower prong

24 of the fork will in its movement entirely recede from the head of the hook 31 of the detent, as shown in Fig. 2, and in order to facilitate such clearance the said head is cut away so as to present an inclined plane 31′ to the rounded end of the lower prong. In the open position ot the switch-arm the anti-friction roller 19 will gently bear upon the curved concavity 37′, formed adjacent to the cam-protuberance 37 on the edge of the switch-lever, as shown in Fig. 2. If it is now desired to close the circuit, the handle of the switch-lever is turned in the direction of the arrow indicated in Fig. 2, whereby the cam-protuberance 37, acting upon the grooved anti-friction roller, turns the switch-arm 14 toward and finally into the position shown in Fig. 1. While this movement is taking place the detent-lever 32, being now released from the trigger-pins 39, is, with its inclined head 31′, in the path of the lower prong 24 of the fork. This prong, however, being rounded and the head 31′ representing an inclined plane, the prong will gradually ride up that inclined plane until the hook 31 again engages the notch 30, which takes place when the straight wedge-shaped portion of the switch-arm is securely lodged between the contact-blocks 4 5 and spring-plates 18. During this operation the actuating-spring 29 is not perceptibly put under tension, so that in the operation of this switch this spring is put under tension only momentarily while the switch-lever is being operated for providing the conditions for breaking the circuit.

While I have described the operation of my improved switch with reference to one switch-arm only, it will be clear that the other switch-arm which I have shown and described in operative relation to the switch-lever will be actuated in precisely the same manner, so that a further description is unnecessary.

Having now fully described my invention, I claim and desire to secure by Letters Patent—

1. In an electrical snap-switch, the combination, with a switch-lever pivoted between its ends, of switch-arms, springs connecting one end of each of said switch-arms to the switch-lever, a trigger for each switch-arm, springs for retaining triggers normally in engagement with said switch-arms, and trigger-pins carried by said switch-lever at opposite sides of its fulcrum and adapted to strike said switch-arms simultaneously when the switch-lever is operated, substantially as set forth.

2. An electric snap-switch comprising a switch-arm, a switch-lever, a spring connecting the switch-lever and the switch-arm, a trigger for said arm, and an adjustable trigger-pin on the said switch-lever, substantially as described.

3. A quick-acting snap-switch, consisting, essentially, of a metallic arm or arms for closing and opening a circuit, a switch-lever having protuberances thereon for forcing said arms in position to close the circuit, detents for locking the arms in their closed position, and a normally-relaxed spring for each arm, connecting the latter with the switch-lever, and a trigger for each detent carried by the lever, whereby each spring is put under tension before the arms are unlocked, substantially as described.

4. In an electric snap-switch, the combination of one of more pivoted switch-arms for closing and opening a circuit or circuits and a switch-lever in operative relation to the arms, protuberances on said switch-lever, adapted to engage said switch-arms and move the same positively in one direction to close the circuit with detents for locking the arms in their closed position, normally-relaxed springs connecting each arm with the lever, so that the springs may be put under tension without moving the arms, and triggers for unlocking the arms after the springs have been put under tension, substantially as described.

5. A quick-acting snap-switch comprising one or more pivoted metallic switch-arms, a switch-lever, protuberances on said switch-lever, adapted to engage the switch-arms and positively actuate them for closing the circuit, detents adapted to engage said arms for locking the arms in the closed position, normally-relaxed springs connected with the arms and lever, and triggers on the lever for operating the detents to release the arms when the springs are placed under tension, substantially as described.

6. A quick-acting snap-switch comprising one or more metallic switch-arms, a switch-lever having cam-protuberances for engaging the switch-arms to move them to the closed position, detents for locking the switch-arms in the closed position, normally-relaxed springs connecting the arms and levers, and triggers on the lever for operating the detents to release the arms when the springs are placed under tension, substantially as described.

7. In an electric switch, the combination, with a pivoted switch-arm provided with an insulating anti-friction roller, of a switch-lever provided with a cam-protuberance for engaging said roller, substantially as described.

8. In an electric switch, the combination, with a switch-arm mounted on a screw-threaded pivot, of an electrical contact having a contact-surface on the side of the arm toward which the said arm is moved by the screw-thread in turning the same to close the switch, substantially as described.

9. The combination of the switch-lever, the switch-arm pivoted on an independent axis parallel with the axis of the switch-lever, a spring connecting the shorter branch of the switch-arm with the switch-lever, and a trigger and detent for said switch-arm, substantially as described.

10. An electric snap-switch comprising a

switch-lever, separate switch-arms mounted independently of said lever and of each other and provided each with its own contacts, springs connecting the said arms, respectively, with the switch-lever, and triggers and detents for said arms, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

GUSTAV PFANNKUCHE.

Witnesses:
A. B. CALHOUN,
W. A. PALLANT.