(No Model.)

W. B. POTTER.

ELECTRIC BRAKE.

No. 560,751. Patented May 26, 1896.

Fig. 1.

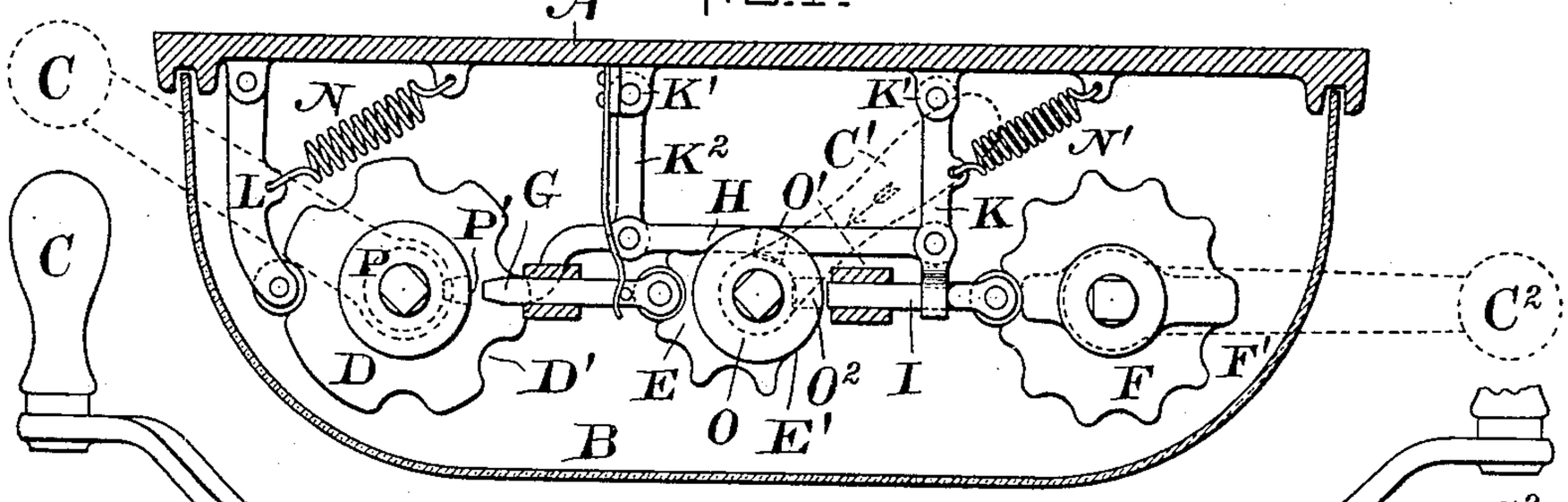


Fig. 2.

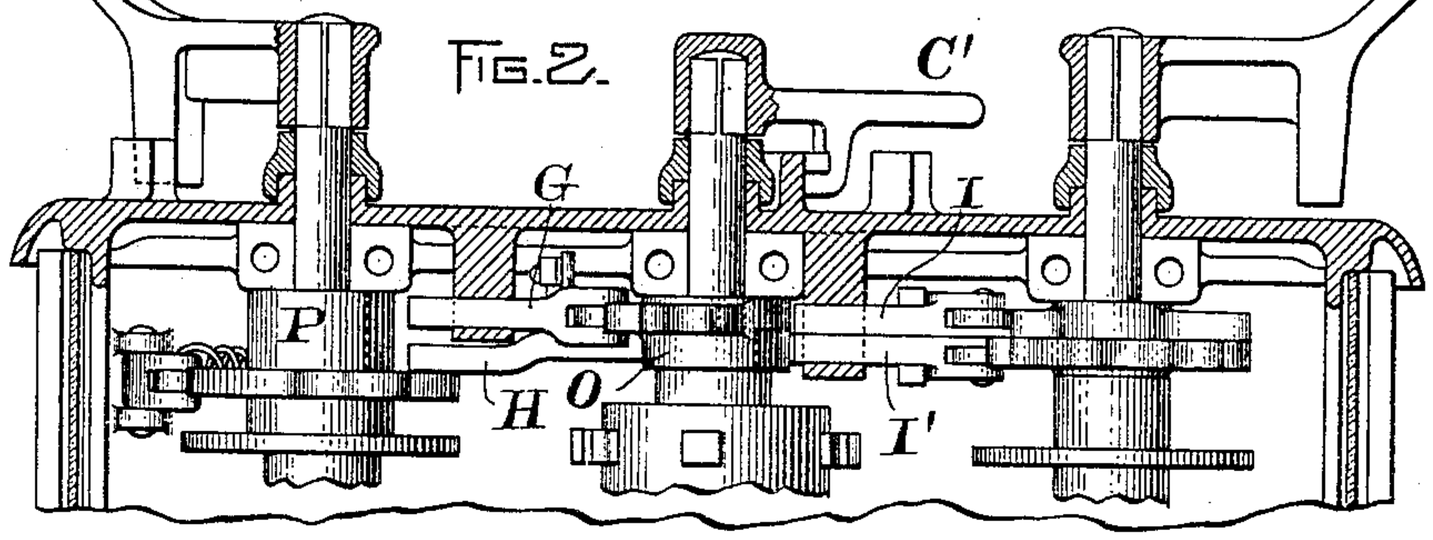


Fig. 3.

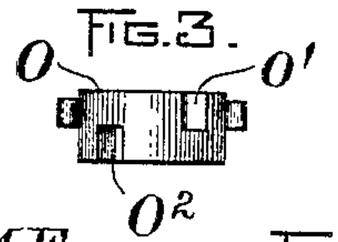
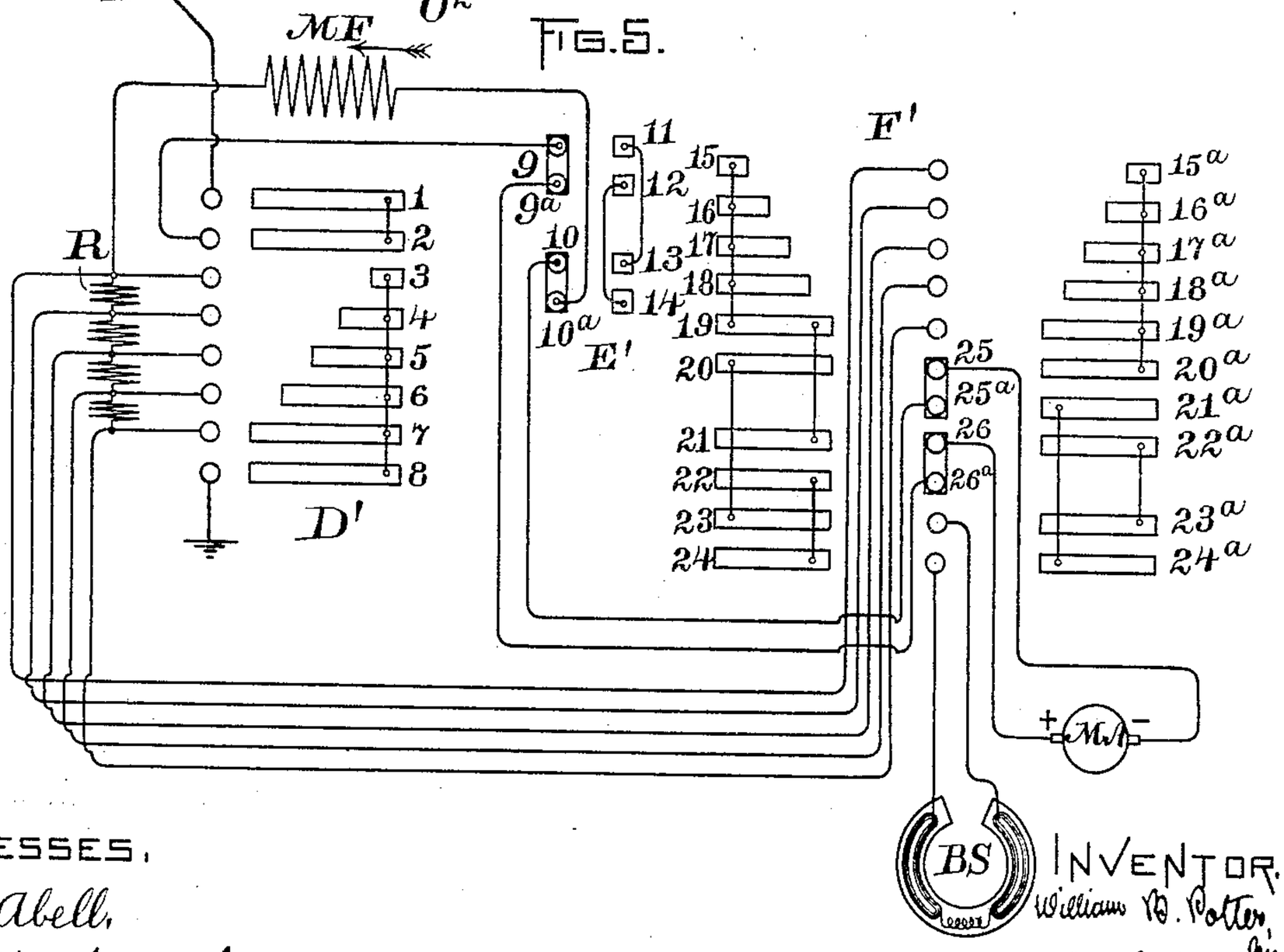


Fig. 4.

Fig. 5.



WITNESSES.

A. St. Abell.

A. E. Macdonald.

INVENTOR.

William B. Potter,

by Geo. B. Blodgett,

Atty.

UNITED STATES PATENT OFFICE.

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

ELECTRIC BRAKE.

SPECIFICATION forming part of Letters Patent No. 560,751, dated May 26, 1896.

Application filed March 13, 1896. Serial No. 583,019. (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, State of New York, have invented certain new and useful Improvements in Electric Brakes, (Case No. 179,) of which the following is a specification.

My invention relates to electric brakes, and has for its object to provide a braking apparatus which shall be operative in whichever direction the car may be moving and which shall also have an interlock so arranged as to prevent its improper manipulation. To the ends pointed out I arrange my controller for the improved braking apparatus with three cylinders—one for the ordinary control of the motors in propelling the car, the other the usual reversing-switch, and the third a switch for converting the motors into generators and utilizing the current in braking-magnets or otherwise to arrest the motion of the car. This latter switch is of peculiar construction, and the interlock adapted to it is also a peculiar one. The switch has two directions of rotation from its off position, these two directions corresponding to the two positions of the reversing-switch. When the reversing-switch is in the forward position, or that corresponding to the position in which the motors propel the car forward, one set of contacts upon the braking-switch are utilized to arrest the motion of the car, and the position of the interlock is such that the braking-switch handle can be rotated only in the direction rendering this set of contacts operative. When the reversing-switch, however, is in the backward position, then the other set of contacts upon the braking-switch is to be brought into play, and the interlock is arranged so that the handle of the braking-switch may be operated to bring this set of contacts into operation.

The accompanying drawings show an embodiment of my invention, Figure 1 being a plan view of the controller with the cover removed, showing the arrangement of the interlocking mechanism; Fig. 2, a front elevation, partly in section, also illustrating the interlock. Figs. 3 and 4 are details more fully described hereinafter; and Fig. 5 is a diagram of the circuits, which are cylindrical, developed in plane.

In Figs. 1 and 2, A is the back of the controller, and B is the cover. In suitable bearings are mounted the three switching-cylinders D′ E′ F′, operated, respectively, by the handles C C′ C^2, these parts being of the usual type. These cylinders are provided with step-by-step devices consisting of ratchets or, as they are now called in the art, "star-wheels" D E F, having notches in which fit pawls L G H I I′, provided with the usual cam-rollers and held in place against the star-wheels by springs N N′. Upon the cylinder D′ is a collar P, provided with a slot P′, with which the pawls G H may register. Another collar O is provided upon the reversing-switch shaft, having two notches O′ O^2, in which the pawls I I′ may respectively be inserted. The detail of this collar is best seen in Fig. 3. The star-wheel F upon the braking-cylinder is illustrated in Fig. 4. It consists of two parts in different planes, the upper one adapted to operate the pawl I and the lower one operating the pawl I′, the latter construction being best seen in Fig. 2. The two pawls I I′ have their bearing in a suitable lug depending from the top of the apparatus. The pawl H is carried upon two links K K^2, journaled in lugs K′ K′ upon the back of the apparatus. The link K has a fork upon its end which embraces both of the pawls I I′, so that whichever one of these pawls is operated the pawl H will also be actuated thereby, and whichever one of the pawls I I′ is not operated by the proper portion of the star-wheel F will remain at rest, the fork being free to move over it.

The operation of the device thus described is as follows: The controlling-cylinder D′ is illustrated in its off position, the reversing-switch cylinder E in its forward position. In this position the notch or slot P′ in the collar P is in alinement with the two pawls G H. The braking-switch cylinder F′ being also at its off position, any one of the three handles may now be operated. If the reversing-switch handle C′ be operated, it will be brought first to its middle position, and in this case the portion of the collar O intermediate between the notches O′ O^2 would be brought op-

posite the two pawls I I′ and the motion of the braking-switch would be prevented, inasmuch as these pawls would lock its star-wheels in place. In this position all of the cylinders would be locked against motion, inasmuch as the pawl G would also be inserted in the slot P′, locking the controlling-cylinder. The further rotation of the reversing-switch handle would release the other two cylinders as soon as the cam-roller upon the pawl G fell into either the forward or back notch of the star-wheel E; but assuming the reversing-switch handle to remain in its illustrated position, the controlling-cylinder D′ may be rotated as desired. Allowing it to remain in its illustrated position, if it be attempted to rotate the brake-cylinder F′ it may only be rotated clockwise, the handle C^2 moving toward the operator, inasmuch as (see also Figs. 3 and 4) the lower part of the cam-wheel F operates the pawl I′, which is free to move in and out of the notch O′ of the collar O, the upper part of the wheel not operating the pawl I. This brings into operation the proper set of contacts upon the braking-cylinder, having reference to the connections between that and the reversing-cylinder, which will presently be described. With the reversing-switch handle thrown to the backward position, the operation of the braking-switch would, however, be reversed. As in this case the notch O^2 would no longer be in alinement with the pawl I′, the motion of the braking-switch handle C^2 must be reversed, as that pawl would then strike against the collar O and prevent its operation in the former direction, the pawl I, however, being free to move in and out of the notch O′.

Referring now to Fig. 5, I illustrate the circuits of the apparatus. The necessity for the characteristic interlocking arrangement will be apparent from this figure. The cylinders are lettered as in Figs. 1 and 2, the contacts being developed in plane and being numbered upon the controlling-switch 1 to 8, upon the reversing-switch 9 to 14, and upon the braking-switch 15 to 24 and 15^a to 24^a. The motor-armature is lettered MA, the motor-field MF, the trolley T, and the brake-shoe BS. The small circles represent the fixed contacts for the various cylinders. The controlling-switch D′ is one adapted for the ordinary resistance-control with a single motor. I may, however, employ a series-parallel or any other form of controller, inasmuch as this forms no part of my invention. It will be understood readily that the different contacts of the controller short-circuit different parts of the resistance R until it is entirely cut out. In its first position the circuit would be as follows: from the trolley T to contact 1, to contact 2 of the controller, thence to contact 9 upon the reversing-switch, to contact 9^a, to contact 26^a upon the braking-switch, to contact 26, through the motor-armature, to contact 25, to contact 25^a, to contact 10 upon the reversing-switch, to contact 10^a, through the motor-field MF, through the resistance to contact 7 upon the controller, to contact 8, and out at ground.

With the controller at the off position and the braking-switch and reversing-switch in their illustrated position the circuit is open, but upon operating the brake-switch to bring the fixed contacts upon the set of contacts 15^a, &c., the circuit is closed through the brake-shoe BS and resistance R, as follows: Starting from the plus brush of the motor-armature the current passes to contact 26, thence to contact-plate 22^a, to contact-plate 23^a, through the brake-shoe to 24^a, to contact-plate 21^a, contact 25^a, to contacts 10 10^a upon the reversing-switch, through the motor-field and resistance, contact 19^a upon the braking-switch, to 20^a, contact 25, and back to the minus brush of the motor. The further manipulation of the brake-switch serves to cut out sections of the resistance, permitting the generation of more and more current and a greater and greater magnetization of the brake-shoe until the car is finally brought to a stop. When, however, the reversing-switch is upon the contacts 11 to 14, or in its backward position, the contacts 15 to 24 of the braking-switch are utilized. The circuit would then be as follows, the relation of armature and field being reversed relatively to their former connection, the current leaving the minus brush of the motor thus passing through the field in the proper direction, for well-known reasons: from the minus brush of the motor-armature MA to contact 25, to contact-plate 20, to contact-plate 23, through the brake-shoe to contact-plate 24, to contact-plate 22, to contact 26^a, to contact 9^a upon the reversing-switch, to contact 12, to contact 14, to contact 10^a, through the motor-field and resistance, to contact-plate 19 upon the braking-switch, to contact-plate 21, to contact 26, and to the plus brush of the motor-armature.

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

1. In an electric braking apparatus, the combination of a controlling-switch, a reversing-switch, and a braking-switch having two sets of contacts corresponding respectively to the forward and backward running positions of the reversing-switch, and means for locking the switches so that only one of the switches may be operated at one time, the interlocking means being so arranged that the braking-switch may be operated only in a direction corresponding to the proper position of the reversing-switch.

2. In an electric brake, the combination of a controlling-switch, a reversing-switch, and a braking-switch provided with two sets of contacts corresponding to the forward and backward running positions of the reversing-switch, and an interlock between the reversing-switch, controller and braking-switch; the interlock arranged to permit the operation of the braking-switch in one direction when the reversing-switch is set forward, and

in the other direction when the reversing-switch is set back.

3. In an electric brake, the combination of a controlling-switch, a reversing-switch, and a braking-switch having two sets of contacts corresponding respectively to the forward and backward positions of the reversing-switch, a pawl operated by a cam upon the reversing-switch to lock the controlling-switch, a second pawl operated by the braking-switch and locking the controller, and a pair of pawls operated by corresponding star-wheels or cams upon the braking-switch, one of said pawls locking the reversing-switch in its forward position, the other in its backward position, and one being operated by the rotation of the braking-switch in one direction, the other by its rotation in the opposite direction.

In witness whereof I have hereunto set my hand this 9th day of March, 1896.

WILLIAM B. POTTER.

Witnesses:

B. B. HULL,

A. F. MACDONALD.