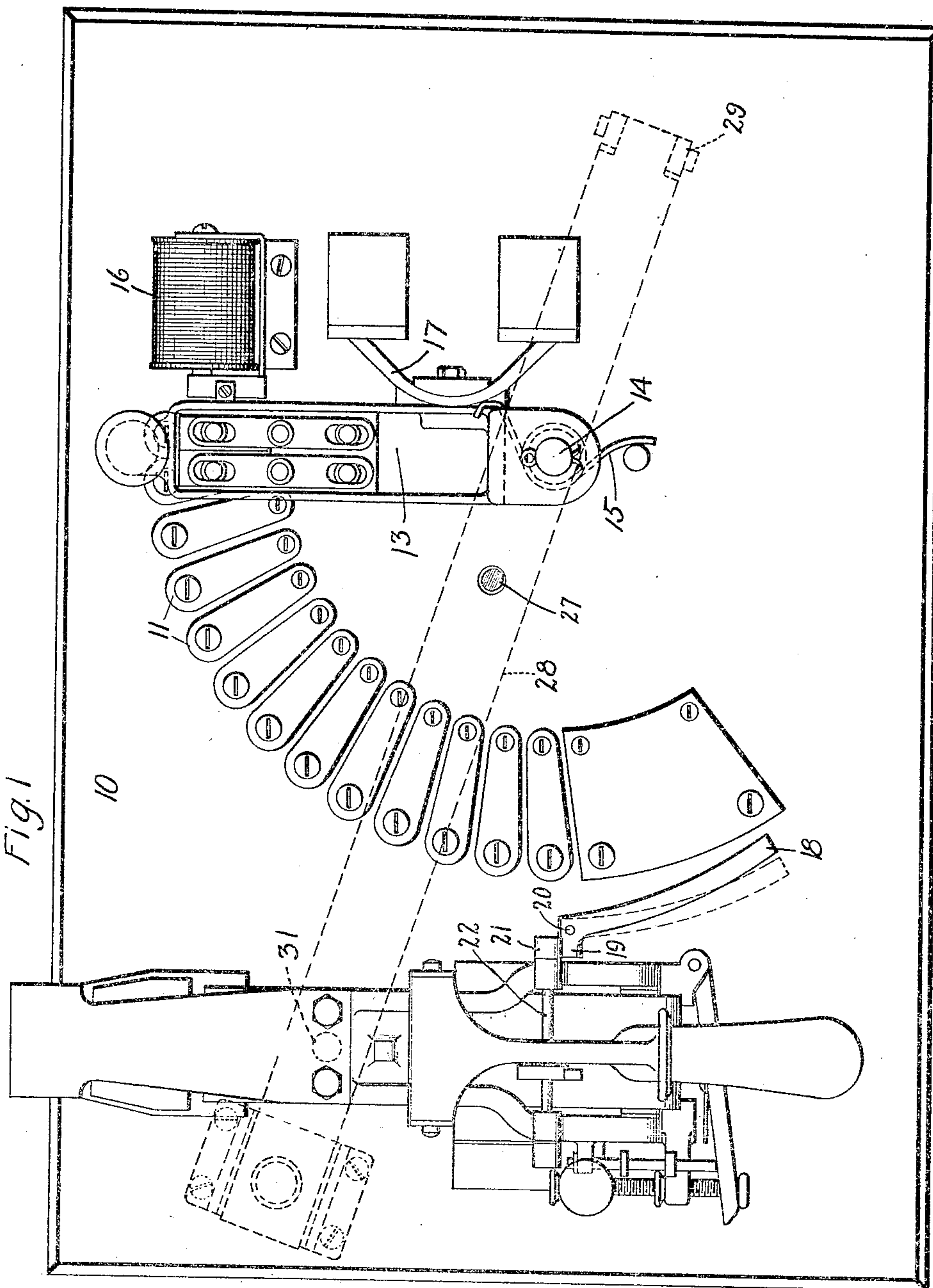


C. D. KNIGHT.
STARTING DEVICE FOR ELECTRIC MOTORS.
APPLICATION FILED JAN. 26, 1907.

913,512.

Patented Feb. 23, 1909.

2 SHEETS—SHEET 1.



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Fig. 3

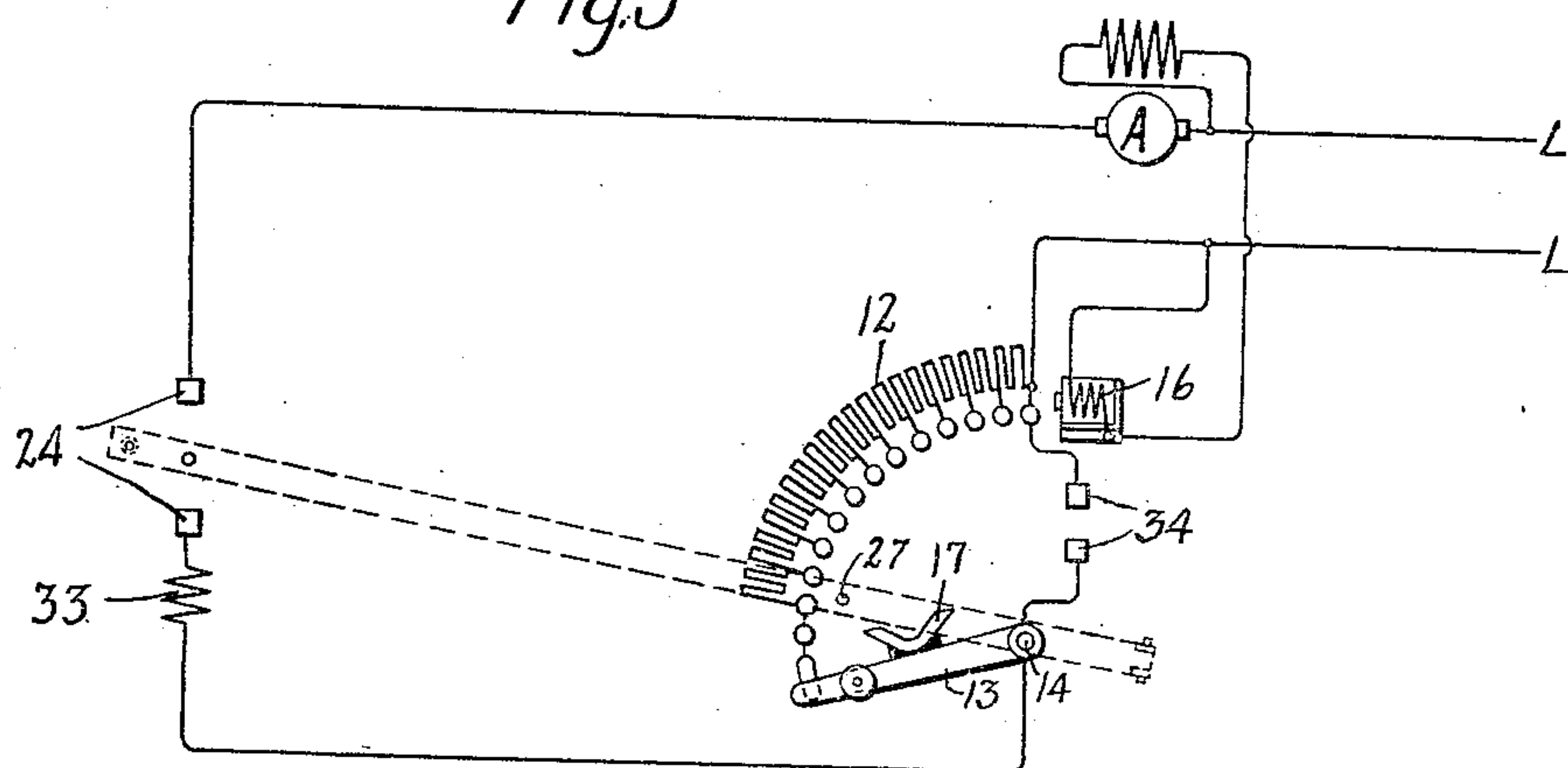
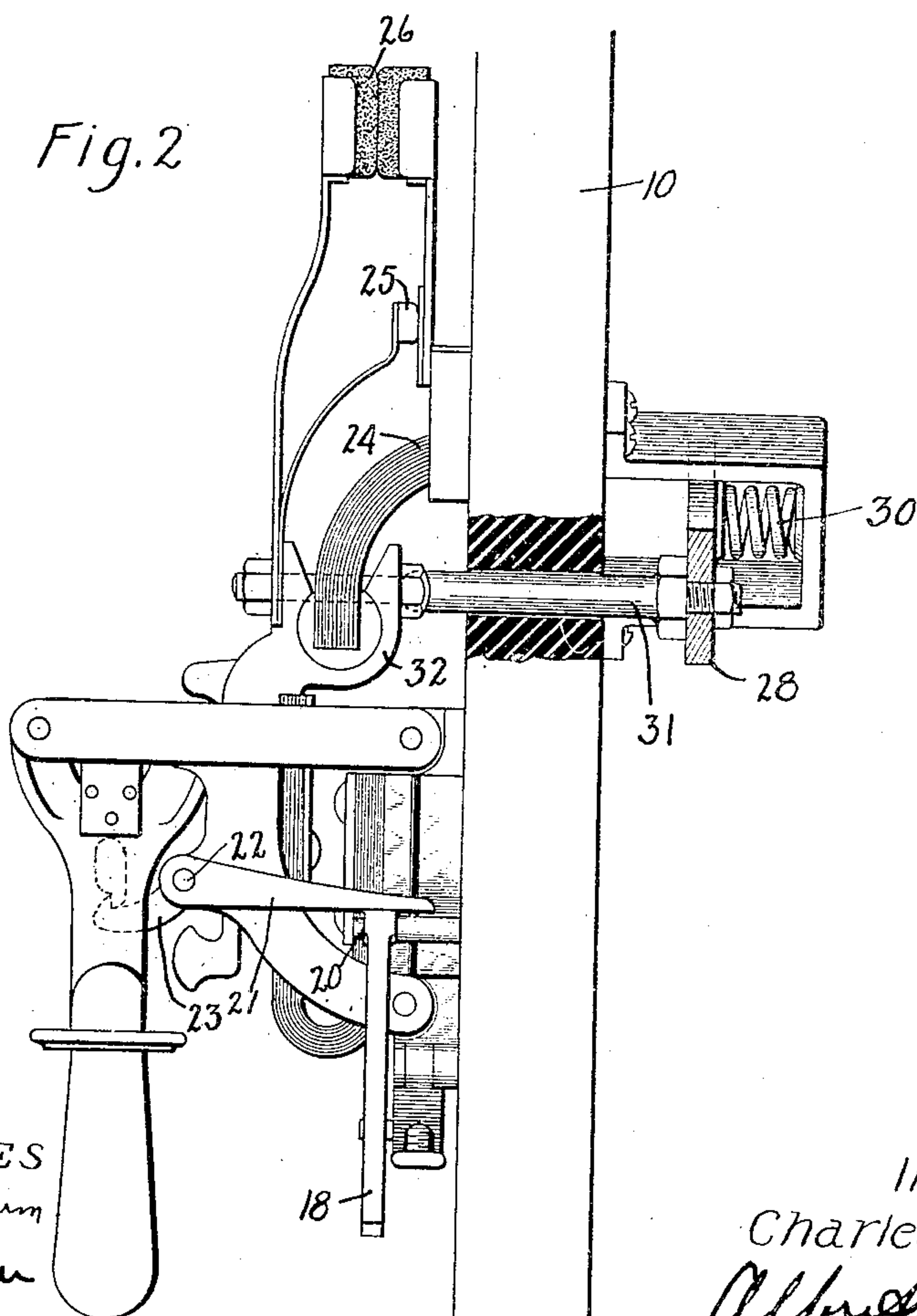


Fig. 2



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UNITED STATES PATENT OFFICE.

CHARLES D. KNIGHT, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

STARTING DEVICE FOR ELECTRIC MOTORS.

No. 913,512.

Specification of Letters Patent.

Patented Feb. 23, 1909.

Application filed January 26, 1907. Serial No. 354,229.

To all whom it may concern:

Be it known that I, CHARLES D. KNIGHT, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Starting Devices for Electric Motors, of which the following is a specification.

This invention relates to means for controlling electric motor circuits and has for its object the provision of a device of this character in which the main armature circuit is automatically opened by means external to the controlling device itself, provision being made whereby the controlling element cannot be operated until the circuit is closed through the external means.

My invention relates more specifically to controlling devices of the type used in starting electric motors. In this type of apparatus, the controlling arm is ordinarily spring-pressed to the "off" or starting position and is held in the "on" or running position by a no-voltage release magnet. Upon failure of voltage, the arm returns to the "off" position and the main circuit is broken on the rheostatic contacts. The breaking of the circuit on the contact studs is objectionable in many instances, especially when the current is heavy, since the contacts are thereby burned and must be replaced.

In carrying out my invention I provide in connection with the ordinary starting rheostat having a spring-pressed controlling arm and a no-voltage release magnet, a circuit breaker arranged to open the main circuit before the arm reaches the "off" position. I also provide means for preventing the closing of the motor circuit when unprotected by the starting resistance. To do this, means are provided whereby the controlling arm cannot be moved from the starting position until the external circuit opening means has been operated to close the circuit.

In the accompanying drawings I have shown a starting panel equipped with my invention.

In the drawings, Figure 1 is a front elevation of the device; Fig. 2 is a side elevation of a portion thereof, certain parts being in section; and Fig. 3 is a diagram of the circuits.

Referring to the drawings, 10 represents an insulating base of slate or soapstone having mounted thereon a motor starting mechanism of the usual type and an automatic circuit breaker adjacent thereto which may also be of standard construction except as to details. The starting mechanism comprises a plurality of starting contact segments 11 arranged in an arc of a circle and forming the terminals of a starting resistance 12. A controlling arm 13 pivoted at 14 is arranged to engage the contact segments to vary the resistance and is biased to the starting position by means of a spring 15. A no-voltage release magnet 16 is arranged to retain the controlling arm in the running position as shown in Fig. 1, and the controlling arm is provided with a bridging contact 17 for closing the armature circuit so as to short circuit the controlling arm when the latter is held by the retaining magnet. The automatic circuit breaker is preferably of standard construction.

The particular circuit breaker which I have shown is of the general type described and claimed in the patent to E. M. Hewlett, No. 840,848, although, of course, any other suitable circuit breaker will serve the purpose. The rheostat and the circuit breaker are so located on the base with reference to each other that they can be conveniently interlocked so that means can be provided whereby the arm of the rheostat will trip the circuit breaker. In order to bring about the tripping operation I provide a bell crank lever having a long arm 18 and a short arm 19 pivoted at 20. The long arm of the lever is normally in the path of the rheostat arm and the short arm engages a finger 21 mounted on the pivot 22, to which the circuit breaker latch 23 is secured. The lever being normally in the position shown in full lines in Fig. 1 when the rheostat arm 13 is moved to the starting position, it engages the long arm of the lever and forces it to the position shown in dotted lines. This causes the short arm 19 to engage the finger 21 which moves the latch 23 against a spring tension out of engagement with the circuit breaker. The circuit breaker thereupon opens, breaking the motor circuit at the main laminated contact 24 and shunt contacts 25 and 26. So long as the rheostat lever is left in this starting position, the circuit breaker cannot be

latched closed but as it is moved toward the running position, the bell crank lever releases the circuit breaker latch so that its spring will cause it to engage the circuit breaker handle, and retain it closed.

In order to prevent the closing of the motor circuit without any protective resistance in the circuit, I provide an interlocking mechanism so that it is impossible to move the controlling arm until the circuit breaker is closed. I have accomplished this result in the present instance by providing a pin 27 mounted in a bar 28 beneath the rheostat base, so as to project up through the slate base and prevent movement of the controlling arm. The bar 28 is pivoted at 29 and its free end is spring-pressed inward by means of a spring 30. This bar also carries a pin 31 near its free end, which is engaged by the movable element of the circuit breaker. As shown in the drawings this pin is engaged by the yoke 32 which secures the main contact 24, and the arrangement is such that when the circuit breaker is closed the yoke 32 forces the pin 31 and bar 28 outward. This movement of the bar moves the stop pin 27 outward so that it no longer operates as a stop to the arm 13. The circuit breaker then being closed, the controlling arm may be moved to running position where it is held by the retaining magnet. In Fig. 1 the parts are so arranged that the controlling arm 13 may be moved over the first three contact segments before reaching the stop pin 27. The movement of the contactor over these segments, however, does not affect the circuit since they are all connected together and as a whole constitute the first starting step, there being no dead or open-circuiting segment. The arrangement of the circuits is clearly illustrated in Fig. 3. Current passes from the line L through the motor armature A across the circuit breaker contacts 24 through the overload trip coil of the circuit breaker 33 thence to the controlling arm 13, starting resistance 12 and back to line at L'. When the rheostat is in running position, the bridging contact 17 short circuits the resistance across the contacts 34. The retaining magnet 16 is preferably connected across the line as shown.

To start the motor, the circuit breaker must first be closed so as to remove the stop pin 27 from the path of the controlling arm. This being done, the arm may be moved to running position in the usual way. Upon failure of voltage the controlling arm will return to the starting position and as it does so it will engage the arm 18 and trip the circuit breaker, thereby opening the main circuit on the circuit breaker contacts instead of on the contact segments of the rheostat. Upon overload the circuit will, of course, be opened upon the circuit breaker

contacts in the usual way. The pin 27 is provided with a beveled head so that in case the circuit breaker opens first so as to project the pin up through the base, the controlling arm will pass over the pin by engaging the beveled portion and forcing it downward. It will thus be seen that I have provided a very convenient and efficient interlocking mechanism between the rheostat and circuit breaker, which protects the segments of the rheostat and at the same time protects the motor against the rush of current occasioned by the closing of the circuit without the protecting resistance. It should be understood, of course, that the particular construction which I have shown and described is for purposes of illustration merely, since many modifications thereof will suggest themselves to those skilled in the art which do not depart 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. The combination with a starting rheostat having a spring-retained arm and a no-voltage magnet for retaining the same in running position, of an automatic circuit breaker in circuit with said arm, means for preventing the movement of said arm from the starting position while said circuit breaker is open and means for automatically opening said circuit-breaker when the arm is moved towards starting position.

2. The combination with a starting rheostat having a spring-retained arm and a no-voltage magnet for retaining the same in running position, of an automatic circuit breaker in circuit with said arm, means whereby said circuit breaker is tripped as the arm returns to starting position, and means for preventing the movement of the arm toward running position while the circuit breaker is open.

3. The combination with a starting rheostat having a spring-retained arm and a no-voltage magnet for retaining the same in running position, of an automatic magnetic circuit breaker in circuit with the arm, means whereby said breaker is tripped as the arm returns to starting position, and means for preventing the movement of the arm toward running position while the circuit breaker is open.

4. The combination with a circuit controller provided with automatic no-voltage release features, of an automatic overload circuit breaker arranged to be tripped as the controlling element moves towards starting position, and means for preventing the movement of the controlling element towards running position when the circuit breaker is open.

5. The combination with a starting rheostat having a spring-retained arm and a

no-voltage magnet for retaining the same in running position, of an automatic circuit breaker, means whereby said breaker is tripped as the controlling element moves toward starting position, a stop normally in the path of the controlling arm when the latter is in the starting position, and means whereby the closing of the circuit breaker removes

said stop and allows the arm to be moved to running position.

In witness whereof, I have hereunto set my hand this 25th day of January, 1907.

CHARLES D. KNIGHT.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.