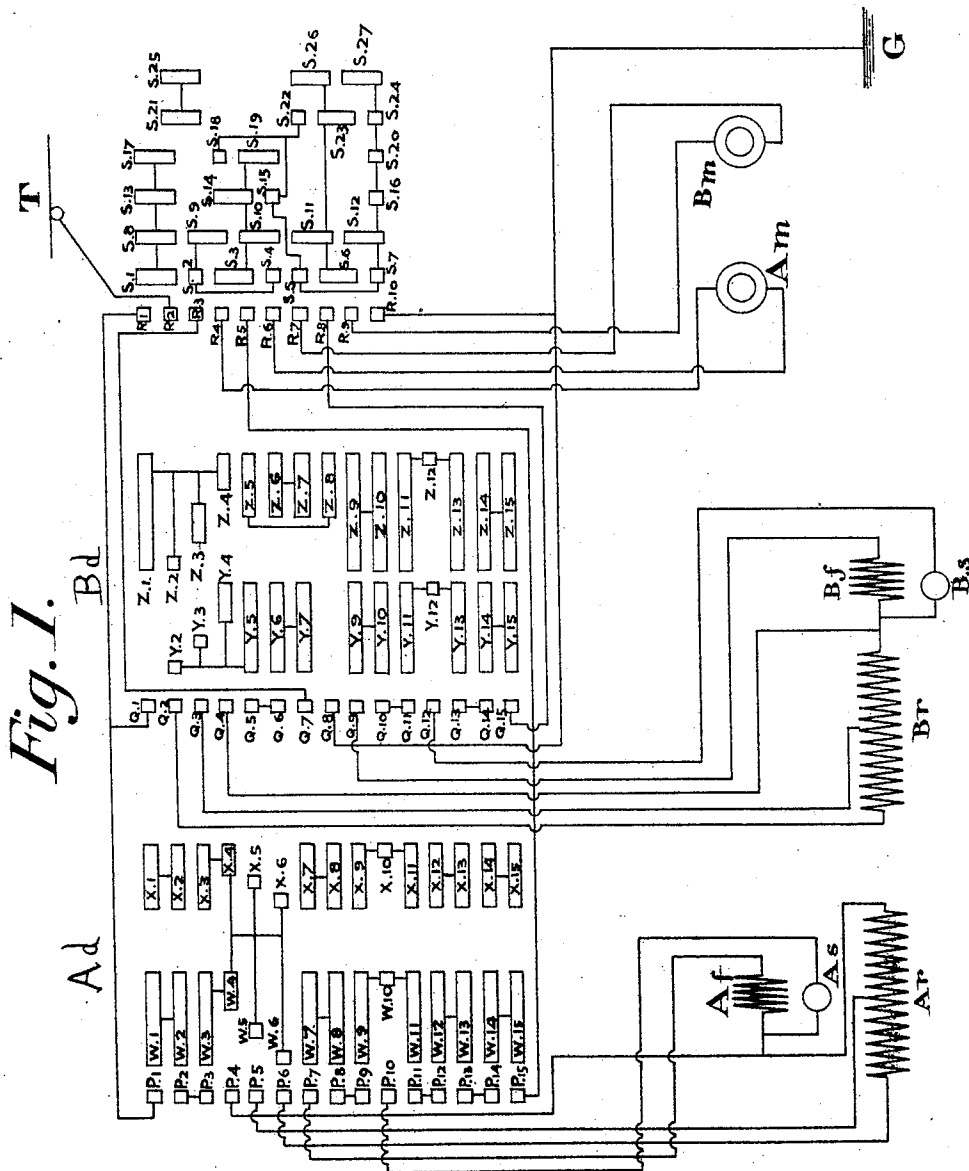


G. VALLEY.
ELECTRIC CONTROLLER.

No. 576,333.

Patented Feb. 2, 1897.



WITNESSES:

A. C. Smith
Lewis L. Durham

INVENTOR

Gustaf Valley
BY
Richard C. ...
ATTORNEY.

(No Model.)

2 Sheets—Sheet 2.

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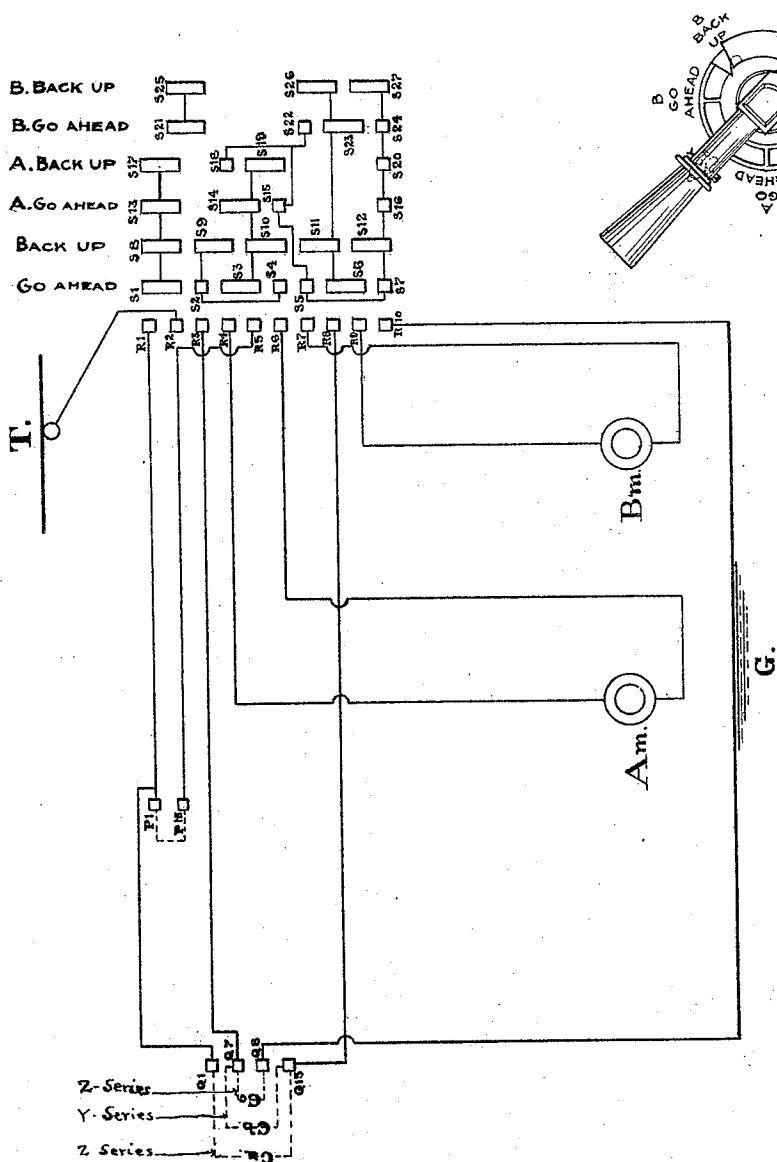


Fig. 2.

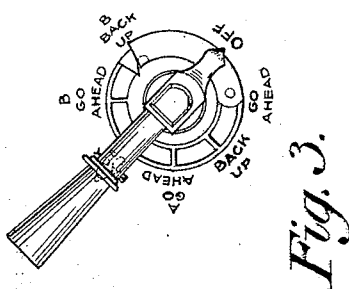


Fig. 3.

WITNESSES:
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INVENTOR
Gustaf Valley
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UNITED STATES PATENT OFFICE.

GUSTAF VALLEY, OF JOHNSTOWN, PENNSYLVANIA, ASSIGNOR TO THE
STEEL MOTOR COMPANY, OF SAME PLACE.

ELECTRIC CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 576,333, dated February 2, 1897.

Application filed November 10, 1896. Serial No. 611,597. (No model.)

To all whom it may concern:

Be it known that I, GUSTAF VALLEY, of Johnstown, in the county of Cambria, State of Pennsylvania, have invented certain new and useful Improvements in Electric Controllers, of which the following is a specification.

My invention relates to electric controllers, especially to such controllers as are used on electric-railway cars or locomotives.

It relates more particularly to that type of controller which has two operating-drums rotated by lever and a third drum used as a reversing and cut-out switch. Such a switch is described in Letters Patent No. 561,839, granted to me on June 9, 1896.

My invention consists in a novel arrangement of the various electric contacts of the controller, of the conductors connecting certain of said contacts together, and of the conductors leading from the controller to certain parts of the outside electrical apparatus.

The object of my invention is to provide a controller having two operating-drums and a reversing and cut-out switch, by the use of which controller the car may be propelled either when one of the motors or when one of the drums has become for any reason inoperative.

Referring to the drawings, Figure 1 is a diagram of the wiring of the car embodying my improvement. Fig. 2 is a diagram similar to Fig. 1, but, for the sake of simplicity, omitting certain portions of the wiring and apparatus not claimed by me as new. Fig. 3 is a plan view of the top of the reversing and cut-out switch.

I have shown my invention as adapted for use with two motors and their respective resistances, fields, and shunt-resistances for weakening the fields. I shall call A the "circuit," which includes one of the motors and any or all of its parts. Included in this A circuit is also one of the operating-drums of the controller.

Am, Ar, Af, As, and Ad are respectively the motor-armature, the resistance adapted to be put in circuit with the same, the motor-field, the resistance adapted to be put in multiple with the same, and one of the controller-drums. Bm, Br, Bf, Bs, and Bd are similar parts of circuit B.

W' W², &c., and X' X², &c., are contacts on Ad.

P' P², &c., are contact-fingers adapted to come into contact with the W and X group of contacts as the drum Ad is rotated. As the mechanical arrangement of these drums is well known in the art and forms no part of my invention, I do not show or describe it.

Y' Y², &c., and Z' Z², &c., are contacts on Bd.

Q' Q², &c., are contact-fingers adapted to come into contact with the Y and Z groups of contacts as the drum Bd is rotated.

S' S², &c., are contacts mounted on the drum of the reversing and cut-out switch in six vertical series.

R' R², &c., are contact-fingers adapted to be placed in contact with either of the six series of the S group, as desired.

Referring to Fig. 1, fifteen contact-fingers are shown in each of the P and Q groups. Of the P group P' and P¹⁵ are connected with fingers of the R group. P⁴, P⁵, P⁶, P⁷, and P¹⁰ are connected to various parts of the A circuit, so that if P' is "live" and the P group are in contact with either the W or X group the current will pass through one, two, or all of Ar, Af, or As, returning to the R group by means of the conductor connected to P¹⁵. As the control of the current through Ar, Af, and As forms no part of my invention, I do not describe it in detail, but any one skilled in the art can trace it out from the diagram. To simplify the description, I show in Fig. 2 P' and P¹⁵ directly connected by a dotted line.

Turning now to the drum Bd, Br, Bs, and Bf are connected to the fingers of the Q group in a somewhat similar manner to the P connections to parts of the A circuit. Q' is connected to the same finger of the R group as is P'. Q⁷ and Q¹⁵ are connected to other fingers of the R group. Q⁸ is connected to the ground side of the circuit. For the same reasons hereinbefore given for connecting P' and P¹⁵ in Fig. 2 by a dotted line I show only four of the Q group in Fig. 2 and connect them by dotted lines. Q' and Q¹⁵ are connected by a dotted line, (marked Ca.) As Q' has no connection with any of the Y group, the line Ca is an open circuit except when the Z and Q groups are in contact. Cb is a similar line

connecting Q^7 and Q^{15} . This line is an open circuit except when the Y and Q groups are in contact. Cc is a similar line connecting Q^7 and Q^8 . This line is an open circuit except

5 when the Z and Q series are in contact.
Referring to Fig. 2, the six vertical rows of contacts in the S group correspond to the six working positions of the reversing and cut-out switch marked above the rows and again
10 in Fig. 3. The R group of fingers are connected as follows: R^1 to P' and Q' , R^2 to the trolley-circuit T, R^3 to Q^7 , R^4 to the forward actuating side of Am , R^5 to P^{15} , R^6 to the backward actuating side of Am , R^7 to the
15 backward actuating side of Bm , R^8 to Q^{15} , R^9 to the forward actuating side of Bm , R^{10} to the ground side of the circuit.

Suppose the reversing-switch to be placed at "Go ahead" and the operating-drums so
20 that the W and Y groups are respectively in contact with the P and Q groups. In these positions of the drums the current would take this path, T R^2 S' R' P' P^{15} R^5 S^3 R^4 Am , (forward,) R^6 S^4 S^2 R^3 Q^7 Cb Q^{15} R^8 S^6 R^9 Bm , (for-
25 ward,) R^7 S^5 S^7 R^{10} , ground, thus going ahead with both motors in series. Leaving the reversing-switch at the same position, but rotating the operating-drums so that the X and Z series are in contact with the P and Q se-
30 ries, the path of the current would be T R^2 S' R' , here the current dividing, part of it taking the path $P' P^{15} R^5 S^3 R^4 Am$, (forward,) $R^6 S^4 S^2 R^3 Q^7 Cc Q^8$, ground, and another part taking the path $Q' Ca Q^{15} R^8 S^6 R^9 Bm$, (for-
35 ward,) $R^7 S^5 S^7 R^{10}$, ground, thus going ahead with the motors in multiple.

If the reversing and cut-out switch be moved to "Back up," the only essential difference
40 in the path of the current would be that from R^5 it would pass to S^{10} , thence to R^6 , so entering the armature Am on the backward actuating side, and from R^8 it would pass by S^{11} to R^7 , thus entering Bm on its backward actuating side.

45 When the reversing and cut-out switch is turned to "A go ahead," the path would be T R^2 S^{13} R' P' P^{15} R^5 S^{14} $R^4 Am$, (forward,) $R^6 S^{15}$ S^{16} R^{10} , ground, thus going ahead with only motor A, Bd being inoperative.

50 When the reversing and cut-out switch is turned to any of the four points which cut out a motor, the drums are only rotated a limited distance, the X and Z groups not coming in contact with the P and Q groups.

55 When the reversing and cut-out switch is turned to "A back up," the path is T R^2 S^{17} $R' P' P^{15} R^5 S^{19} R^6 Am$, (backward,) $R^4 S^{18} S^{20} R^{10}$, thus going backward with motor A only, the drum Bd being out of circuit.

60 When the reversing and cut-out switch is at "B go ahead," the path is T R^2 S^{21} $R^3 Q^7 Cb Q^{15} R^8 S^{23} R^9 Bm$, (forward,) $R^7 S^{22} S^{24} R^{10}$, ground, thus going ahead with motor B, drum Ad being out of circuit.

65 When the reversing and cut-out switch is at "B back up," the path is T R^2 S^{25} $R^3 Q^7 Cb Q^{15} R^8 R^7 Bm$, (backward,) $R^9 S^{27} R^{10}$,

ground, thus going backward with motor B only, Ad being out of circuit.

It is now shown that by the use of my im- 70 proved controller any part of either circuit A or circuit B or that either of the operative drums may be rendered inoperative from any cause without forbidding the propulsion of the vehicle upon which they are secured. 75

I do not limit myself to the exact details as herein described, for many modifications can be made in the arrangement of the con- 80 tacts, conductors, &c., without departing from the scope of my invention. Neither do I limit myself to the use of my invention with any particular form of mechanical construction or arrangement of the controllers, nor to the use of my invention on a vehicle supplied 85 with two motors, as I might have a plurality of motors in each of the A and B circuits set forth.

What I claim, and desire to protect by Let- 90 ters Patent, is—

1. In an electric controller, in combination, 90 two movable groups of contacts adapted to regulate the course of the current by engagement with fixed contacts, and an electric switch which affords means by which either group alone or both of said groups may be 95 used to supply current.

2. In an electrically-propelled vehicle, a plurality of motors, an electric controller hav- 100 ing two operating groups of movable contacts, part of said motors and one of said groups being in the same electric circuit, the rest of said motors and the other of said groups be- 105 ing in another electric circuit, and a switch having a plurality of operative positions, some of said positions cutting out one of said circuits, others of said positions cutting out 105 the other of said circuits, and a third set of said positions cutting out neither of said circuits.

3. In a controller for electric railways, two 110 operating-drums and an electric switch which affords means whereby either drum alone or both drums together may be used to supply electric current for propelling the vehicle.

4. An electric controller containing two 115 operating-drums and a reversing and cut-out switch by the use of which either of said drums may be used to regulate the current to part of the motors, the other of said drums being inoperative. 120

5. An electric controller comprising two oper- 120 ating-drums and a reversing and cut-out switch, said switch having a plurality of operative positions, some of said positions cutting one drum out of the working circuit, 125 others of said positions cutting the other of said drums out of the working circuit, and a third set of said positions putting both of said drums in the working circuit.

6. In an electrically-propelled vehicle, a 130 plurality of motors, an electric controller having two operative drums, part of said motors and one of said drums being in the same electric circuit, and the rest of said motors

and the other of said drums being in another electric circuit, and a switch having a plurality of operative positions, some of said positions cutting out one of said circuits, others of said positions cutting out the other of said circuits, and a third set of said positions cutting out neither of said circuits.

7. In a controller for electric railways, in combination, a reversing and cut-out switch
10 having seven operative positions substan-

tially as, and for the purpose, set forth, and two operating-drums each connected to parts of the electrical apparatus carried by the car for the purpose set forth.

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

GUSTAF VALLEY.

Witnesses:

HUGO NORMAN,
H. W. SMITH.