(No Model.) 2 Sheets—Sheet 1.

# M. WHELESS.

## ELECTRO MAGNETIC SWITCH FOR ELECTRIC RAILWAYS.

No. 441,218. Patented Nov. 25, 1890.

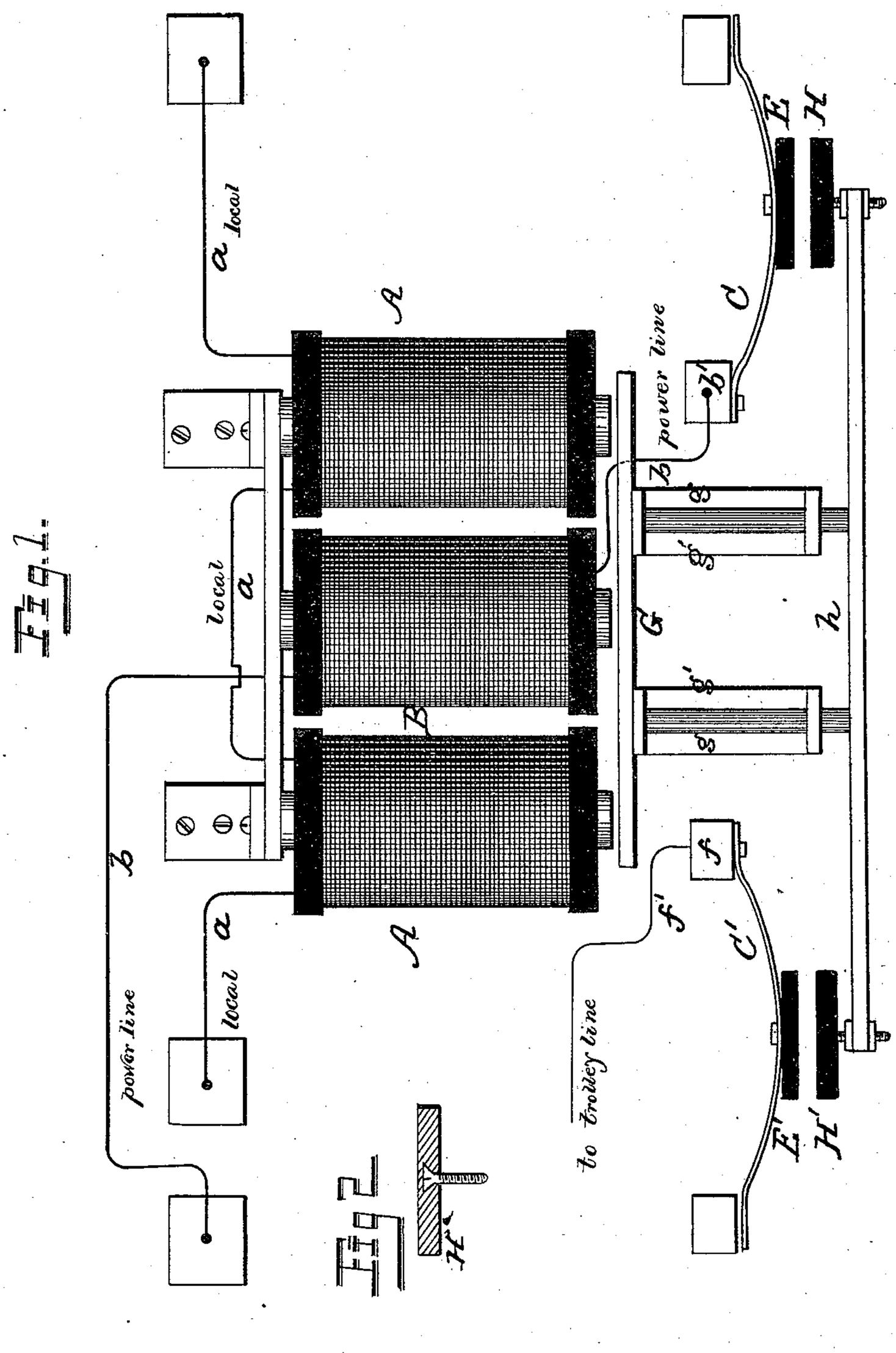


Fig. 1.



Fig. 2.

Witnesses
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Thos. Houghton.

Inventor
Malone Wheless,
per W. H. Singleton.
Atty.

(No Model.) 2 Sheets—Sheet 2.

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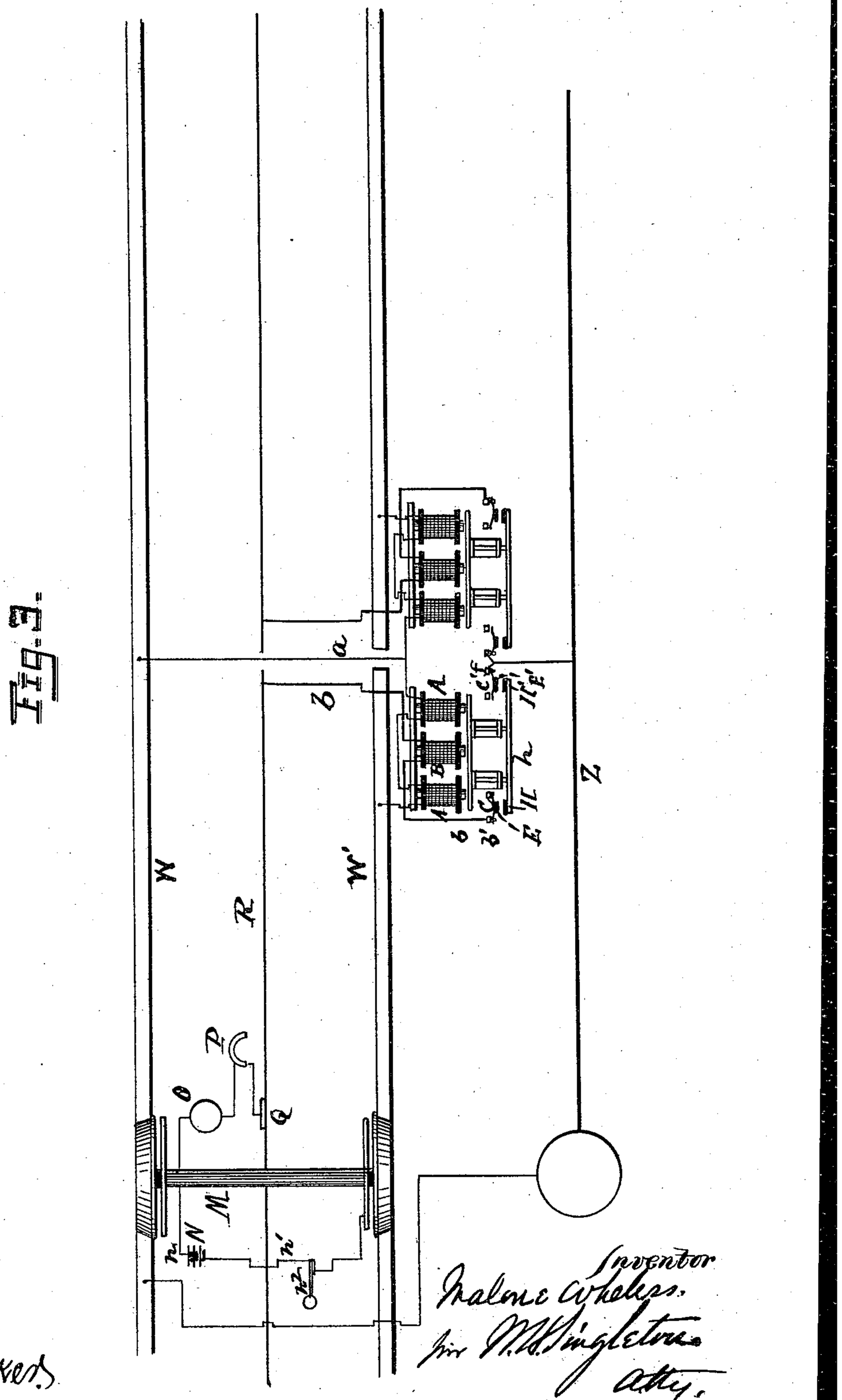


FIG. 1.

Witnesses:
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W. E. Barker.

Inventor
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# UNITED STATES PATENT OFFICE.

MALONE WHELESS, OF NASHVILLE, TENNESSEE, ASSIGNOR TO THE WHELESS ELECTRIC RAILWAY COMPANY, OF ALEXANDRIA, VIRGINIA.

## ELECTRO-MAGNETIC SWITCH FOR ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 441,218, dated November 25, 1890.

Application filed August 27, 1890. Serial No. 363,205. (No model.)

*To all whom it may concern:*

Be it known that I, MALONE WHELESS, a citizen of the United States, residing at Nashville, in the county of Davidson and State of Tennessee, have invented certain new and useful Improvements in Electro-Magnetic Switches for Electric Railways; and I do 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

Figure 1 is a side view of the device, and Fig. 2 is a detail section through one of the "contacts." Fig. 3 shows the device in use.

This invention relates to improvements in electric street-railway systems, more particularly to that system devised by me wherein a local circuit having a source of electricity on a car vitalizes a magnet of an electro-magnetic switch and connects a power-line with a section of a working-conductor. This switch is located at a break between the power-line and a section of the working-conductor, the armature of the switch spanning the break, and normally the break is maintained. As soon as the magnet is vitalized, the break is closed. Prior to the present invention the contacts at this break have been made of metal, and while actual practice has demonstrated the efficiency of the switch with metal contacts it has been found that under some circumstances, especially in wet or damp weather, should there be any leakage, as there necessarily is almost always, as the contacts recede the metal will fuse and stick. It is to obviate this tendency that the present invention is devised, as continued use has proven that with the present invention there is obtained an electro-magnetic switch in which there is no fusing and therefore no sticking.

I am aware that carbon contacts for an electro-magnetic switch are not, broadly, new.

My invention consists in applying them to a switch between a power-line and working-conductor.

In the annexed drawings, the letters A A indicate the two magnets, to which is connected the local line *a*, and B the magnet, to which is connected the power-line *b*. The power-line *b* runs from the magnet B to the post *b'*. To this post is secured a metallic strip C, preferably elastic. To the middle of this strip is fastened a carbon contact E. Located conveniently near is a post *f*, from which the wire *f'* runs to the trolley-line. To this post is secured a strip C', preferably elastic. To the middle of this strip C' is fastened a carbon contact E'. The armature G has connected to it by rods *g g* the contact-maker *h*, the rods *g g* being held in guides *g' g'*. This armature and contact-maker are located so that the ends of the latter are in juxtaposition with the contacts E E', and at these ends are fastened the carbon contacts H H', the contacts E and H E' and H' being in pairs opposite each other. As soon as the magnets are vitalized and draw up the armature, the contacts E H and E' H' close and the power-line and trolley-section are connected together.

On Sheet II, Fig. 3, is shown the device applied in use. Instead of the switch being located so that the power-current first passes around the magnet and then through the break, it is reversed, first passing through the break and then around the magnet, but the action is the same.

On Sheet II, the letter M represents a car having a battery N, wires *n n'*, switch $n^2$, motor O, rheostat P, and trolley Q. R is a working-conductor or trolley-line in insulated sections *r*. From these sections runs the wire *b* around the magnet B and to the post *b'*, whereto is secured the spring-plate C, carrying the carbon contact E. Near thereto is the post *f*, to which is secured the spring-plate C', carrying the carbon contact E, and the post *f'* is connected with the main power-line Z. The contact-maker *h* is placed so that its carbon contacts H H' are opposite the carbon contacts E E'. The wheels of the car are insulated, and the wires *n' n'* are electrically connected with them. From one line of rails W the wire *a* runs around the magnets A A and to the other line of rails W'. When the switch $n^2$ is closed, the battery-current, passing through the wheels, the rails W and W',

and the wire *a*, vitalizes the magnets A A, drawing up the armature and closing the break at the contacts E H and E′ H′. The power-current then strains in from the power-line Z through the contact-maker *h*, wire *b*, trolley-line R, trolley Q, and to the motor.

With such a device as has been previously forecast there is absolutely no fusing or sticking, as this device has been used in all kinds of weather, and this fact is due to the use of carbon contacts.

It is a well-known electrical fact that in order to obtain an arc between two carbon points it is necessary to "draw the arc"—that is, the carbon points must first be contacted, the current turned on, and then the carbon separated, the arc being thus drawn. This is the principle on which the arc lamps are based, and in the present device the carbon contacts first come together, and *eo instanti* the circuit is closed and they remain in contact as long as the current is on. The separation of the carbons only takes place after the current is off. Hence one of the essentials of arcing is absent—that is, the flow of current after the separation of the carbons. The utilization of this electrical fact in an electro-magnetic switch with carbon contacts is one of great and vital importance, as it absolutely precludes any arcing or sparking unless there should be any leakage. Should there be any leakage it would not be sufficient to affect the carbon, and hence the latter would preserve its integrity. With the use of carbon contacts on a switch where the current is broken before the switch is opened there is no injurious effect produced upon the contacts. This construction, therefore, produces a device certain in its action and free from defects.

Having described my invention, what I claim is—

1. A power-line and a working-conductor or trolley-line normally disconnected with each other, in combination with an electro-magnetic switch located at the break between the two lines, each line and the switch being provided with carbon contacts, as set forth.

2. The combination of a power-line, a working-conductor or trolley-line in sections, a local circuit, and an electro-magnetic switch, the magnets of which are vitalized by the power-line and local circuit, there being a break between the power-line and the working-conductor, the switch being located at this break, and said switch and the power-line and working-conductor being provided with carbon contacts, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

MALONE WHELESS.

Witnesses:

GRAHAM L. GORDON,

S. C. HILL.