

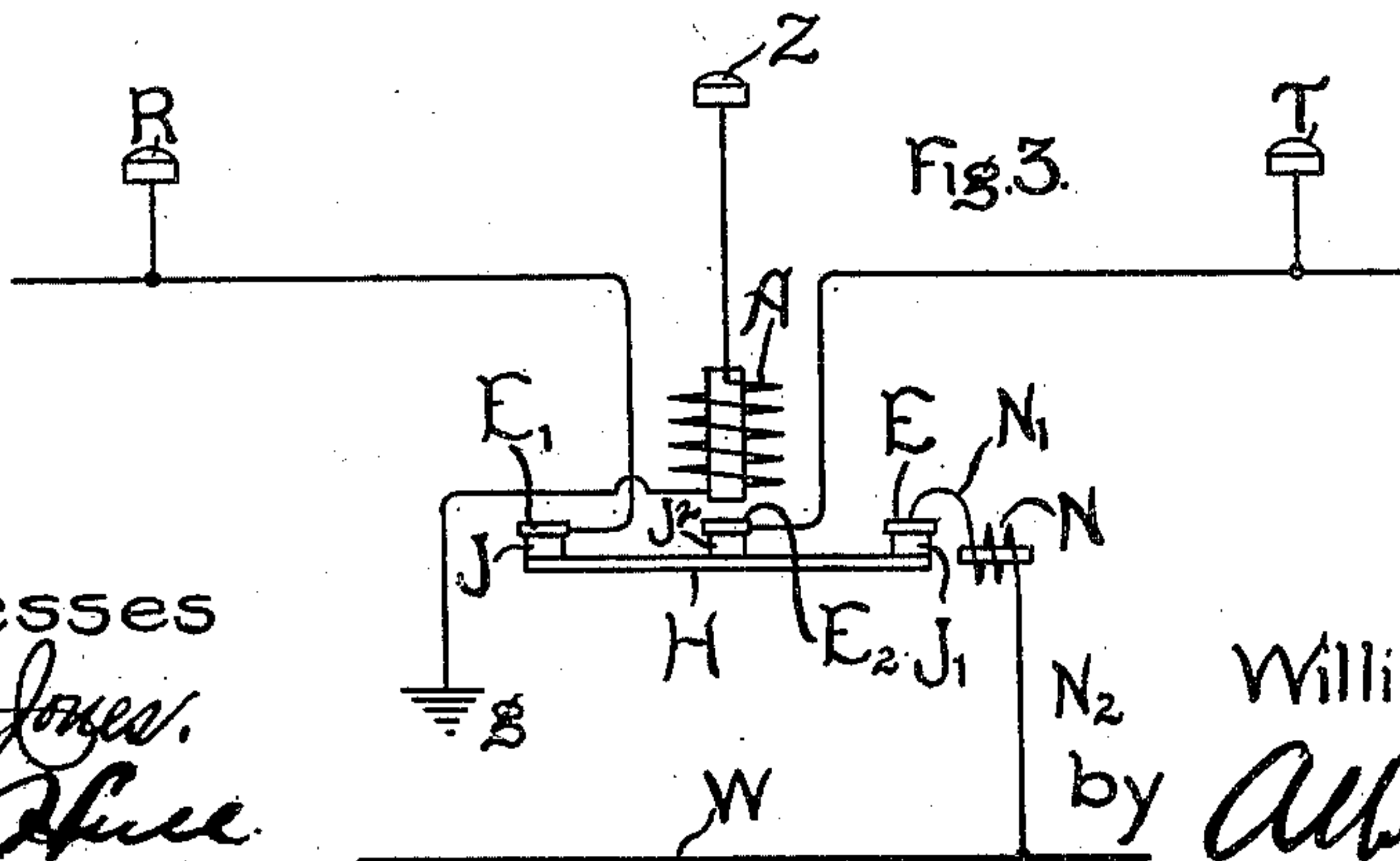
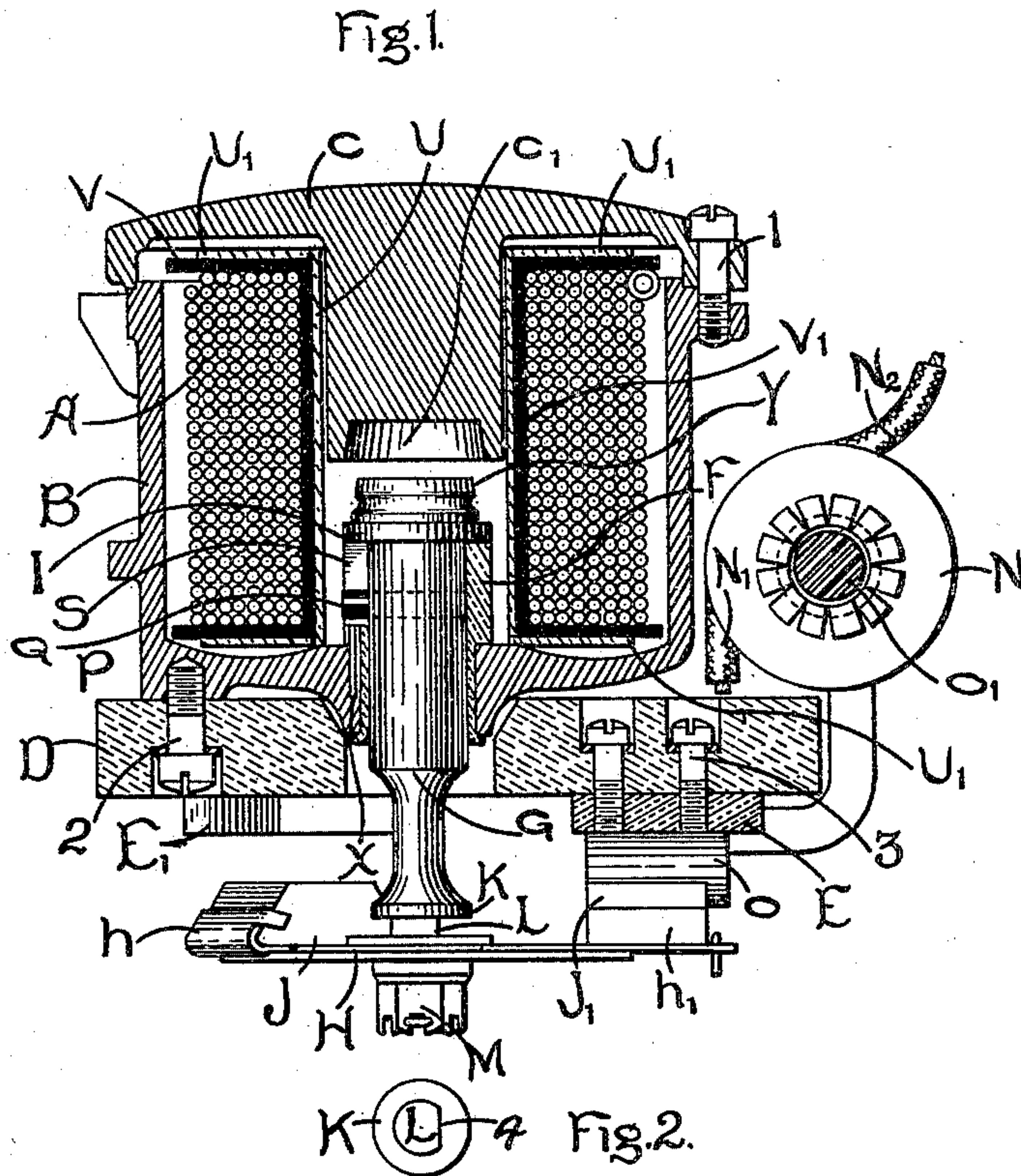
No. 705,137.

Patented July 22, 1902.

W. B. POTTER.
ELECTRIC SWITCH.

(Application filed July 27, 1900. Renewed Apr. 23, 1902.)

(No Model.)



Witnesses
Wm. H. Jones.
Chas. B. Hume.

Inventor
William B. Potter
by *Alfred B. Davis*
Att'y.

UNITED STATES PATENT OFFICE.

WILLIAM B. POTTER, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 705,137, dated July 22, 1902.

Application filed July 27, 1900. Renewed April 23, 1902. Serial No. 104,321. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. POTTER, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Electric Switches, (Docket No. 1,783,) of which the following is a specification.

This invention relates to electric switches. The invention consists in means for separating switch-contacts which may be stuck together owing to arcing. In many types of electric switches and in switches used on certain circuits the contacts are liable not only to be impaired by arcing, but may be caused thereby to be partially welded or stuck together, so that they can be opened with great difficulty. This is especially true of switches for electric railways having sectional service-conductors, which switches are adapted to open automatically by gravity when their actuating magnet-coils are open-circuited, whereby their opening is attended with great uncertainty. Even in the case of the present switch, although it has been constructed so that the liability of the occurrence of serious arcing is greatly decreased, it is highly desirable to guard against the possibility that the switch-contacts may be stuck together from this cause. The reason that it is so very important that the switch be opened in the particular case of its use in a sectional railway is that if it should remain closed the surface contacts of the railway would remain alive after the car had passed from above them, so that the very advantage intended to be obtained from the sectional safety system would not be had.

Figure 1 is a vertical section of a switch embodying the invention. Fig. 2 is a plan of a detail thereof, and Fig. 3 is a diagrammatic illustration of circuit connections in which such a switch might be used.

This switch in general construction is similar to that disclosed in my application for patent, Serial No. 654,793, filed October 11, 1897, and is particularly adapted for use in a surface-contact railway, such as that described in my Patent No. 589,786, dated Sep-

tember 7, 1897. However, the switch, including the improvements set forth hereinafter, is adapted for various uses.

In Fig. 1, B is a box provided with a cover C of magnetic material, secured thereto by a suitable screw 1. Inside the box is a coil A, which may be supplied with current from the same source as that flowing through the switch, or not, as desired. The box B is secured to an insulating-base D by one or more screws 2. To the lower side of the base D are secured the terminals E' E', &c., by the screws 3. A movable magnet portion or plunger G is mounted within the box for vertical movement and is normally maintained by gravity in the position shown. The movable switch portion comprises a support H, of resilient material, provided with radial arms and mounted on the lower end of the plunger G, and on this support, mounted in clips h h', &c., the carbon switch-contacts J J', &c. When the coil A is energized, the plunger G is raised until its upper portion engages in the recess C' in a portion of the cap C, which extends downwardly into the center of the coil, and the carbon contacts J, &c., are brought into contact with the terminals E, &c. The support H yields in this operation to prevent damaging impact of the carbon contacts and by its resiliency serves to hold the contacts tightly together and to compensate for any wear of the upper portion of the plunger G, which is of soft material, as will be seen hereinafter. A suitably-mounted magnet N is provided with extended pole-pieces O, adjacent to the terminals E, in order to blow out the arc when the contact J' is separated from the terminal.

The switch may be connected, as shown in the circuits of Fig. 3, wherein Z is a surface-contact or surface-rail section adapted to be engaged by a collector carried by the car and connected with the coil A. R and T are also surface contacts or rail sections, which are adapted to be engaged by a second car-collector independent of the first and are connected with the switch to supply current to the car-motors. The coil A is connected to ground and is adapted to be connected in series with the motor through the contact Z and

the collector. Blow-out magnet N is connected in series between the switch and the main W by the connections N' and N².

Recurring to Fig. 1, it will be seen that coil A is wound around a support V of insulating material. Surrounding the support V is a closed conductor U', which is adapted to prevent sparking at the surface contact Z of Fig. 3.

The improvements which it is desired to particularly point out herein may be described as follows: A sleeve F, of non-magnetic material, is mounted in the box B, so that an opening is provided in the bottom of the box. The sleeve is prevented from rotation by a pin X, which engages in the lower part of the box. The plunger G extends through the sleeve F and the opening in the base D and is provided with a shoulder I, which is adapted to rest on the top of the sleeve F to limit the downward movement of the core. A pin Q, mounted in the plunger, reciprocates in a vertical slot S in the sleeve to prevent the plunger from rotation. A thin cap Y, of non-magnetic material, such as copper, is attached to the upper portion of the plunger and is adapted to fit the recess C' of the cap C. This cap and the sleeve F being of non-magnetic material serve to prevent the plunger from being held by residual magnetism in its closed position after the coil A has been open-circuited. The lower portion of the plunger is provided with a shoulder K and a reduced portion L, which portion is provided with one flat surface 4. The support H is provided with a hole of the same shape as the portion L, so that the latter may fit and reciprocate therein, but cannot rotate. A nut M serves to retain the support H on the portion L; but the support is not secured against the shoulder K, being permitted to have considerable play between the shoulder and the nut.

The operation is as follows: It may be assumed that arcing between the terminals E E' and the contacts J, J', and J² has caused them to stick together. Then when the coil A is open-circuited the plunger G is prevented by the non-magnetic cap Y and sleeve F from sticking in its raised position and falls by gravity until the shoulder K impinges upon the support H, and as the plunger is of considerable mass and the support H is made of resilient material the carbon contacts J J', &c., will be drawn a short distance across the terminals E E' and forced downward away from the terminals, thus breaking any mechanical connection between the contacts and the terminals and opening the switch. In case the support H were made of rigid material the plunger G would force it directly downward, and, in fact, this would usually be the case unless the parts were especially designed. The plunger will not deliver a blow to the support H if the contacts are not stuck together, for the support will fall with the plunger as

soon as the coil A is open-circuited. Hence the support is subjected to the blow only in case the contacts are stuck together.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an electric switch, the contacts of which are liable to stick, owing to arcing, the combination with the movable switch portion, of an actuator therefor, having a lost-motion connection therewith, whereby in opening the switch the actuator can have a free movement at first, and will then, if the contacts are stuck together, impinge against the switch portion to positively force the switch-contacts apart, against their tendency to stick.

2. In an electric switch, the contacts of which are liable to stick, owing to arcing, the combination with the movable switch portion, of an actuator therefor, having a lost-motion connection therewith, and non-mechanical means for moving the switch portion and holding it in the position to which it may have been moved, to close the switch and maintain it closed, whereby when said means is made inoperative the actuator can have a free movement at first, and will then, in case they cohere, impinge against the switch portion to positively force the switch-contacts apart.

3. In an electric switch, the contacts of which are liable to cohere, owing to arcing, the combination with the movable switch portion, of an actuator therefor, having a lost-motion connection therewith, said actuator being normally maintained by gravity in a position to maintain the switch open, and means for lifting the actuator and switch portion and holding them in their raised position, to close the switch and maintain it closed, whereby, when said means is rendered inoperative, the actuator can move by gravity freely at first, and will then, if the contacts adhere, one to the other, impinge against the switch portion to positively open the switch.

4. In an electric switch, the contacts of which are liable to adhere, owing to arcing, the combination with the movable switch portion, of an electromagnet for moving the switch portion to close the switch, the movable portion of the magnet having a lost-motion connection with said movable switch portion, whereby, when the magnet-coil is open-circuited, the movable magnet portion can have a free movement at first, and will then, if one contact adheres to the other, impinge against the movable switch portion to open the switch, by forcing the contacts apart.

5. In an electric switch, the contacts of which are liable to stick, owing to arcing, the combination with the movable switch portion, normally maintained in its open position by gravity, of an electromagnet for lifting said portion to close the switch, the movable portion of the magnet having a lost-motion connection with the switch portion, whereby, when the magnet-coil is open-circuited, the movable magnet portion moves freely by

gravity at first, and then, if the switch-contacts are stuck together, impinges against the movable switch portion to positively separate the contacts.

5 6. In an electric switch, the contacts of which are liable to be caused to cohere by arcing, the combination with the movable switch portion, of an electromagnet, the movable portion of which has a lost-motion connection with the switch portion, said magnet portion and switch portion being normally maintained by gravity in a position to maintain the switch open when the magnet-coil circuit is open, and non-magnetic material 10 between the movable magnet portion and the other parts of the magnet, to prevent sticking of the movable magnet portion in its raised position after the magnet-coil is open-circuited, whereby it is certain that the movable magnet portion will descend by gravity, 15 freely at first, owing to the lost-motion connection, and will then, in case the contacts are sticking, impinge upon the movable switch portion to positively separate the switch-contacts. 20 25

7. In an electric switch, the contacts of which are liable to stick, owing to arcing, the combination with the movable switch portion, of an actuator therefor having a lost-motion connection therewith in the direction of motion of the actuator, the switch portion being immovable except in the direction of the motion of the actuator.

8. In an electric switch, the contacts of 35 which are liable to stick, owing to arcing, the combination with the movable switch portion, of an electromagnet, the movable portion of which has a lost-motion connection with the switch portion, the switch portion being immovable except in the direction of motion of 40 the movable magnet portion, whereby, when the magnet-coil is open-circuited, the movable portion of the magnet can have a free movement at first, and will then, if the contacts stick, impinge against the movable switch portion to open the switch. 45

9. In an electric switch, the contacts of which are liable to stick, owing to arcing, the combination with the movable switch portion, 50 of an electromagnet, the movable portion of which has a lost-motion connection with the switch portion, the switch portion being immovable except in the direction of motion of the movable magnet portion, and means for 55 preventing any movement of the latter except back and forth in the path through which it is drawn by its coil, whereby, when the magnet-coil is open-circuited, the movable portion of the magnet can have a free movement 60 at first, and will then, in case the contacts are stuck together, impinge against the movable switch portion to open the switch.

10. In an electric switch, the contacts of which are liable to stick, owing to arcing, the combination with a movable switch portion 65 made of resilient material, the resiliency of which prevents severe impact in closing, of

an electromagnet, the movable portion of which has a lost-motion connection with the switch portion, whereby, when the magnet-coil is open-circuited, the movable magnet 70 portion can have a free movement at first, and will then, if the contacts are stuck together, impinge against the resilient switch portion, to exert upon the sticking contacts 75 strains both parallel and transverse to the direction of motion of the movable magnet portion.

11. In an electric switch, the contacts of which are liable to stick, owing to arcing, the combination with the line-terminals, of carbon switch-contacts, a resilient support therefor which yields in closing to prevent injury 80 to the carbons, a support for the carbon contacts, and an electromagnet, the movable portion of which has a lost-motion connection with the support, whereby, when the magnet-coil is open-circuited, the movable magnet 85 portion can have a free movement at first, and will then impinge against the resilient switch portion to force the carbons across and away from the surfaces of the line-terminals. 90

12. The combination with an electric switch, the contacts of which are liable to be caused 95 by arcing to be stuck together, of means for opening the switch whereby, in case the contacts are stuck together, a hammer-blow is automatically delivered to separate them, but no blow is delivered in case the contacts are 100 not stuck together.

13. The combination with an electric switch, of an electromagnet for closing the same, and a mass of magnetic material which falls by gravity against the switch when the magnet-coil is open-circuited, to force the switch open. 105

14. The combination with an electric switch, the contacts of which are liable to be caused by arcing to be stuck together, of an electromagnet for closing the same, and a magnetic 110 hammer which falls by gravity when the magnet-coil is open-circuited, and impinges upon the switch to open the same, only in case the switch is held closed by the coherence of the contacts. 115

15. The combination with an electric switch, the contacts of which are liable to be caused by arcing to be stuck together, of an electromagnetic hammer which falls by gravity, and impinges upon the switch to open the same 120 when the magnet-coil is open-circuited, and a stop-rest for the hammer which permits the hammer to fall through and below the space occupied by the switch in its closed position.

16. In an electric switch, the contacts of 125 which are liable to be caused by arcing to be stuck together, the combination with the movable switch portion, of an electromagnet, the movable portion of which is provided with a shoulder, and means for holding the movable switch-piece so that it can move freely 130 on the movable magnet portion below the shoulder, whereby, when the magnet-coil is open-circuited, the magnet portion falls by

gravity, and in case the contacts are stuck together, its shoulder impinges upon the switch portion, to open the switch, and means for limiting the fall of the movable magnet

5 portion.

17. In an electric switch, the contacts of which are liable to be caused by arcing to be stuck together, the combination with the movable switch portion, of an actuator therefor
10 having a portion with a non-circular periphery, said switch portions fitting over said non-circular portion, to prevent rotation, and having a lost-motion connection with said actuator in the direction of motion of
15 the latter, said actuator being normally maintained by gravity in a position to maintain the switch open, and means for lifting the actuator and switch portion and holding them in their raised position, to close the
20 switch and maintain it closed, whereby, when said means is rendered inoperative, the actuator can gravitate freely at first, and will then, if the contacts are stuck together, impinge against the switch portion to positively
25 open the switch.

18. In an electric switch, the contacts of which are liable to stick, owing to arcing, the combination with the movable switch portion, of means for delivering a hammer-blow there-
30 to, to separate the sticking contacts, and an electromagnet for closing said switch and controlling said means, the latter being operative when the magnet-coil is open-circuited.

35 19. In an electric switch, the contacts of which are liable to stick together, owing to

arcing, the combination with the movable switch portion normally held by gravity in its open position, of an electromagnet for raising the switch portion to close the switch, 40 and means for delivering a hammer-blow to the movable switch portion when the magnet-coil is open-circuited.

20. In an electric switch, the contacts of which are liable to stick together, owing to 45 arcing, the combination with the movable switch portion, of means for delivering a blow thereto to separate the contacts in case they are stuck together, and an electromagnet which controls said means and permits 50 it to be operated when the magnet-coil is open-circuited, and the contacts are stuck together.

21. The combination with an electric switch, normally held in its open position by gravity, 55 of means whereby, when the switch is closed, a hammer-blow is automatically, in case the contacts are stuck together, delivered to the switch to force it open.

22. In an electric railway, the combination 60 with the feeder, of a sectional conductor, a connection between each such section and the feeder, a switch for each such connection, and a switch-actuating, electrically-controlled device mechanically connected to 65 said switches by a lost-motion joint.

In witness whereof I have hereunto set my hand this 24th day of June, 1900.

WILLIAM B. POTTER.

Witnesses:

BENJAMIN B. HULL,

MARGARET E. WOOLLEY.