No. 661,518. Patented Nov. 13, 1900.

E. W. HAMMER.

CONTROLLING DEVICE FOR ELECTRIC CIRCUITS.

(Application filed Aug. 31, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

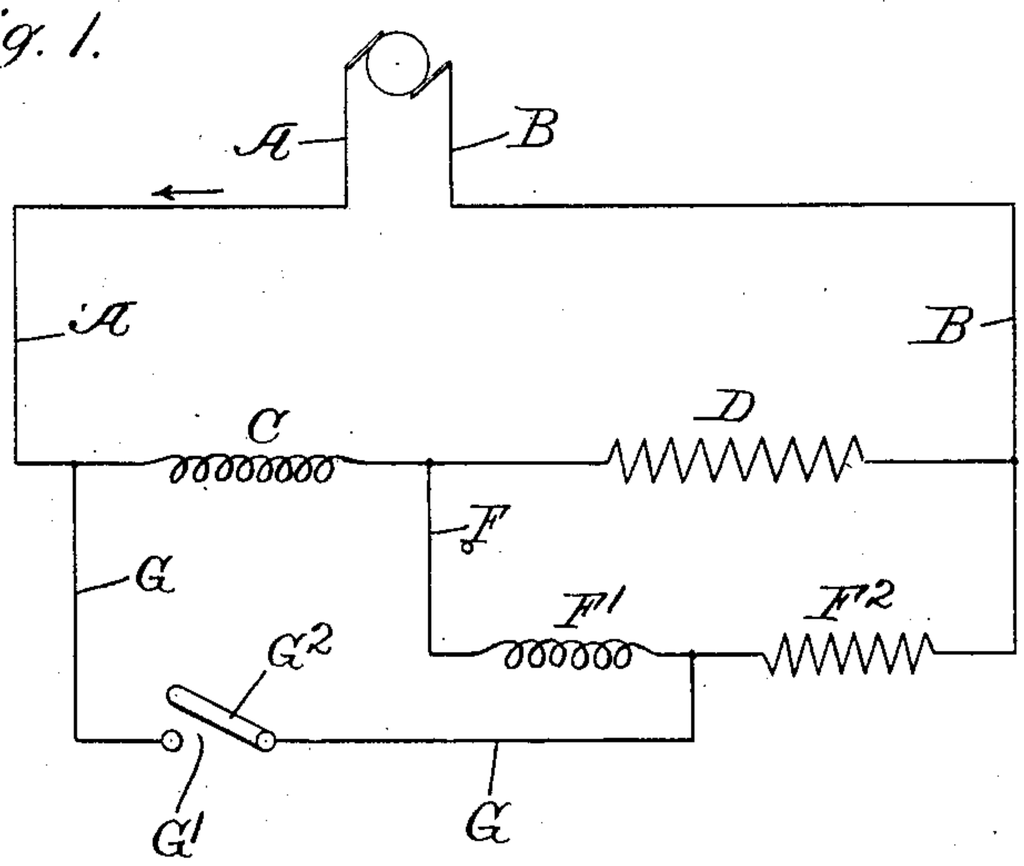

Fig. 2.

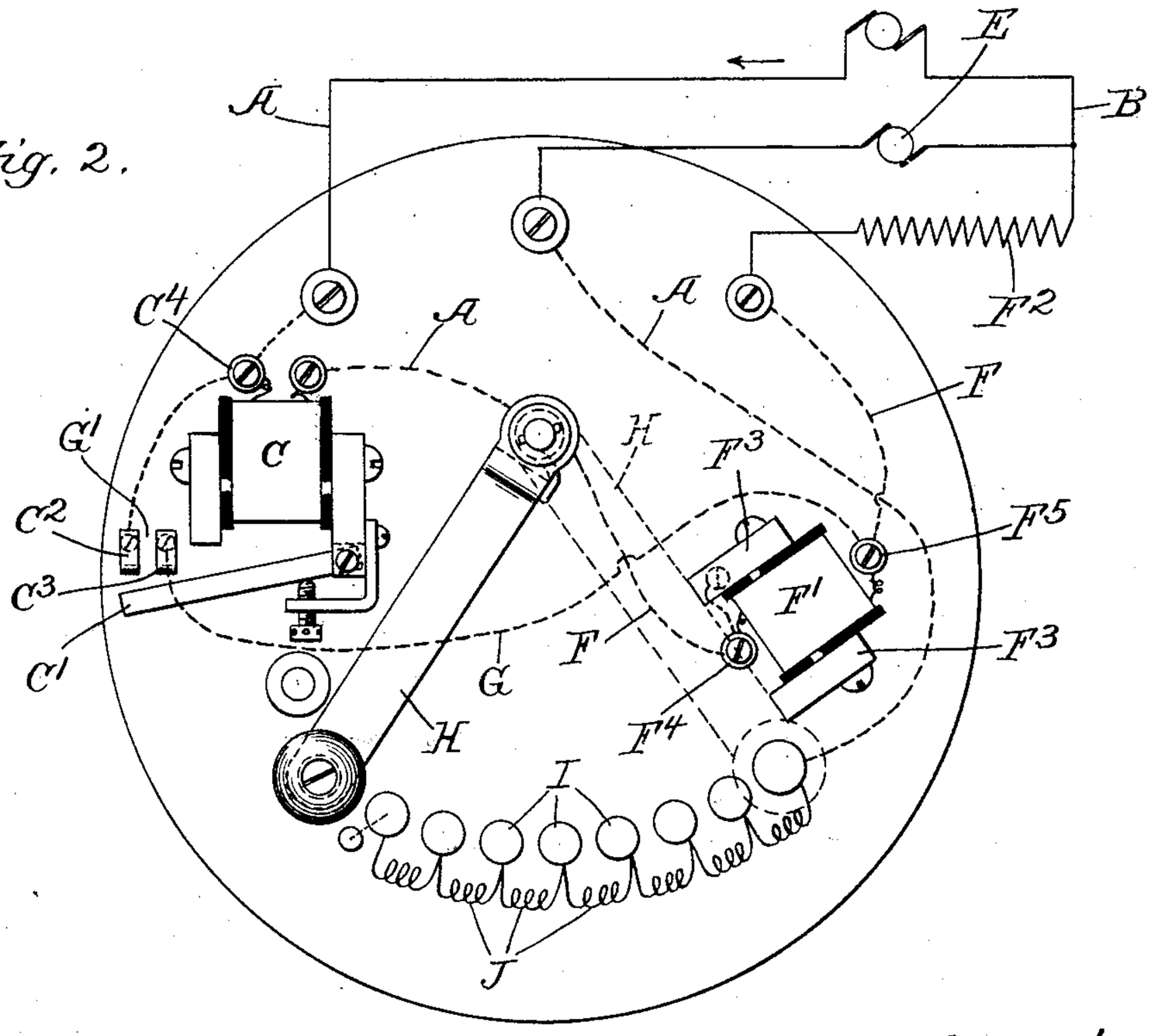

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Fig. 3.

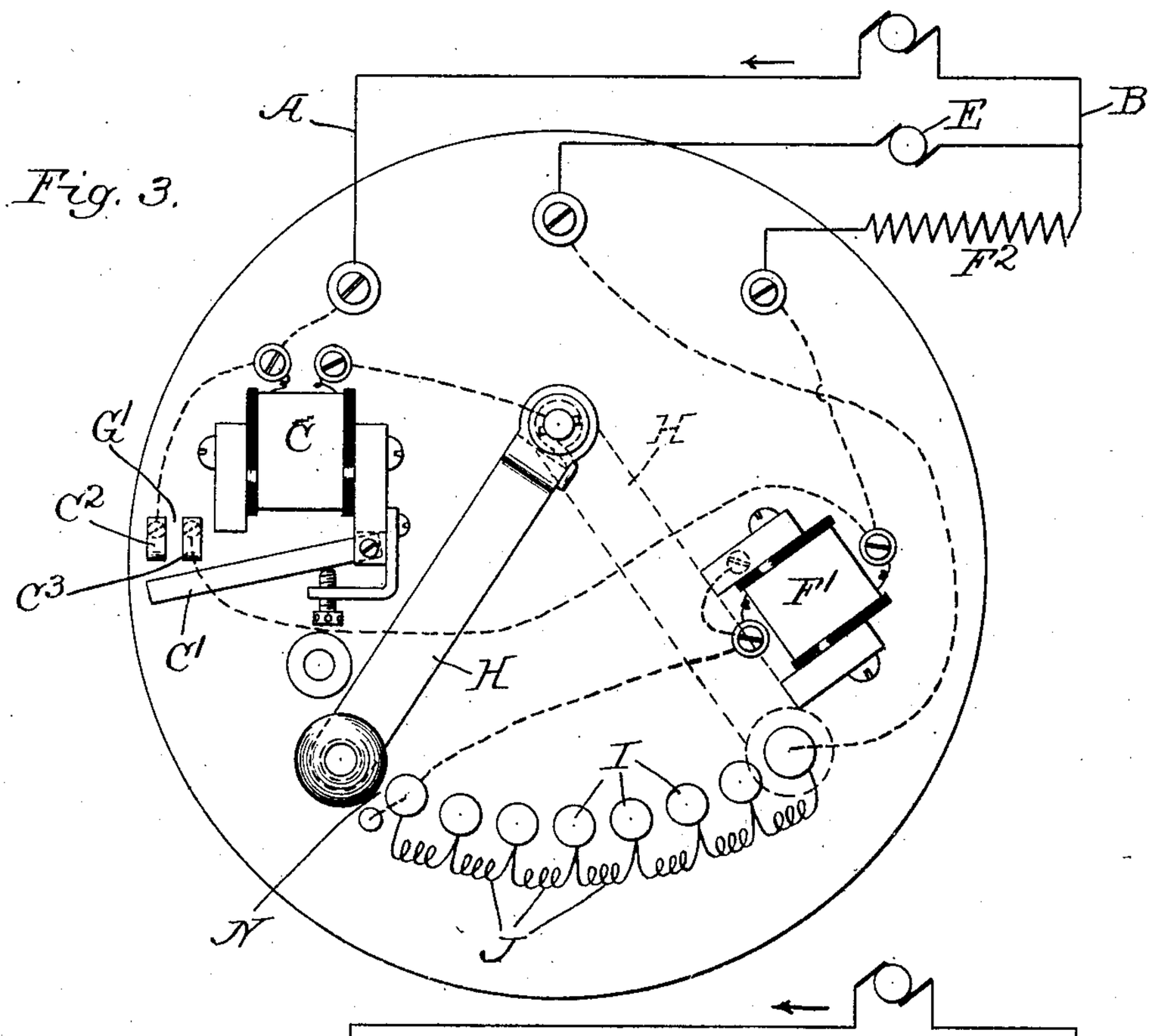
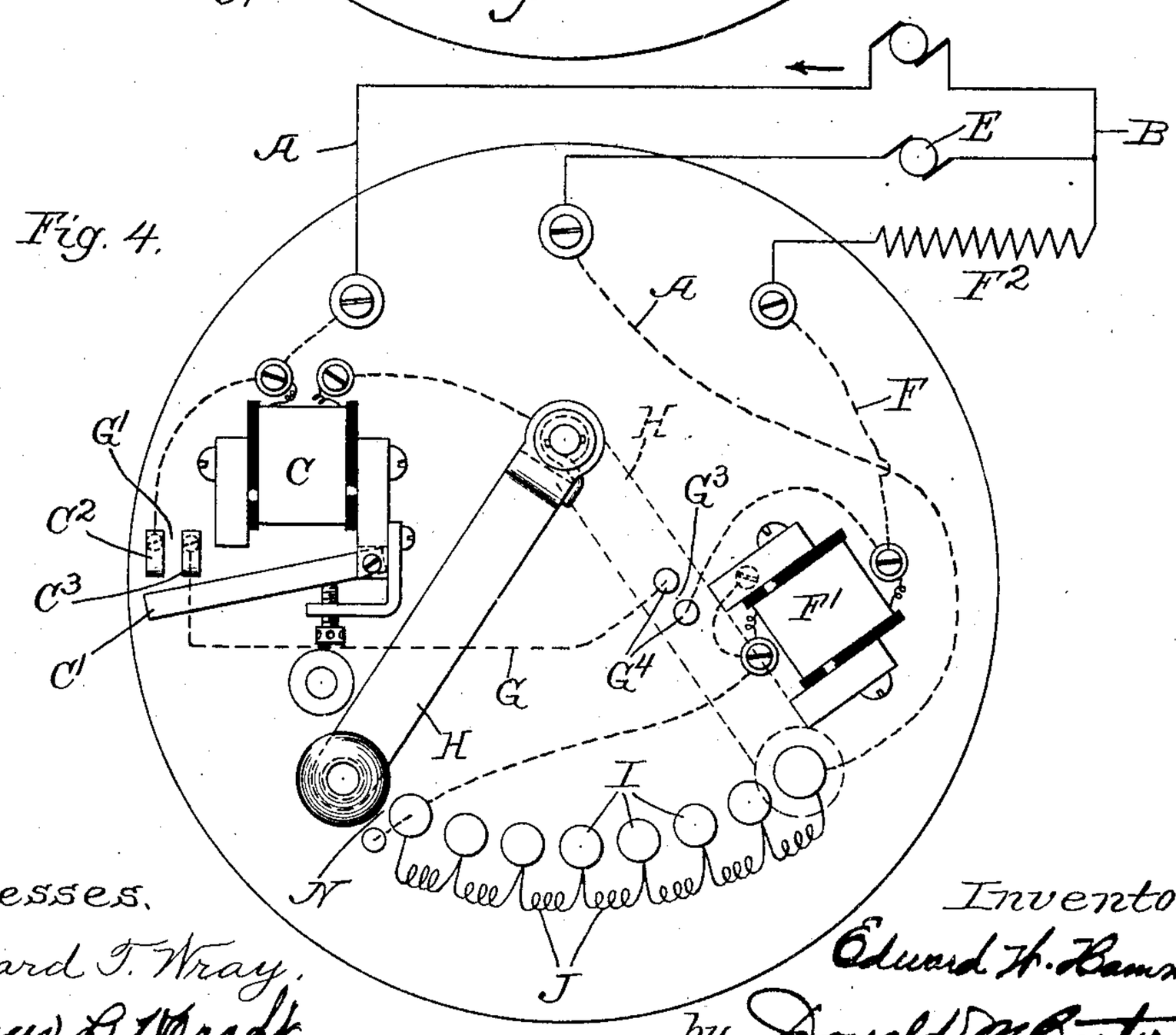


Fig. 4.



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UNITED STATES PATENT OFFICE.

EDWARD W. HAMMER, OF CHICAGO, ILLINOIS.

CONTROLLING DEVICE FOR ELECTRIC CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 661,518, dated November 13, 1900.

Application filed August 31, 1899. Serial No. 729,024. (No model.)

To all whom it may concern:

Be it known that I, EDWARD W. HAMMER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Controlling Devices for Electric Circuits, of which the following is a specification.

My invention relates to controlling devices for electric circuits, and has for its object to provide a new and improved controlling device, of which the following is a description, reference being had to the accompanying drawings, wherein—

Figure 1 is a diagrammatic view illustrating my invention. Fig. 2 is a view showing my invention as applied to a device for controlling motors. Figs. 3 and 4 are views showing modified constructions.

Like letters refer to like parts throughout the several figures.

My present invention may be applied in practice in various ways, and I have not attempted to show these applications, as they will readily occur to those versed in the art.

Referring now to Fig. 1, I have shown a simple diagrammatic view of a device illustrating the application of my invention. In this device I have shown the main conductors A and B leading to some suitable source of supply, the conductor A containing the coil C. A shunt-circuit F is shunted around the remainder of the main circuit and contains the coil F′. In order to represent in a measure the conditions in which I have shown my device applied in the remaining figures, I have illustrated the conductor A as containing the coil D and the conductor F as containing the coil F^2. It is, of course, evident that these two coils D and F^2 may be omitted and an ordinary wire used in their place without affecting the result desired. The conductor G is connected with the conductor A in advance of the coil C and connects said conductor with conductor F, between F′ and F^2. The conductor G is normally open at G′, there being a suitable circuit-closing device G^2 for completing the circuit at this point. When the parts are in the position shown in Fig. 1, the current normally travels from the source of supply along conductor A, through the coil C, to the point where the conductor F is connected. The current then divides, part going through D and conductor B back to the source of supply, the remainder going through F, F′, and F^2 and conductor B back to the source of supply. If now the circuit at G′ is completed, the path of the current will be changed, and a current in the reverse direction will flow through the coil F′. The current will now be traced from the source of supply along conductor A to the point where conductor G connects therewith. The current will be here divided, part going through C, D, and conductor B back to the source of supply, another part going through conductor G to the point where said conductor connects with conductor F, where the current again divides, a portion going through the coil F′ in a reverse direction, thence through D and conductor B back to the source of supply, the remainder going through F^2 and conductor B back to the source of supply. It will thus be seen that I obtain at will the reversal of the current through the coil F′ by utilizing the drop of potential across the terminals of the coil C. When the circuit through conductor G is closed, it will be seen that the point where said conductor connects with conductor F is of substantially the same potential as the point where it connects with conductor A, as the resistance of this conductor is practically negligible. It will thus be seen that a current in the reverse direction through the coil F′ necessarily results from the completion of the circuit through conductor G and that this reverse current is independent of the resistance afforded by either of the coils C and F′.

Referring now to Fig. 2, I have shown my invention in connection with a device for controlling motors. In this figure the armature E of the motor represents a portion of D of Fig. 1, while the field-magnets represent F^2 of said figure. The coils C and F′ of Fig. 1 are represented by two electromagnets C and F′, while the coil or resistance D of Fig. 1 is represented in part by a series of resistance-coils J, connected to the contacts I, along which moves the pivoted arm H, connected in circuit, so as to be part of conductor A. This resistance is cut in and out of the motor-circuit in starting and stopping the motor. The magnet C is provided with the pivoted armature C′, adapted to complete the circuit

through the conductor G by connecting the contacts C^2 and C^3. This armature is so adjusted as to be held away from the poles of the magnet when the current through the armature-circuit is normal, but is attracted by said magnet when said current becomes abnormal, thus closing the break in conductor G. The magnet F′ in the field-circuit of the motor becomes energized as soon as the circuit through the motor is completed and normally holds the arm H in the position where the resistance is cut out of circuit. Any suitable means for this purpose may be utilized, and I have shown said arm made of magnetic material and as making contact with the pole-pieces F^3 of said magnet. The arm H is provided with a suitable retracting device, so as to be moved to its initial position and break the circuit through the motor when the magnet F′ becomes deënergized or the current therein is reduced below a predetermined amount. The conductor F is preferably provided with the binding-posts F^4 and F^5 at the terminals of the magnet. When the motor is not operating, the arm H is in the position shown in full lines in Fig. 2, and the circuit through the motor is broken. When it is desired to start the motor, said arm is moved over to the first contact I, so as to complete the circuit through the motor-armature, and the resistance-coils J are gradually cut out as the motor gains speed, the arm H being held in the position shown in dotted lines by the magnet F′ while the motor is operating. During the normal operation of the motor, when the arm is in the dotted position, the current will be traced as follows: from the source of electric supply, through conductor A and magnet C, to the arm H. The current here divides, a portion going through conductor A and the armature E of the motor back to the source of supply and a portion going through the magnet F′, from binding-post F^4 to binding-post F^5, thence through conductor F and field-coils F^2 of the motor back to the source of supply. If now the current in the armature-circuit becomes abnormal, the armature of the magnet C is attracted and closes the circuit between the contacts C^2 and C^3. The binding-post F^5 is now at substantially the same potential as the binding-post C^4, associated with the magnet C, and hence a current will flow from said binding-post through conductor G to binding-post F^5, where it will then divide, a portion going in a reverse direction through the magnet F′ and then through conductor A and back to the source of supply. Since a current in the reverse direction flows through the magnet F′, said magnet will be instantly demagnetized and will cease to attract the arm H. The retracting device now moves the arm H back to its initial position, and the circuit through the motor-armature is broken. It will be seen that there is a complete and instantaneous reversal of current through the magnet, which overcomes any residual magnetism, and hence the action of the parts is instantaneous and assured, thus preventing any injury to the motor. In Fig. 2 I have shown a form of motor-controlling device so arranged that when connected with the main circuit the circuit through the field-coils of the motor is always completed.

In Fig. 3 I have shown a construction similar to that of Fig. 2, with the exception that both the armature and field circuit of the motor are broken at the point N when the arm H is moved to its initial position.

In Fig. 4 I have shown a device similar to that shown in Fig. 3, except that the conductor G is open at two points G′ and G^3. Said circuit is controlled at G^3 by the movable part or arm H, which engages the contacts G^4 when in the position shown in dotted lines, so as to complete said circuit. The circuit through the motor is finally broken across contacts C^2 and C^3 by the movement of the armature C′, and these parts receive the effect of the arc produced by the broken circuit. When the circuit is provided with contacts G^4, as shown in Fig. 4, it will be seen that the circuit through conductor G is broken by the movement of the arm H before the circuit through the motor is broken, and hence no spark is formed either at these contacts or at the contacts C^2 and C^3. This construction is the preferred construction when my invention is applied to motor-controlling devices.

I have described in detail a device for carrying my invention into practice; but it is of course evident that various applications and various appliances may be used with equal effect, and I therefore do not limit myself to the construction shown.

I claim—

1. An electric device, comprising two coils, one in a main circuit and the other in a shunt-circuit, and a controllable conductor connected with the main circuit in advance of the coil therein and with the shunt-circuit below the coil therein, whereby the current through said latter coil is varied by manipulating said controllable conductor.

2. An electric device, comprising a magnet in series with the main circuit, a shunt-circuit containing an electromagnet, a connection leading from the main circuit above the series magnet to the shunt-circuit below the shunt-magnet, a circuit-controlling device operated by said series magnet and adapted to control said connection, so as to cause a reverse current to flow through the shunt-magnet.

3. An electric circuit, comprising a magnet in series with the main circuit, a shunt-circuit containing an electromagnet, a connection leading from the main circuit above the series magnet to the shunt-circuit below the shunt-magnet, a circuit-controlling device operated by said series magnet and adapted to control said connection, so as to cause a reverse current to flow through the shunt-magnet, means for breaking the main circuit,

and a second circuit-controlling device in said connection adapted to be operated to break the connection before the main circuit is broken.

4. A circuit-controlling device, comprising main and shunt circuits, each containing an electromagnet, a connection leading from the main circuit above the magnet therein to the shunt-circuit below the magnet therein, a circuit-controlling device associated with the magnet in the main circuit and adapted to control said connection, a movable circuit-controlling arm provided with a retracting device and adapted to be held in a predetermined position by the magnet in the shunt-circuit.

5. A circuit-controlling device, comprising main and shunt circuits, each containing an electromagnet, a connection leading from the main circuit above the magnet therein to the shunt-circuit below the magnet therein, a circuit-controlling device associated with the magnet in the main circuit and adapted to control said connection, a movable circuit-controlling arm provided with a retracting device and adapted to be held in a predetermined position by the magnet in the shunt-circuit, the parts so arranged that, when the current in the main circuit becomes abnormal, the circuit-controlling device associated with the magnet therein is actuated to vary the connection between the main and shunt circuits so as to cause a reverse current to flow in the shunt-magnet and release the circuit-controlling arm, said circuit-controlling arm associated with the connection between the shunt and main circuits so as to break said connection when the arm is moved to its initial position.

6. The combination with a motor of an electromagnet in circuit with the armature of said motor, a second electromagnet in circuit with the field-coils of said motor, a normally open connection leading from a point in advance of the magnet in the armature-circuit to the field-circuit below the magnet therein, a circuit-controlling device associated with the magnet in the armature-circuit and adapted to be actuated to close said connection when the circuit in the motor-armature becomes abnormal, so as to cause a reverse current to flow in the magnet in the field-circuit, a controlling-arm for controlling the armature-circuit of the motor adapted to be held in a predetermined position by the magnet in the field-circuit, and a retracting device associated with said arm and adapted to move it to its initial position when the circuit-controlling device associated with the magnet of the armature-circuit is operated.

7. The combination with a motor of an electromagnet associated with the motor-circuit, a second electromagnet in a shunt-circuit with said first magnet, a normally open connection leading from a point in advance of the first magnet to a point below the second magnet, a circuit-controlling device associated with the first magnet and adapted to be actuated to close said connection when the motor-circuit becomes abnormal, so as to cause a reverse current to flow in said second magnet, a controlling-arm for controlling the circuit of the motor and adapted to be held in a given position by said second magnet, said arm provided with a retracting device adapted to move it to its initial position when said connection is closed.

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Witnesses:
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