No. 787,293. PATENTED APR. 11, 1905.

L. A. HAWKINS.

CONTROL OF BULKHEAD DOORS.

APPLICATION FILED SEPT. 30, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

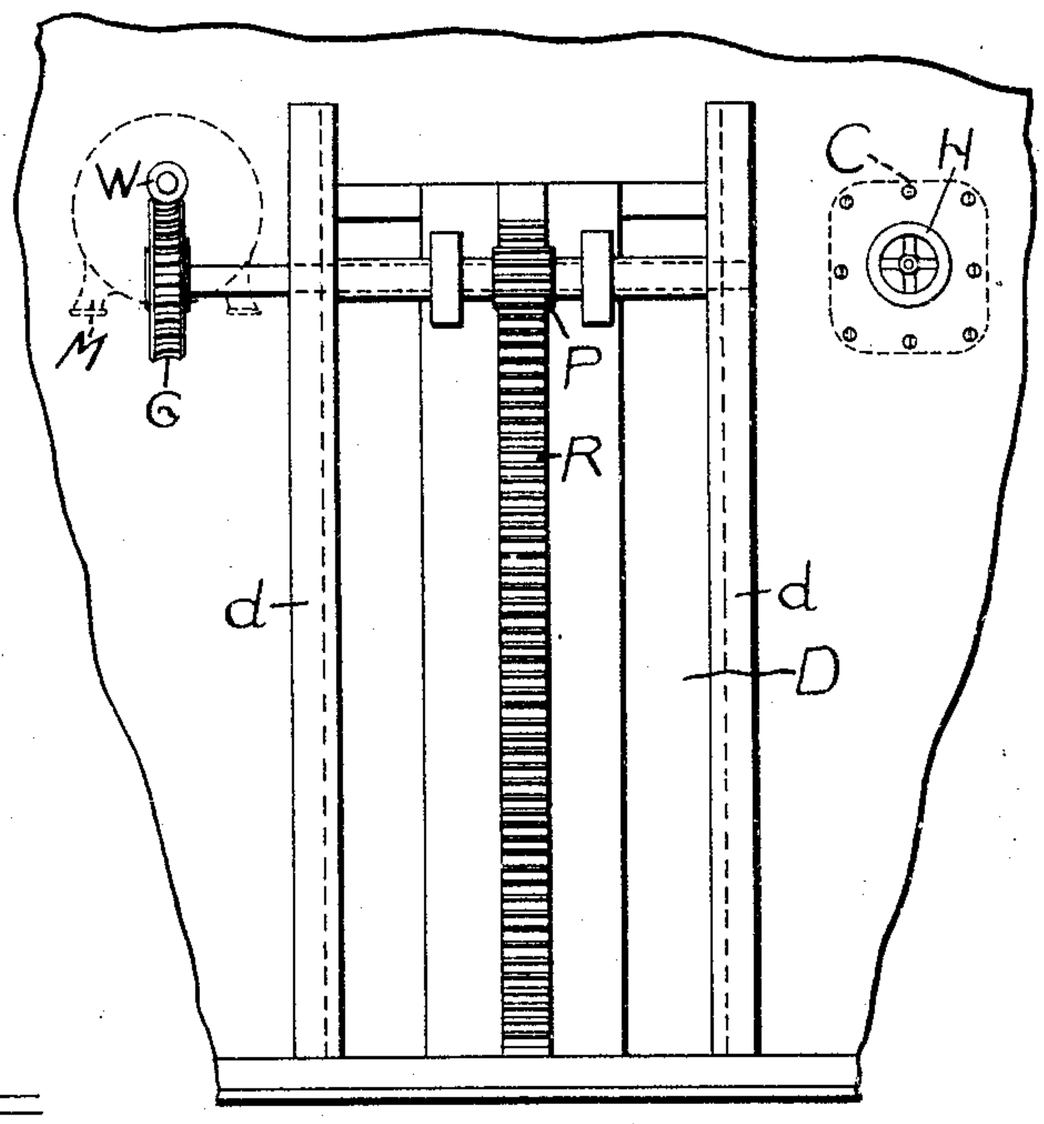
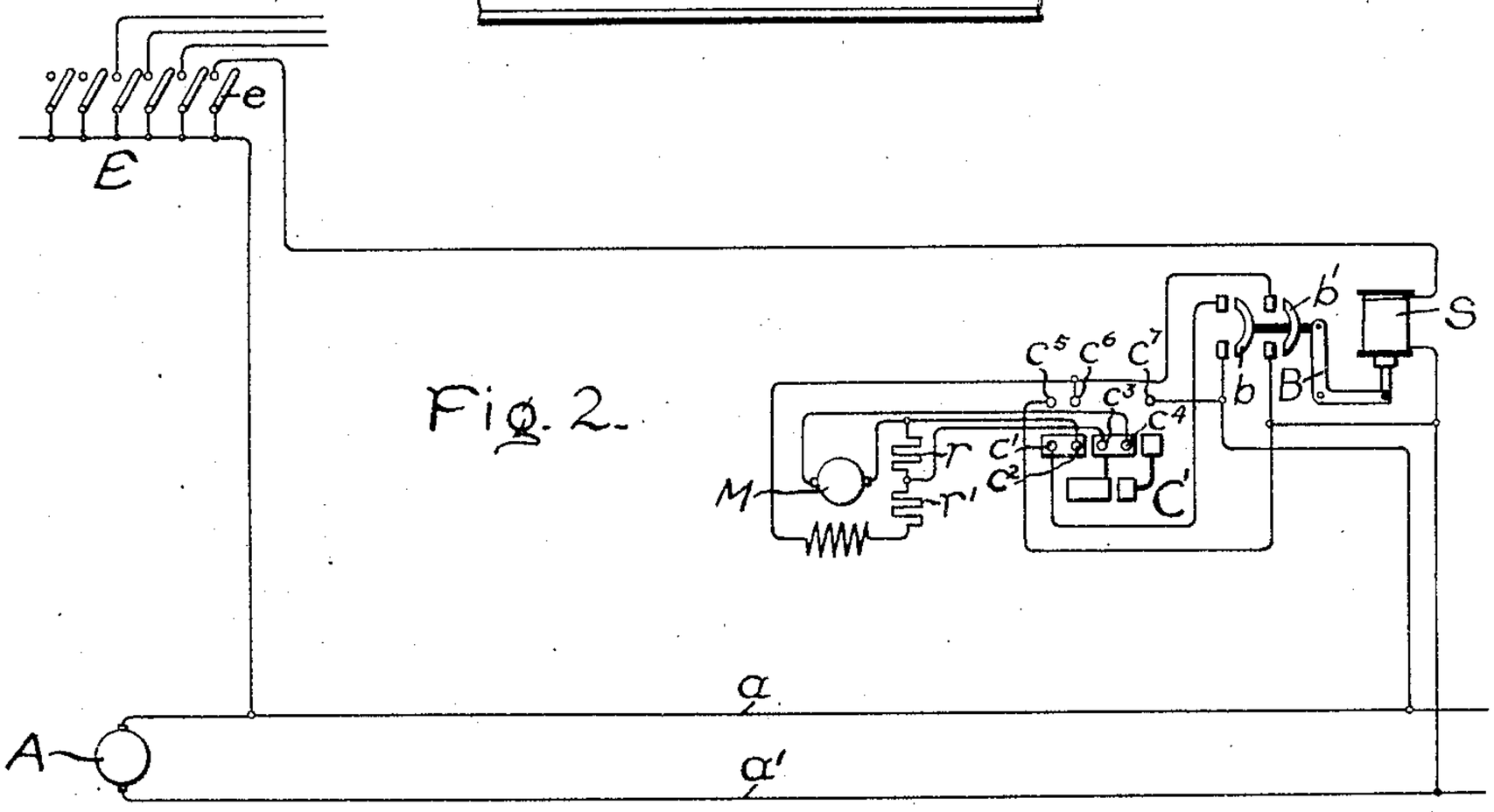


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

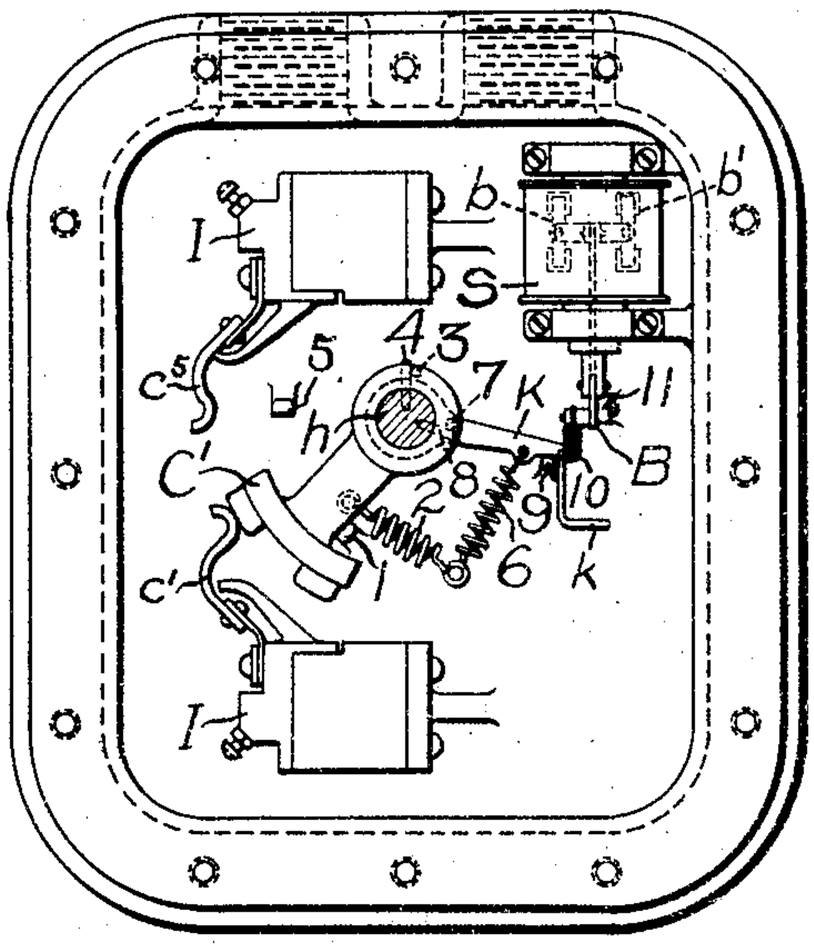
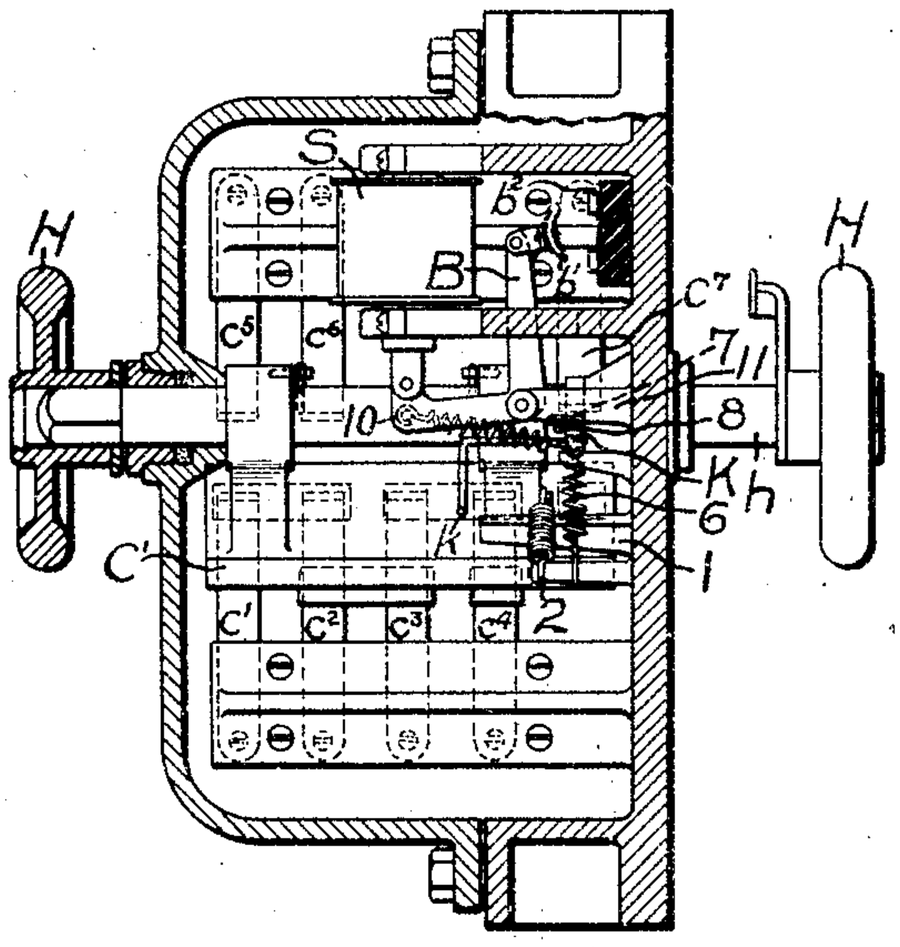


Fig. 4.



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UNITED STATES PATENT OFFICE.

LAURENCE A. HAWKINS, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CONTROL OF BULKHEAD-DOORS.

SPECIFICATION forming part of Letters Patent No. 787,293, dated April 11, 1905.

Application filed September 30, 1904. Serial No. 226,625.

To all whom it may concern:

Be it known that I, LAURENCE A. HAWKINS, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Control of Bulkhead-Doors, of which the following is a specification.

My invention relates to the control of electrically-operated devices which must be controlled both from a distance and locally.

My invention is thus particularly applicable to bulkhead-doors on shipboard, since the several doors must be controllable from a distant point and also by a man at the door, who must be able to control the door independently of the distant station. I shall consequently describe my invention as applied to the operation of bulkhead-doors; but it will be understood that my invention is not limited to this particular application.

In the control of a system of bulkhead-doors it is necessary that the operating mechanisms for the several doors should be under the control of an operator at a distant point, who is thus enabled to close all the doors in case of an emergency. At the same time it is necessary that the man at the door should be enabled to raise or lower the door independently of the distant station.

The object of my invention is to provide a control system which shall meet the above requirements with economy, efficiency, and reliability and with a minimum complication and liability to derangement.

My invention consists in providing a manually-operated reversing-switch for the motor with means for holding the switch normally in one operative position, together with a second switch controllable either locally or from a distance and arranged to complete the motor-circuit when the reversing-switch is in said lowering position, the reversing-switch being arranged when in its other operative position to close the motor-circuit independently of the second switch.

More specifically considered, my invention consists of a reversing-switch for the motor with means for holding it normally in lowering position, a second switch controllable from a distance and arranged to complete the motor-circuit when the reversing-switch is in its lowering position, the reversing-switch being arranged in its raising position to complete the motor-circuit independently of the second switch, a manually-operated shaft and connections between the shaft and both switches, whereby the reversing-switch is moved to its raising position or the second switch is moved to its lowering position, according as the shaft is moved in one direction or the other.

Still more specifically considered, my invention consists in a manually-operated shaft, a reversing-switch for the motor loosely journaled on the shaft, means for holding it normally at lowering position, a switch controllable from a distance for completing the circuit when the reversing-switch is in this position, a member loosely journaled on the shaft and adapted by its movement to move the distant control-switch to its closed position, and operative connections between the shaft and both the reversing-switch and said member, whereby the reversing-switch or said member is moved according as the shaft is moved in one direction or the other.

My invention also comprises a number of other features, which will appear from the following specification and which will be more specifically pointed out in the appended claims.

My invention will best be understood by reference to the accompanying drawings, in which—

Figure 1 shows a bulkhead-door provided with the operating-motor and a motor-controller. Fig. 2 shows a diagram of connections of a motor-control system arranged in accordance with my invention. Fig. 3 shows a front elevation of the motor-controller with the casing removed, and Fig. 4 shows a side elevation of the same.

In Fig. 1, M represents an electric motor which drives a pinion P through the worm W and gear G. This pinion engages a rack R, carried by the door D, which is movable in

the guides *d* and is raised or lowered according to the direction of rotation of the pinion. C represents the controller for the motor, which is provided with an operating-shaft extending through the bulkhead-door and carrying at each end a handle H, so that it my be operated from either side of the bulkhead.

In Fig. 2 the circuit connections of the motor and controller are shown. The controller comprises a reversing-switch C′ and a magnet-winding or solenoid S, with the switch-contacts *b b′* controlled thereby. The reversing-switch C′ comprises seven stationary contact-fingers *c′* to *c⁷* and the movable contacts, as shown. This reversing-switch has two positions for raising and for lowering the door, respectively. The switch is normally held, by means which will be hereinafter described, in the position shown, which is the lowering position. With the reversing-switch C′ in this position and the solenoid deënergized the motor-circuit is not completed. If, however, the solenoid is energized, drawing up its core, it will rock bell-crank lever B on its pivot, bringing the bridging members *b b′* into engagement with the stationary contacts. The circuit is then closed from the line-wire *a*, which is connected to a suitable source of current A through bridging member *b* to contact *c′*, contact *c²*, to the junction of the motor-armature and the resistance *r*. Here the current divides, part passing through the resistance *r*, the other part passing through the motor-armature, contact *c⁴*, contact *c³*, to the other terminal of the resistance *r*. The resistance *r* is thus placed in shunt to the motor-armature for the purpose of giving the motor a strong field to increase the torque and prevent racing when the door is being lowered. From this point the circuit passes through the resistance *r′*, which is always in the motor-circuit to limit the motor-current after the door is closed and before the circuit is broken through the motor-field through bridging member *b′* to the line-wire *a′*. The motor-circuit is thus closed for lowering whenever the solenoid S is energized. The circuit of the solenoid S is controllable from the distant control-station E, which is provided with a plurality of switches *e*, by means of which the circuits of the solenoids of the several motor-controllers may be energized. By this means the motors at all the doors may be energized to close them.

For purposes of local control by an operator at the door means is provided, as will be hereinafter described, for closing the switch-contacts *b b′* manually or for moving the reversing-switch C′ to its other position. When the contacts *b b′* are closed manually, the motor is connected for lowering the door in exactly the same manner as though these contacts were closed by the energizing of solenoid S. When, on the other hand, the reversing-switch is moved to its other position, the circuit is closed as follows: from line-wire *a* to contact *c⁷*, to contact *c⁴*, through the armature of motor M in the reverse direction, contact *c²*, contact *c³*, resistance *r′*, through the motor-field, contact *c⁶*, contact *c⁵*, line-wire *a′*. The motor-circuit is thus closed independently of the switch-contacts *b b′*, and the motor is connected for rotation in the opposite direction to raise the door. If while the reversing-switch C′ is in its raising position the solenoid S is energized, the closing of the contacts *b b′* will have no effect on the motor-circuit, since contact *b* merely establishes a connection from line-wire *a* to contact *c′*, which is open-circuited in the raising position of the reversing-switch, and bridging member *b′* closes a circuit from line-wire *a′* to contact *c⁶*, which is already connected to line-wire *a′* through contact *c⁵*. As soon as the reversing-switch is released, however, and is returned to its lowering position by the automatic returning means the solenoid S, if still energized, will connect the motor for lowering the door, and the door will consequently be closed. Thus while the door is always controllable from the distant station, except while an operator has hold of the reversing-switch, nevertheless the operator is able at all times to control the door independently of the distant station.

Referring now to Figs. 3 and 4, the construction of the controlling-switch will be explained.

h represents the operating-shaft extending through the bulkhead and provided at each end with an operating-handle H. On this shaft *h* is loosely journaled the controlling-switch C′, which is normally held against the stop 1 both by its own weight and by the tension-spring 2. The reversing-switch is preferably made heavy enough to return by gravity when released to the position shown, so that the spring 2 may be omitted; but this spring serves to give a quicker break and a more positive action of the switch. In the position shown the reversing-switch is engaged by the contacts *c′* to *c⁴*, which are connected, as has been already explained. The reversing-switch is provided with a pin 3, which is adapted to be engaged by a pin 4, carried by the operating-shaft *h*. Thus when the shaft *h* is turned in a clockwise direction, as viewed in Fig. 3, the reversing-switch C′ is moved into its raising position, in which it is arrested by the stop 5. The reversing-switch is then in engagement with the stationary contact-fingers *c⁵* to *c⁷*, as has been heretofore explained. In this position the motor is connected for raising the door, as has been already explained; but when the operator releases the handle the reversing-switch is returned to the position shown by gravity and by the spring 2, carrying the operating-shaft with it. Also loosely journaled on the shaft *h* is the

arm K, which is normally held in the position shown in engagement with a stop 9 by the spring 6. This spring may also be omitted if the arm K is made heavy enough to return to the position shown by gravity. The arm K is provided with a pin 7, which is adapted to be engaged by a pin 8, carried by the operating-shaft, so that when the operating-shaft is rotated counter-clockwise, as viewed in Fig. 1, the arm K is raised. Thus it is seen that as the operating-shaft is moved in one direction or the other the reversing-switch C′ or the arm K is raised, the other in each case being left stationary, and when the operating-shaft is released it will always be returned to the position shown either by the weight of the reversing-switch and its spring or by the spring attached to the arm K. Attached to the extremity of arm K is a tension-spring 10, the other end of which engages one arm of the bell-crank lever B, pivoted on the support 11, the other arm of which carries the bridging members *b b′*. With the arm K in the position shown the spring 10 tends to hold the bridging members *b b′* in open position; but when arm K is raised so as to pass above the line connecting the pivot of bell-crank lever B and the point of attachment of spring 10 to the lever the tension of spring 10 will tend to rock the bell-crank lever B on its pivot, and the bridging members *b b′* will be closed with a snap action. When the operating-handle is released, the arm K will be returned to the position shown by the spring 9, shifting the spring 10 below the pivot of bell-crank lever B, so as to open the bridging members *b b′* with a snap action. When the solenoid S is energized from the distant control-station, the bell-crank B will be moved to close the bridging members *b b′* independently of the position of the operating-handle.

It will be seen that since the reversing-switch C′ is normally held in lowering position by gravity and since the core of solenoid S is directly connected to the bell-crank lever B the breaking of one or all of the tension-springs cannot interfere with the control of the motor from the distant station. Furthermore, since there is a positive though loose connection between the operating-shaft and the reversing-switch C′ the reversing-switch may be moved by an operator at the door to connect the motor for raising regardless of whether one or more of the springs is broken. In order to enable an operator at the door to close it in case of an emergency, even though spring 10 is broken, I provide the extension *k*, carried by the arm K, which projects into the plane of movement of the bell-crank lever B. This extension is normally inoperative, since the bell-crank lever is moved to closed position before the extension *k* is brought into engagement with it; but in case the tension-spring 10 should break extension *k* will engage the bell-crank lever B and move it to closed position in the same manner as though the spring were intact, though no snap action is obtained. The control is therefore absolutely reliable and cannot fail in case of an emergency as long as the electric circuits are intact.

I do not desire to limit myself to the particular construction and arrangement of parts shown, but aim in the appended claims to cover all modifications which are within the scope of my invention.

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

1. In combination, an electric motor, a manually-operated reversing-switch therefor, means for holding said switch normally in one operative position, and a switch controllable locally or from a distance for completing the motor-circuit.

2. In combination, an electric motor, a manually-operated reversing-switch therefor, means for holding said switch normally in one operative position, and a switch controllable locally or from a distance for completing the motor-circuit when said reversing-switch is in said position, said reversing-switch being arranged in its other position to complete the motor-circuit independently of the other switch.

3. In combination, an electric motor, a reversing-switch therefor, means for holding said switch normally in one operative position, an operating-handle for said switch, a magnetically-operated switch adapted to complete the motor-circuit, and mechanical connections between said operating-handle and said magnetically-operated switch.

4. In combination, an electric motor, a reversing-switch therefor, means for holding said switch normally in one operative position, an operating-handle for said switch, a magnetically-operated switch adapted to complete the motor-circuit when said reversing-switch is in said position, said reversing-switch being arranged in its other position to complete the motor-circuit independently of the magnetically-operated switch, and mechanical connections between said operating-handle and said magnetically-operated switch.

5. In combination, an electric motor, a reversing-switch therefor, means for holding said switch normally in one operative position, a switch controllable from a distance and adapted to complete the motor-circuit, said reversing-switch being arranged in its other operative position to complete the motor-circuit independently of the second switch, an operating-handle, and operative connections between said handle and both of said switches whereby said reversing-switch is moved to its other position when said han-

dle is moved in one direction, and the second switch is moved to its closed position when said handle is moved in the other direction.

6. In combination, an electric motor, a reversing-switch therefor, means for holding said switch normally in one operative position, a switch controllable from a distance and adapted to complete the motor-circuit, an operating-handle, and operative connections between said handle and both of said switches.

7. In a controller for electric motors, a manually-operated shaft, a reversing-switch loosely journaled thereon, means for holding said switch normally in one operative position, a switch controllable from a distance, a member loosely journaled on said shaft and adapted when moved to move the second switch to closed position, and operative connections between said shaft and both said reversing-switch and said member whereby said switch or said member is moved when said shaft is moved in one direction or the other.

8. In a controller for electric motors, a manually-operated shaft, a reversing-switch loosely journaled thereon, means for holding said switch normally in one operative position, a switch controllable from a distance, a member loosely journaled on said shaft and adapted when moved to move the second switch to closed position, and means carried by said shaft for engaging said reversing-switch or said member when said shaft is moved in one direction or the other.

9. In combination, a switch, a magnet-winding adapted when energized to close said switch, a manually-controlled movable member, a spring connecting said switch to said member, said member being arranged to vary the direction of the tension of said spring on said switch, whereby said switch is opened and closed with a snap action by the movement of said member, and means for holding said member normally in position to open said switch.

10. In combination, a system of doors, a motor for raising and lowering each door, a reversing-switch for each motor, means for holding each switch normally in lowering position, a second switch for each motor adapted to complete the motor-circuit when the reversing-switch is in lowering position, means controllable from a distant point for operating the circuit-completing switches for the several doors, and means at each door for manually closing said circuit-completing switch or moving said reversing-switch to its raising position.

11. In combination, a system of doors, a motor for raising and lowering each door, a reversing-switch for each motor, means for holding each switch normally in lowering position, a second switch for each motor adapted to complete the motor-circuit when said reversing-switch is in lowering position, said reversing-switch being arranged in raising position to complete the motor-circuit independently of the second switch, an electromagnet for each circuit-completing switch, means at a distant point for controlling the circuits of the several electromagnets, and means at each door for manually closing the circuit-completing switch at that door or moving the reversing-switch to its raising position.

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

LAURENCE A. HAWKINS.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.