(No Model.)

# R. T. MURRAY & C. M. ALLEN.

## ELECTROMAGNETIC CAR BRAKE.

No. 525,505. Patented Sept. 4, 1894.

Fig. 2.

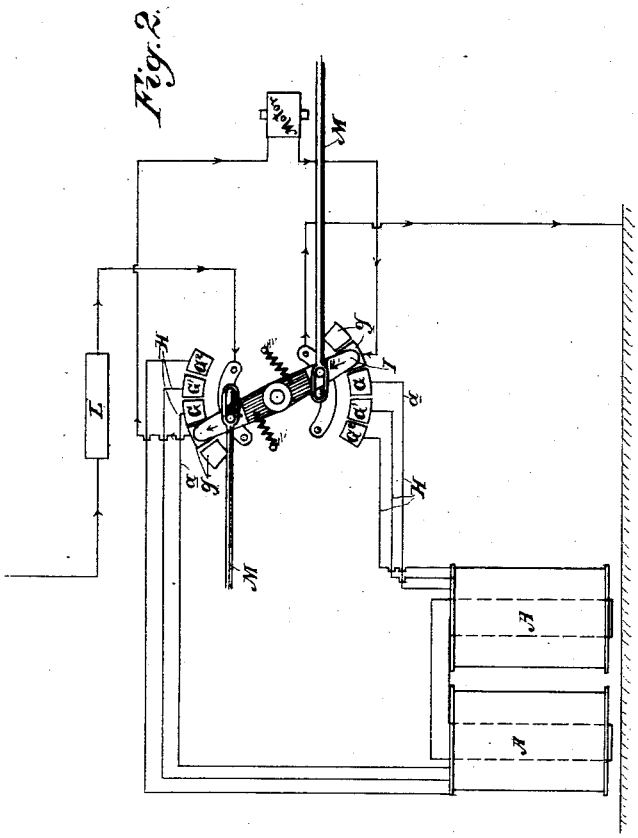
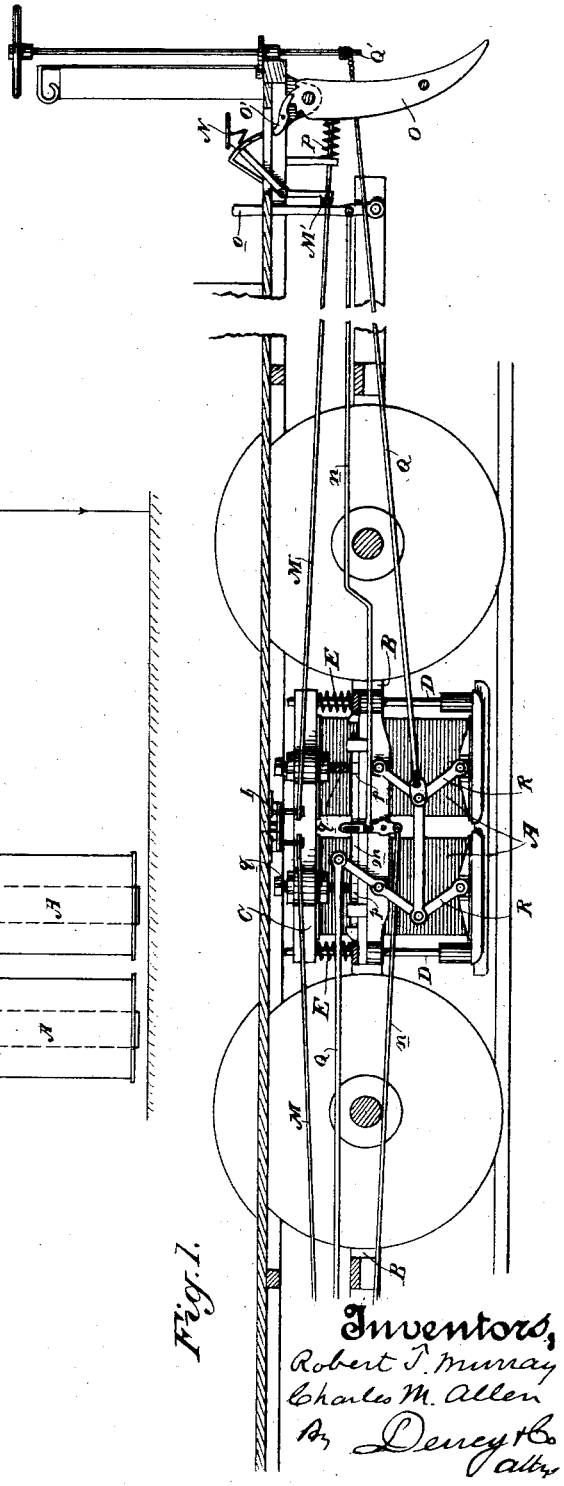



Fig. 1.

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# UNITED STATES PATENT OFFICE.

ROBERT T. MURRAY AND CHARLES M. ALLEN, OF SAN FRANCISCO, CALIFORNIA.

## ELECTROMAGNETIC CAR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 525,505, dated September 4, 1894.

Application filed October 24, 1892. Serial No. 449,853. (No model.)

*To all whom it may concern:*

Be it known that we, ROBERT T. MURRAY and CHARLES M. ALLEN, citizens of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Electromagnetic Car-Brakes; and we hereby declare the following to be a full, clear, and exact description of the same.

Our invention relates to improvements in car brakes for electric or other roads; and it consists in the employment of a powerful electro magnet or magnets through which a direct attraction and frictional resistance may be had with the surface of the track over which the car is passing.

It also consists in certain details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a longitudinal cross section through our car showing the arrangement of a brake. Fig. 2 is a diagram of the wires and their connections with the magnet and switch.

The object of our invention is to provide a brake in which the electro magnet is attracted with any desired degree of force, to the rails over which the car is passing whereby the friction of the brake upon the rail may be increased to any desired degree independent of the weight of the car.

The device is also useful in the case of electric cars when climbing steep grades, to increase the tractile force of the wheels by the employment of a strong electro magnet, the armature of which is retained a short distance above the rail but near enough so that the attraction will act to hold the wheels more firmly in contact with the rails than could be effected by the weight of the car alone.

In our invention we have shown electro magnets A A mounted upon the car truck, B, which we have in the present case shown for the purpose of illustrating the operation of our invention. These electro magnets are made of any suitable or desired power. We prefer to wind them with wires in independent series, so that the current may pass through one, two, or more of the series, thus increasing the power of the magnet to any desired degree. These magnets are mounted upon frames C and have guide rods D passing vertically through the ends, upon which they are movable up and down. Each magnet is set over the line of the rails upon which the car passes, at any suitable or convenient point upon the car. In the present case we have shown them mounted between the truck wheels, and they are supported by springs, E E which normally support the magnets, so that the brake shoes which are secured to the lower ends of the magnets, are at a sufficient distance above the surface of the track, where they remain when no current of electricity is passing through the coils. When, however, a current of electricity passes through the coils, the magnet is energized and the attraction between the magnets and the surface of the track draws the brake shoes downward until they are drawn into strong frictional contact with the track. It will be manifest that this friction may be increased to any desired degree by the strength of the current and by the addition of more coils in the series. This may be effected in various ways. In the present case we have shown these coils of the magnet connected with insulated plates G, G′, $G^2$ by connecting wires H.

I is a switch lever fulcrumed between these plates which are arranged in series upon opposite sides of the center about which the lever turns, and they are arranged in such a manner with relation to each other that when the switch lever is turned so that the two plates G, G upon opposite sides are coupled together, the coils *a* will be connected, and the current passing through these will be of a certain strength. By moving the lever so that either plates G′, G′ or $G^2$, $G^2$ are connected, the strength of the magnet will be increased at will, while by turning it to the first of the series of plates *g* upon opposite sides of the center, the current will be cut off from the magnets altogether. When this occurs the springs E which support the magnet carrying frame, will act to raise the brake shoes from the track and leave the car free to run without resistance.

L represents a resistance coil through which the current passes before entering the magnets, and which reduces the current to the

proper tension for use in the magnet coils. The switch lever I is actuated by a rod M connecting it with the foot lever N by which the motorman can operate it by pressing the lever against a collar M′ upon the rod M, so as to force the latter back and turn the switch lever. This rod M is also moved by a hinged swinging guard O at the front of the car whenever the guard strikes an obstruction, so as to throw the switch lever into proper position to give the necessary amount of power to the magnet for the stop, and the guard is held in this position by a pawl O′. This pawl may be released by the action of the foot lever N which when pressed down releases the pawl, and allows the spring P to force the guard O back to its original position, when the pressure upon the lever N is relieved. This is done gradually and the switch lever I moves correspondingly to cut off the current from the magnet coils.

When the brake is to be put on by hand, it is done by means of the connecting rod Q extending from the ordinary rotary brake shaft Q′ back to the knee levers R, and these levers acting upon the brake shoes force them down upon the track so as to make the usual frictional brake which depends upon the weight of the car for its efficiency. This brake may then be used entirely independent of the electro magnetic device.

When the power of the magnets is to be used to increase the tractile power of the wheels, in ascending gradients, a stop is employed, which consists of a bar *m* movable horizontally upon supporting guides and connected by a rod *n* with an actuating lever *c* within reach of the motorman. The bar *m* has openings *p* made vertically through it and when the bar is in its normal position, these openings will stand beneath the adjustable screws *q* which pass through the top bar of the frame C in which the magnets are fixed. In this position the magnets are free to move downward to apply the brakes when the magnets are energized.

If it is desired to increase the tractile force upon the wheels, the bar *m* is moved until the openings *p* are out of line with the screws *q*. Now when the magnets are energized, they are drawn down toward the tracks, but the screws *q* strike the bar *m*, and prevent actual contact between the brake shoes and the rails, so that while there is a powerful attraction between the magnets and the rails, there is no actual frictional contact. The screws *q*, may be so adjusted as to stop the magnets and brake shoes at any desired distance from the rails.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A brake for railway cars consisting of vertically moving brake shoes adapted to form contact with the line of rails, and an electro magnet which carries the brake shoes and moves with them, independent coils surrounding the core of the magnet, said coils being connected in series, and with switch plates arranged about a center, a lever pivoted at this center and movable to make connection between the various pairs of plates whereby the power of the magnet is increased, diminished or destroyed, substantially as described.

2. A brake for railway cars consisting of vertically moving brake shoes adapted to form contact with the rails, an electro magnet which carries the brake shoes, coils surrounding the core of the magnet which may be connected or disconnected to vary the strength of the magnet, switch plates and a switch lever I, whereby the connections for this purpose are made, a lever N, a connecting rod, and a returning spring whereby the switch lever is actuated, substantially as described.

3. A brake for railway cars consisting of vertically moving shoes adapted to form contact with the rails, an electro magnet which carries the brake shoes and moves with them a switch mechanism by which an electric current is caused to pass through the coils of the magnet or is cut off therefrom, a connecting rod and lever whereby the switch is actuated at will, and a movable guard extending down in front of the car and connected with the switch actuating mechanism whereby the magnet is energized and the brake applied automatically by contact with any obstruction, substantially as described.

4. The swinging guard connected with a mechanism whereby the electro magnet is energized when the guard strikes an obstruction and the connected brakes are applied, a pawl and ratchet by which it is retained in position to continue the electric current through the magnet, and a foot lever whereby the pawl is disengaged and the guard allowed to swing back to its normal position, the electric current being also cut off from the magnet and the brakes released at the will of the operator, substantially as described.

In witness whereof we have hereunto set our hands.

ROBERT T. MURRAY.
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