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E. R. WHITNEY.
SWITCH FOR ELECTRIC CIRCUITS.

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Fig. 1.

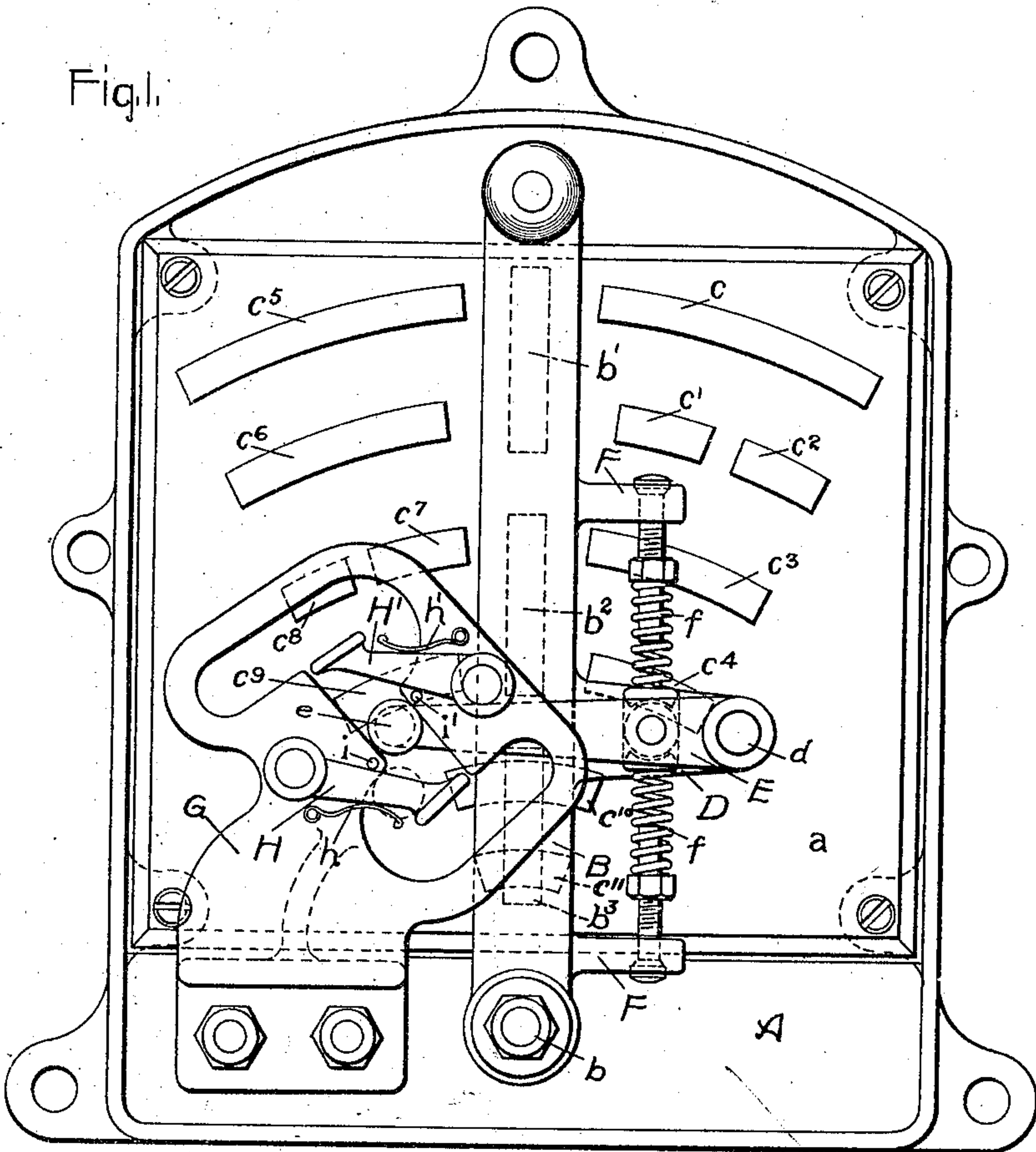
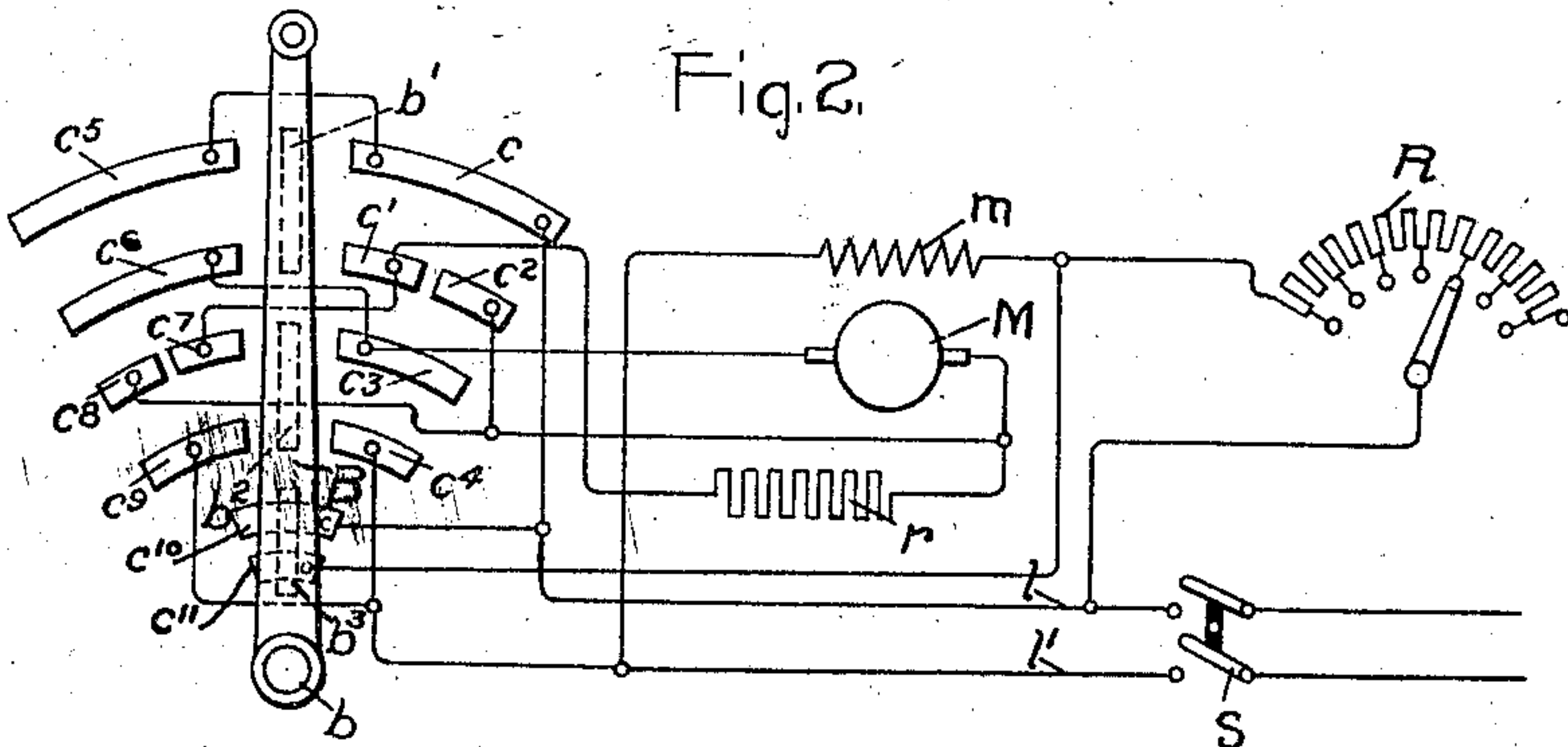


Fig. 2.



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UNITED STATES PATENT OFFICE.

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SWITCH FOR ELECTRIC CIRCUITS.

No. 830,628.

Specification of Letters Patent.

Patented Sept. 11, 1906.

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To all whom it may concern:

Be it known that I, EDDY R. WHITNEY, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Switches for Electric Circuits, of which the following is a specification.

My invention relates to reversing-switches for electric circuits, and is particularly adapted to reversing-switches for electric motors, although it is not limited to this specific application. For certain applications of electric motors—such, for instance, as in the case of the electric-motor drive of machine-tools—it is desirable to employ a single switch adapted for starting the motor in either direction, for stopping, and for reversing. Such a switch should be placed conveniently for the operator, and should be so designed that the operator may be able to move the switch quickly from either running position to off position without requiring him to remove his eyes from the work. With starting and reversing switches as ordinarily constructed there is danger that the operator in moving the switch quickly to off position may carry the switch member too far, so as to reverse the current from the motor, thereby putting an undue strain upon the motor and transmitting mechanism. It is also desirable that the operator should be able to start the motor with full field without disturbing the speed-controlling field-rheostat. This enables the operator after once adjusting the speed to stop and start the motor and bring it back to the same speed without further adjustment. This is impossible with starting-switches as ordinarily arranged.

One object of my invention is to provide a switch which shall enable the operator to move the switch member as quickly as may be desired to the off position, with no danger whatever of carrying it too far, so as to reverse the motor.

Another object of my invention is to provide a simple form of starting-switch which shall enable the operator to stop and start the motor with full field without disturbing the speed-controlling field-rheostat.

My invention will best be understood from the accompanying drawings, in which—

Figure 1 shows a reversing-switch constructed in accordance with my invention,

and Fig. 2 shows diagrammatically the switch-circuits applied to the control of an electric motor.

In Fig. 1, A represents the frame of the switch provided with suitable lugs for attaching to a support. *a* represents a slab of insulating material secured to the frame A and carrying stationary contacts *c* to *c*¹¹. B represents the movable switch member, pivoted to the frame A at *b* and carrying the three movable contacts *b*¹, *b*², and *b*³, (shown in dotted lines.) The position of switch member B (shown in Fig. 1) is the off position of the switch, and as it is moved in one direction or the other the motor will be started in the direction desired, as will be hereinafter explained. D represents a lug carried by switch member B and carrying a pin *d*, on which is pivoted the lever E. Lever E is normally held in a position at right angles to switch member B by means of the two springs *f f*, carried by lugs F F on switch member B. Lever E carries at its end a roller *e*, which travels in a cam-slot of approximately Z shape in the stationary member G. H H' represent two pivoted dogs which are normally held in the position shown by the springs *h h*¹, respectively, which press the dogs against the stops *i i*¹.

Referring now to Fig. 2, the circuit arrangements will be described. M represents the armature, and *m* the field, of an electric motor. Motor-field *m* is shown connected across the line *l l*¹ through the field-rheostat R. By means of this rheostat the motor-field strength, and consequently the speed, may be adjusted. Leads are brought from the terminals of the field-rheostat R to contacts *c*¹⁰ and *c*¹¹, which are engaged by movable contact *b*³ when member B is in the off position, as shown. Thus rheostat R is short-circuited at starting and the motor will always start with full field. When member B is moved to either extreme position, contact *b*³ leaves contacts *c*¹⁰ and *c*¹¹ and a resistance is thrown into the field-circuit, the amount of this resistance depending on the previous adjustment of rheostat R. Thus the operator is enabled to start the motor under full field without disturbing the speed-controlling field-rheostat.

With the switch member B in the position shown, the circuit of the armature M is

opened. Now if switch member B is brought into engagement with contacts c , c' , c^2 , and c^4 a circuit will be closed as follows: from line-wire l , contact c , movable contact b' , contact c' , resistance r , armature M, contact c^2 , contact b^2 , contact c^4 , line-wire l' . The motor-armature is consequently connected across the line in series with the starting resistance r . When switch member B is moved to engage contact c^2 , the resistance r is short-circuited and the motor operates at full speed, corresponding to the position of field-rheostat R. Similarly, it will be seen by tracing out the circuits that when switch member B is moved to the left from the off position armature M again has its circuit closed, but with its connections relatively reversed, and when switch member B is brought into engagement with contact c^3 starting resistance r is again short-circuited. Thus the arrangement of contacts is adapted to start the motor in either direction with full field and to bring the motor to the speed determined by the previous adjustment of the field-rheostat.

Now referring again to Fig. 1, the function of the cam-slot of member G and the dogs H H' will be explained. If member B is moved toward the right from its off position, the roller e will travel down the slope of the cam-slot in member G until it strikes the toe of dog H. As the motion of member B is continued roller E will push dog H aside and will pass the corner of the cam-slot and travel upward into the extremity of the slot. The extremity of the slot limits the movement of member B and stops it at the full-speed running position. After the passage of roller e dog H will be pressed back into the position shown against stop i by the spring h . Now if it is desired to return switch member B quickly to its off position roller e will travel along down the slot until it strikes the toe of dog H. Dog H is now pressing against the stop i and cannot be pushed out of the way. Roller e will consequently travel along the face of dog H until it reaches the position shown in dotted lines. This position represents the limit of possible movement in one direction and corresponds to the off position of switch member B. In order to carry switch member B over to the reverse position, it is necessary to retract the switch member a small amount in order to enable the roller e to pass from the position shown in dotted lines to the position shown in full lines, the spring f acting to raise the roller to the full-line position when switch member B is retracted a sufficient amount to enable the roller to clear the corner of the cam-slot. The same process will be repeated when the switch member is moved to the left to operate the motor in the opposite direction. Roller e is thus given a zigzag movement, and it is impossible to carry the switch member

from either running position to the other by a unidirectional movement. Consequently the operator may move switch member B from either running position as rapidly as desired without removing his eyes from the work and without any danger of carrying the switch member to the reverse position.

I am aware that it has been proposed heretofore to prevent a continuous movement of a reversing-switch from one running position to the other by providing means, such as a spring-pressed pawl, adapted to engage a stop at the off position and to require releasing by the operator before the movement can be continued; also, I am aware that it has been proposed heretofore to provide a member for a reversing-switch movable in different planes with a stop or stops, necessitating a shifting of the switch member from one plane to another; but I am not aware that it has been proposed heretofore to provide means for preventing a unidirectional movement from one running position to the other of a member movable in a single plane. By interrupting the direction of the movement instead of merely its continuity, I provide a greater safeguard against an accidental reversal, and at the same time enable the operator to control the switch by a single handle without the necessity of releasing a pawl or similar stop every time the switch is served through the off position, and by providing means for interrupting the continuity of movement of a member movable in a single plane I avoid the necessity of using universal joints or similar complications.

It is evident that the arrangement of circuits and contacts may be varied as desired to meet varying requirements. Furthermore, the mechanical arrangement of the parts may be altered—as, for instance, by placing the cam-slot on the movable switch member and making the lever stationary. Also, although I have shown the switch-contacts carried by the operating-handle itself, my invention is obviously not limited to this particular construction, but may be applied to the handle or any other suitable member of any well-known type of reversing-switch. Thus when I employ the phrase "switch member" in the appended claims I intend to include any member of the switch mechanism which moves with the movable contacts and to which my invention may be applied. Accordingly I do not desire to limit myself to the particular construction and arrangement of parts here shown, since changes which do not depart from the spirit of my invention will be obvious to those skilled in the art.

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

1. In a reversing-switch for electric circuits, a switch member movable in a single plane and having an off position and a running position on each side of said off position,

and means for preventing a unidirectional movement of said member from one running position to the other.

2. In a reversing-switch for electric circuits, a switch member movable in a single plane having an off position and a running position on each side of said off position, and a stationary member adapted to be engaged thereby and to prevent a unidirectional movement of said switch member from one running position to the other.

3. In a reversing-switch for electric circuits, a switch member movable in a single plane and having an off position and a running position on each side of said off position, and a stationary member adapted to be engaged thereby and to act as a positive stop therefor at the off position to prevent a unidirectional movement from one running position to the other.

4. In a reversing-switch for electric circuits, a switch member movable in a single plane and having an off position and a running position on each side of said off position, a member carried by said switch member, and a stationary cam adapted to be engaged thereby and to prevent a unidirectional movement of said switch member from one running position to the other.

5. In a reversing-switch for electric circuits, a switch member having an off position and a running position on each side of said off position, a pivoted spring-pressed lever carried by said switch member, and a stationary cam-slot adapted to be engaged by said lever and to prevent a unidirectional movement of said switch member from one running position to the other.

6. In a reversing-switch for electric circuits, a switch member having an off position and a running position on each side of said off position, a pivoted spring-pressed lever carried by said switch member, a stationary cam-slot adapted to be engaged by said lever, and spring-pressed dogs coacting with said slot and said lever to permit a unidirectional movement of said switch member from off position to either running position and to prevent a unidirectional movement from one running position to the other.

7. In a reversing-switch for electric circuits, a movable switch member having an off position and a running position on each side of said off position, a spring-actuated lever carried by said member, and a stationary cam-slot of approximately Z-shape adapted to be engaged by said lever. 55

8. In a reversing-switch for electric circuits, a movable switch member having an off position and a running position on each side of said off position, a spring-actuated lever carried by said member, and a cam-slot adapted to be engaged with said lever and to enforce a zigzag movement thereof when said switch member is moved from one running position to the other. 65

9. In combination, a variable-speed electric motor, a rheostat in circuit with the motor-field for varying the speed at which the motor may run, and a starting-switch for said motor, said switch being constructed and arranged to connect said motor to a source of current-supply at starting independently of said rheostat. 70

10. In combination, a variable-speed electric motor, a rheostat in circuit with the motor-field, means for operating said rheostat to vary the speed of the motor, and a starting-switch constructed and arranged to connect said motor to a source of current-supply so as to start with a uniform resistance in the field-circuit for all positions of the rheostat-operating means. 75

11. In combination with an electric motor, a rheostat in circuit with the motor-field, means for operating said rheostat to vary the speed of the motor, a starting resistance, and a starting-switch constructed and arranged to connect said motor to a source of current-supply so as to start with said resistance in series with the armature and with a field-circuit independent of the position of the rheostat-operating means. 80 85 90

In witness whereof I have hereunto set my hand this 28th day of May, 1904.

EDDY R. WHITNEY.

Witnesses:

DUGALD McK. McKILLOP,
JOHN J. WALKER.