No. 799,035. PATENTED SEPT. 12, 1905.

A. L. CUSHMAN.

REVERSING MECHANISM FOR MOTORS.

APPLICATION FILED MAY 31, 1904.

2 SHEETS—SHEET 1.

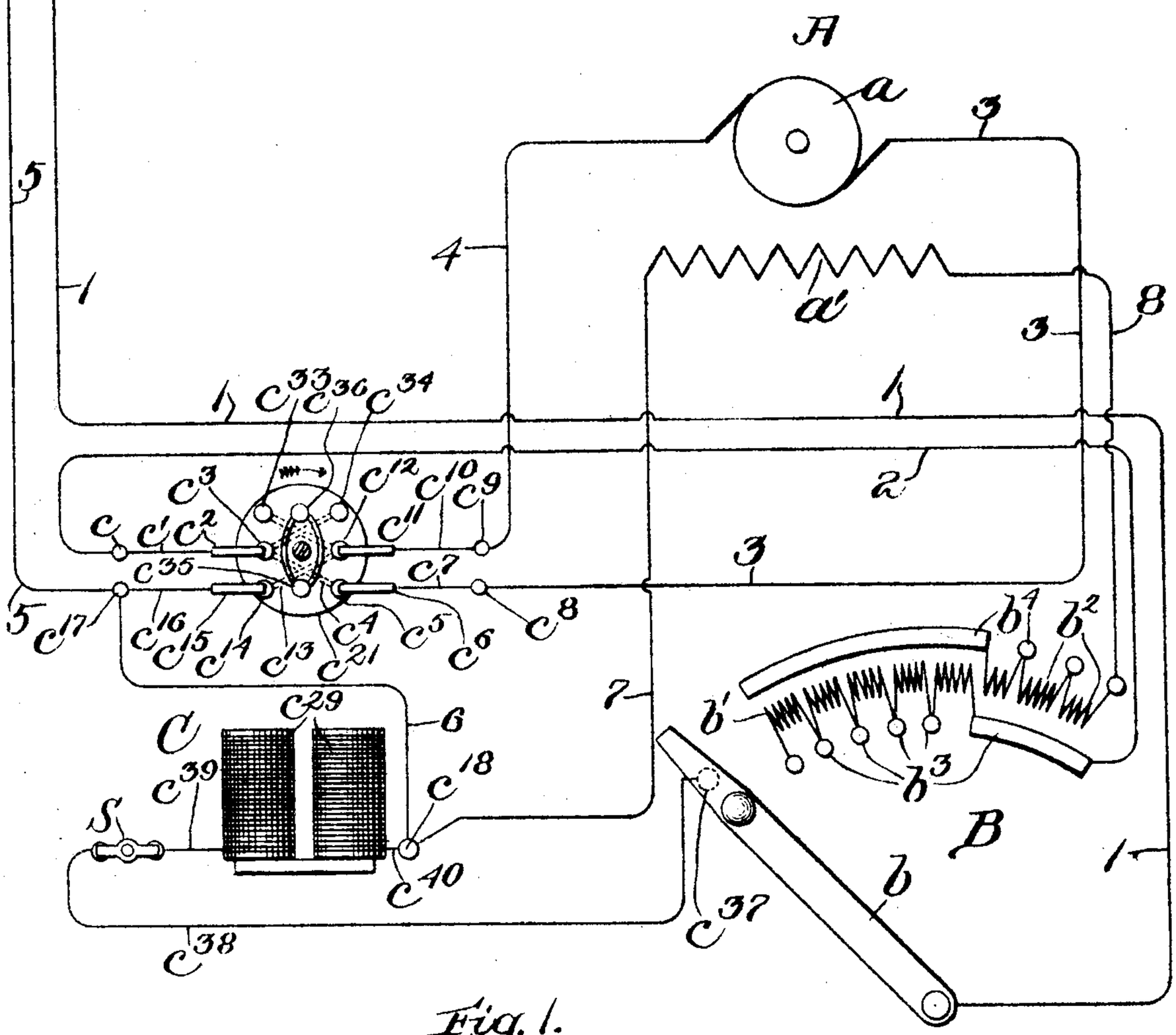

Fig. 1.

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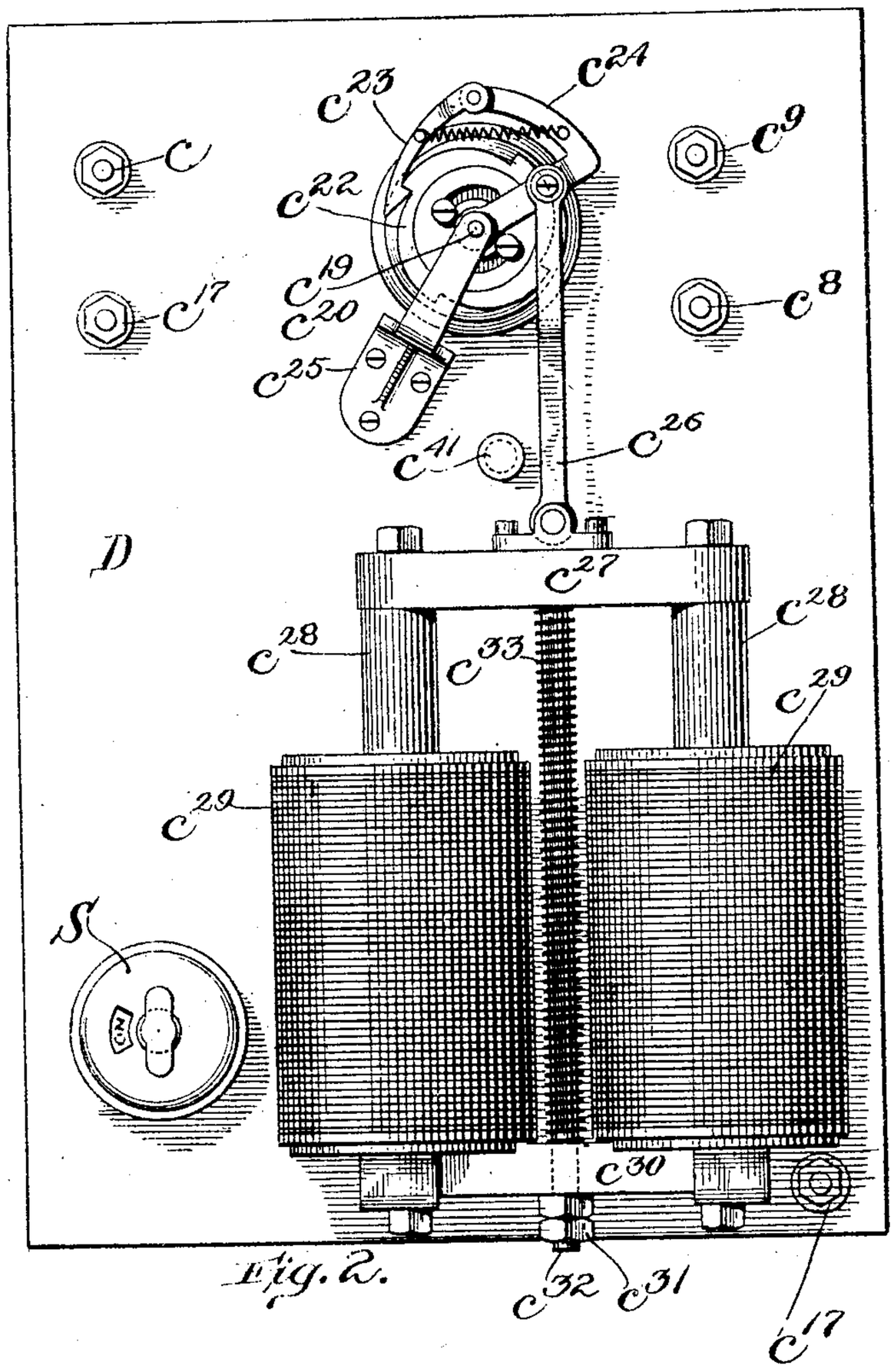

Fig. 2.

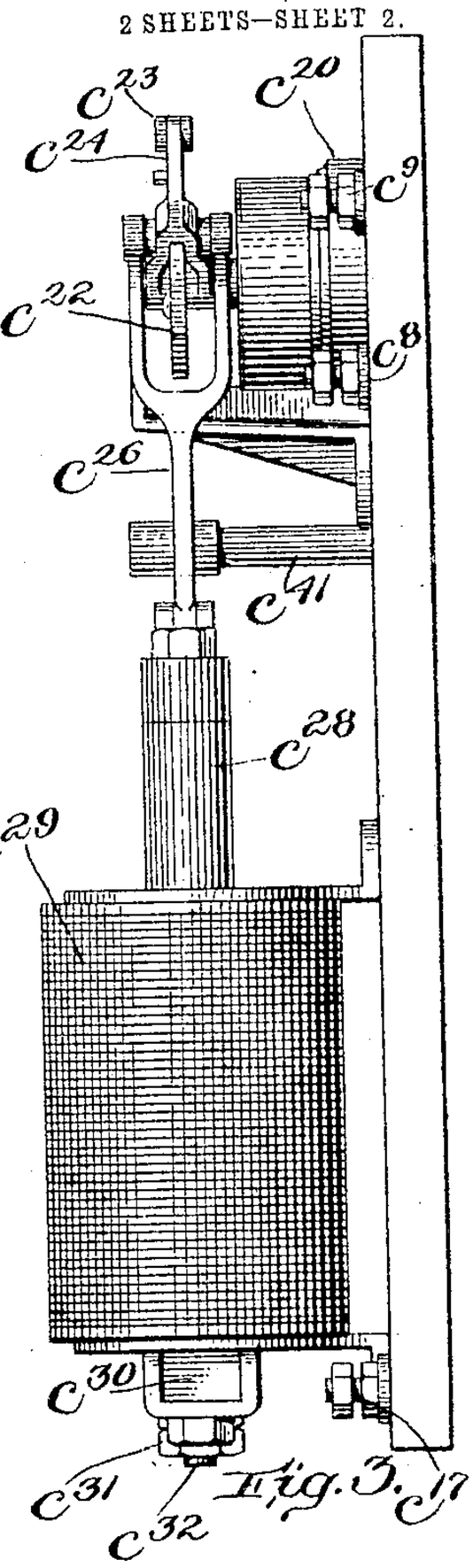

Fig. 3.

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UNITED STATES PATENT OFFICE.

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REVERSING MECHANISM FOR MOTORS.

No. 799,035. Specification of Letters Patent. Patented Sept. 12, 1905.

Application filed May 31, 1904. Serial No. 210,510.

To all whom it may concern:

Be it known that I, ABE LINCOLN CUSHMAN, a citizen of the United States, and a resident of Concord, in the county of Merrimack and State of New Hampshire, have invented new and useful Improvements in Reversing Mechanisms for Motors, of which the following is a specification.

My invention is a mechanism for reversing motors, and is particularly intended for use in connection with the driving-motor of a machine which is intermittently reversed to reciprocate the tool, such as a lathe or planer.

With machines of the class indicated it has heretofore been customary to have the driving-motor or prime power-shaft rotate continuously in one direction and to provide a shiftable belt or clutch, operated sometimes automatically and sometimes by hand, to reverse the machine. Such devices, however, have been in some respects and in some situations objectionable by reason of the fact that they occupy considerable room and subject the machine to injurious shocks and strains unless carefully controlled and operated.

My invention has for its object to provide an improved reversing mechanism particularly adapted to be used in connection with the driving-motor of a machine of the class indicated, which will not only be free from the objections above noted, but which will not require the attention of the workman and to that extent will be automatic.

My invention resides in the combination, with a motor, such as an electric motor, and a power-controlling member—such, for example, as the arm or lever of a rheostat—of a reversing device for the motor, such as a pole-changer in circuit with the motor, and means connecting the power-controlling member with the reversing device for operating the latter when said member is shifted to stop the motor. By this construction no attention is required by the workman to effect the reversal of the motor, but each time the power-controlling member is shifted into its "off" position the reversing device is operated and the motor reversed. The main advantage to this construction is that the reversal of the motor is effected automatically only when the motor is stopped, thereby preventing injury to the machine driven by the motor which has heretofore been caused by too quick reversal of the driving-motor.

Other features of my invention are hereinafter pointed out.

In the accompanying drawings, Figure 1 is a diagrammatic view illustrating one form of my invention. Figs. 2 and 3 are respectively face and side views of the pole-changer or reversing-switch hereinafter described.

Having reference to the drawings, A represents an electric motor, B a rheostat for controlling said motor, and C a pole-changer or reversing-switch.

The armature-circuit of motor A when pole-changer C is in the position shown in Fig. 1 is made up of wire 1, which connects with the arm b, resistance b' of rheostat B, wire 2 to a binding-post c of pole-changer C, wire c', finger c^2, wire c^4, and contact c^5, finger c^6, wire c^7, binding-post c^8, wire 3, armature a, wire 4, binding-post c^9, wire c^{10}, finger c^{11}, contact c^{12}, wire c^{13}, contact c^{14}, finger c^{15}, wire c^{16}, binding-post c^{17}, and wire 5. The field-circuit of motor A is a shunt made up of a wire 6, connecting binding-post c^{17} of pole-changer C with a binding-post c^{18} thereof, wire 7, field a', wire 8, and resistance b^2.

As shown in Figs. 2 and 3, the pole-changer C comprises a base D, on which all of the parts of the instrument are mounted. The contacts c^3, c^5, c^{12}, c^{14}, c^{33}, c^{34}, c^{35}, and c^{36}, which coöperate with fingers c^2, c^6, c^{11}, and c^{15}, are, as shown in Fig. 1, mounted upon a disk c^{21}, carried by an arbor c^{19}, journaled in bearings on a bracket c^{25} and a frame c^{20}, fixed to the base of pole-changer C. At its outer end arbor c^{19} has fixed upon it a ratchet-wheel c^{22}, coöperating with a pawl c^{23}, carried at one end of a swinging arm c^{24}. At its other end arm c^{24} is forked and straddles ratchet-wheel c^{22}, the two members of the fork being pivoted loosely on arbor c^{19}. Arm c^{24} is connected by a link c^{26} with a cross-head c^{27}, carrying two solenoid-cores c^{28}, which extend into a pair of coils c^{29}, mounted on the base D of the pole-changer C. Cores c^{28} and coils c^{29} constitute an electric motor for operating disk c^{21} of the pole-changer. Near its middle cross-head c^{27} has fixed to it one end of a rod c^{32}, which at its other end extends loosely through a cross-bar c^{30}, fastened to the ends of coils c^{29}, and outside of which bar c^{20} is threaded to receive upon it two nuts c^{31}. Mounted upon rod c^{32} is a spring c^{33}, bearing at one end against cross-head c^{27} and at its other end against cross-bar c^{30}, so as to normally hold the cores c^{28} projected, with pawl c^{23} in engage-

ment with one of the teeth of ratchet-wheel c^{22}. When coils c^{29} are energized, cores c^{28} are retracted, and their inward movement acts, through link c^{23}, to turn ratchet-wheel c^{22}, arbor c^{19}, and disk c^{21} angularly a distance of ninety degrees. When coils c^{29} are deënergized, spring c^{33} returns the cores, link c^{26}, arm c^{24}, and pawl c^{23} to normal position with nuts c^{31} against cross-bar c^{30}. The stop c^{41} limits the lateral movement of link c^{26} and prevents the moving of disk c^{21} more than a quarter-turn when the cores c^{28} are retracted.

By reference to Fig. 1 it will be seen that each time disk c^{21} is moved ninety degrees the current through armature a is reversed, thus reversing the motor A—that is to say, contacts c^{12}, c^{14}, and c^{33} on disk c^{21} are electrically connected, contacts c^{3}, c^{5}, and c^{34} are electrically connected, and the contacts c^{35} and c^{34} are electrically connected. Therefore, as shown in Fig. 1, finger c^{2} is connected with finger c^{6} and finger c^{11} with finger c^{15}; but when disk c^{21} is turned in the direction of the arrow in Fig. 1 ninety degrees from the position shown fingers c^{2} and c^{11} are electrically connected, and at the same time fingers c^{6} and c^{15} are electrically connected, while another step movement of disk c^{21} ninety degrees connects c^{2} with c^{6} and c^{11} with c^{15}.

Located in position to engage arm b when the latter occupies its "open" or "off" position is a contact c^{37}, connected by a wire c^{38} with one terminal of a hand-operated switch S, the other terminal of said switch being connected by a wire c^{39} with one end of the winding of coils c^{29}. The other end of the winding of coils c^{29} is connected by a wire c^{40} with binding-post c^{18}, so that when switch S is closed and arm b is brought into engagement with contact c^{37} a circuit from line-wire 1, through coils c^{29}, to line-wire 5 is established and pole-changer C is operated.

When motor A is started, arm b is swung away from contact c^{37} into engagement with contacts b^{3} and b^{4}, and to stop motor A arm b is moved back out of engagement with contacts b^{3} and b^{5} and against contact c^{37}. It will therefore be clear that when motor A is used to drive a lathe, planer, or the like and is stopped either automatically or by the workman at the end of either stroke or travel of the machine the pole-changer C is automatically operated, so that when motor A is started again it will run in the opposite direction from that in which it was running before it was stopped. This change is effected, as will be seen, without subjecting the machine to injurious shocks and strains such as are caused by too sudden reversal, because to make the reversal motor A must first be cut off from the power.

The switch S provides means by which the operator can at will stop the motor A (by opening said switch) without reversing it.

What I claim is—

1. In combination a motor; a power-controlling member; a reversing device for the motor; and means connecting the power-controlling member with the reversing device for operating the latter without reversing the current to the reversing device, when the power-controlling member is in an off position with reference to the motor.

2. In combination an electric motor; a motor-circuit therefor connected with a source of electrical power; a reversing device in said circuit for reversing the direction of the flow of current to the armature of the motor; and a power-controlling member adapted, when it opens said motor-circuit, completely to operate the reversing device, and when next it closes said motor-circuit to cause the motor to be actuated in reverse direction by such reversed current.

3. In combination an electric motor; a motor-circuit therefor connected with a source of electrical power; a pole-changer in said circuit for reversing the direction of the flow of current to the armature of the motor; and a power-controlling member adapted, when it opens said motor-circuit, completely to operate the pole-changer, and when next it closes said motor-circuit to cause the motor to be actuated in reverse direction by such reversed current.

4. In combination an electric motor; a motor-circuit therefor connected with a source of electrical power; a reversing device in said circuit for reversing the direction of the flow of current to the armature of the motor; and a rheostat having a movable arm or lever controlling said circuit and adapted, when it opens said motor-circuit, completely to operate the reversing device, and when next it closes said motor-circuit to cause the motor to be actuated in reverse direction by such reversed current.

5. The combination with an electric driving-motor, a power-controlling member, and a pole-changer in circuit with the motor, of a second electric motor for operating the pole-changer, and a circuit for the second motor controlled by the power-controlling member when the same is in an off position with reference to the driving-motor, whereby the pole-changer will be completely reversed when the circuit of the second motor is operated by the power-controlling member.

6. In combination, an electric motor; a power-controlling member therefor; a pole-changer in circuit with the motor; an electromagnet for operating the pole-changer, and a circuit therefor; said power-controlling member being adapted to close the electromagnet-circuit and so operate the pole-changer when the power-controlling member is in an off position with reference to the motor, substantially as described.

7. In combination, an electric motor; a rhe-

ostat for controlling the circuit thereof having a control arm or lever; a pole-changer in circuit with the motor; an electromagnet for operating the pole-changer, and a circuit therefor, said lever being adapted to close the electromagnet-circuit when in an off position with reference to the motor-circuit, and constituting a component part of the electromagnet-circuit when the same is closed.

8. In combination an electric motor; a power-controlling member therefor; a pole-changer in circuit with the motor; an electromagnet; connection between said electromagnet and the pole-changer for operating the latter, comprising a ratchet-wheel rotatable with the pole-changer, and a ratchet actuated by the electromagnet; and a circuit for the electromagnet; said power-controlling member being adapted to close the electromagnet-circuit and so operate the pole-changer when said member is in an off position with reference to the motor.

Signed by me at Concord, New Hampshire, this 23d day of May, 1904.

ABE LINCOLN CUSHMAN.

Witnesses:

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