

No. 878,855.

PATENTED FEB. 11, 1906.

T. E. BARNUM.

SYSTEM FOR CONTROLLING THE OPERATION OF ELECTRIC MOTORS.

APPLICATION FILED JULY 10, 1905.

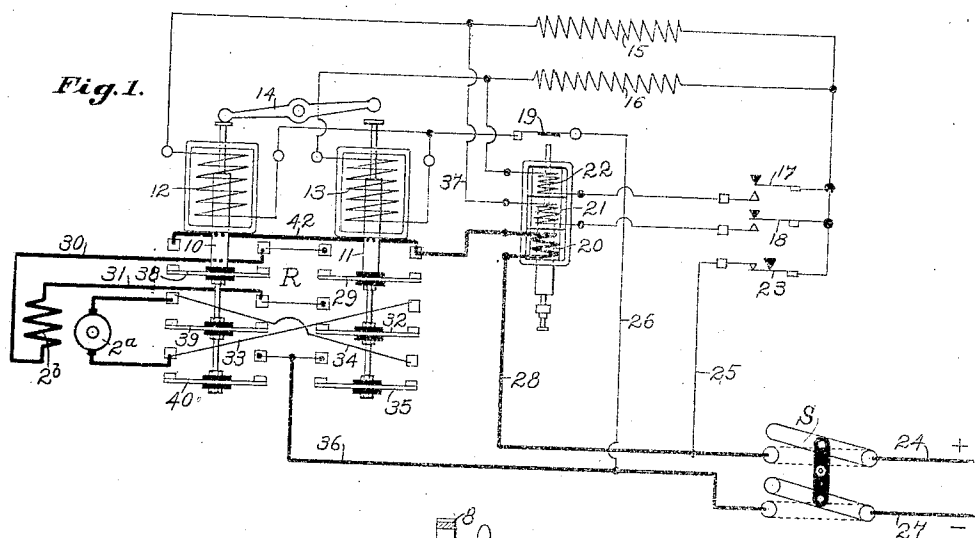
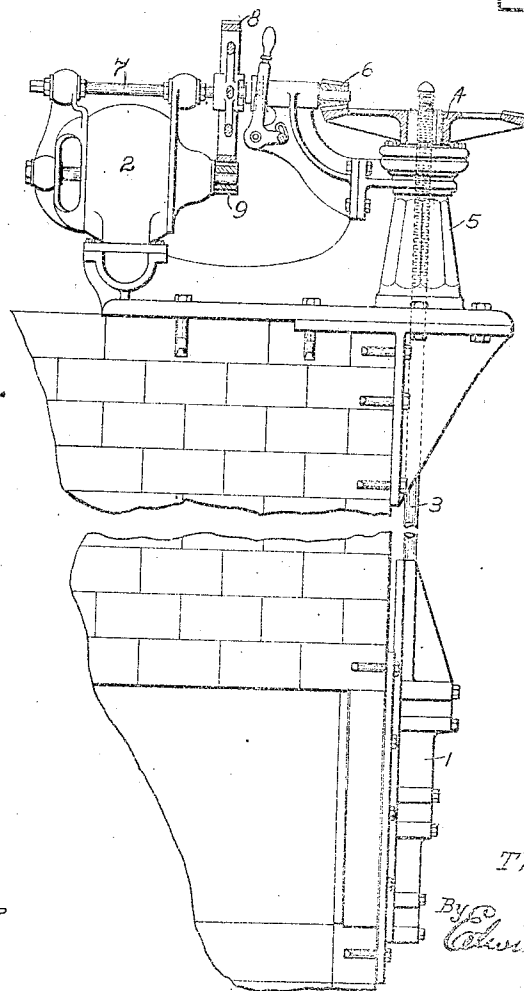


Fig. 2.



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SYSTEM FOR CONTROLLING THE OPERATION OF ELECTRIC MOTORS.

No. 878,855.

Specification of Letters Patent.

Patented Feb. 11, 1908.

Application filed July 10, 1905. Serial No. 268,974.

To all whom it may concern:

Be it known that I, THOMAS E. BARNUM, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Systems for Controlling the Operation of Electric Motors, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to improvements in systems for controlling the operation of electric motors.

The object of my invention is to provide a system by means of which the operation of the motor may be controlled from a distant point.

The other objects of my invention will be understood from the description of the system which is contained herein.

For the purpose of illustrating my invention, I have designed the system which is illustrated in the accompanying drawing, in which,

Figure 1 shows a diagram of my system, and Fig. 2 illustrates a valve.

Although I preferably employ my system for the purpose of operating valves, it will be understood that it may be applied to other purposes.

The valve 1, which is illustrated in Fig. 2 of the drawing, is connected or geared to a motor 2. This valve is preferably attached to a screw 3, which is threaded into a gear 4. This gear bears upon a standard 5 and meshes with a pinion 6, which is mounted upon a countershaft 7. The motor 2 is geared to the countershaft by means of a gear 8 which is mounted upon the countershaft and meshes with a pinion 9 mounted upon the countershaft. The valve may be opened by running the motor in one direction, and closed by running said motor in the opposite direction. Of course, the valve 1 may be of any type and it may be geared or connected to the motor in various ways, so far as my invention is concerned.

I shall now describe my system for controlling the operation of the motor 2, reference being had particularly to Fig. 1. The motor is provided with an armature 2^a and a field 2^b. Of course, it may be of various forms.

I preferably provide a reversing switch R for controlling the motor circuit, it prefer-

ably being provided with plungers 10 and 11, which are adapted to be raised by electromagnetic windings or solenoids 12 and 13 respectively. The plungers carry switch contacts, and the same are preferably interlocked so that it will be impossible for both plungers to be raised simultaneously. The windings 12 and 13 are preferably connected in circuit in series with resistances 15 and 16 respectively, which may be short circuited by controlling switches 17 and 18. These controlling switches may be arranged at a distant point and by means of same the operation of the motor is directed.

The motor may be started by closing one or the other of the controlling switches 17 or 18, to cause the reversing switch to close the motor circuit, the switch 17 being closed, if it is desired to open the valve, and the switch 18 being closed, if it is desired to close the valve.

To open the motor circuit after the motor has been started, I preferably employ an overload switch 19, which I preferably provide with electro magnetic windings 20, 21 and 22, the windings 22 and 21 being wound to oppose the winding 20. The winding 20 is preferably arranged in circuit in series with the armature of the motor, and the windings 21 and 22 are preferably arranged in the short circuits around the resistances 15 and 16 respectively, so that the circuits of the same will be controlled by controlling switches 17 and 18. I preferably arrange with the controlling switches 17 and 18 a switch 23, by means of which the reversing switch may be opened whenever it is desired to stop the motor while the valve 1 is in an intermediate position.

I shall now describe the operation of my system.

If the main switch S be closed, current will flow from the positive main 24, through conductor 25, thence dividing through resistances 15 and 16 and windings 12 and 13, and finally through overload switch 19 and conductor 26 to the negative main 27. As the resistances 15 and 16 will not permit sufficient current to pass therethrough to energize the windings 12 and 13, the reversing switch will remain open. If now the controlling switch 17 be closed to short circuit the resistance 16, a circuit will be established from the positive main 24 through the conductor 25, switch 23, controlling switch 17, winding

22, winding 13, overload switch 19 and conductor 26 to the negative main 27. The winding 13 will then raise the plunger 11, thereby causing the motor circuit to be closed from the positive main 24 through the conductor 28, overload magnet 20, switch contact 29, conductor 30, field 2^b, conductor 31, switch contact 32, conductor 33, armature 2^a, conductor 34, switch contact 35 and conductor 36 to the negative main 27. Inasmuch as the winding 22 opposes the overload magnet 20, it will prevent said overload magnet from responding to the heavy current which flows through the same during the period of starting the motor. After the motor has passed through the starting period; the switch 17 may be opened, it being no longer necessary to have the winding 22 opposed to overload magnet 20, as the current flowing through said overload magnet will then be reduced by the counter electro motive force of the motor. The motor having been started, it will cause the valve to be raised. As soon as the valve has been opened, the motor will be stalled and in consequence the current in the motor circuit will increase to such an extent that the overload magnet will respond, thereby causing the overload switch 19 to open the circuit of winding 13. The reversing switch will then open the motor circuit. If now the controlling switch 18 be closed, the resistance 15 will be short circuited, and current will flow from the positive main 24 through conductor 25, switch 23, controlling switch 18, winding 21, conductor 37, winding 12, overload switch 19 and conductor 26 to the negative main 27. The winding 12 will then raise the plunger 10 to cause the reversing switch to close the motor circuit from the positive main 24, through conductor 28, overload magnet 20, switch contact 38, conductor 30, field 2^b, conductor 31, switch contact 39, armature 2^a, switch contact 40, and conductor 36 to the negative main 27. With the motor circuits closed in this manner, the motor will lower the valve 1. While the switch 18 remains closed, the winding 21 will oppose the overload magnet 20 and accordingly it will prevent the overload switch being opened during the period of starting the motor. As soon as the valve has been closed, the motor will be stalled. As the overload magnet will then respond, the overload switch will open the circuit of winding 12, and thus cause the reversing switch to open the motor circuit. If it is desired to stop the motor at any time while the valve is in an intermediate position, the switch 23 may be opened, thereby causing either the winding 12 or the winding 13 to be deenergized so that the reversing switches will open the motor circuit.

It will be understood that various changes may be made in the system which I have

illustrated and described herein without in any way departing from my invention.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. In a system for controlling the operation of electric motors, in combination, a motor, electro magnetic means for closing the motor circuit to start the motor, an electro responsive overload device for opening the motor circuit to stop the motor, and means temporarily in operative relation with said overload device for preventing the same from responding during the period of starting the motor.
2. In a system for controlling the operation of electric motors, in combination, a motor, means for closing the motor circuit to start the motor, means for stalling the motor after the same operates for a prearranged period, an electro responsive device for opening the motor circuit after the motor becomes stalled, and means for preventing said overload device from responding during the period of starting the motor.
3. In a system for controlling the operation of electric motors, in combination, a motor, a magnetically operated switch for closing the motor circuit to start the motor, means for controlling the operation of said switch from a distant point, means adapted to stall said motor after it operates for a prearranged period, an electro responsive overload device adapted to open the motor circuit, and means for preventing said device from responding during the period of starting the motor.
4. In a system for controlling the operation of electric motors, in combination, a motor, a magnetically operated reversing switch for closing the motor circuit to start the motor, means for controlling the operation of said switch from a distant point, means adapted to stall said motor after it operates for a prearranged period, an electro responsive device adapted to open the motor circuit, and means for preventing said device from responding during the period of starting the motor.
5. In a system for controlling the operation of electric motors, in combination, a motor, electro magnetic means for closing the motor circuit to start the motor, an electro responsive overload device for opening the motor circuit, an electro magnetic winding adapted to prevent said device from responding during the period of starting the motor.
6. In a system for controlling the operation of electric motors, in combination, a motor, electro magnetic means for closing the motor circuit to start the motor, an overload electro magnet, means adapted to be operated by said magnet to open the motor circuit, a winding adapted to oppose said magnet, and

means for closing the circuit of said winding to prevent said overload magnet from responding during the period of starting the motor.

7. In a system for controlling the operation of electric motors, in combination, a motor, a motor switch for closing the motor circuit to start the motor, an overload magnet, means adapted to be operated by said magnet to open the motor circuit, a controlling switch for controlling the operation of said motor switch, and an electro magnetic winding adapted to oppose said overload magnet to prevent said magnet from responding during the period of starting the motor, said winding being arranged in circuit to have the circuit thereof controlled by said controlling switch.

8. In a system for controlling the operation of electric motors, in combination, a motor, a magnetically operated switch for closing the motor circuit during the period of starting the motor, means for controlling the operation of said switch from a distant point, an overload magnet, means adapted to be operated by said magnet to open the motor circuit, and an electro magnetic winding adapted to oppose said overload magnet during the period of starting the motor to prevent said magnet from responding.

9. In a system for controlling the operation of electric motors, in combination, a motor, a magnetically operated motor switch for closing the motor circuit to start the motor, a controlling switch arranged at a distant point for controlling the operation of said motor switch, an overload magnet, means adapted to be operated by said overload magnet to open the motor circuit, and an electro magnetic winding adapted to oppose said overload magnet during the period of starting the motor.

10. In a system for controlling the operation of electric motors, a motor, a motor switch, an electro magnetic winding adapted to operate said switch to close the motor circuit, a resistance arranged in circuit in series with said winding, a switch adapted to short circuit said resistance, an overload magnet arranged in circuit in series with the armature of said motor, means adapted to be operated by said overload magnet to open the motor circuit, and an electro magnetic winding adapted to oppose said overload magnet and adapted to have the circuit thereof closed by said controlling switch during the period of starting the motor.

11. In a system for controlling the operation of electric motors, in combination, a motor, a motor switch, an electro magnetic winding adapted to operate said switch to close the motor circuit, a resistance arranged in circuit in series with said winding, a controlling switch adapted to short circuit said resistance, an overload magnet arranged in

circuit in series with the armature of said motor, an overload switch adapted to be operated by said overload magnet to open the circuit of said winding for operating said motor switch, and an electro magnetic winding adapted to oppose said overload magnet and arranged in circuit to have the circuit thereof closed by said controlling switch during the period of starting said motor.

12. In a system for controlling the operation of electric motors, in combination, a motor, a reversing switch for said motor, electro magnetic windings for operating said switch, switches for controlling the operation of said reversing switch, an overload electro magnet arranged in circuit in series with the armature of said motor, means adapted to be operated by said overload magnet to open the motor circuit, and electro magnetic windings adapted to oppose said overload magnet during the period of starting the motor.

13. In a system for operating valves, in combination, a valve, a motor adapted to operate said valve, means for closing the motor circuit to start the motor, an electro responsive overload device adapted to respond whenever the motor becomes stalled by opening or closing the valve, and means for preventing said device from responding during the period of starting the motor.

14. In a system for operating valves, in combination, a valve, a motor adapted to operate said valve, a magnetically operated motor switch adapted to close the motor circuit to start the motor, means adapted to control the operation of said motor switch, an overload magnet arranged in circuit in series with the armature of said motor, means adapted to be operated by said overload magnet to open the motor circuit whenever the motor becomes stalled by opening or closing said valve, and an electro magnetic winding adapted to oppose said overload magnet during the period of starting the motor.

15. In a system for operating valves, in combination, a valve, a motor adapted to operate the same, a magnetically operated reversing switch adapted to close the motor circuit to start the motor, means for controlling the operation of said reversing switch, an overload electro magnet, means adapted to be operated by said overload magnet to open the motor circuit whenever the motor becomes stalled by opening or closing said valve, and means for preventing said overload magnet from responding during the period of starting the motor.

16. In a system for operating valves, in combination, a valve, a motor adapted to operate said valve, a reversing switch, electro magnetic windings for operating said switch, switches for controlling the operation of said reversing switch, an overload electro magnet arranged in circuit in series with the arma-

ture of said motor, means adapted to be operated by said overload magnet to open the motor circuit whenever the motor becomes stalled by opening or closing said valve, and electro magnetic windings adapted to oppose said overload electro magnet during the period of starting the motor.

17. In a system for operating valves, in combination, a valve, a motor adapted to operate said valve, a reversing switch adapted to close the motor circuit to start the motor, electro magnetic windings for operating said reversing switch, resistances arranged in circuit in series with said windings, switches adapted to short circuit said resistances, an overload electro magnet arranged in circuit in series with the armature of said motor, a switch adapted to be operated by said overload magnet to open the circuits of said windings, an electro magnetic winding arranged in the short circuits around said resistances and adapted to oppose said overload magnet.

18. In combination, a translating device, an electro-magnetically operated switch for controlling the circuit of said translating device, means for controlling said switch from a distant point, an overload device for causing the circuit of said translating devices to be opened when a predetermined current flows, and means temporarily in operative relation with said overload device to prevent the same from responding.

19. In combination, an electro magnetically operated switch, means for controlling said switch, an overload device, and means temporarily in operative relation with said overload device to prevent the same from responding.

20. In combination, an electro magnetically operated switch, means by which said switch is controlled from a distant point, an overload device, and an electro magnetic winding by means of which said device is temporarily prevented from responding.

21. In combination, an electro magnetically operated switch, an overload device for causing said switch to be opened, and an electro magnetic winding for temporarily preventing said overload device from responding.

22. In combination, an electro magnetically operated reversing switch, an overload device for causing said switch to be opened when a predetermined current flows, and an electro magnetic winding for temporarily preventing said overload device from responding.

23. In combination, a main switch, an

electro magnetic winding for operating said main switch, an overload switch arranged in the circuit of said winding, an overload coil for opening said overload switch, and a coil for temporarily preventing said overload coil from responding.

24. In combination, a main switch, an electro magnetic winding for operating the same, an overload switch arranged in the circuit of said electro magnetic winding, an overload coil for opening said overload switch when a predetermined current flows, a coil for opposing the action of said overload coil, and means by which the circuits of said winding and said opposing coil are controlled.

25. In combination a main switch, an electro magnetic winding for operating the same, a resistance arranged in series with said winding, an overload switch arranged in the circuit of said winding, an overload coil for opening said overload switch, a coil for opposing said overload coil, and a switch for short circuiting said resistance and closing the circuit of said opposing coil.

26. In combination, a reversing switch, electro magnetic windings for operating the same, an overload switch arranged in the circuits of said windings, an overload coil for operating said overload switch, a coil for opposing the action of said overload switch and also the energization of said opposing coil.

27. In combination, a reversing switch, electro magnetic windings for operating the same, an overload switch arranged in the circuit of said windings, an overload coil for operating said overload switch, electro magnetic windings adapted to oppose action of said overload coil, and means for causing the operation of said reversing switch and the energization of said opposing coils.

28. In combination, a reversing switch, electro magnetic windings for operating the same, resistance arranged in the circuits of said windings, an overload switch arranged in the circuits of said windings, an overload coil for operating said overload switch, coils for opposing the action of said overload coil, and switches for short circuiting said resistance and closing the circuit of said opposing coils.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

THOMAS E. BARNUM.

Witnesses:

J. F. HAWKINS,

EDWIN B. H. TOWER, Jr.