(No Model.) 2 Sheets—Sheet 1.

J. B. SMITH & A. L. CLOUGH.

ELECTRIC SWITCH.

No. 549,162. Patented Nov. 5, 1895.

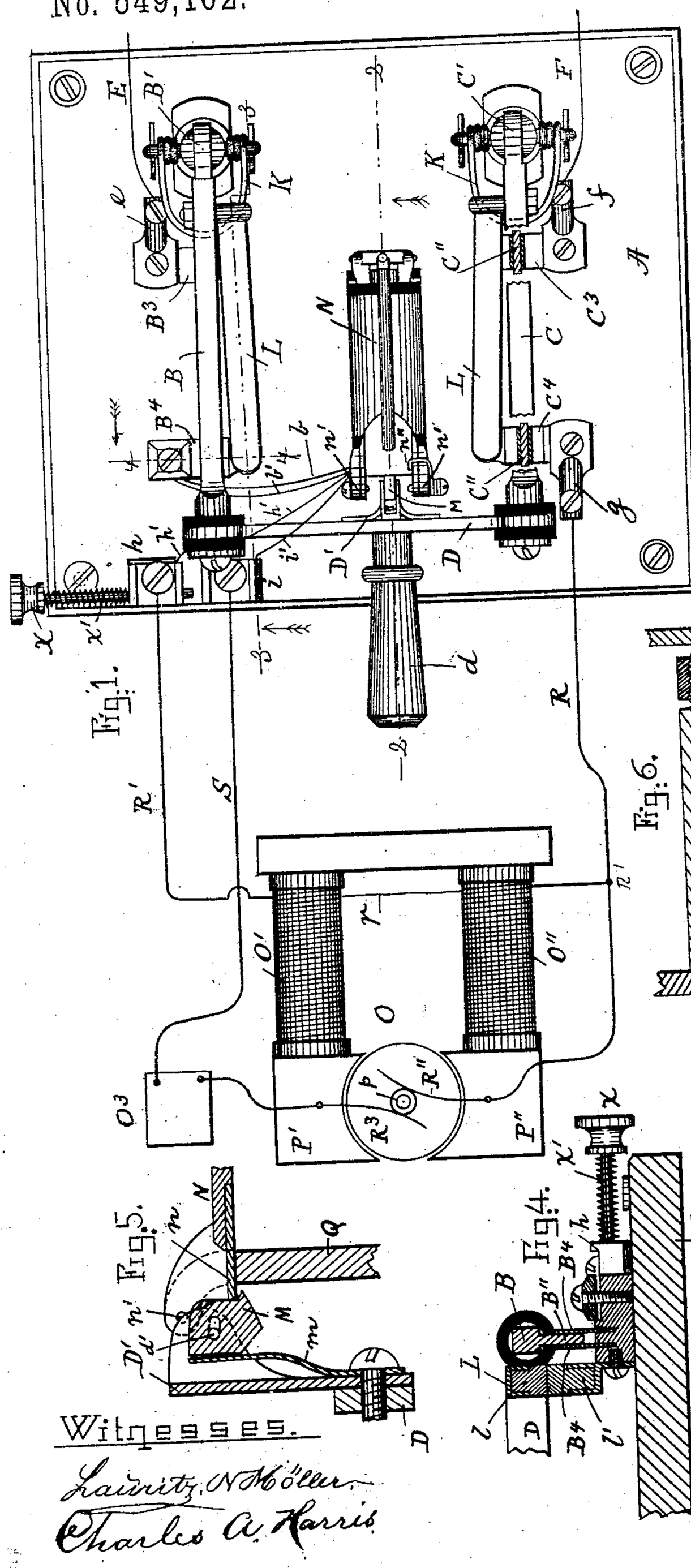

Fig. 1.

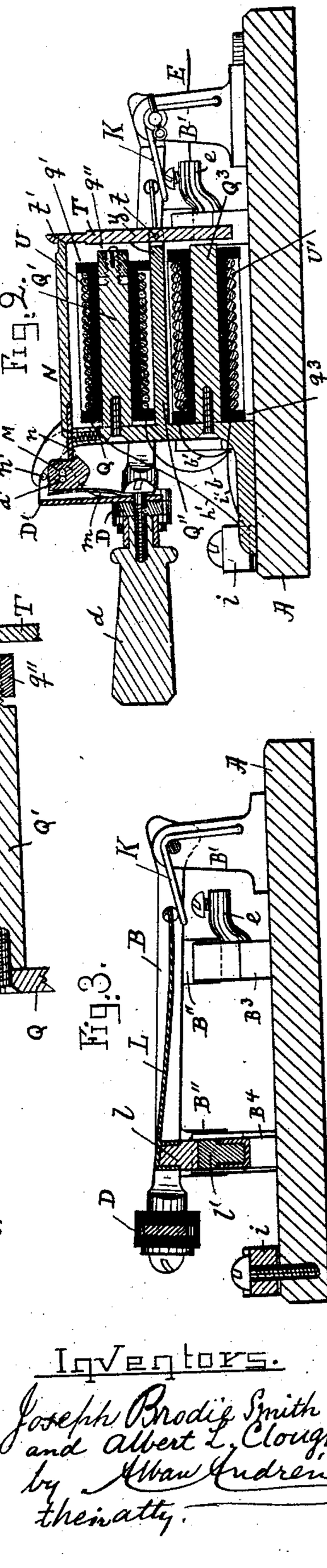

Fig. 2.

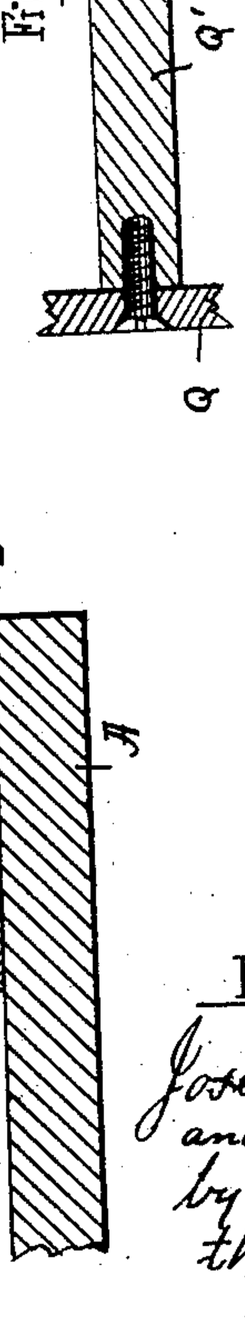

Fig. 6.

Fig. 3.

Fig. 5.

Fig. 4.

Witnesses.

Lauritz N. Möller.

Charles A. Harris.

Inventors.

Joseph Brodie Smith
and Albert L. Clough
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(No Model.)

2 Sheets—Sheet 2.

J. B. SMITH & A. L. CLOUGH.

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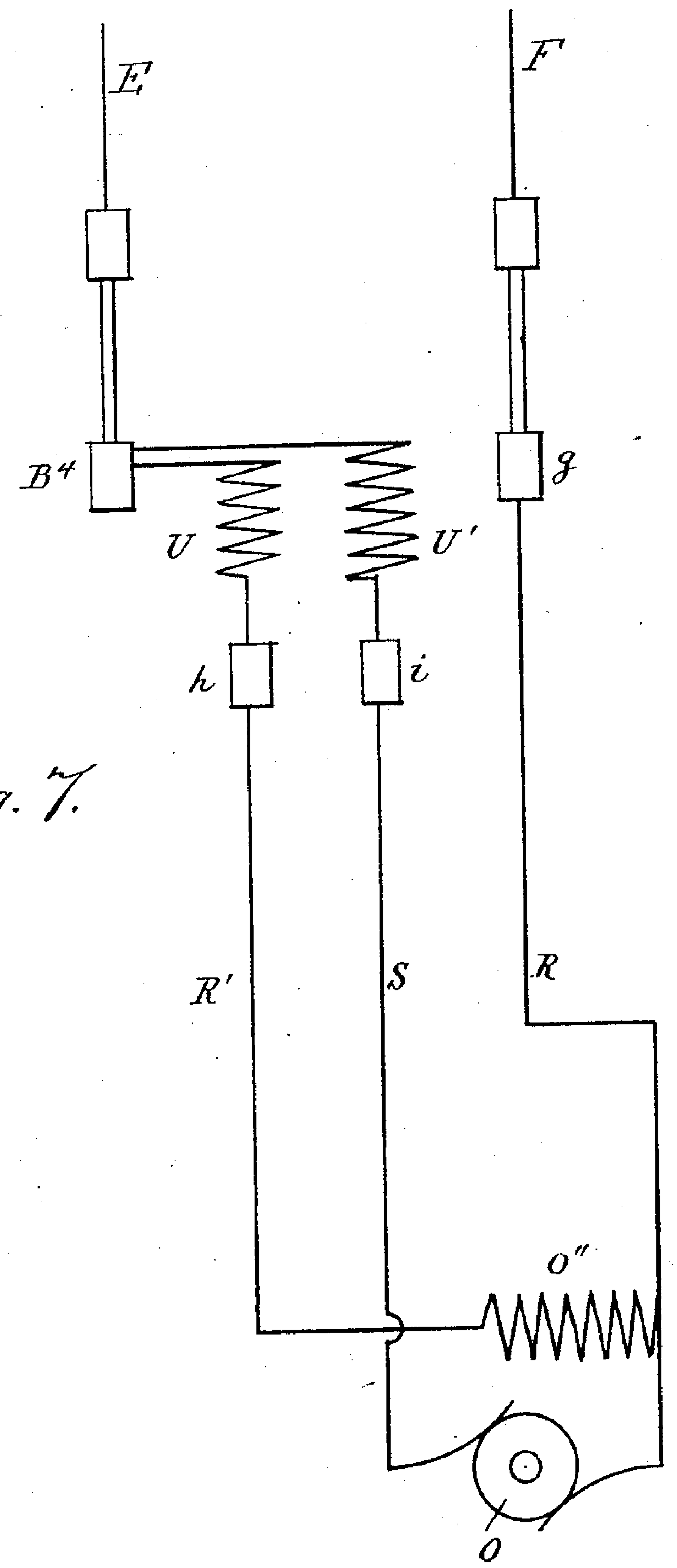

Fig. 7.

Witnesses.

Samuel J. Craddock.

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UNITED STATES PATENT OFFICE.

JOSEPH BRODIE SMITH AND ALBERT L. CLOUGH, OF MANCHESTER, NEW HAMPSHIRE.

ELECTRIC SWITCH.

SPECIFICATION forming part of Letters Patent No. 549,162, dated November 5, 1895.

Application filed April 26, 1895. Serial No. 547,207. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH BRODIE SMITH and ALBERT L. CLOUGH, citizens of the United States, and residents of Manchester, in the county of Hillsborough and State of New Hampshire, have invented new and useful Improvements in Electric Switches, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention relates to improvements in means for protecting electric motors from damage by careless handling or otherwise, as from the throwing onto the motor of an excessive load or the throwing onto the motor of the full electrical pressure when the motor is in a state of rest, the functions of the device being to disconnect the motor from the supply-circuit in case the current which the machine is taking becomes dangerous and capable of over heating the machine and burning out the insulation, and also to disconnect it from the circuit in case of the cessation or failure of the line-circuit.

This our present invention is an improvement on the patent granted to Joseph Brodie Smith for electric switch April 17, 1894, No. 518,471, and it is carried out as follows, reference being had to the accompanying drawings, wherein—

Figure 1 represents a front elevation and partial section of the invention, showing a jackknife-switch of the double-pole variety having line-wires connected to its terminals. Fig. 2 represents a central longitudinal section on the line 2 2 shown in Fig. 1. Fig. 3 represents a longitudinal section on the line 3 3 shown in Fig. 1. Fig. 4 represents a cross-section on the line 4 4 shown in Fig. 1. Fig. 5 represents an enlarged detail section of the detent and releasing-lever for the pivoted armature; and Fig. 6 represents an enlarged detail longitudinal section of the electromagnet-core and its adjustable pole-piece. Fig. 7 represents a diagrammatic view of the switch connections.

Similar letters refer to similar parts wherever they occur on the different parts of the drawings.

In the drawings, A represents a base of insulating material adapted to be secured to a wall or other convenient object.

B and C are the metal switch-levers, pivoted, respectively, at B′ C′ on the plate A, and having their free ends connected to an insulated cross-bar D, provided with a hard rubber or other suitable handle *d*, in a manner like that shown and described in the above-mentioned patent.

To the levers B and C are secured, respectively, the metal switch plates or blades B″ C″, and below the latter are secured to the base A the forked metal contact-pieces B^3, B^4, C^3, and C^4, like that shown and described in the Smith patent aforesaid.

E and F represent the line-wires connected, respectively, to the cups or binder-posts *e* and *f*, which are metallically connected, respectively, with the contact-pieces B^3 and C^3, as shown.

g is a cup or binder-post metallically connected to the contact-piece C^4.

h and *i* represent cups or binder-posts secured to the plate A and connected by wires to the electric motor O, as follows: O′ O″ are the field-coils of said motor, on which P′ and P″ are the pole-pieces, P the rotary armature, and *p* the commutator, as usual in devices of this kind. Q is the rheostat or resistance-box used in starting the electric motor, as usual. R″ and R^3 are the brushes having their free ends bearing against the commutator, as is common in electric motors. From the cup *g* leads a wire R to the field-coil O″ and armature-commutator *p*. From the cup *h* leads the wire R′ to the field-coil O′, the wire of which is connected to the wire of the coil O″ by means of the wire *r*, as shown in Fig. 1.

In Fig. 1, S is a wire leading from the binder-post *i*, through the rheostat O^3, to the commutator on the armature P, as shown. K K are springs designed to hold the switch normally in an open position, so as to cause the circuit from the line to the motor to be interrupted. L and L are spring-contacts carried on the switch-arms B C and having their free ends tipped with carbon rods *l*, which when the switch is in a closed position touch similar carbon rods or blocks *l′ l′*, secured to the contacts B^4 C^4. Said spring-contacts are designed to receive the spark which is made upon the breaking of the circuit, and are so

constructed as to hold the circuit closed until the metallic contacts of the switch have parted.

The controlling mechanism of the switch which constitutes the novel part of the arrangement, is fully shown in Figs. 1, 2, and 5, and consists of a spring-pressed detent M, which is slotted, as shown in Figs. 2 and 5, and pivoted at d' to a projection or bracket D' on the switch-bar D. This detent is arranged to engage with a catch n, forming part of a spring-pressed releasing-lever N, which is pivoted at n' to the electromagnet frame or standard Q, as shown in Figs. 1, 2, and 5. To the frame Q are secured three legs Q', Q'', and Q^3, of which Q' is the upper one, Q'' the middle one, and Q^3 the lower one, as shown in Fig. 2. To the middle one Q'' is pivoted at t the rocking armature T, having at its upper position a notch t', capable of engaging with the free end of the releasing-lever N, which is the continuation of the catch n previously mentioned. The slotted detent M is acted upon by a suitable spring m, (shown in Figs. 2 and 5,) which tends to push it toward the catch n, and in addition to such longitudinal yielding motion to and from the catch n it is also capable of rotation on the pivot d', as shown. Upon the upper leg Q' of the electromagnet is placed a spool q', around which is wound a coil of wire U, which is in series with the field-current of the motor by means of wires h' b, leading, respectively, to the cup h and contact-piece B^4. Upon the lower leg Q^3 of the electromagnet is placed a spool q^3, around which is wound a coil of wire U', which is traversed by the armature-current of the motor by means of wires i' and b', leading, respectively, to the cup i and contact-piece B^4, as shown. The armature T is thus under the attraction of both coils U and U', which act in contrary directions on said armature, which constitutes a differential electromagnetic device.

In practice the coil U' is made of somewhat coarser wire than the coil U, as shown in Fig. 2.

In detail in Fig. 6 is shown a means for adjusting the core Q' to and from the armature T for the purpose of changing the pull which the coil U exercises on the said armature, and it consists of an adjustable screw-threaded sleeve or pole-piece q'', which is adjustably screwed on the forward end of said core Q' and capable of adjustment to and from the armature for the purpose stated. The lower core Q^3 may likewise be provided with such adjustable pole-piece, if so desired.

It will be seen that when the releasing-lever N is engaged with the notch t in the armature T the catch n on said lever is placed in such a position that the detent M engages with it, thus holding the switch closed. In case, however, the releasing-lever N leaves the notch t' it is pushed upward by the action of the springs K K against the force of a small spring n'', (shown in Fig. 1,) which normally tends to return said lever N to its lowest position for interlocking with the notched armature. During such release of the lever N from the armature the catch n retreats from the detent M, the latter frees itself, and the switch opens.

In Fig. 1, X represents a spring-pressed button attached to a metal rod X', adapted to slide in a perforation in the block h, and adapted to be brought in contact with the block i, so as to metallically connect said blocks for the purpose of short-circuiting the winding, which is in series with the motor-field, thus allowing the switch to open in the same manner as through the failure of the current.

In Fig. 1, y is a small spring bearing against the inside of the pivoted armature T, above its fulcrum t, for the purpose of disengaging the hook t' from the releasing-lever N during the opening of the switch.

The action and operation of the switch are as follows: When it is closed, the circuit is completed and the currents flow in both spools U and U', according to the connections shown. Owing to the preponderance of the magnetic force of the upper coil U in circuit with the field of the motor, the notch t' on the armature T is brought into engagement with the releasing-lever N and the switch is held closed. In case, however, that the current passing in the motor becomes abnormally large, its attraction overcomes the attraction due to the field-current, and the said notch disengages from the releasing-lever N, which allows the switch to open, as previously stated. In case, also, that the line-current fails from any reason, the small spring shown at y acts with sufficient force to disengage the armature notch t' from the releasing-lever N and the switch opens. In case it is desired to adjust the switch to open on a smaller armature-current, it is only necessary to screw the movable pole-piece q'' farther onto its core Q', thus decreasing the attraction due to the field-current and relatively increasing the attraction due to the armature-current. In order to effect the opposite result, the pole-piece q'' is moved in the opposite direction.

By the use of the releasing mechanism here shown it is possible to control a switch that is actuated by strong opening-springs without necessitating too strong electromagnets, or to waste too much electrical energy.

Having thus fully described the nature, construction, and operation of our invention, we wish to secure by Letters Patent and claim—

In an automatic electric switch, the combination with a switch of springs tending to hold said switch in an open position, of an electro-magnetic mechanism consisting of two electro-magnets having their windings respectively in series with the armature and field of an electric motor, said electro-mag-

nets acting in mechanical opposition upon a pivoted armature and one or both of them having a movable pole piece capable of adjustment in such a manner as to vary the distance between the cores of said magnets and their armature; the said armature being adapted for engagement with the long arm of a pivoted angular lever, said lever carrying on its short arm a catch capable of engagement with a detent fastened to said switch and when so engaged acting to hold the switch closed, substantially as and for the purpose set forth.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, on this 6th day of March, A. D. 1895.

JOSEPH BRODIE SMITH.
ALBERT L. CLOUGH.

Witnesses:
ALBAN ANDRÉN,
LAURITZ N. MÖLLER.