(No Model.)

E. M. BENTLEY.

ELECTRICAL RESISTANCE.

No. 409,135. Patented Aug. 13, 1889.

Fig I

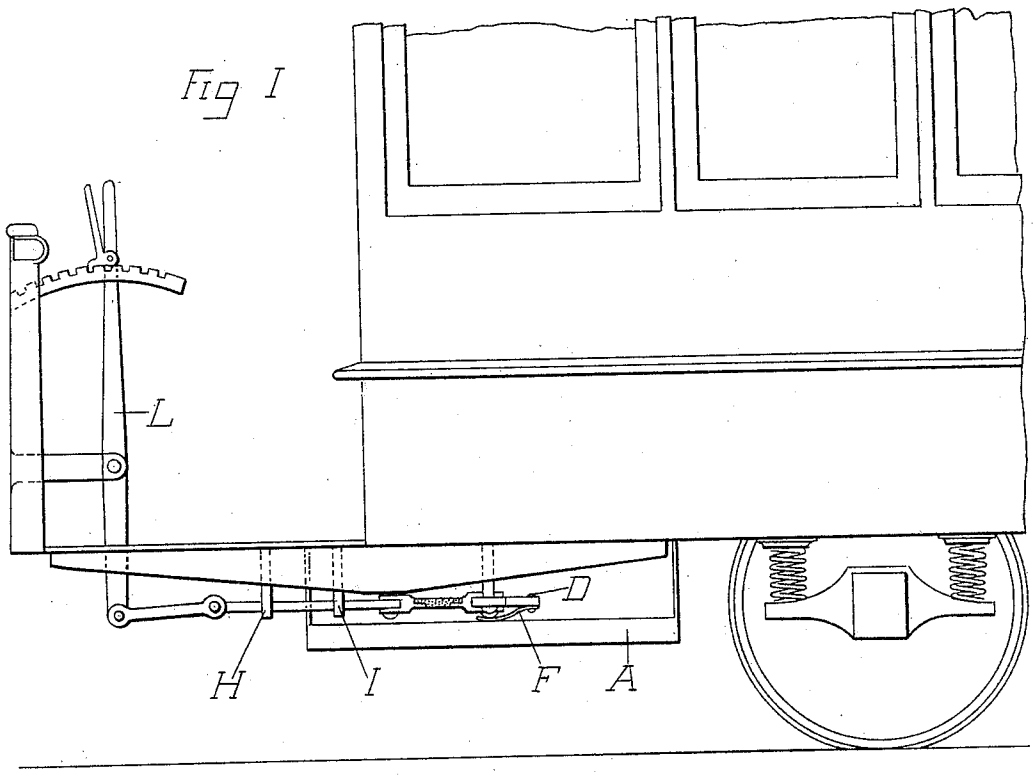
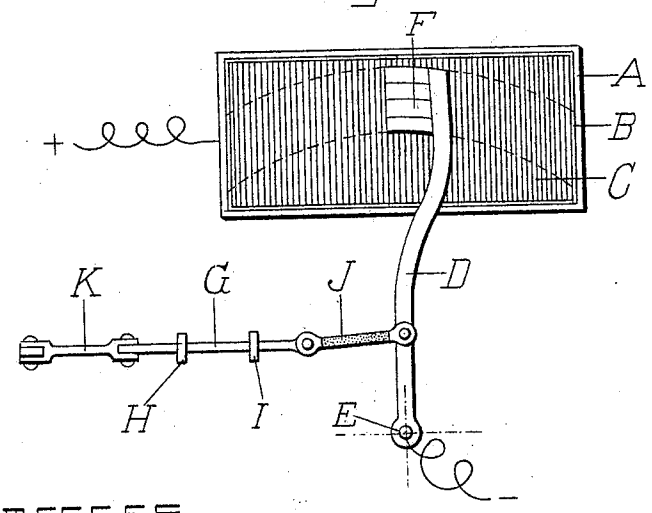


Fig II



Witnesses

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ELECTRICAL RESISTANCE.

SPECIFICATION forming part of Letters Patent No. 409,135, dated August 13, 1889.

Application filed June 5, 1889. Serial No. 313,176. (No model.)

To all whom it may concern:

Be it known that I, EDWARD M. BENTLEY, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Electrical Resistances, of which the following is a specification.

My invention relates to resistance-boxes in which an artificial resistance is made up of a series of plates in contact with one another and provided with a moving arm for cutting more or less of the plates out of circuit to vary the resistance at will.

It consists in a resistance-box of the kind described, provided with a contact-arm moving about a center, so that its outer end, to which the contact-piece is attached, moves in the arc of a circle. The box is made of such a width that, although it has not a circular form, the contact-piece is always in engagement with the edges of the plates at any point.

It consists, moreover, in a longitudinally-moving rod or similar device connected to the pivoted contact-arm for operating it.

It further consists in the connection of a box of this description to a vehicle in such a manner that the plates may be vertical while the contact device moves in a horizontal plane, an actuating device of the kind mentioned being used for the contact-arm when the resistance-box is on a vehicle.

My invention is illustrated in the accompanying drawings, in which—

Figure I is a side view of a portion of a car with the resistance thereon, and Fig. II is a plan view of the resistance and certain operating-connections.

A is an inclosing-box, preferably of metal.

B is a lining therefor, of asbestus or similar non-conducting and non-combustible material.

C is a series of plates placed in contact with one another so as to fill snugly the interior of the box.

D is a contact-arm, pivoted at E, having a number of contact-springs at its outer extremity bearing upon the edges of the plates.

G is a longitudinally-moving rod in bearings H and I.

J is an insulating-rod leading from the outer end of G to the contact-arm D. This rod is attached to the arm at a point to one side of the pivot of said arm, and forms a laterally-moving operating-connection between rod G and arm D.

K is a second link connecting the opposite end of rod G to an actuating-lever L, Fig. 1. It will be apparent that as the rod D moves about the center E its outer end F will follow the direction indicated by the dotted lines on the surface of the plates; but the plates are made of such a width that in no position will the contact F leave the box.

When a resistance-box of this description is placed upon a vehicle—such as an electric-motor car for regulating the supply of current—it is preferably placed at an intermediate point between the ends of the vehicle, and in a horizontal position, so that while the plates stand vertically the contact-arm G moves in a horizontal plane. This is illustrated in Fig. I, where the box A is shown in side elevation, and the actuating devices for controlling the resistance are shown extending in a fore-and-aft direction to the front platform, where a controlling-lever L is placed. By this arrangement the plates will always be held down by their own weight and a much more satisfactory contact maintained. Moreover, as the space below the body of the car is limited, the horizontal disposition of the resistance-box is a matter of importance, in that it can be placed close up to the car-body out of the way and away from any mud or water which might be spattered thereupon to the injury of the contact. As it is necessary to have a box of considerable size for the regulation of a car, a compact form of resistance-box is essential. This can best be attained by the device shown, where a centrally-pivoted contact-arm may be employed. A contact-arm of this kind can best be operated in a horizontal plane, and in this case a direct-moving connecting-rod or other actuating device must be employed to connect the contact-arm with the operating-lever on the platform of the car. It is also of great advantage to have the resistance-box rectangular and of such width that the contact-pieces are constantly pressing upon the surface of the plates, whatever may be the position of the contact-arm. In place of the

rod G, movable in a straight line longitudinal with the vehicle, any other suitable form of mechanism may be employed giving the same longitudinal movement and connecting the contact-arm D with a lever or other operating device placed on the platform or other accessible point of the vehicle.

The spring contact-pieces F are offset from the contact-arm D and project toward the terminal connecting the resistance with the electric circuit, so that when the arm is moved in such a direction as will cut the resistance into circuit the sliding contacts trail over the surface of the plates. This is a matter of importance, because in practice it has been found that the contact-pieces are liable to become worn and to become stuck between the edges of the plates or to force the plates out of place. It must be made certain that this does not occur when the contact is coming off and the resistance being thrown in. Otherwise the car cannot be stopped and great damage may ensue, while, on the other hand, there is less likelihood of injury arising from an inability to start the car.

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

1. The combination, with a rectangular resistance-box, of a contact-arm moving about a center, the width of the box being such relatively to the contact-arm that the contact-piece is at all times in connection with the series of plates.

2. The combination, with an electrically-propelled vehicle, of a controlling-resistance therefor carried upon the vehicle, consisting of a series of plates connected to one another, the containing box or holder for the plates being set horizontally, and a pivoted contact-arm moving in a horizontal plane and passing over the plates to bring more or less of them into circuit.

3. The combination, with an electrically-propelled vehicle and a resistance-box composed of a series of plates in contact with one another, of a pivoted arm adapted to pass over the plates and bring more or less of them into circuit, and an actuating device for the said contact-arm moving in a straight line and operated from an accessible part of the vehicle.

4. The combination, with an electrically-propelled vehicle, and a resistance-box thereon placed horizontally and composed of a number of iron or steel plates in connection with one another, of a contact-arm movable in a horizontal plane, and a direct-moving actuating device connected with the said arm.

5. The combination, with an electrically-propelled vehicle, of a regulating-resistance therefor, consisting of a series of plates in contact with one another and placed horizontally with a pivoted contact-arm, and an actuating device for the said arm movable in a direct line.

6. The combination, with an electrically-propelled vehicle, of a horizontal resistance-box controlling the same, a pivoted contact-arm for said box, and connections therefrom leading to the platform of the vehicle and movable in a straight line.

7. The combination, with an electrically-propelled vehicle, of a horizontal resistance-box controlling the same, a pivoted contact-arm therefor, and a longitudinally-moving contact device connected to the said contact-arm and extending to an accessible point of the vehicle, with a lever or similar operating device therefor.

8. In an electrical resistance, the combination, with an electrically-propelled vehicle and a series of plates in connection with one another, of a contact-arm adapted to pass over the said plates, and an actuating device for the said contact-arm extending to an accessible part of the vehicle and attached to the contact-arm, but insulated therefrom.

9. The combination, in an electrical resistance, of a series of plates in connection with one another, a pivoted contact-arm adapted to bring more or less of the plates into circuit, and a longitudinally-moving device for actuating the said contact-arm, connected therewith and insulated therefrom.

10. The combination, with an electrically-propelled vehicle, of a controlling-resistance therefor, consisting of a series of plates connected to one another, a pivoted contact-arm therefor, and an actuating device for the said arm, connected therewith, but insulated therefrom and extending to the platform or a similar accessible part of the vehicle.

11. The combination, with an electrically-propelled vehicle, of a controlling-resistance therefor, composed of a series of plates, a pivoted contact-arm therefor moving in a horizontal plane, and a longitudinal actuating device for the said arm, insulated therefrom and leading to the platform or other accessible part of the vehicle.

12. The combination, with an electrically-propelled vehicle, of a resistance therefor consisting of a series of plates suspended beneath the body of the vehicle, a pivoted contact-arm, a longitudinal actuating device attached to the said arm, and a handle for operating the same extending vertically to an accessible part of the body of the vehicle.

13. The combination, with an electrically-propelled vehicle, of a resistance composed of a series of plates placed horizontally beneath the body of the vehicle, a longitudinally-moving rod or similar actuating device for the resistance, and an upright handle or similar actuating device extending above the floor of the vehicle for operating the resistance.

14. The combination, in an electrically-propelled vehicle, of a plate-resistance therefor beneath the body of the vehicle, a pivoted contact-arm therefor, an upright handle on the platform of the vehicle, and a jointed or flexible connection between the said handle and contact-arm.

15. The combination, in an electrically-pro-

pelled vehicle, of a plate-resistance therefor beneath the body of the vehicle, a horizontal actuating device therefor, and an upright handle connected therewith for moving the same.

16. The combination, in an electrically-propelled vehicle, of a resistance therefor consisting of a series of plates beneath the body of the vehicle, a contact device therefor, an actuating-handle on the platform of the vehicle, and an intermediate connection insulated from the said contact device.

17. The combination, in an electrically-propelled vehicle, of a plate-resistance therefor, a contact-arm for the said resistance, the said arm forming a movable electric connection for bringing more or less of the plates into circuit, an actuating device on the platform or other accessible part of the vehicle, and an intermediate insulated connection, whereby the said actuating device forms no part of the electric circuit.

18. The combination, with an electrically-propelled vehicle, of a resistance consisting of a horizontal series of upright plates beneath the vehicle, an operating device therefor consisting of a contact-arm or traveler between the plates and the floor of the vehicle movable over the series of plates, and a manual connection extending therefrom to the platform or operating point of the vehicle.

19. The combination, with an electrical resistance composed of a series of metallic plates in contact with one another, of an arm or traveler movable along the series of plates and provided with an offsetting sliding spring contact-piece bearing on the edges of the plates, an electrically-propelled vehicle, and an actuating device for the contact-arm extending to an accessible part of the vehicle.

20. The combination, with an electrically-propelled vehicle and a controlling plate-resistance therefor, of a contact-piece passing over the edges of the plates, and an operating-lever therefor on the platform or controlling-point of the vehicle.

21. The combination, with an electrically-propelled vehicle, of a resistance for the motor, consisting of a series of plates in contact with one another, the said resistance being located beneath the vehicle at an intermediate point between its ends, and a controlling-connection therefor extending longitudinally to the platform or controlling-point of the vehicle.

22. The combination, with an electrically-propelled vehicle, of a plate-resistance for the motor, having a movable contact-piece, and a mechanical connection from said piece extending longitudinally to the platform or controlling-point of the vehicle.

23. The combination, with an electrically-propelled vehicle, of a controlling-resistance for the motor, consisting of a series of plates having exposed edges and located beneath the vehicle, and a contact-piece, also beneath the vehicle, provided with an operating-connection extending upward to the platform or controlling-point of the vehicle.

24. The combination, with a series of resistance-plates beneath an electrically-propelled vehicle, of a centered contact-arm sweeping over the edges of the plates, a longitudinal operating-connection extending to the platform or controlling-point of the vehicle, and means for converting the longitudinal movement of said connection into the rotary movement of the contact-arm.

25. The combination, with the motor of an electrically-propelled vehicle, of a controlling-resistance consisting of a series of plates in connection with one another and placed beneath the vehicle, a centered contact-piece movable over the edges of the plates, and an operating-connection for said contact-piece, extending up to the platform or controlling-point of the vehicle.

26. The combination, with an electrically-propelled vehicle and a controlling-resistance therefor, of a contact-piece moving over the contact-surface of the resistance, and a metallic operating device extending to the platform or controlling-point of the vehicle, but insulated from the said contact-piece.

27. The combination of an electrically-propelled vehicle and a controlling-resistance therefor, consisting of a series of resistance-plates with a sliding spring contact-piece so arranged as to trail over the said plates when resistance is being cut into circuit, whereby danger of losing control of the car by the catching of the contacts is avoided.

28. The combination of an electrically-propelled vehicle and a controlling-resistance beneath the car, consisting of a series of plates with a contact-arm and a sliding spring contact-piece offset from said arm toward the terminal of the resistance, and an actuating device for said arm extending to the platform or accessible part of the car, whereby the said contact-piece trails over the edges of the plates when resistance is being cut into the motor-circuit to stop the car, as described.

29. The combination, with an electrically-propelled vehicle, of a controlling-resistance at an intermediate point between the ends of the vehicle, a horizontal pivoted contact-arm, and a laterally-movable operating-connection attached to said contact-arm at a point to one side of its pivot and extending to the end of the vehicle.

EDWARD M. BENTLEY.

Witnesses:
ALEXANDER MOFFAT,
G. RENAULT.