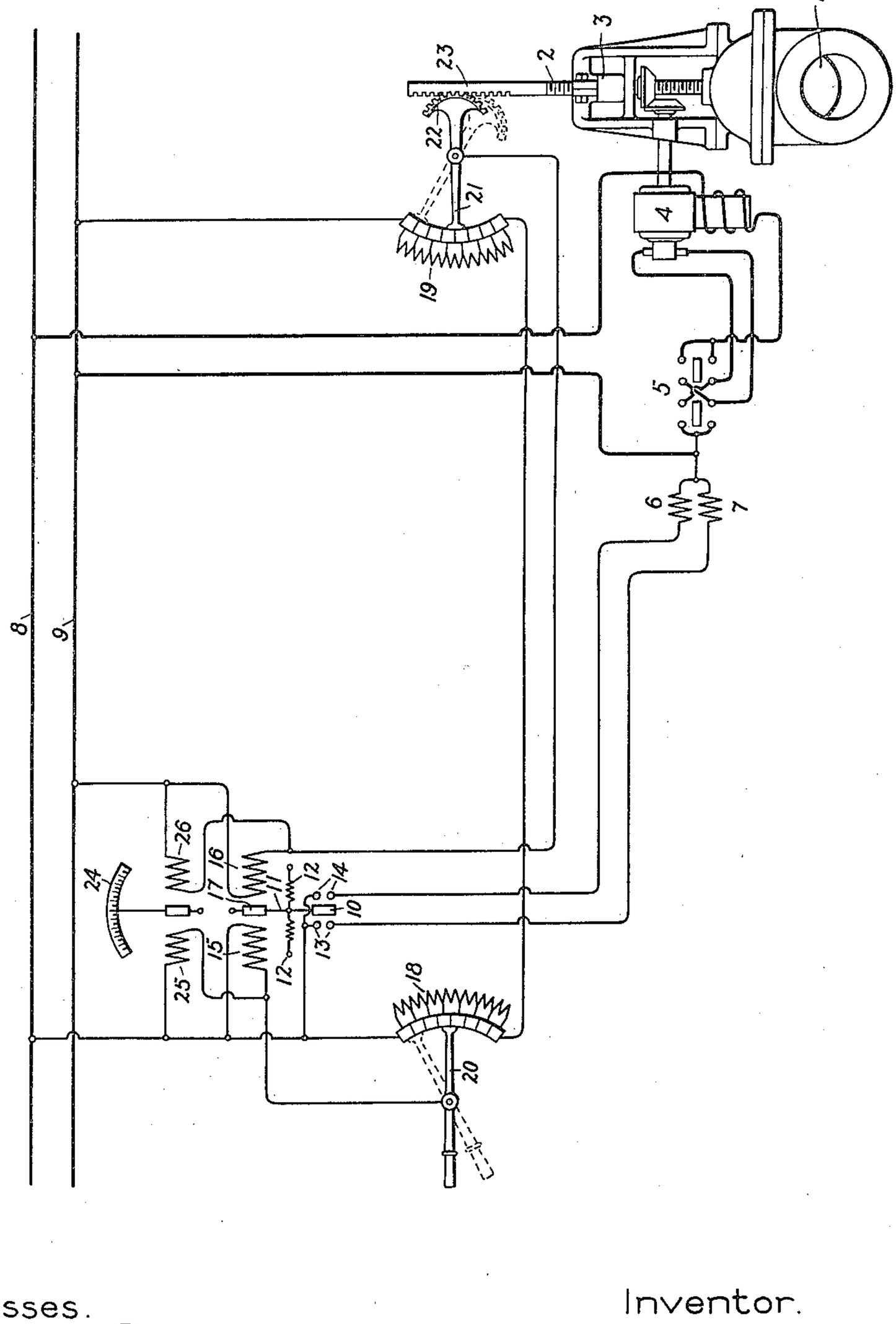
No. 786,024. PATENTED MAR. 28, 1905.

J. GOMBOROW.

SYSTEM OF DISTANT ELECTRICAL CONTROL.

APPLICATION FILED SEPT. 15, 1904.



Witnesses.

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No. 786,024. Patented March 28, 1905.

UNITED STATES PATENT OFFICE.

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SYSTEM OF DISTANT ELECTRICAL CONTROL.

SPECIFICATION forming part of Letters Patent No. 786,024, dated March 28, 1905.

Application filed September 15, 1904. Serial No. 224,541.

To all whom it may concern:

Be it known that I, JOEL GOMBOROW, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Systems of Distant Electrical Control, of which the following is a specification.

This invention relates to means for controlling the motion of an object within fixed limits, so that it can be stopped at any point in its travel and started in either direction from any such point.

The object of the invention is to render it possible to stop the object when the desired point of its travel has been reached, to indicate at the controlling-station the fact that the object is moving and its position at any instant while it is moving and the point at which it stops, and to effect the control and indication electrically in order to avoid the use of ropes, chains, gearing, &c., between the controlling-station and the working station, so that they can be separated hundreds or thousands of feet, if need be.

The accompanying drawing is a diagram of circuits embodying my system of distant electrical control.

The object to be moved may be a steam or hydraulic valve, a door, steering-gear, an elevator, or the like. In the drawing is indicated at 1 a gate-valve, having a screw-threaded stem 2, which can be raised and lowered by a rotatable nut 3, geared to an electric motor 4. The direction of rotation of the motor can be reversed in any suitable manner—as, for instance, by a reversing-switch 5, operated by two solenoids 6 7. Such switches are well known and need no detailed description. The motor is supplied with current from the mains 8 9. The two solenoids are connected in multiple across these or other mains, a double-throw switch being provided to close the circuit of one or the other of the solenoids at will. The switch has a contact 10, carried on a lever 11, which is held in a normal central position, as by springs 12. In order to move the lever one way or the other to close the contact on the studs 13 or 14, and thus close the circuit of one of the solenoids, I provide two electromagnets 15 16, which act in opposite directions on an armature 17, attached to the switch-lever. When these magnets are equally energized, they balance each other and the switch remains open. I will now describe the means for altering the current flowing through one or the other of said magnets, thereby unbalancing their effect on the armature 17 and closing the switch at the studs 13 or 14.

At the controlling-station is a rheostat 18, whose coils are in series with those of a second rheostat 19 near the valve-stem, the two rheostats being connected across the mains 8 9. A switch-arm 20 coöperates with the rheostat 18 and a switch-arm 21 with the rheostat 19. The contacts must be so arranged that the circuits of the magnets 15 16 will not be broken when the switch-arm passes from one stud to another. The arm 20 is movable by hand, while the arm 21 is geared to move with the valve-stem, preferably by means of a sector-gear 22 on the arm 21 meshing with a rack 23 on the upper end of the valve-stem. The electromagnet 15 has one terminal connected with the main 8 and the other with the switch-arm 20, so that it is in a shunt around that portion of the rheostat 18 between the main 8 and the contact-stud on which the switch-arm 20 rests, while the electromagnet 16 is similarly shunted around that portion of the rheostat 19 between the main 9 and the contact-stud on which the switch-arm 21 rests. A differential voltmeter or ammeter 24 has one coil, 25, in shunt to or in series with the electromagnet 15 and its other coil, 26, in shunt to the electromagnet 16.

The operation is as follows: So long as the switch-arms 20 21 rest on corresponding studs, so that the resistances in shunt to the two electromagnets 15 16 are equal, said magnets are equally energized and the switch remains open; but if the handle of the arm 20 is moved, say, downward, so that the arm itself moves up and includes less of the rheostat 18 in shunt to the magnet 15 then a smaller portion of the current will flow through the magnet 15, and the magnet 16

will attract the armature 17, so that the contact 10 will close on the studs 14, thereby energizing the solenoid 6, which closes the reversing-switch on the upper set of contacts (in the diagram) and starts the motor running in the right direction to close the valve—*i. e.*, move it downward. This movement causes the arm 21 to move upward and include less of the rheostat 19 in shunt to the electromagnet 16. The current through this magnet is thereby decreased, and when the arm 21 has cut out the same number of resistance-coils as the arm 20 the currents through the two magnets will again be equal and the switch-lever 11 will be returned to its central position, open-circuiting the solenoid 6 and allowing the reversing-switch to open and stop the motor. A reverse movement of the handle of the arm 20—*i. e.*, upward—will cause an increase of the current in the magnet 15 and a consequent closing of the contact 10 on the studs 13, thereby causing the motor to run the valve upward. The differential voltmeter or ammeter index stands in a central zero position when both electromagnets 15 16 are taking an equal current; but when either of them overbalances the other the voltmeter or ammeter needle swings to one side or the other, as the case may be, and then gradually returns to zero in synchronism with the movement of the valve.

It will be seen that this system fulfils the requirements set forth at the beginning of this specification and that it is applicable to many different situations requiring distant electrical control of a movable object, requiring only four controlling-wires between the control-station and the working station.

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

1. In a control system for a distant object, the combination with two rheostats, of a hand switch-arm for one, a switch-arm for the other geared to said object, an electric motor for moving said object, and a switch for controlling the motor comprising two opposed electromagnets respectively in shunt to variable portions of the rheostats.

2. In a control system for a distant object, the combination with supply-mains, of two rheostats connected across said mains, a switch-arm for each rheostat, one movable by hand and the other geared to said object, an electric motor for moving said object, and a switch for reversing the motor comprising two opposed electromagnets respectively in shunt to those portions of the rheostats between the switch-arms and the mains.

3. In a control system for a distant object, the combination with supply-mains, of two rheostats connected across said mains, a switch-arm for each rheostat, one movable by hand and the other geared to said object, an electric motor for moving said object, a switch for reversing the motor comprising two opposed electromagnets respectively in shunt to those portions of the rheostats between the switch-arms and the mains, and a differential voltmeter having opposed coils respectively in shunt to said electromagnets.

In witness whereof I have hereunto set my hand this 12th day of September, 1904.

JOEL GOMBOROW.

Witnesses:

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HENRY O. WESTENDARP.