(No Model.) 2 Sheets—Sheet 1.

R. THURY.

REGULATING DEVICE FOR CONTROLLING WORKING OF ELECTROMOTORS.

No. 556,945. Patented Mar. 24, 1896.

Fig. 1

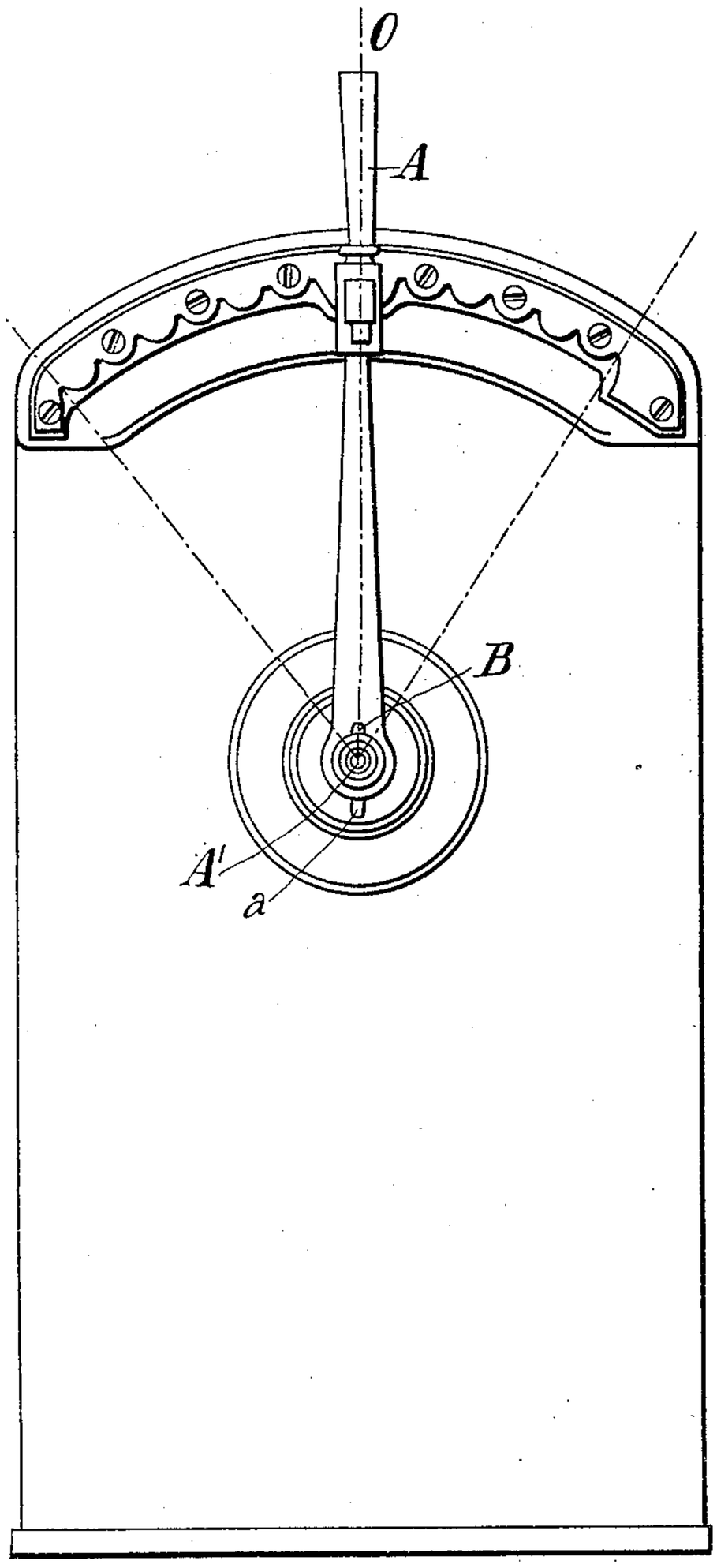
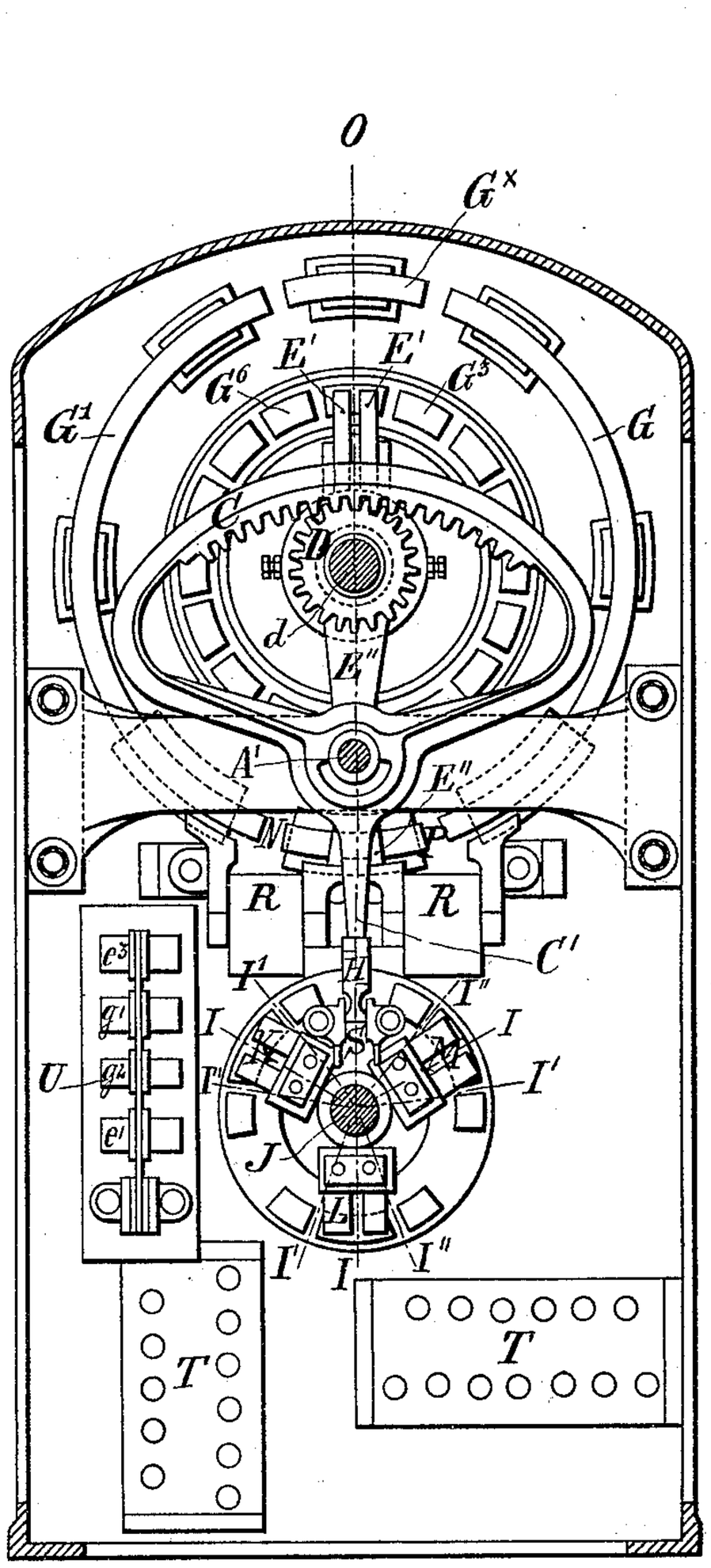


Fig. 2



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3

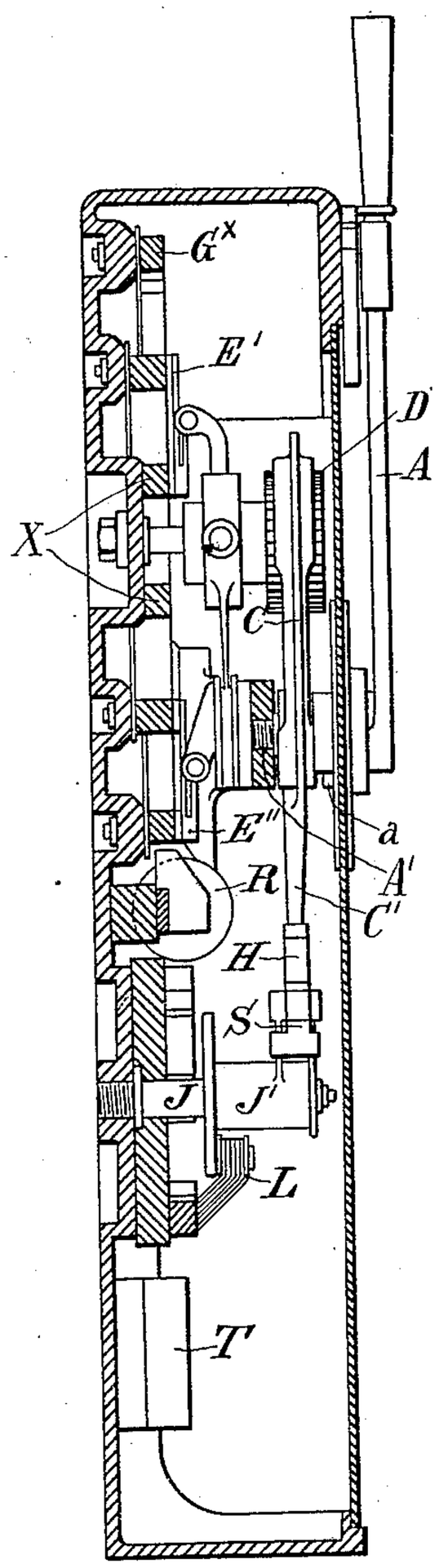
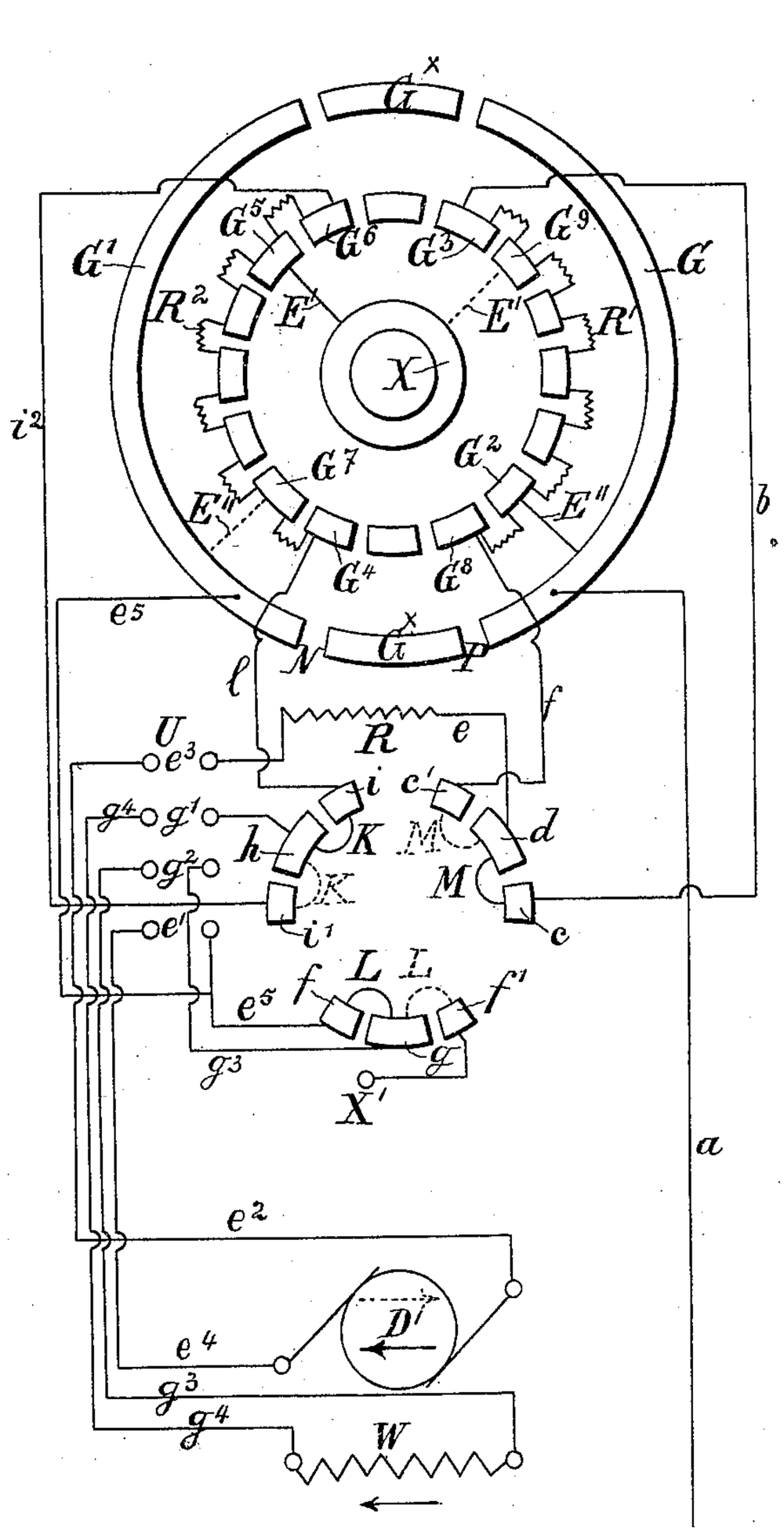


Fig. 4



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UNITED STATES PATENT OFFICE.

RENÉ THURY, OF GENEVA, SWITZERLAND, ASSIGNOR TO THE COMPAGNIE DE L'INDUSTRIE ELECTRIQUE, OF SAME PLACE.

REGULATING DEVICE FOR CONTROLLING WORKING OF ELECTROMOTORS.

SPECIFICATION forming part of Letters Patent No. 556,945, dated March 24, 1896.

Application filed February 3, 1896. Serial No. 577,865. (No model.) Patented in Switzerland September 7, 1895, No. 10,513.

To all whom it may concern:

Be it known that I, RENÉ THURY, electrician, of Geneva, Switzerland, have invented certain new and useful Improvements in and Relating to Regulating Devices for Controlling the Working of Electromotors, (for which Letters Patent have been granted to me in Switzerland, dated September 7, 1895, No. 10,513,) of which the following is a specification.

The invention consists of a regulating device for controlling the working of electromotors, and especially of such motors applied to locomotion.

The device is intended to cause the following effects to be obtained by means of manipulating one and the same hand-lever: first, to control the speed of an electromotor by means of putting into or out of its circuit a variable number of resistances; second, to interrupt the main feeding the motor by means of gradually increasing the resistances of the circuit, so as to have the interruption always taking place after the maximum of resistances have been put into circuit—that is to say, when the current is minimal—and further to reduce to a minimum the interruption-sparkle by means of the action of an electromagnet upon said sparkle; third, to reverse the direction of the current either in the inductor or in the induced coil of the electromotor, in view of transforming the latter into a dynamo-machine, in view of absorbing an electromotive force which may be controlled by means of the same resistances which in the first case were intended to control the speed of the motor, the said dynamo-machine working in this case like a brake.

In the accompanying drawings, Figure 1 is an external front elevation of the apparatus. Fig. 2 is a similar elevation after the withdrawal of the hand-lever A and of the cover of the casing. Fig. 3 is a vertical cross-section of the apparatus. Fig. 4 is a diagram of the electric connections of the same.

In all the figures the same letters of reference refer to the same parts.

A is the hand-lever, which is intended to act upon the whole device. The said lever is pivoted to a fixed axis A′ and connected to an interior segmental rack C in such a way that it may easily be withdrawn from the same. A nose B of said rack C engages a suitable recess of the lever A, so as to cause the said rack C to be rocked by said lever A from its central rest position (shown in Fig. 1) into either of its active positions. (Shown by dash and dot in same figure.)

The hole of the casing-cover intended to receive the sleeve of the lever A will suitably be formed like a keyhole and the said sleeve of the lever A be provided with a suitable projection *a*, so as to have the lever A only liable to engage said keyhole when it is held in its central rest position, which corresponds to the inoperative position of the switches.

The rack C is pivoted to the axis A′ of the lever A and is provided with a teeth-range engaging a pinion D, the axis *d* of which bears two switch-arms E′ and E″. The end of the switch-arm E′ is intended to connect either of the concentric contact-pieces G^2 G^3 G^4, &c., with the contact-ring X, and the end of the switch-arm E″ is intended to connect the segmental contact-piece G or G′ with either of said concentric contact-pieces G^2 G^3 G^4, &c., in view of the putting into the circuit one or more of the resistances R′ or R^2, which are connected to the said contact-pieces G^2 G^3 G^4, &c.

$G^\times$ $G^\times$ are two dead contacts intended to receive the ends of the arms E′ and E″ when the lever A is in its central rest position, the switch being then inoperative.

The segmental rack C is provided with an arm C′, the end piece H of which is suitably formed to engage the forked arm S of a switch J′ pivoted to an axis J. The switch J′ has three arms K, L and M, which, according to the action of the said arm C′ of the rack C, are successively rocked from the position marked I in Fig. 2 either into the position I′ or into the position I″, the switch-arm K connecting thereby the contact-piece *h* either with the contact-piece *i* or with *i*′, the switch-arm L connecting the contact-piece G either with the contact-piece *f* or with *f*′ and the switch-arm M connecting the contact-piece *d* either with the contact-piece *c* or with *c*′. There are further provided two electromagnets R R at proximity of the points N and P, where the interruption of the current by

the switch-arm E″ takes place and where a sparkle may be produced by such interruption.

T T are the series of terminals intended to connect the different parts of the apparatus, as it will be hereinafter described with reference to Fig. 4, and U is an interrupter intended to connect the apparatus either with the one electromotor shown at D′ W in Fig. 4 or with another electromotor (not shown) or with both at a time, as it will be generally advisable to be done in railway-cars.

D′ is the induced coil of the electromotor and W is the inductor of the same.

a is a wire connecting the main of the line by means of a trolley or by any other suitable means whatever to the contact-piece G, and the central metallic ring X, as well as the terminal X′, are both connected by any suitable means whatever to the return-wire of the electric line.

Now if the lever A is rocked from its rest position shown in Figs. 1 and 2 to the left, so as to place the switch-arms E′ and E², by means of the action of the rack C upon the pinion D, into the position shown in full lines in Fig. 4, the lower switch-arms K, L and M will at same time be rocked into the position shown by full-lined arcs of circles in the said Fig. 4 and by the line I in Fig. 2, and the circuit will be formed as follows: The electric current fed through the main *a* to the contact-piece G will flow from there through the switch-arm E″ to the contact-piece G² and thence through the resistances R′ to the contact-piece G³, thence through the wire *b* to the lower contact-piece, *c*, which is connected by means of the switch-arm M to the contact-piece *d*. From there the current flows through the wire *e* to the electromagnets R and through the contact-piece e^3 of the interrupter U and the wire e^2 to the induced coil D′ of the electromotor, which will be put into rotation, for instance, in the sense shown by a full-lined arrow. The current leaves the said coil through the wire e^4, crosses the interrupter U at *e′*, passes the wire e^5 and reaches the lower contact-piece, *f*. From there the current is led by the switch-arm L to the contact-piece *g* and through the wire g^3 and the contact-piece g^2 of the interrupter U to the inductor W of the motor, thence through the wire g^4 and contact-piece *g′* of the interrupter U to the lower contact-piece *h* and through the switch-arm K and wire *l* to the upper contact-piece, G⁴. From there the current flows through the resistances R² to the contact-piece G⁵ and through the switch-arm E′ to the circle X connected to the return-wire of the line.

When the lever A is placed in the just-described position the dynamo is put into motion by the current fed to the same by the main *a*, the induced coil D′ of the motor being then rotated in the sense shown by a full-lined arrow in Fig. 4.

If one rocks the lever A to its central position, (shown in Fig. 2,) the main *a* will be cut off and the apparatus will be out of action; but it will be seen that this can only be done after the maximum of the resistances of the apparatus have been put into circuit by the switch-arms E′ and E″. Now, if one supposes the car provided with such apparatus rolling under the action of gravity upon its track and the coil D′ of the dynamo mechanically rotated thereby, it appears that this rotation will produce in the said coil D′ an electric current of inverse sense to that which was produced by the action of the current fed from the main *a* in the above-described case—say in the sense shown by a dotted-lined arrow in Fig. 4. In this case the gravity will produce an electric current in the dynamo D′ W, and the same above-described device will be liable to be used as an electric brake by means of putting into the circuit one or more resistances R′ and R², as will be hereinafter described. To this effect the lever A is rocked to the right, so as to place the switch-arms E′ and E″, for instance, into the position shown by dotted lines in Fig. 4, the switch-arms K, L, and M being rocked at same time into the position indicated by the line I″ in Fig. 2 and by the dotted-lined arcs of circle K, L, and M in Fig. 4. The electric current produced by the rotation of the coil D′, as explained above, will then circulate as follows: leaving the coil D′ through the wire e^2, it passes the contact-piece e^3 of the interrupter U and reaches the electromagnet R, thence through the wire *e*, the contact-piece *d*, the switch-arm M, contact-piece *c′*, wire *f*, and contact-piece G⁸. The current traverses then the resistances R′ up to the contact-piece G⁹ and is led by the switch-arm E′ to the circle X, which is in electric connection with the terminal X′ by any suitable means whatever. (Not shown.) From the terminal X′ the current flows through the contact-piece *f′* to the switch-arm L and contact-piece *g*, then through the wire g^3 and contact-piece g^2 of the interrupter U to the coil W of the electromotor, in which it circulates in the same direction as in the first case considered above. From said coil W the current flows through the wire g^4 and contact-piece *g′* of the interrupter U, the contact-piece *h*, switch-arm K, contact-piece *i′*, and wire i^2 to the contact-piece G⁶, from which the current flows through the resistances R² to the contact-piece G⁷, then through the switch-arm E″ to the external contact-piece, G′, and through the wire e^5, contact-piece *e′* of the interrupter U and wire e^4 back to the coil D′ of the electromotor.

Having thus fully described my invention, I claim—

A device for controlling the speed of an electromotor and for putting the latter into circuit as an electric brake in electric-railway cars, characterized by the combination of only one hand-lever A with a segmental rack C acting on the one hand upon a pinion D bearing two switch-arms E′ and E″ and on the

other hand by means of its arm H upon the forked arm S of a switch J′ in combination with the external contact-pieces G and G′ and internal contact-pieces G^2 G^3 G^4 &c., which are disposed concentrically to the axis of the pinion D in view of putting into the circuit of the electromotor a variable number of resistances and with contact-pieces disposed concentrically to the axis J of the switch J′ in view of reversing the direction of the electric current in the induced coil of the electromotor.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

RENÉ THURY.

Witnesses:
G. IMER SCHNEIDER,
E. F. BARRY.