No. 614,472. Patented Nov. 22, 1898.

J. D. IHLDER.

POTENTIAL SWITCH.

(Application filed Aug. 5, 1897.)

(No Model.)

Fig. 1.

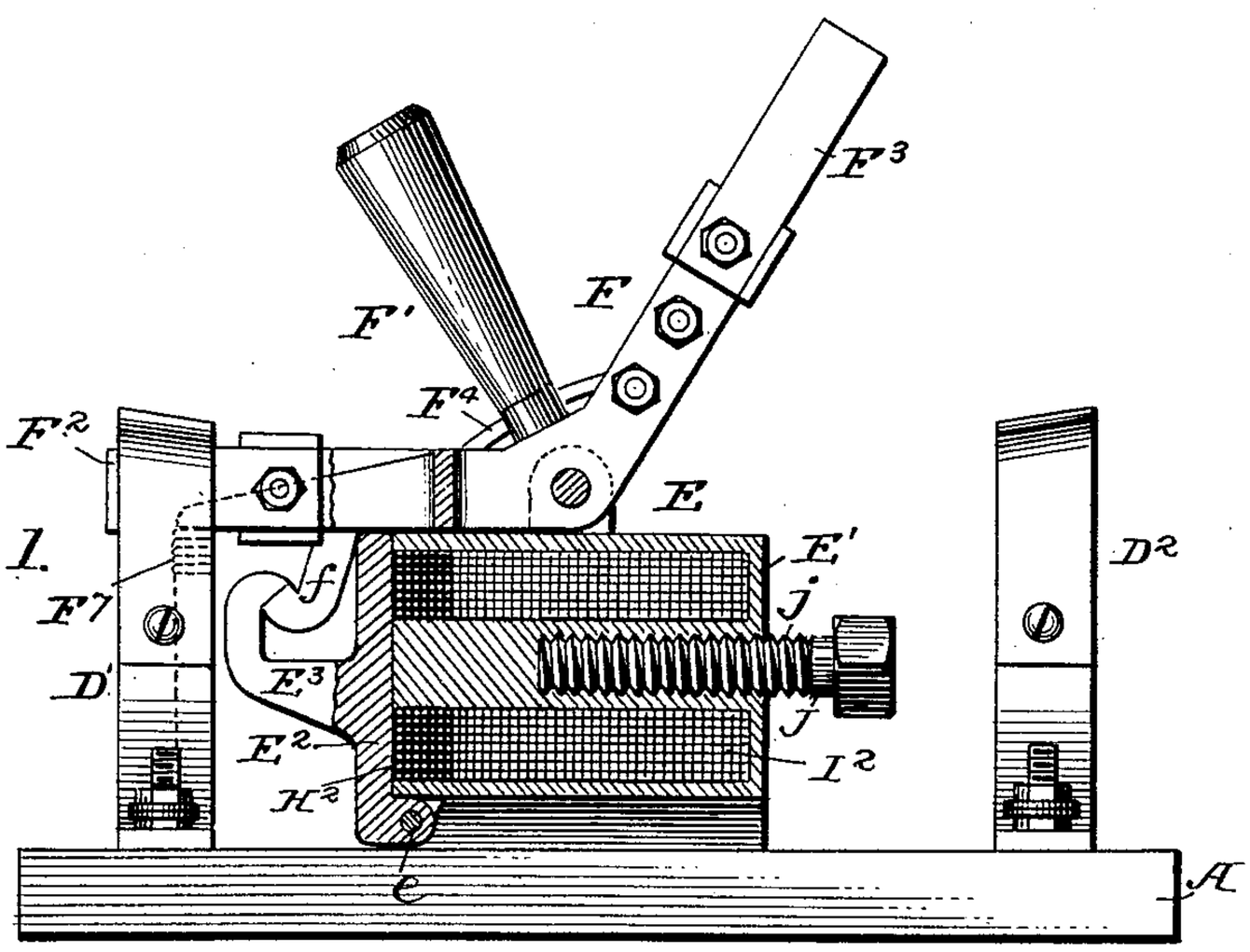


Fig. 2.

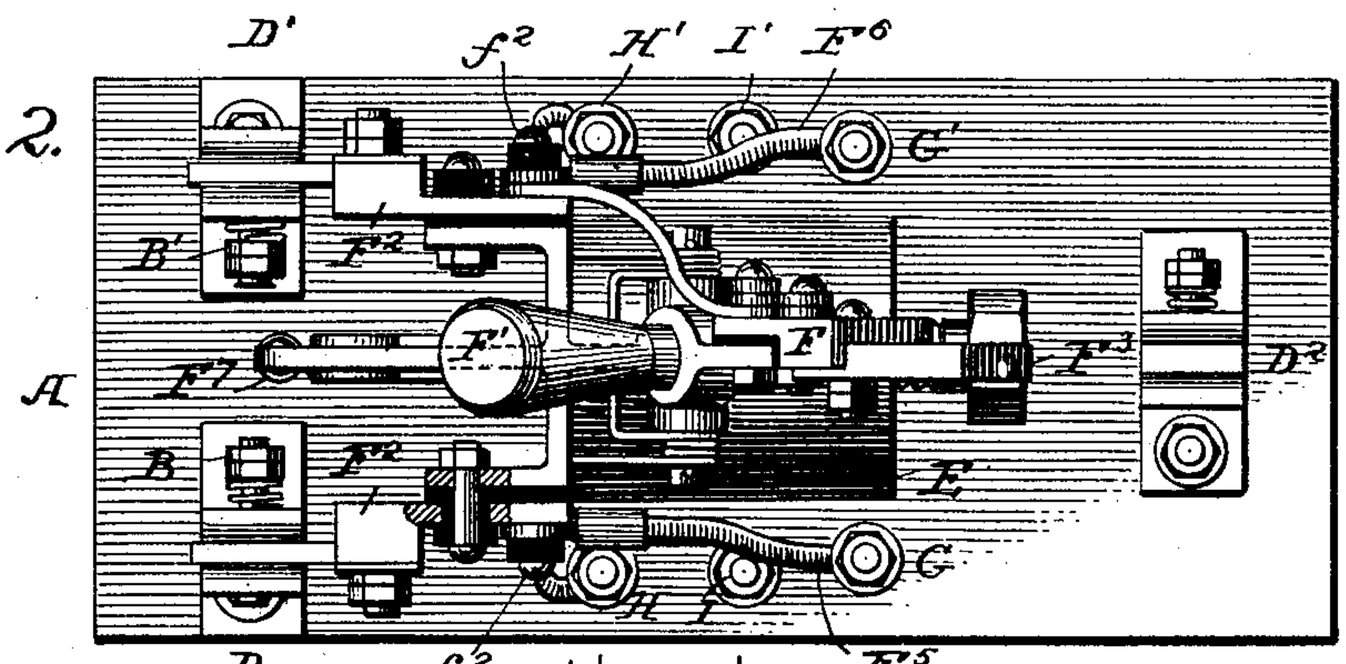
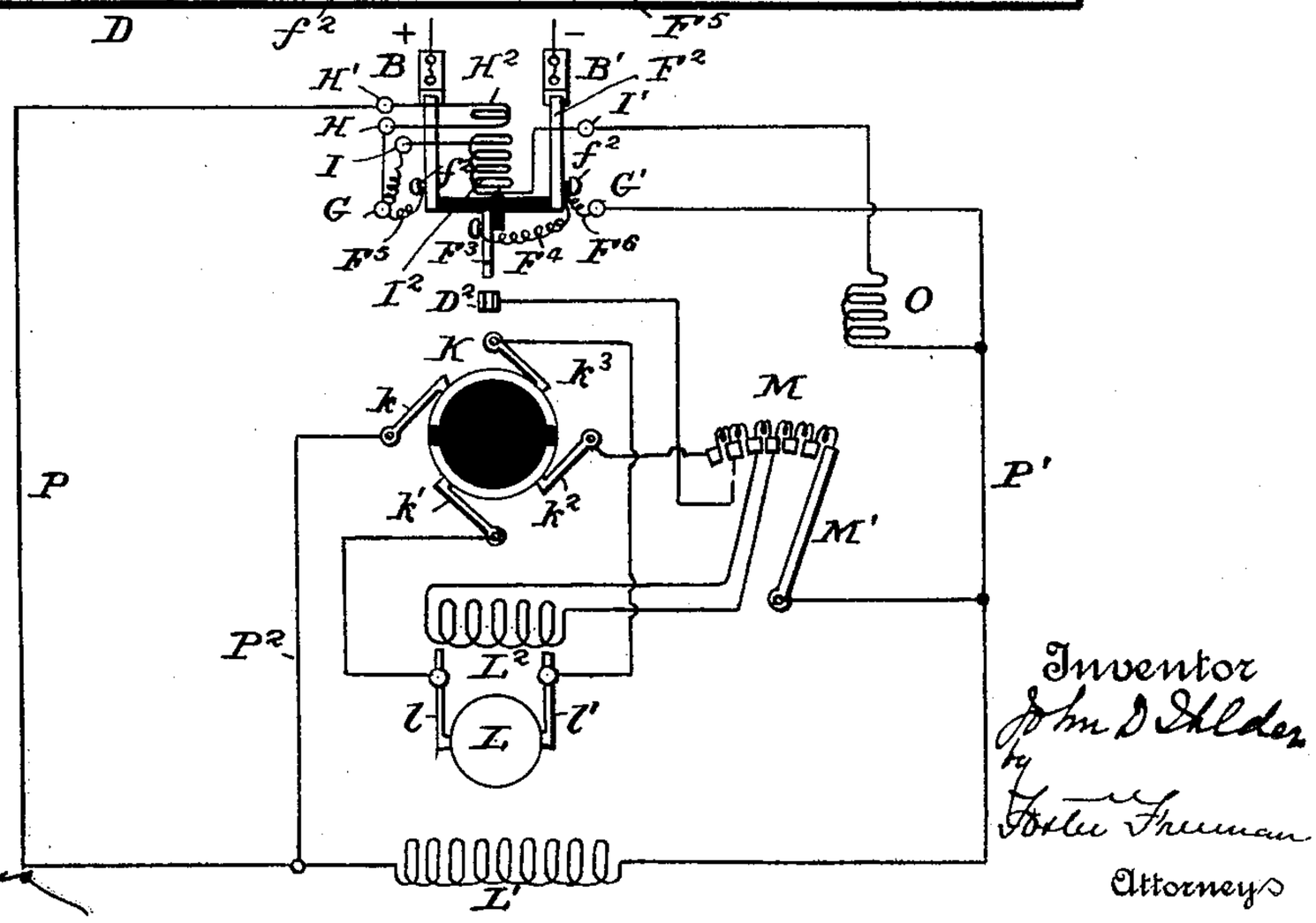


Fig. 3.



Witnesses
J. J. Hinkel
Tamworstevens

Inventor
John D Ihlder
by
Foster Freeman
Attorneys

UNITED STATES PATENT OFFICE.

JOHN D. IHLDER, OF YONKERS, NEW YORK, ASSIGNOR TO THE OTIS BROTHERS & COMPANY, OF NEW YORK, N. Y.

POTENTIAL-SWITCH.

SPECIFICATION forming part of Letters Patent No. 614,472, dated November 22, 1898.

Application filed August 5, 1897. Serial No. 647,252. (No model.)

To all whom it may concern:

Be it known that I, JOHN D. IHLDER, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Potential-Switches, of which the following is a specification.

My invention relates to electric switches, and more particularly to what are generally termed "potential-switches;" and it has for its object to improve the construction and arrangement of such switches whereby they are not only operative under a fall of electric potential, but also under any abnormal increase of current on the line; and it further relates to making such switches adjustable, so that they may be adapted to operate under varying currents without changing their winding or construction; and to these ends my invention consists in the various features of construction and arrangement of parts substantially as hereinafter more particularly pointed out.

Referring to the accompanying drawings, Figure 1 is a sectional view of one embodiment of my invention. Fig. 2 is a plan view of the same, and Fig. 3 is a diagrammatic representation of one arrangement of circuits in which my invention may be advantageously employed.

While a switch embodying the principles of my invention may be used in many and various relations, I have shown it as applied in connection with an electric elevator-circuit, where it is found especially useful; but it is evident that it could be adapted for other positions and purposes without departing from the spirit of the invention. Moreover, while I have shown and shall describe the various features of my invention as embodied in a single structure it is evident that the details of construction can be varied and other equivalent constructions substituted therefor.

The switch comprises a base A, which may be of any suitable insulating material, and mounted on one end of the base are binding-posts B B', with which the terminals of the feeding-circuit are connected, and these posts are shown as connected with the standards D D', which may be of any suitable form, but are shown as spring-blades to receive the knives or blades of a moving switch-arm. Also mounted on the base is another terminal or separate terminals D^2, which are arranged to operate with a branch circuit when the switch is intended to close such a circuit on breaking the main circuit. Of course if the switch is used simply to break the circuit this terminal or terminals may be dispensed with. Mounted on the base and in the present instance between the posts or terminals just described is an electromagnet E, which may be variously formed, but the preferred construction of which will be described hereinafter. Arranged to be operated or controlled by the electromagnet is a switch-lever F, and in the present instance this is mounted upon the magnet E, although, of course, it may be differently arranged, and it is provided with an operating-handle F' and carries the blades F^2, suitably insulated from each other and from the lever and adapted to make contact with the blades D D' of the main-line terminals. Also mounted on the lever in the present instance is a blade F^3, insulated from the lever and arranged to make contact with the terminals D^2. In the present instance this blade F^3 is connected to the blades F^2 by a conductor F^4. The blades F^2 are provided with binding-screws f^2, and to these screws are connected the flexible conductors F^5 F^6, leading, respectively, to the binding-posts G G', mounted on the base.

The binding-post G is in electrical connection with the post H, and connecting with this post is the main-circuit wire, including part of the coils of the electromagnet E and leading to the binding-post H', so that the main-line circuit includes in series the coils H^2 of the magnet, they being few in number, and the terminal H' becomes the + terminal of the switch for the working circuit, while the terminal G' is the − terminal of the switch; also, connected to the post G is a post I, and connecting this post with the post I' is a conductor forming the shunt-coils I^2 of the electromagnet, there being a number of these shunt-coils of greater magnetic power than the series coils H^2 and they being wound in

opposition to such series coils, so as to have an opposing magnetic effect on the electromagnet E.

While, as before stated, the electromagnet may be variously constructed, I have shown it as comprising a housing E′ of magnetic material in the shape of a cup and having a cover E^2 hinged to the housing, as at *e*, and forming an armature to the magnet, and this cover is provided with a catch E^3, which is adapted to coöperate with a catch *f* on the lever F. A suitable spring-tension device F^7 is arranged to throw the lever F when released from the catch.

The core of the electromagnet E is made hollow, and arranged to move in the core is a core piece or rod J of magnetic material, and this is preferably made adjustable, as by means of screw-threads *j* or any other equivalent device, so that it may be moved in and out of the core and held in position with relation thereto. The series coils H^2 are preferably arranged at the end of the magnet adjacent its armature, and it is evident that when the core-piece J completely fills the core it will require more current to produce the demagnetization needed to release the armature and overcome the attractive force of the shunt-coils than when the screw is removed, and by adjusting the core-piece in its core it is evident that the switch may be made to respond to varying currents or currents having varying relations in the series and shunt windings of the magnet without changing the windings. While I have thus shown this feature of my invention in one embodiment which I have found satisfactory, it is evident that it may be embodied otherwise, and the core-piece may be made adjustable in any desired manner, while the relations between the opposing coils can be arranged to suit the requirements of the use to which the invention is to be put.

In order to show one application of this invention, especially to electric motors, reference is made to the diagram Fig. 3, where the parts of the switch are lettered to correspond to the parts in the other figures. In this figure also K is a circuit-reverser having two conducting portions separated by insulating portions in the manner indicated on which are arranged the brushes *k k′* k^2 k^3. L represents the armature of the motor, while *l l′* are the brushes thereof, and L′ the shunt field-magnet coils and L^2 the series field-magnet coils. M represents the resistance controlled by the switch-arm M′, while O represents a safety electromagnetic device—as, for instance, a brake operating on the shaft of the motor.

Assuming the switch to be closed, the current enters at the binding-post B, passes through the switch-blade F^2, thence from the point f^2 to the binding-post G, thence to the post H around the coils H^2 of the electromagnet to the post H′, thence through the conductor P, through the shunt field-magnet coils L′, the conductor P′, binding-post G′, conductor F^6, blade F^2, and post B′. A branch circuit P^2 leads to brush *k*, and, assuming the pole-changer K to be moved a quarter-revolution from the position shown, it passes out of the brush *k′* to the brush *l* of the armature, thence through the armature L, brush *l′*, and brush k^3 of the pole-changer, thence through the brush k^2, through the resistance device M, switch-arm M′ to conductor P′, and out.

Of course when the pole-changer is reversed the direction of the current through the motor-armature is reversed.

Connected to some of the intermediate contacts of the resistance M are the series field-magnet coils L^2, and these are shown to be energized or not, according to the position of the switch-arm M′. A branch circuit leads from the post G to the post I, thence around the coils I^2 of the magnet E in a direction opposite to the coils H^2, thence to the binding-post I′, and through the magnet-coils O of the brake or other safety device. The resistance in this circuit is preferably such that a comparatively small amount of the current passes through this branch circuit; but there being more coils on the electromagnet E under normal conditions the armature of the magnet is held in place, locking the switch-lever in the position shown in Fig. 1. The relation of these coils is such that when the normal current is flowing through the main line and the coils H^2 and the motor is operating correctly the switch will be held closed; but if, perchance, the potential falls below the normal working potential the armature will be released and the switch operated to break the circuit. On the other hand, if the current in the main line and the series magnet-coils H^2 increases above the normal the magnetization of the core is weakened to such an extent that the armature is released. Thus under an excessive current or a fall of potential in the main line the switch is operated, and it may be operated simply to break the main-line circuit, or when a construction similar to that illustrated is used the switch-blade F^3 engages the contact D^2, closing a circuit around the armature of the motor, which operates as a brake, the armature being short-circuited on itself.

With this general description of the principles of my invention, together with the illustration of its use, the invention will be readily understood by those skilled in the art, and it can be adapted and arranged to suit the purposes for which it is intended, and it will be seen that not only does the switch operate under an excess or fall of potential in the main line, but that it may be adjusted so that the relations of the varying currents can be readily changed, and the whole apparatus is exceedingly simple and cheap to manufacture and not liable to get out of order, while

it has been found effective and satisfactory in operation.

It will be seen that the coils arranged in opposition on the magnets are both main-line coils—that is, the shunt-coil H^2 is in the main line supplying current to the shunt-field and to the armature and series field of the motor, while the shunt-coil I^2 leads from the main line through a magnet O of a safety device and does not include the motor-circuit and is of a constant resistance.

What I claim is—

1. A potential-switch the coils of which are wound in opposition, having an adjustable core-piece, substantially as described.

2. A potential-switch the coils of which are included in the main circuit and in a shunt-circuit respectively, and wound in opposition, and having an adjustable core-piece, substantially as described.

3. An adjustable potential-switch comprising an electromagnet the coils of which are in opposition, a switch-lever, an armature controlling the switch-lever, and an adjustable core-piece for regulating the operation of the magnet, substantially as described.

4. An adjustable potential-switch comprising an electromagnet in the form of a cup-shaped housing inclosing the coils and having a hollow core, a lever having a catch engaging a catch on the armature of the magnet, and a core-piece adjustable within the core, substantially as described.

5. A potential-switch comprising an electromagnet the core of which is wound with a coil in series with the main-line circuit and a shunt main-line coil in opposition to said series coil and including the magnet of a safety device, and a switch-lever controlled by the magnet whereby the switch-lever will be operated on the abnormal rise or fall of potential in the main-line circuit, substantially as described.

6. A potential-switch comprising an electromagnet, the core of which is wound with a coil in series with the main-line circuit and a shunt main-line coil in opposition to said series coil, a switch-lever controlled by the magnet, and a short circuit for the armature of the motor, the switch-lever being arranged to close said short circuit of the armature when the main-line circuit is broken through an abnormal rise or fall of potential in said circuit, substantially as described.

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

JOHN D. IHLDER.

Witnesses:
JAMES S. FITCH,
O. B. WARING.