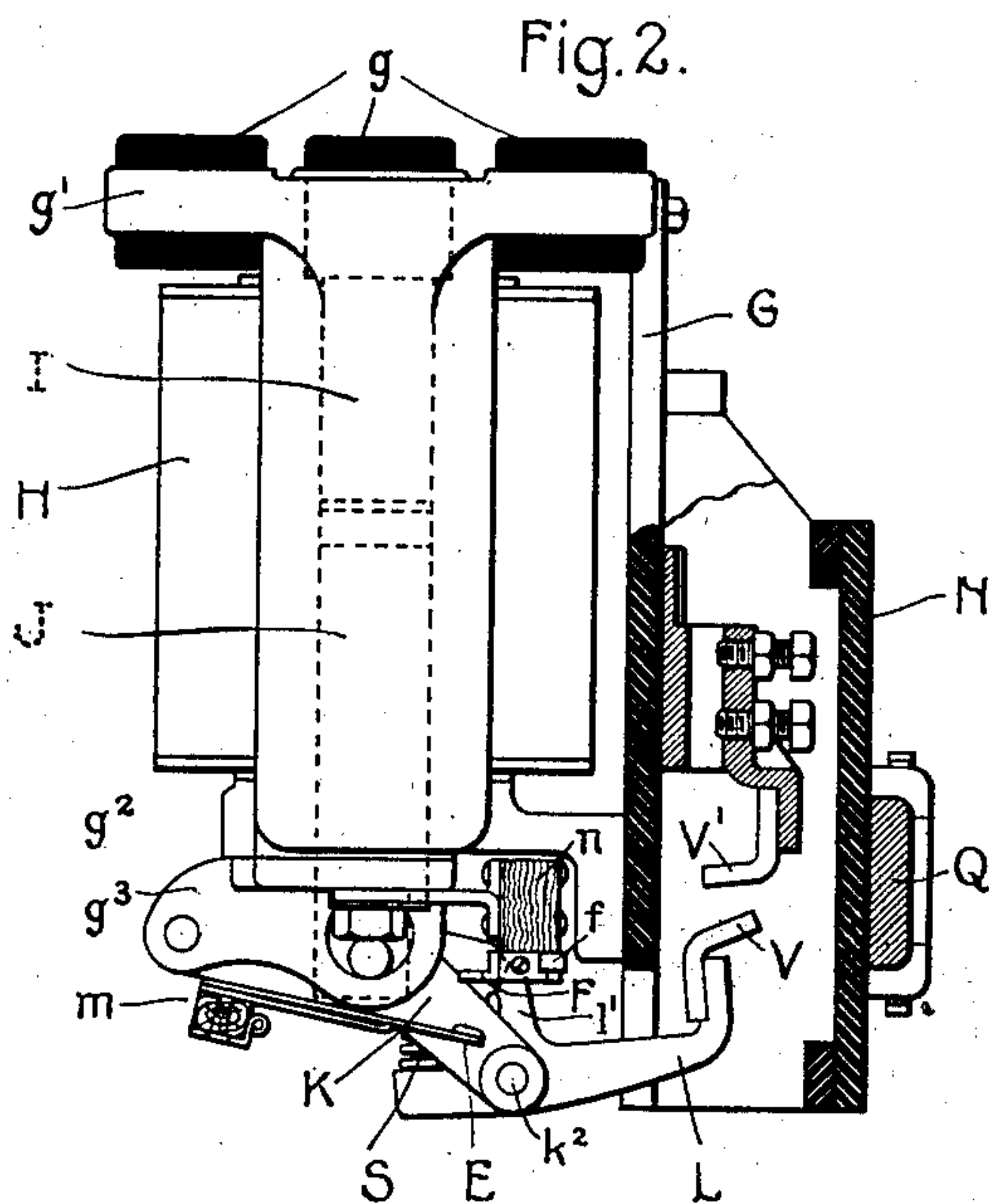
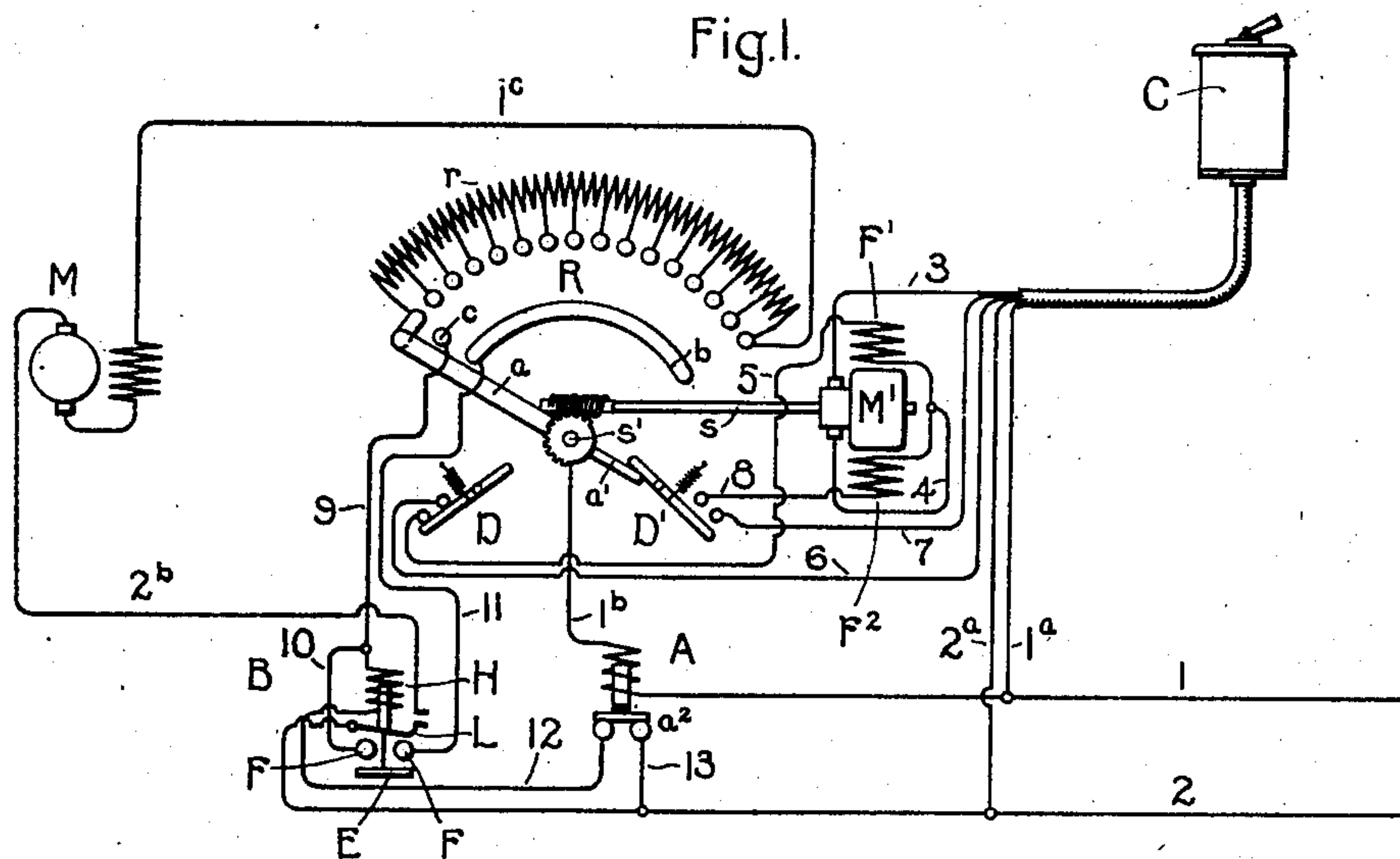


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PATENTED MAY 26, 1903.

C. E. BARRY.
MOTOR CONTROL SYSTEM.
APPLICATION FILED FEB. 12, 1902.

NO MODEL.



Witnesses.

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UNITED STATES PATENT OFFICE.

CHARLES E. BARRY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

MOTOR-CONTROL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 729,117, dated May 26, 1903.

Application filed February 12, 1902. Serial No. 93,711. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. BARRY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Motor-Control Systems, of which the following is a specification.

My invention relates to systems of motor-control in which overload and underload circuit-breaking devices are employed in combination with the motor-controller or rheostat.

The main object of my invention is to prevent the reapplication of current to the motor-circuit after the said circuit has been opened by the circuit-breaking devices until the motor or other apparatus in the circuit has been protected by sufficient resistance.

My invention consists of the combination, in a motor-circuit, of a controller, a separate switch which operates to open the circuit either on an overload or an underload, and means, such as an auxiliary switch, for preventing said circuit from being completed until the controller has been moved into its "off" or first operative position.

The invention further consists of means for automatically resetting said circuit-opening switch when the controller is turned into its first operative position.

One application of the present invention is in the control of printing-press motors; but it may be applied in a variety of ways to various devices driven by electrical power without departing from the spirit of my invention.

My invention will be better understood by reference to the following description, taken in connection with the accompanying drawings.

In the drawings, Figure 1 is a diagrammatic view of the motor-circuit, including the controller and its connections. Fig. 2 is a side view, partly in section, of one form of an electromagnetically-controlled circuit-opening switch which may be used in connection with my invention.

Referring to Fig. 1, M represents the motor of an electrically-driven device, such as a printing-press or the like. The motor M is controlled by the controller R, the arm a of which is actuated by the pilot-motor M' through the

agency of a worm and gear mounted on the shafts s and s' , respectively. The pilot-motor M' is controlled by the master switch or controller C. A represents a common type of overload-switch which operates to open the circuit at a^2 in case of a sudden rush of current or an overloading of the motor M. B represents an electromagnetically-operated circuit-opening switch which will automatically open the circuit in which the motor M is located in case of a loss of voltage on the supply-mains and also in case of an opening of the circuit at a^2 by the operation of the overload-switch A. The switch B is so constructed that so long as the solenoid H remains energized the auxiliary switch-contacts E F and switch member L remain closed, and immediately upon the failure of the voltage of the line or an overload the solenoid becomes deenergized and the switch-contacts E F and member L automatically open. When the controller-arm a is moved forward by means of the pilot-motor M', (the connections of which will be hereinafter explained,) so that the arm a contacts with the special contact c , a circuit is completed through the solenoid of the overload-switch A from the positive main 1, through the connections 1^b , arm a , contact c , connection 9, solenoid H, connection 12, switch-contacts a^2 and 13, back to negative main 2. This energizes H and closes the switch-contacts E F and operates the switch member L, completing the circuit through the motor M as follows: positive main 1, solenoid of the overload-switch A, 1^b , arm a , resistances r , 1^c , motor M, 2^b , switch member L, to negative main 2. As the arm a moves farther along to cut out more and more of the resistance r and leaves the contact c the circuit changes and may be readily traced through the following connections: positive main 1, solenoid of the overload-switch A, 1^b , arm a , to contact-strip b , from which two separate circuits lead, one through the connection 11, auxiliary switch-contacts E F, 10, solenoid H, 12, switch-contacts a^2 , 13, to negative main 2, the other through the controller and motor M, as before. Thus it will readily be seen that the solenoid H remains energized for any position of the arm a other than the off position so long as there is a supply of

current in the mains 1 and 2, and the over-load-switch A does not operate to open the circuit. The pilot-motor M' is controlled by the master-switch C and operates to move the member *a* of the controller R forward and backward between limits prescribed by the switches D and D', which switches open the circuit of the motor when the arm *a* has reached the position in which all the resistance *r* is short-circuited and when the arm *a* is in the off position, respectively. This is accomplished by the projection *a'*, carried by the shaft *s'*, to which the arm *a* is attached, striking the pivoted switches D and D', as clearly shown in Fig. 1. For the forward movement of the arm *a* the circuit through the motor M' may be traced as follows: positive main 1, 1^a, master controller-switch C, 6, limit-switch D, 5, field F', 4, armature of M', 3, master controller-switch C, 2^a, to negative main 2. For a reverse movement of the arm *a* the circuit is readily seen to be: positive main 1, 1^a, C, 7, limit-switch D', 8, field F², 4, armature of M', 3, switch C, 2^a, to negative main 2. The circuit-breaker or switch illustrated in Fig. 2 of the drawings is of well-known construction and forms no part of the present invention. Any other form of switch which would operate automatically to open the circuit on the failure of voltage in the line would answer my purpose as well.

Referring now to Fig. 2, G is a framework, supporting between its heads *g'* and *g''* a solenoid-coil H. The upper head *g'* carries a core I (shown in dotted lines) of magnetic material, extending part way into the coil H. A movable arm K, pivoted at one end to lugs *g''*, carried by the casing G, is operatively connected to a core J, (shown in dotted lines,) which, together with the coil H, constitutes the means for operating the switch-contacts V and V'. The core J is surrounded by a casing of non-magnetic material, and a disk of non-magnetic material is interposed between the ends of the cores J and I to prevent sticking. The arm K is provided with a contact-carrying member L, pivotally mounted on the end of the arm K opposite its pivotal attachment to the lugs *g''*. This member L has an extension *l'*, which serves to limit the relative movements of the arm K and the member L. At a point removed from the pivot on which the member L is mounted a spring S is interposed between the ends of the members K and L, this spring tending normally to keep the extension *l'* in engagement with the end of the arm K, but permitting the contact V, mounted on the end of the member L, to make a wiping or sliding engagement with the fixed contact V' both when the contacts are brought together and when they are being separated. The contact V' is mounted on a suitable terminal supported on an insulating-board fastened to one side of the framework G, and both of the contacts are surrounded by an insulating-chute N, closed in front by the insulated pole-piece Q of a blow-out magnet.

(Not shown.) A block of wood or other insulating material *m*, attached to the arm K, carries a pair of spring contact-arms E, electrically connected. Rigidly attached to the frame G is a pair of blocks *n* of insulating material, each of which carries a contact F, to which the wires 10 and 11, respectively, Fig. 1, may be attached, as at *f*. When the solenoid H is energized, the core J, with which the arm K is operatively connected, is raised and the switch-contacts E and V are brought into communication with the contacts F and V', respectively.

In order to insulate the base or casting on which the switch is mounted, the holes through which the supporting-bolts are passed are provided with insulating-bushings *g*.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In combination, a motor-circuit, a controller in said circuit, a separate switch which operates to open said circuit either on overload or underload, and means for automatically resetting said switch when the controller is moved into its first operative position.

2. The combination in a motor-circuit, of a controller, a separate switch for opening said circuit on an underload, a switch separate from the first-mentioned switch for causing said first-mentioned switch to open the said circuit on an overload, and an auxiliary switch for preventing said circuit from being closed after it has been opened by the operation of either of said switches until the controller has been turned to the "off" or first operative position.

3. In a motor-circuit, a controller, means for operating said controller, a switch separate from said controller for automatically opening said circuit when there is a failure of voltage or an excess of current, and an auxiliary switch operatively connected with said switch for preventing the completion of said circuit until said controller has been returned to its "off" or first operative position.

4. In a motor-circuit, a controller, means for operating said controller from a distance, means separate from said controller for opening said circuit either on overload or underload, and means for preventing the completion of said circuit after it has been opened until the said controller has been turned to its "off" or first operative position.

5. In combination, a motor-circuit, a controller in said circuit, an electromagnetically-actuated switch which operates to open said circuit on overload or underload, and means for maintaining the circuit through the actuating-coil of said switch open after the switch has operated until the controller is moved into its first operative position.

6. In combination, an electrical circuit, an electromagnetically-actuated switch operating to open said circuit on an underload, a switch operating to cause said electromagnetically-actuated switch to open said circuit on an overload, a controller, and electrical

connections including an auxiliary switch for preventing said circuit from being completed after it has been opened by the operation of either of said switches until the controller has
5 been turned into its "off" or first operative position.

7. The combination of a controller, means for operating said controller, an electromagnetically-actuated switch in series with said
10 controller, a switch adapted to cause the said electromagnetically-actuated switch to open on an overload, a separate switch adapted to open with said electromagnetically-actuated switch on an underload, said separate switch
15 being so connected as to prevent the closing of said electromagnetically-actuated switch until the controller has been turned to its "off" or first operative position.

8. The combination of a controller, means
20 for operating said controller, an electromagnetically-actuated switch in series with said controller, contacts at the first operative position of the controller arranged to close a circuit through the actuating-winding of the

said electromagnetically-actuated switch, and 25 contacts operatively related to the switch itself for maintaining said circuit closed after the controller has been moved into its succeeding operative positions.

9. The combination of a controller, means 30 for operating said controller, an electromagnetically-actuated switch in series with said controller, contacts at the first operative position of the controller arranged to close a circuit through the actuating-winding of the
35 said electromagnetically-actuated switch, contacts operatively related to the switch itself for maintaining said circuit closed after the controller has been moved into its succeeding operative positions, and an overload-
40 switch in the circuit of said actuating-winding.

In witness whereof I have hereunto set my hand this 10th day of February, 1902.

CHARLES E. BARRY.

Witnesses:

BENJAMIN B. HULL,
MARGARET E. WOOLLEY.