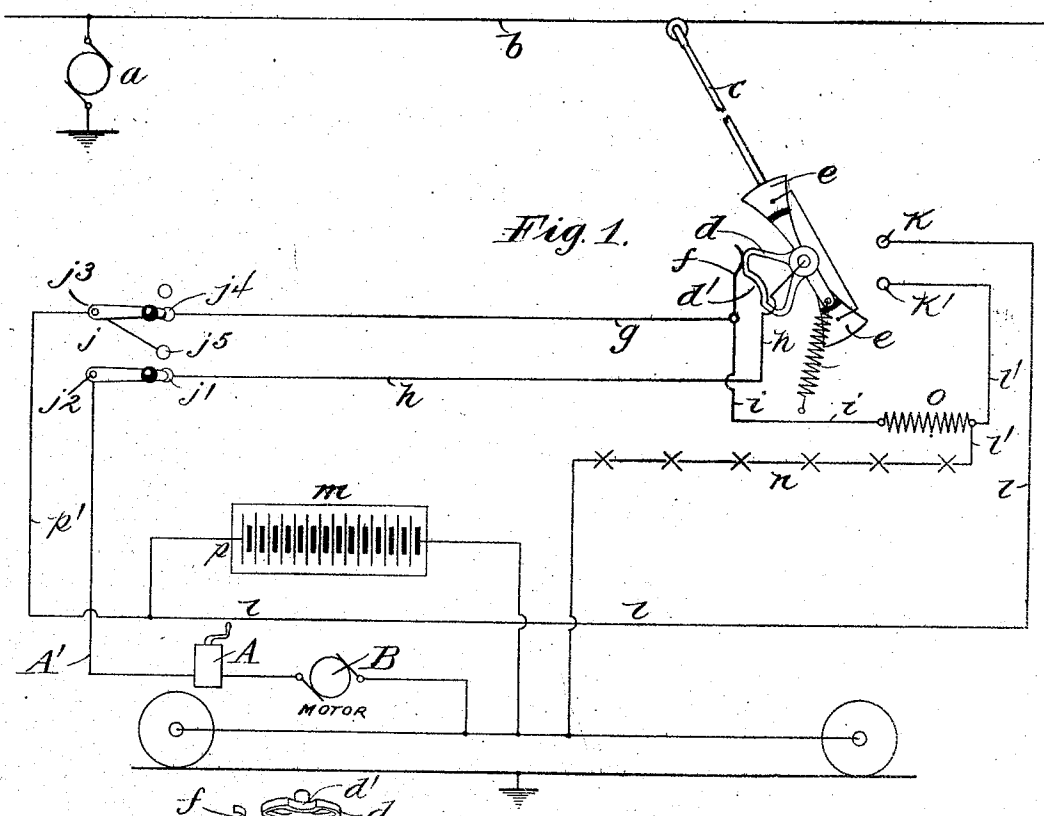
(No Model.)

E. B. W. REICHEL.

SWITCHING DEVICE AND CIRCUIT ARRANGEMENT FOR ELECTRICALLY PROPELLED VEHICLES.

No. 605,013. Patented May 31, 1898.

Fig. 1.



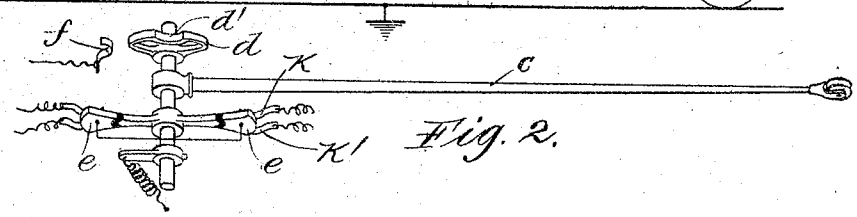
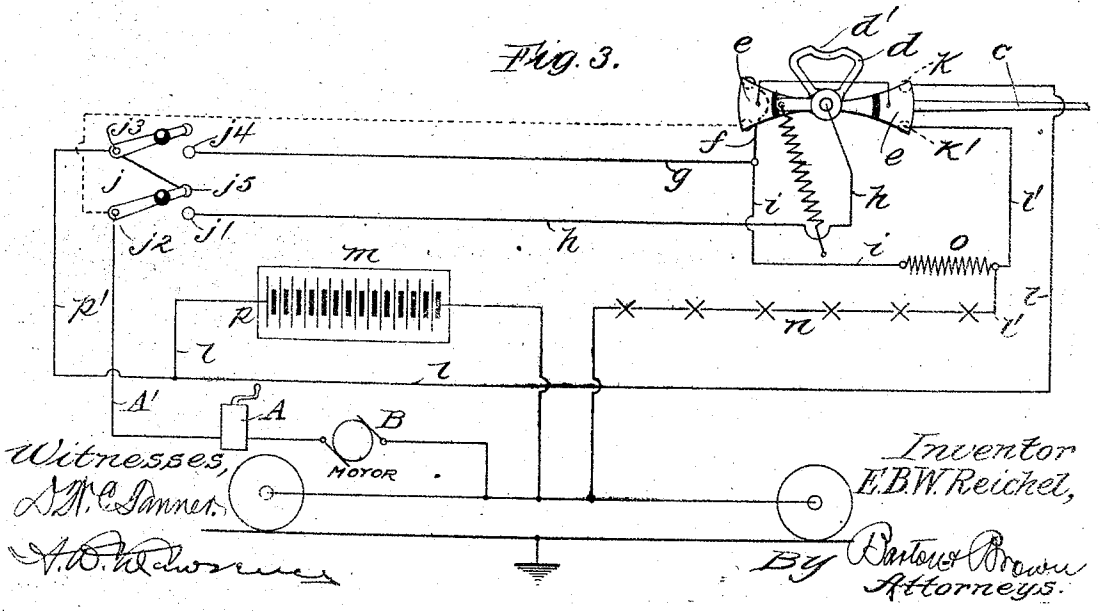


Fig. 2.

Fig. 3.



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UNITED STATES PATENT OFFICE.

EMIL BERTHOLD WALTER REICHEL, OF BERLIN, GERMANY, ASSIGNOR TO THE SIEMENS & HALSKE ELECTRIC COMPANY OF AMERICA, OF CHICAGO, ILLINOIS.

SWITCHING DEVICE AND CIRCUIT ARRANGEMENT FOR ELECTRICALLY-PROPELLED VEHICLES.

SPECIFICATION forming part of Letters Patent No. 605,013, dated May 31, 1898.

Application filed January 10, 1898. Serial No. 666,136 (No model.)

To all whom it may concern:

Be it known that I, EMIL BERTHOLD WALTER REICHEL, a subject of the Emperor of Germany, residing at Berlin, Germany, have invented new and useful Improvements in Switching Devices and Circuit Arrangements for Electrically-Propelled Vehicles, (Case No. 124,) of which the following is a specification, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to improvements in an automatic switching device and circuit arrangement for electrically-propelled vehicles, and has for its object the provision of means for obtaining greater security in the operation of such vehicles, while making the several circuit-changes practically automatic.

My invention will be described in connection with an electric vehicle provided with storage batteries which may be utilized either for power purposes, for lighting the car, or for both purposes combined, and which may be charged, preferably, from the main circuit or source of supply during the operation of the vehicle.

My invention may be briefly described as consisting in providing switching mechanism actuated by the trolley-arm or contact device of the vehicle, whereby the several circuit-changes necessary to secure the operation of the vehicle under its different conditions are attained by the engagement of the trolley-arm with the trolley-conductor or its release therefrom and withdrawal to a normal position of rest.

My invention also contemplates the circuit arrangement of a car whereby a storage battery may be connected in circuit alternately to be charged or discharge itself through suitable translating devices, according to the operative condition of said car.

My said invention will be more readily understood by reference to the accompanying drawings, wherein—

Figure 1 diagrammatically illustrates the trolley-arm with its connected contacts and the several circuits of the car, the trolley being shown in position for deriving power from the main source of supply. Fig. 2 is a detail view of the trolley-arm, somewhat diagrammatic in its character. Fig. 3 is a diagrammatic view of the trolley-arm and contact devices and the altered circuits of the car when the said trolley-arm is withdrawn from the conducting-wire and maintained in its normal position of rest.

Similar parts are designated by the same letters of reference in each of said figures of the drawings.

The main dynamo or source of electrical energy a is connected with the trolley-conductor b of the system and with the earth in the usual manner. The trolley-arm c is provided with any suitable contact device and is adapted normally to engage the trolley-conductor b and convey current to the several circuits of the car. Upon the arm and electrically connected therewith is provided a segmental contact d, centrally recessed at d'. Contacts e, electrically connected, are also provided upon said trolley-arm, but are insulated therefrom and lie without the plane of contact d. A spring f is mounted upon the trolley-support or in other suitable position upon the car and is adapted to engage the surface of the contact part d when the trolley-arm is in engagement with trolley-conductor b. Connected with the spring f are conductors g and i, respectively leading to the contact j' of a switch j and to the lamp-circuit of the car. Conductor h is maintained in permanent connection with the trolley-arm and extends also to a second contact j'' of said switch. The switch j is diagrammatically illustrated as being provided with circuit-terminals j^2 j^3, respectively connected with a motor-circuit of the car and with a conductor p', leading to the positive terminal of the storage batteries or accumulators m, which are provided with a ground connection. The contact-arms of the said switch j are adapted to connect terminal j^2 either with contact j' or j'', the latter contact being in turn connected with circuit-terminal j^3, while the other contact-arm of said switch is adapted, when closed, to maintain the circuit between terminal j^3 and contact j'. From the positive terminal p of the accumu-

lators a conductor l extends to contact k of the trolley switching device, and a second contact k' of said switching device is connected by means of conductor l' with the lamp-circuit n of the car beyond the resistance or a secondary group of lamps o, connected in circuit with conductor i, thus being adapted to short-circuit said resistance o when current is flowing through said conductor l'. The lamp-circuit is also provided with a ground-contact. When the trolley-arm is in engagement with the trolley-conductor, the spring f being in engagement with the contact d, circuit is established through conductors g and h to the switch j and through conductor i and the resistance o to the lamp-circuit of said car. The circuit is closed between terminal j^2 and contact j', which permits the actuating-current to flow through a conductor A', controller A, and motor B of said car. If the accumulator is to be charged, the circuit is also closed between terminal j^3 and contact j^4, when current will flow through conductor p' to the positive terminal of the accumulator, charging the cells thereof, and thence to earth.

It will thus be seen that three paths may be provided for the current from the main conductor b—viz., through the motor-circuit, the accumulator-circuit, and through a resistance and the lamp-circuit to ground. Hence by means of auxiliary switching devices the current may be connected with the several translating devices of the car. As far as possible in the operation thereof the storage batteries will of course be maintained charged at their maximum capacity.

When the car leaves the section of road provided with the trolley-conductor, the trolley-arm through the medium of its impelling-spring will be forced to an upright position, thus at once disengaging the spring f from contact d, provided thereon. This serves to open all the circuits of the car, and should the accumulator at that time be connected in circuit through the switch j its circuit will be opened at the trolley switching device. If it is now desired to actuate the car by means of the storage battery—as, for instance, when said car is designed to travel over an outlying line or within a business district where trolley-conductors are objectionable—the trolley-arm will be drawn down to its normal or horizontal position of rest upon the roof of the car. This will serve to engage one or the other of the contact-pieces e with the contacts k k' of the switching device. Switch j is thrown, closing the circuit between terminal j^2 and contact j^5, or, in other words, short-circuiting the terminals j^2 j^3 of said switch and opening the circuit at j'. The circuit is also broken between terminal j^3 and contact j^4, thus entirely disconnecting the trolley switching-contacts from the accumulator.

It will be seen that the storage batteries are now electrically connected with the controller and motor circuit of said car through conductor p', switch j, and conductor A'. Moreover, the lamp-circuit of the car is closed through conductor l, contacts k e k', conductor l', and thence through the lamps to earth, the resistance o being short-circuited. Thus the useless expenditure of the battery energy in overcoming this resistance is avoided. The car may now be operated as an automobile car, the limit of its run being set only by the capacity of its accumulators, of which it is obvious one or more sets of batteries may be carried, if found necessary. The motor circuit, if desired, may be automatically closed by the forward contact c, as shown in dotted lines in Fig. 3.

It will be seen that the trolley-arm and its connected contacts d are wholly insulated from the actuating-current emanating from the accumulator and also that the separate circuits may be controlled as before, as when current is derived from the main source of power a. Thus all danger of establishing accidental grounds through the medium of these parts is avoided.

With the circuit arrangement herewith shown and described the car is adapted to be readily actuated according to the improved method above referred to, the requirements of the system being capable of numerous alterations to meet the conditions of work imposed. I do not therefore desire to be understood as limiting the application of my invention to the precise devices or circuit arrangements herein diagrammatically illustrated; but

What I claim as new, and desire to secure by these Letters Patent, is—

1. In a trolley switching device, the combination with the trolley-arm c, contact-piece d electrically connected with and actuated by said trolley-arm, and contact part f adapted to be electrically engaged by said contact-piece only when the trolley-arm is in engagement with the trolley-conductor, substantially as described.

2. In a trolley switching device, the combination with the trolley-arm c, contact-piece d electrically connected with and actuated by said trolley-arm, contact part f adapted to be electrically engaged by said contact-piece only when the trolley-arm is in engagement with the trolley-conductor, and contact e also actuated by the trolley-arm and adapted to close a second circuit when said trolley-arm is in a position of rest, substantially as described.

3. The combination with a trolley-arm for electrically-propelled vehicles, of a conductor connected with said trolley-arm having included therein suitable circuit-controlling apparatus extending to the motor of said vehicle, a contact part connected with a secondary circuit of said vehicle, and a contact-piece actuated by said trolley-arm to engage

the contact part only when the trolley-arm is in engagement with the trolley-conductor, substantially as described.

4. In an electrically-actuated vehicle, the combination with a trolley-arm adapted to engage the trolley-conductor, of a motor-circuit connected therewith, a lamp-circuit and an accumulator, a contact part connected therewith, and a contact-piece actuated by the trolley-arm to move into engagement with said contact part when the said trolley-arm is connected with the trolley-conductor, substantially as described.

5. In an electrically-actuated vehicle, the combination with a trolley-arm adapted to engage the trolley-conductor, of a motor-circuit connected therewith, a lamp-circuit and an accumulator, a contact part connected therewith, a contact-piece actuated by the trolley-arm to move into engagement with said contact part when the said trolley-arm is connected with the trolley-conductor, a switch *j* adapted to connect said accumulator with the motor-circuit, and a contact *e* actuated to close the accumulator-circuit by the movement of the trolley-arm to its position of rest, substantially as described.

6. The herein-described circuit arrangement for electrically-actuated vehicles, consisting of motor, accumulator and lamp circuits, a switching or trolley arm adapted to be connected with an external source of power and the motor-circuit, a contact-piece connected therewith, a contact part adapted to be engaged by the contact-piece and insure the electrical continuity of the remaining circuits when said arm is connected with the source of power, a switch *j* controlling these two circuits, and a contact part *e* actuated by said switching-arm to close the lamp-circuit when said arm is in a position of rest, substantially as described.

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

EMIL BERTHOLD WALTER REICHEL.

Witnesses:

CHARLES H. DAY,

HENRY HASPER.