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W. R. WHITEHORNE.

CURRENT CONTROLLING SYSTEM.

APPLICATION FILED SEPT. 22, 1904.

NO MODEL.

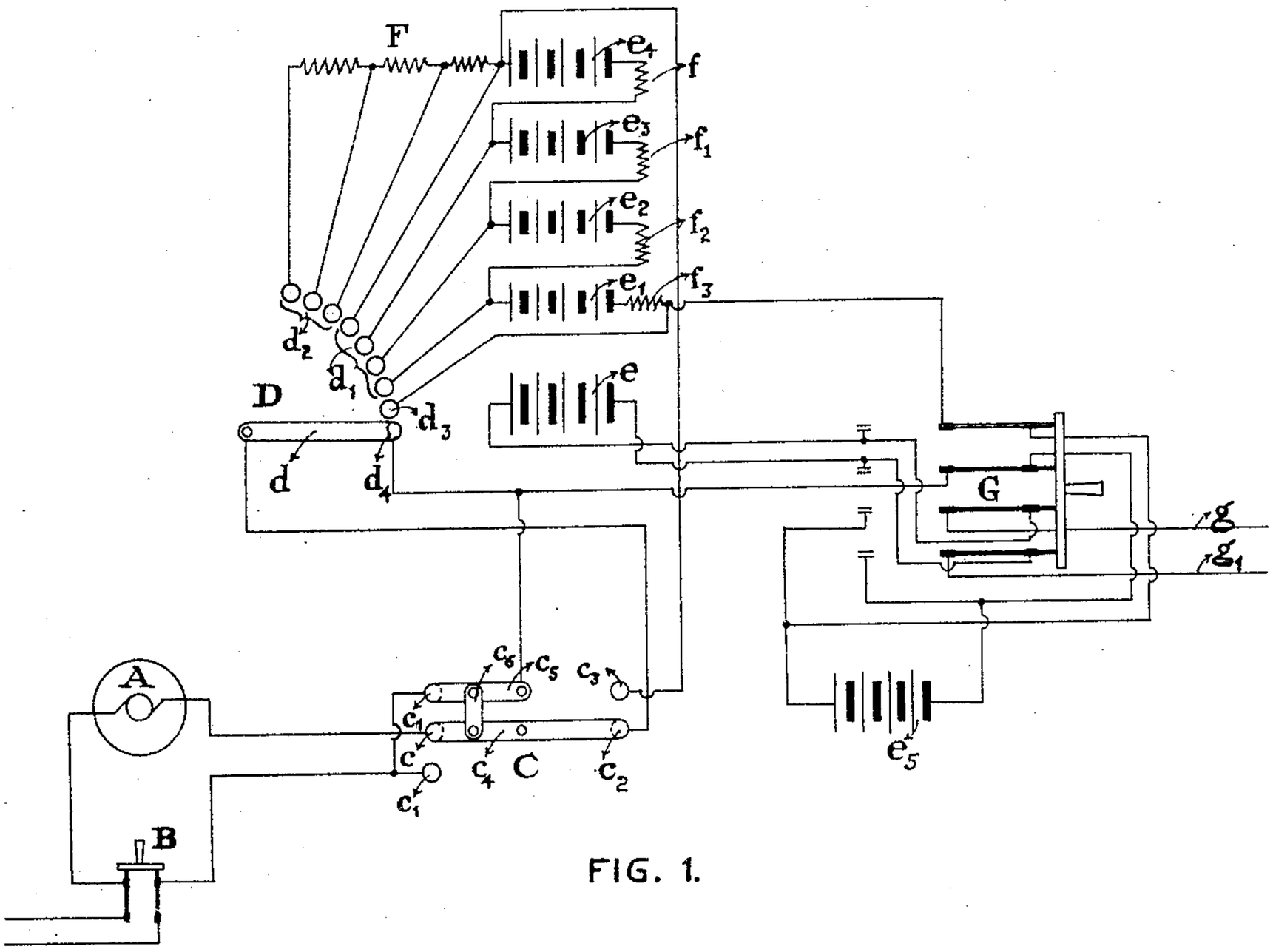

FIG. 1.

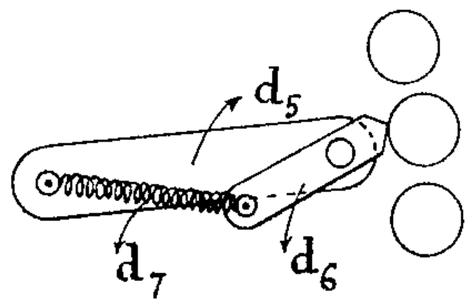

FIG. 2.

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No. 776,878. Patented December 6, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM R. WHITEHORNE, OF BETHLEHEM, PENNSYLVANIA.

CURRENT-CONTROLLING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 776,878, dated December 6, 1904.

Application filed September 22, 1904. Serial No. 225,487. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM R. WHITEHORNE, a subject of the King of Great Britain, residing in Bethlehem, Pennsylvania, have invented certain Improvements in Current-Controlling Systems, of which the following is a specification.

One object of my invention is to provide a system for controlling the speed of a motor by which any desired number of storage-battery cells may be employed to vary the motor speed in place of a rheostat, as customarily used, it being also desired to so arrange the electrical connections of the apparatus that certain of said cells may be used interchangeably with an independent group of cells, thereby always rendering available a fully-charged battery for supplying low-voltage current for any purpose—as, for example, to the key-desk of an organ.

Another object of the invention is to provide a system of the general character above noted with means for avoiding the short-circuiting of the battery-cells or groups of cells while the controlling-switch is being operated.

A further object of my system is to so arrange and connect a group of battery-cells relatively to a motor and supply-mains that a single switch may be used for causing the electromotive force of the cells to either oppose or become additive to that tending to force current through the motor, a further object contemplated being to provide a switch by which this end may be accomplished.

The above objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view illustrating the apparatus and the connections thereof comprising my improved system, and Fig. 2 is an elevation of one form of switch which may be employed to replace certain of the apparatus shown in Fig. 1.

In the above drawings, A represents a motor, having one terminal connected to a main switch B, interposed between it and current-supply mains, the second terminal of said motor being connected to a contact c of a combined switch and pole-changer C. Two other contacts c' and c^7 of said switch are both connected to the second terminal of the main switch B, while of the two contacts remaining one of them, c^2, is in connection with the pivotal point of a battery-controlling switch D, while the other, c^3, connects to the last of a series of battery-cells, hereinafter referred to.

The movable parts of the switch C consist of two pivoted bars c^4 and c^5, having a link c^6, whereby they are connected and compelled to move together, the first of said bars, c^4, being extended on both sides of its pivot, so as to engage either of the contacts c and c^2 or the contacts c' and c^3. The bar c^5 extends from its pivotal point, so as to engage either of the contacts c or c'.

The switch D consists of a pivoted arm d, having a number of contact-buttons d', d^2, d^3, and d^4, placed in the arc of a circle. Of these buttons those indicated by the letter d' are respectively connected to different points of a series of battery-cells e', e^2, e^3, and e^4, whose individual members are connected in series. The buttons indicated by the letter d^2 are attached to different points of a bank of resistance F, one end of said resistance being connected to the last of the series of battery-cells.

The button d^3 is connected to the battery-cells e', and there is extending from the same point a connection to one of the pivotal points of a four-pole double-throw switch G. Without describing in detail the connections of this switch it may be noted that it is so constructed that two of its four pivotal terminals are connected by two lines g and g' to some form of current-utilizing apparatus, such as the key-desk of an organ, while the remaining pivotal terminal of said switch is connected to a line joining the pivotal terminal of the bar c^5 of switch C and the contact-button d^4 of switch D. Four of the clip-terminals of switch G—two on each side of its pivotal terminals—are connected to a group of battery-cells e, while four other terminals, also arranged in sets of two on each side of the pivotal terminals of the same switch, are connected to a second group of cells e^5.

Bodies of resistance f, f', f^2, and f^3 are respectively connected in series with each group of the cells e^4, e^3, e^2, and e' in order to prevent excessive flow of current when each group is short-circuited by the arm d of

switch D temporarily resting upon two of the contacts d' as said arm is moved through its various positions.

Under operating conditions, with the switches C, D, and G in the positions shown and the groups of cells e', e^2, e^3, e^4, and e^5 connected to force current through the motor in the direction opposite that in which the current from the supply-mains tends to flow, it will be seen that current from the positive one of said supply-mains will pass through the motor, through bar c^4 of switch C, arm d of switch D, and bar c^5 of switch C to the negative supply-main. At the same time it will be noted that current from the battery e will flow through two of the blades of switch G, through lines g and g' to the key-desk of the organ.

If it be desired to diminish the speed of the motor for any reason, this may be done by moving the arm d of switch D into engagement with one of the contact-buttons d'. Under these conditions current after passing through the motor will flow through arm d, through one or more of the batteries e', e^2, and e^3, one of the blades of switch G, battery e^5, and the second blade of switch G, bar c^5 of switch C, and so to the negative supply-main.

Since, as above noted, the electromotive force of the batteries is opposed to that of the current-supply mains, the current flowing through the motor will be reduced. The bank of resistance F is employed to avoid a great multiplication of batteries, and if the blade d of switch D be brought into engagement with one of the contact-buttons d^2 more or less of this bank of resistance is placed in series with the batteries.

After the motor has been operated and the battery e permitted to discharge in supplying the lines g and g' with current for a predetermined time the switch G is thrown so as to bring the blades into engagement with the second set of terminals, thereby substituting the battery e^5 for the battery e on the lines g and g' and placing the battery e in connection with the switch D, so that its electromotive force opposes the applied electromotive force of the line-current. By this means said latter battery will be charged, with the result that even though the motor be worked at a relatively high speed and, as in the case of an organ, the keys be rapidly operated at short intervals, so as to cause considerable discharge of the battery e, the throwing of switch G so as to place the battery e^5 in circuit with the lines g and g' will permit said latter battery to discharge and will place the former battery in connection with the current-supply mains through the motor, so that it will be charged at the same time that it regulates the speed of said motor.

If for any reason it be desired to greatly overload the motor for a short period of time, the operation of the pole-changing switch C will bring its bar c' into engagement with contacts c^3 and c' and its bar c^5 into engagement with contact c, thereby so connecting the various cells of the battery that their electromotive force will become additive to that of the current-supply mains, the path of the current being from the positive supply-mains, through the motor to bar c^5 of switch C, through switch G, battery e^5 to switch G, batteries e', e^2, e^3, and e^4 to contact-button c^3, through bar c^4 to contact-button c', and so to the negative supply-main.

If desired, the bodies of resistance f' to f^3, inclusive, may be omitted and a switch-blade similar to that shown in Fig. 2 be employed in place of the blade d of switch D. In this case there is a main blade d^5, which is not long enough to engage the contact-buttons of the switch, but which has pivoted to its end an auxiliary contact-piece d^6, pointed at one end so as to engage but one of the cylindrical surfaces of said buttons at the same time. There is a spring d^7 connected between the other end of the auxiliary blade and the blade d^5, so that as said main blade is moved the auxiliary blade d^6 passes from one contact-button to the next in an exceedingly short time without electrically connecting them, and yet not opening the motor-circuit for a sufficiently long time to be injurious or objectionable.

I claim as my invention—

1. A system including a motor having means for connecting it to current-supply mains, a battery or group of batteries in circuit with the motor, a bank of resistance in series with the battery, a switch for causing the electromotive force of the battery to become either added to or subtracted from that of the current-mains, and means for varying the amount of resistance and the amount of battery in circuit, substantially as described.

2. A system including a motor having means for connecting it to current-supply mains, a battery or group of batteries and a switch for causing the electromotive force of the battery to become either added to or subtracted from that of the current-mains, with a second switch for controlling the number of cells in circuit, substantially as described.

3. The combination of a motor having means for connecting it to current-supply mains, two batteries, a line to be supplied with current and a switch for connecting either one of the batteries either to the motor or to the said line, substantially as described.

4. A system including a motor having means for connecting it to current-supply mains, a battery including a number of groups of cells, a line to be supplied with current, a switch for connecting certain of the battery-cells so that their electromotive force is opposed to that of the supply-mains, with a second switch for connecting either of two of the groups of cells to the line to be supplied with current, substantially as described.

5. The combination of a motor having means for connecting it to supply-mains, a battery, a bank of resistance, a switch for connecting said battery to the motor so that its electromotive force will oppose the normal flow of current through the motor, a controlling-switch including a series of contacts connected to various points of the battery and resistance, and a contact-arm for said contacts for varying the number of cells and the amount of resistance in circuit, substantially as described.

6. The combination of a motor having means for connecting it to supply-mains, a battery, a switch for connecting any desired number of battery-cells in circuit with said motor, with a second switch connected to either cause current to pass through the first switch in a direction to oppose the electromotive force of the battery or to cut out said first switch and cause the electromotive force of the battery to act with that of the supply-mains, substantially as described.

7. The combination with a motor connected to supply-mains, of two batteries, a line to be supplied with current and a switch constructed to connect one battery with the said line and the other battery to the motor so that its electromotive force will be opposed to the current flowing through said motor, substantially as described.

8. The combination with a motor connected to supply-mains, of two batteries, a line to be supplied with current and a switch constructed to connect one battery with the said line and the other battery to the motor so that its electromotive force will be opposed to the current flowing through said motor, said switch including means whereby the said batteries may be interchanged with each other, substantially as described.

9. The combination with a motor connected to supply-mains, of two batteries, a line to be supplied with current and a double-throw four-pole switch, having connections such that the batteries may be interchanged relatively to the remainder of the apparatus by operating said switch from one position to the other, substantially as described.

10. A system including a battery composed of a number of units, and a controlling-switch having a series of contacts respectively connected to said units, said switch including a movable arm of a length insufficient to permit it to engage said contacts, a bar pivotally carried on said arm, with a spring tending to hold said bar in a definite position on said arm, substantially as described.

11. A system including a battery composed of a number of units, and a controlling-switch having a series of contacts respectively connected to said units, said switch including a movable arm of a length insufficient to reach to said contacts, a bar pivoted to said arm and projecting beyond the end of the same so as to engage the said contacts, and a spring tending to retain said bar in a definite position, substantially as described.

12. A system including a battery composed of a number of units, a controlling-switch having a series of substantially cylindrical contacts respectively connected to said units, said switch including an arm mounted so as to be movable adjacent to said contacts, a bar on said arm having at one end two contact-faces at an angle to each other and placed to engage the cylindrical surfaces of said contacts, and a spring acting on the bar and tending to resist movement thereof past the respective contacts, substantially as described.

13. A system including three groups of battery-cells, a line to be supplied with current, a motor, and current-supply mains, with means for connecting either of two of the groups of cells to the line to be supplied with current and the remaining group of cells, with the third group of cells and the motor, to the supply-mains, substantially as described.

14. A system including three groups of battery-cells, a line to be supplied with current, a motor, and current-supply mains, with means for connecting either of two of the groups of cells to the line to be supplied with current and the remaining group of cells, with the third group of cells and the motor, to the supply-mains, and means for varying the number of cells of the third group in circuit, substantially as described.

15. A system including three groups of battery-cells, a line to be supplied with current, a motor, current-supply mains, means for connecting either of two of the groups of cells to the line to be supplied with current and the remaining groups of cells with the motor, to the supply-mains, the connection of said remaining groups of cells to the supply-mains including means whereby their electromotive force may be either added to or subtracted from that of said supply-mains, substantially as described.

16. A system including three groups of battery-cells, a line to be supplied with current, a motor, current-supply mains, means for connecting either of two of the groups of cells to the line to be supplied with current and the remaining groups of cells with the motor, to the supply-mains, the connection of said remaining groups of cells to the supply-mains including means whereby their electromotive force may be either added to or subtracted from that of said supply-mains, with means for varying the number of cells of the third group in circuit, substantially as described.

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

WILLIAM R. WHITEHORNE.

Witnesses:

FRANK L. TIBBETTS,

GEORGE F. EWELL.