

No. 890,621.

PATENTED JUNE 16, 1908.

G. H. DORGELOH.
CIRCUIT CONTROLLING DEVICE.

APPLICATION FILED OCT. 5, 1907.

2 SHEETS—SHEET 1.

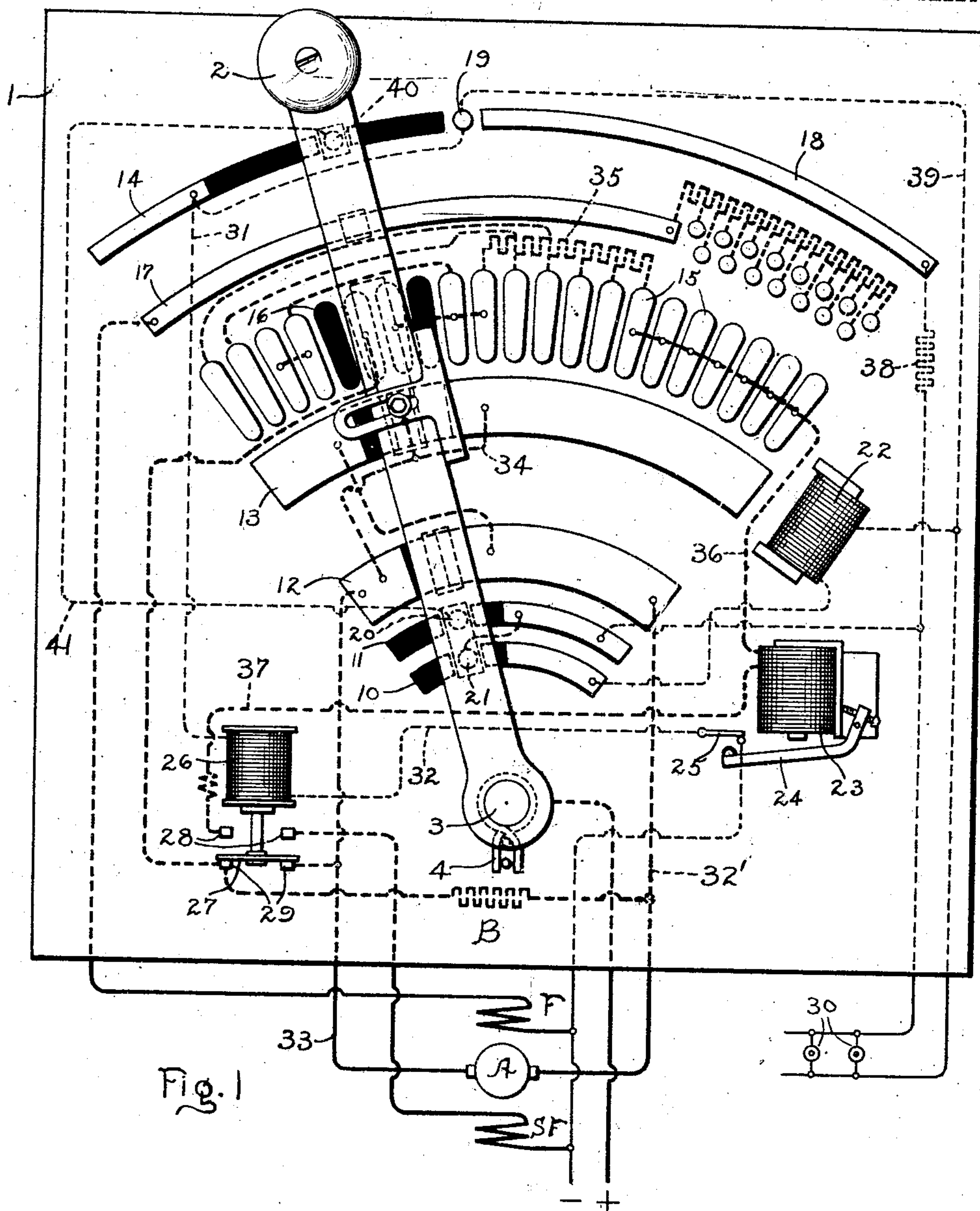


Fig. 1

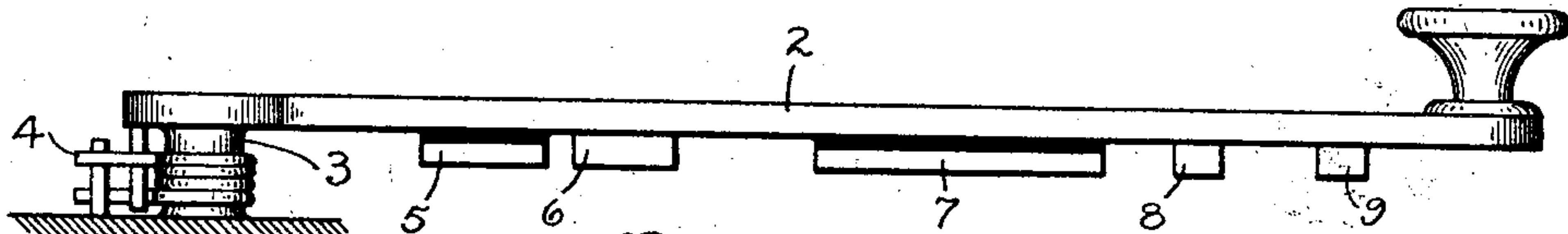


Fig. 2

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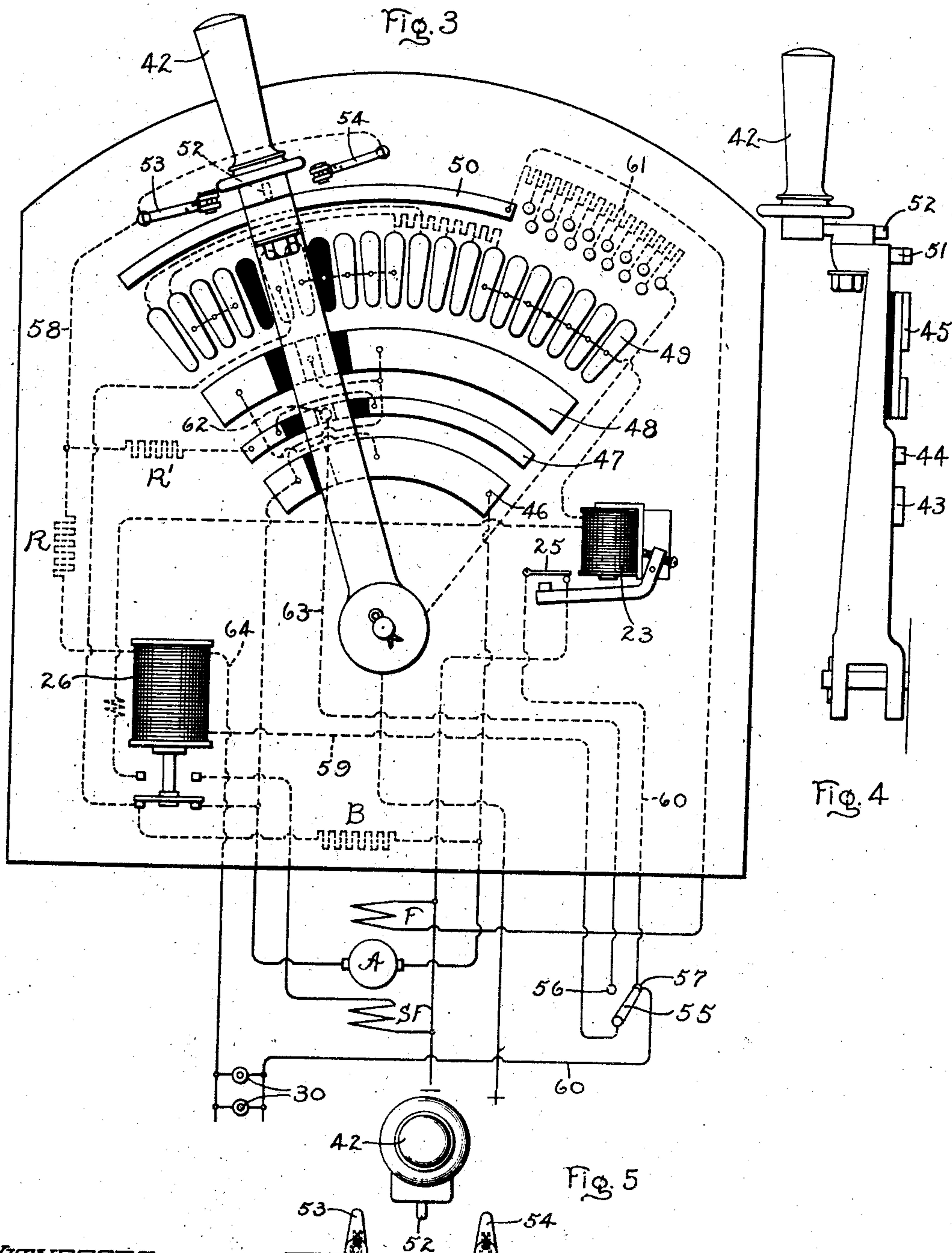
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UNITED STATES PATENT OFFICE.

GEORGE H. DORGELOH, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CIRCUIT-CONTROLLING DEVICE.

No. 890,621.

Specification of Letters Patent.

Patented June 16, 1908.

Application filed October 5, 1907. Serial No. 396,005.

To all whom it may concern:

Be it known that I, GEORGE H. DORGELOH, a subject of the Emperor of Germany, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Circuit-Controlling Devices, of which the following is a specification.

This invention relates to devices for controlling electric circuits and has for its object the provision of means whereby an electric motor may be stopped, started and generally controlled in a reliable, safe and efficient manner.

My invention relates more particularly to means for controlling motors of the type adapted to be run at a low speed in addition to the normal running speed, and which it is desired shall be started and stopped quickly when running at full speed. This type of control is commonly used in connection with printing presses in which it is desired that means be provided whereby the motor may be "jogged" along at a low speed. This "jogging" is preferably and usually accomplished by having switches arranged at definite points around the press. In the patent to Yates, No. 857,142, is disclosed a controlling device of this type in which the motor may be jogged along from points around the press with the starting arm in the off position. It has been found, however, that the operator frequently will not take the trouble of going to one of the control switches or buttons in order to "jog" the machine along but will use the controlling handle. The result is that the starting contact segments are frequently injured by arcing.

In carrying out my invention I provide in connection with a controlling device of the type above described, an electromagnetic switch which is so arranged that the motor circuit is broken upon its contacts. This switch is energized as the controlling arm is moved towards running position before the starting resistance is substantially varied. The switch is in series with the starting resistance so that it closes the armature circuit and opens it instead of having the circuit opened and closed upon the contacts. The electromagnetic switch is likewise controlled by push-buttons so that the motor may be stopped and started at points around the press by operating the electromagnetic

switch. I also provide an overload magnet which controls the circuit of the electromagnetic switch in all positions of the controlling handle so that it will be impossible to injure the device by starting too quickly. Means are also provided in connection with the electromagnetic switch whereby, when the latter opens to stop the motor, a brake resistance will be connected in circuit with the armature so as to quickly stop the same.

In the accompanying drawings, in which I have shown my invention embodied in a concrete form, Figure 1 represents one embodiment of my invention, the controlling arm being spring-pressed to the off position; Fig. 2 shows the details of the controller handle; Fig. 3 shows a different form of my invention; Fig. 4 shows a controller handle for the same; and Fig. 5 shows means whereby the controller handle effects the opening and closing of the electromagnetic switch.

Referring to the drawings (Figs. 1 and 2), 1 represents the insulating base of slate or soapstone having mounted thereon a controller handle 2 pivoted at 3 and provided with a double-acting spring 4, which gives the controlling arm a bias to the position shown in Fig. 1. The controlling arm is provided with a series of contacts 5, 6, 7, 8 and 9, of which 5 and 7 are insulated from the arm and 6, 8 and 9 have electrical contact therewith. The arm coöperates with segments 10, 11, 12, 13 and 14, each of which have an insulating portion adapted to be engaged by the contacts on the arm when the latter is in the off position. Segments 10 and 11 are bridged by contact 5; segment 12 is engaged by contact 6; segment 14 is engaged by contact 9; and contact 7 engages segment 13 so as to act as a bridging contact between it and the resistance contacts 15. A plurality of insulating contacts 16 are likewise provided so as to be engaged by the arm in the off position. Contact segment 17 is likewise arranged to be engaged by contact 8 and has no insulating portion. A similar segment 18 is arranged to be engaged by contact 9 when the latter is moved towards running position while between this segment and segment 14 is arranged a contact stud 19 for purposes hereinafter set forth. Contact studs 20 and 21 are inserted in the segments 10 and 11 so as to be engaged by contact 5 when the arm is in the off position. A no-voltage magnet

22 is arranged to hold the controlling arm in running position in the usual way and an overload magnet 23 is provided, having a pivoted armature 24 which when raised opens the switch 25. This switch controls the circuit of the electromagnetic switch 26 operating a contactor 27 between the pairs of contacts 28 and 29. A plurality of switches or push-buttons 30 are arranged at some convenient place, as for instance, points around the machine which is to be controlled.

The arrangement of circuits and the mode of operation are as follows: A represents the armature of the motor to be controlled and, as shown, is of the compound-wound type having a shunt field F and a series field S F. When it is desired to start the motor in the usual way, the controlling arm is moved towards the right. As soon as the contact 9 engages the contact stud 19, the electromagnetic switch 26 will be energized as follows: from the positive main through the controlling arm to contact stud 19, thence through conductor 31 to the solenoid of switch 26, conductor 32, switch 25 and back to the negative main. The switch 26 thereupon operates and the contacts 28 are bridged so that the armature circuit will be closed as follows: from the positive main to segment 12; conductor 32; armature A; conductors 33 and 34 and segment 13, thence through contact 7; starting resistance 35; conductor 36; overload magnet 23; conductor 37; contacts 28; series field S F and back to line. As the arm is moved on towards running position, resistance is cut out in the usual way, and contact 9 moves off the stud 19 and on to the segment 18. The circuit of the electromagnetic switch is thus maintained and now has in series with it the resistance 38 and the no-voltage magnet 22, the circuit being as follows: from the positive main to segment 18; resistance 38; segments 11 and 10; magnet 22; conductor 39; conductor 31; solenoid 26; switch 25 and back to line. The magnet 22 being energized the arm will be held in running position in the usual way. Upon the occurrence of an overload, switch 25 will be opened, which in turn will deenergize switch 26, to open the armature circuit at contacts 28. This may occur while the arm is in any position. Upon failure of voltage, the arm will return to the off position and the armature circuit will be opened at switch 26.

If it is desired to stop the motor, one of the buttons 30 is pressed, which will short-circuit the no-voltage magnet 22.

If, instead of bringing the motor up to running speed, it is desired to "jog" the press along at a low speed, the arm may be left in the off position and one of the buttons 30 pressed. This will cause the solenoid of switch 26 to be energized as follows: from the positive main to contact stud 40, thence

through conductor 41; stud 21; segment 11; switch 30; conductor 39; conductor 31; solenoid 26; conductor 32; switch 25; and back to line. This will start the motor at a low speed and when the switch 30 is released, the armature circuit will be opened. It will be noticed that the overload magnet also controls the armature circuit during the jogging of the motor. In order to quickly stop the motor, brake resistance B is connected across the armature terminals from conductor 32 to conductor 33 through contacts 28 and 29, and therefore when the contactor drops to open the motor circuit, and contacts 29 are bridged, the armature is short-circuited through the brake resistance thereby quickly bringing the armature to rest. The motor may be reversed by moving the controlling arm to the left.

In Fig. 3 I have shown a form of my invention in which the controlling arm is not biased to the off position, but may be left in any position as desired. The arm 42 is provided with contacts 43 and 44 electrically connected thereto, with the bridging contact 45 insulated from the arm. Contacts 43 and 44 engage respectively segments 46 and 47 while contact 45 bridges segment 48 and starting contacts 49, the insulating portion of the segments being provided as shown. Segment 50 is engaged by contact 51 electrically connected to the end of the arm, and a projection 52 on the arm is adapted to engage switches 53 and 54 when the arm is moved in either direction. These switches are of bell-crank form as shown in Fig. 5, and are spring-pressed to the open position. The overload magnet 23 and solenoid switch 26 are provided as shown, and the switch 55 adapted to engage with either stud 56 or 57 is conveniently arranged as are also the buttons 30.

The arrangement of the circuits and the mode of operation are as follows: When it is desired to bring the motor up to normal running speed, the switch 55 engages contact 57, and arm 42 is moved to the right, closing the switch 54, when the solenoid switch 26 will be energized, as follows: from the positive main to switch 54; conductor 58; resistance R; solenoid 26; conductor 59; switch 55; conductor 60; switch 25 and back to the negative main. The armature circuit will thus be closed at the switch 26. As soon as the arm releases the switch 54, the latter will again open so that the circuit of switch 26 will be maintained with the additional resistance R' in series; the circuit now being as follows: from the positive main to segment 47, thence to resistance R'; resistance R; solenoid 26; switch 55; switch 25 and back to line. The additional resistance R' cuts the current of the solenoid down to a point where it will hold the switch closed but will not close it. The arm may now be

moved to any position on the contacts so as to bring the motor up to the desired speed. Field resistance 61 is provided to vary the speed, if desired. By pressing one of the push buttons 30 the solenoid 26 will be short-circuited as follows: from conductor 58 to conductor 64, push buttons 30 and conductor 60 to switch 55. Upon the occurrence of an overload the circuit will be opened as before on the switch 26. In order to again close the armature circuit, the arm must be brought back past the switch 54 so that the arm passes off the segment 47, and then by again closing the switch 54, the solenoid switch 26 will be closed with the resistance R in circuit. When it is desired to "jog" the motor along, the switch 55 is moved on to contact 56, and then by pressing one of the push-buttons 30, the circuit will be as follows: from the positive main to contact 62; conductor 63; switch 55; conductor 59; solenoid 26; conductor 64; push-button 30; conductor 60; switch 25 back to the negative main. This will close the armature circuit through the starting resistance.

It will be seen that I have provided a rheostat in which the motor may be run at a normal speed; jogged along at a slow speed at definite points around the press; and at the same time always protected against overload, while the circuit is moreover always made and broken upon the electromagnetic switch.

Various modifications of my invention will, of course, suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the annexed claims.

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

1. A starting rheostat comprising a resistance-varying switch, an electromagnetic switch in series therewith, means whereby said latter switch is closed when the resistance switch is moved towards running position, and means for controlling said electromagnetic switch when the resistance-switch is in the off position.

2. A starting rheostat comprising a resistance-varying switch, an electromagnetic switch in series therewith, means whereby said latter switch is closed by the initial movement of the resistance switch, and means independent of the position of the resistance switch for controlling the electromagnetic switch.

3. A starting rheostat comprising a resistance-varying switch, an electromagnetic switch in series therewith, an overload magnet controlling said electromagnetic switch, means whereby said latter switch is closed when the resistance switch is moved towards running position, and means independent of the current and of the position of the resist-

ance switch for controlling the electromagnetic switch.

4. A starting rheostat comprising a resistance-varying switch, an electromagnetic switch in series therewith, means whereby said latter switch is operated when the resistance switch is moved towards running position, means for controlling said electromagnetic switch when the resistance switch is in the off position, and an overload magnet controlling said electromagnetic switch in all positions of the resistance switch.

5. A starting rheostat comprising a resistance-varying switch, an electromagnetic switch in series therewith, means whereby said latter switch is operated when the resistance switch is moved towards running position, means independent of the position of said resistance switch for controlling the electromagnetic switch, and an overload magnet controlling said electromagnetic switch in all positions of the resistance switch.

6. The combination with an electric motor, of a starting rheostat therefor, an electromagnetic switch arranged to control the motor through the starting resistance with the starting arm in the off position, connections whereby said switch is actuated to close the motor circuit when the arm is moved towards running position, and an overload magnet controlling said switch in all positions of the arm.

7. The combination with an electric motor, of a starting rheostat therefor, an electromagnetic switch in series with the starting resistance and arranged to control the motor through the same with the starting arm in the off position, connections whereby said switch is actuated to close the motor circuit when the arm is moved towards running position, and an overload magnet controlling said switch in all positions of the arm.

8. The combination with an electric motor, of means for starting the same comprising a starting resistance, a controlling arm therefor, an electromagnetic switch in series therewith and arranged to close the motor circuit with the controlling arm in the off position, a brake resistance, and means whereby said resistance is connected in circuit with the motor armature when the electromagnetic switch is deenergized.

9. The combination with an electric motor, of means for starting the same comprising a starting resistance, a controlling arm therefor, an electromagnetic switch controlled by said arm and arranged to close the motor circuit through the starting resistance with the controlling arm in the off position, a brake resistance, and means whereby said resistance is connected in circuit with the motor armature when the electromagnetic switch is deenergized.

10. The combination with an electric motor, of means for starting the same compris-

ing a starting resistance, a controlling arm therefor, an electromagnetic switch controlled by said arm and arranged to close the motor circuit through the starting resistance
5 with the controlling arm in the off position, means independent of the controlling arm for controlling the electromagnetic switch, a brake resistance, and means whereby said resistance is connected in circuit with the

motor armature when the electromagnetic switch is deenergized. 10

In witness whereof, I have hereunto set my hand this 3rd day of October, 1907.

GEORGE H. DORGELOH.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.