

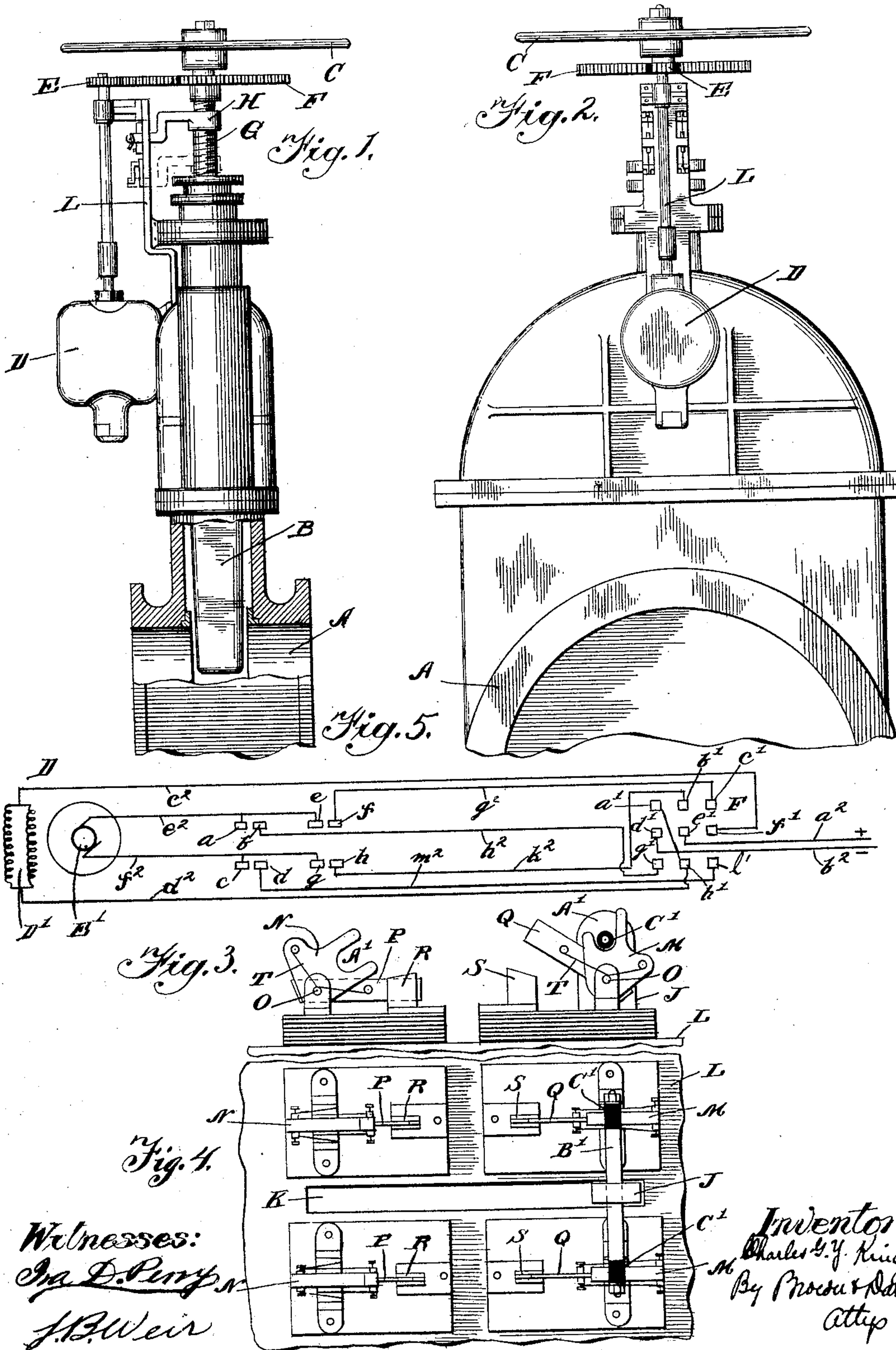
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Patented July 22, 1902.

C. G. Y. KING.  
MEANS FOR OPERATING VALVES.

(Application filed Nov. 14, 1901.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

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## MEANS FOR OPERATING VALVES.

SPECIFICATION forming part of Letters Patent No. 705,250, dated July 22, 1902.

Application filed November 14, 1901. Serial No. 82,198. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES G. Y. KING, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Means for Operating Valves, of which the following is a specification.

This invention relates to means for operating valves.

10 The object of the invention is to provide power mechanism for operating gate or other valves wherein the motive power is not required to effect the final movement of the valve in closing or the initial movement in  
15 opening the valve.

A further object of the invention is to provide means for automatically arresting the power-actuating mechanism.

20 A further object of the invention is to provide means for manually moving the valve in its initial movement in opening and to complete such opening movement by power-actuated mechanism.

25 A further object of the invention is to provide power mechanism for effecting the closing movement of the valve and manually-actuated mechanism for effecting the final closing movement of the valve.

30 Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location, and arrangement of parts, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

Referring to the accompanying drawings, and to the various views and reference-signs appearing thereon, Figure 1 is a view in side elevation of a construction of valve-operating means embodying the principles of my invention, parts of the valve-casing being broken out and parts in vertical section. Fig. 2 is a broken view in elevation, taken  
45 from the left of Fig. 1. Fig. 3 is a broken detail view in side elevation, showing the means for automatically arresting the motor at the limits of the movement thereof. Fig. 4 is a top plan view of the construction shown  
50 in Fig. 3. Fig. 5 is a diagram showing the motor-circuits.

The same part is designated by the same

reference-sign wherever it occurs throughout the several views.

In the case of gate or other valves employed 55 in connection with pipes, conduits, and the like it is desirable to provide means for quickly operating the valve to open and to closed position. In the case of pipes and conduits, water-mains, and the like, in which 60 high pressure is maintained, it is difficult to manually operate the valve on account of the pressure imposed upon one side thereof by the pressure medium in the pipe, conduit, main, or the like. Moreover, it is usual to 65 construct valves, and particularly gate-valves, of wedge shape in order to enable the same to be efficiently received and seated in its seat, and by reason of the wedging of the valve in its seat when seated, combined with 70 the influence of the pressure exerted thereagainst by the pressure medium in the pipe, main, or conduit, considerable power is required to initially start the valve from its seat in opening and to complete the final 75 movement of the valve into its seat in closing.

It is the special purpose of my invention to provide a construction of power mechanism for moving the valve to its open and toward its closed position, and in order to relieve the 80 power mechanism of the strains and injurious effects incident to the large amount of power required to be developed in initially starting the valve from its closed position and in effecting the final movement of the valve to 85 its closed position, I propose to combine with manually-actuated devices for imparting the initial opening movement of the valve and for completing the final closing movement of the valve, a power mechanism whereby the valve 90 having been started by hand out of its seat in opening its opening movement is completed quickly by power mechanism, and also whereby, in closing, the power mechanism will effect quickly the closing movement of the 95 valve until it approaches its closed position and the final closing movement may be effected by hand or manually, and in carrying out my invention I provide means for automatically arresting the motor or power mechanism before the valve completes its closing movement and also when the valve has been completely opened.

Various specific constructions and arrange-



ments of gearing and power mechanism for accomplishing these objects may be employed in carrying out the principles of my invention. While, therefore, I have shown and will now describe one form which I have found in practice efficient for the accomplishment of the desired object, I do not desire to be limited or restricted to the exact and specific construction and arrangement shown and described.

In the drawings, A represents a pipe-main, conduit, or the like, and B the valve, which in the particular form shown is of the gate-valve variety. This valve is provided with a threaded valve-stem, to which is connected a hand-wheel C, by which the initial starting movement may be imparted to the valve in opening and the final closing movement may be given to the valve.

D designates a motor, which in the form shown may comprise an electric motor, although it is evident that any other form of motor may be employed.

The motor D is suitably geared to the valve-stem—as, for instance, by means of the intermeshing gears E F, respectively mounted upon the shaft of the motor and the valve-stem—whereby when the motor is actuated the valve is moved toward open or closed position, according to the direction of action of the motor. Upon the threaded portion G of the valve-stem is mounted a traveling nut H, formed with or connected to an arm J, suitably held from rotation, so that when rotation is imparted to the valve-stem said arm will travel back and forth upon the valve-stem, according to the direction of rotation imparted to the valve-stem. In the particular form shown the arm J operates through a slot K in a frame or plate L, suitably supported upon the valve-casing or otherwise.

M N designate rocking blocks, pivotally mounted, as at O, and carrying contact-levers P Q, cooperating with contacts R S for controlling the circuits of the motor. A suitable tension—such, for instance, as springs T—may be employed for normally maintaining the blocks M N rocked into position to snap contact-levers P Q into contact with contacts R S, respectively. The blocks M N are provided with seats A', (see Fig. 3,) adapted to receive the ends of a bar B', carried by arm J. The rocking blocks M N are arranged, respectively, at the limits of travel of arm J, and the seats A' are faced in opposite directions—that is, are presented toward each other—so that when arm J approaches one limit of its movement the end of bar B', carried thereby, will enter the seat A' in one of the rocking blocks, thereby rocking said block so as to break circuit between the lever Q or P, carried thereby, and its cooperating contact S or R, as the case may be, and similarly when the arm J moves in the opposite direction from one of its limits of travel it will cause the block M or N, as the case may be, to rock so as to close the switch-lever thereof

upon its cooperating contact and will leave the block M or N in proper position to receive the end of bar B' upon completing the return movement of said bar or arm J'. The ends of arm B', which engage or are received in the seats of blocks M N, are preferably covered with insulation, as indicated at C'. As above indicated, the switch-arms P Q, in connection with their cooperating contacts R S, control the circuits of the motor, and therefore from the foregoing description it will be seen that when the arm J approaches the limit of its travel in either direction it will open the circuits of the motor, thereby automatically arresting the motor, and when said arm J begins its travel it leaves the adjacent switch arm or lever in closed position ready to permit of the reversal of the motor, as will presently appear more fully.

In Fig. 5 I have illustrated in diagram the circuits of the motor, in which D' designates diagrammatically the motor-field, and E' the motor-armature. *a b c d* represent diagrammatically the pair of switch-levers P and their cooperating contacts R. *e f g h* illustrate diagrammatically the pair of switch-levers Q and their cooperating contacts S. F' designates diagrammatically a main hand or wall switch, which may be of the usual construction and arrangement for completing circuit with a source of current-supply and comprises the contacts *a' b' c' d' e' f' g' h' l'*. *a<sup>2</sup> b<sup>2</sup>* designate, respectively, the supply and return wires communicating with a source of current-supply. These conductors terminate at the contacts *d' e'* of the main switch. *c<sup>2</sup> d<sup>2</sup>* designate, respectively, the circuit-wires of the motor-field windings and are in electrical connection with the contact-points *f' h'* of the main switch. *e<sup>2</sup> f<sup>2</sup>* are respectively the circuit-wires of the motor-armature, the wire *e<sup>2</sup>* being in electrical connection with the contacts *a e* and the wire *f<sup>2</sup>* being in electrical connection with the contacts *c g*. Contact *f* is in electrical connection with main-switch contact *c'* through wire *g<sup>2</sup>*. Contact *b* is in electrical connection with main-switch contact *g'* through wire *h<sup>2</sup>*. Contact *h* is in electrical connection with contact *b'* of the main switch through wire *l<sup>2</sup>*, and contact *d* is in electrical connection with contact *l'* of the main switch through wire *m<sup>2</sup>*. In starting up the motor the main switch is manipulated to close circuit between contacts *e'* and *f'*, between *a'* and *b'*, and assuming the parts of the automatic circuit-breaking switches to be in their relative positions thereof as shown in Fig. 3—that is, automatic switch-levers P, closed upon contacts R, referring to the diagram in Fig. 5, with the circuit closed between contacts *a b* and *c d*—the main switch F' is manipulated to close the circuit in starting the motor between contacts *d'* and *g'* and contacts *f' l'*. Under these circuit conditions the circuit of the motor may be traced as follows: from the main or positive supply-wire *a<sup>2</sup>* to contact *e'*, to contact *f'*, where the current divides, part pro-



ceeding through wire  $c^2$ , through the motor-field  $D'$ , thence through wire  $d^2$  to contact  $h'$ , to contact  $a'$ , to contact  $d'$ , to return-wire  $b^2$ . The other part of the current traverses a circuit from contact  $f'$  to contact  $l'$ , wire  $m^2$ , contacts  $d c$ , wire  $f^2$ , the armature  $E'$  of the motor, wire  $e^2$ , contacts  $a b$ , wire  $h^2$ , contact  $g'$ , contact  $d'$ , to return-wire  $b^2$ , thus starting up the motor in one direction. The motor continues to operate under these conditions until the arm  $J$  reaches the limit of its travel from the position thereof as shown in Figs. 3 and 4 toward the left. At the beginning of this travel of arm  $J$  the contact-blocks  $M$  are rocked so as to cause contact-levers  $Q$  to make electrical connection with their cooperating contacts  $S$ . This, however, does not disturb the circuits of the motor, and the bridging at this point of contacts  $e f$  and  $g h$  does not effect a continuation of the operation of the motor under the conditions previously described. The motor continues to operate until the arm  $J$  completes its travel, thereby bringing arm  $B'$  into position to engage or to be received in the seats  $A'$  of switch-blocks  $N$ , thereby rocking said switch-blocks, so as to break circuit connection between switch-levers  $P$  and their cooperating contacts  $R$ , thus breaking the motor-armature circuit between the contacts  $a b$  and  $c d$ , and hence the motor is arrested, while the contact-blocks  $M$  at the opposite limit of travel of bar  $B'$  are in position to receive said arm to arrest the motor when said arm is returned to its opposite limit of travel. Supposing the operation above described effects a movement of the valve toward closed position, then in accordance with the principles of my invention the switch-blocks  $N$  are so located as to be opened to break the motor-circuits and to arrest the motor before the valve reaches its extreme seated position. Thereafter the final or seating movement of the valve is imparted by hand through the manual operation of hand-wheel  $C$ . Thus the motor is not required to develop the increased power necessary to effect the final movement of the valve in closing, and hence the danger of burning out the motor or of overloading it is avoided, the final movement of the valve in closing being effected manually. Now suppose it is desired to open the valve. The initial opening movement is imparted by manual operation of hand-wheel  $C$ , thereby loosening the valve in its seat. Then the main switch  $F'$  is manipulated to close circuit between contacts  $e' f'$  as before and  $a' b'$  as before, thereby completing the circuit of the motor-field in identically the same manner as above described. The main switch  $F'$  is also manipulated to break the circuits between the contacts  $f' l'$  and between  $d' g'$  and complete the circuits between  $f' c'$  and between  $a' b'$ , whereupon the motor-armature circuit is completed as follows: from main supply-wire  $a^2$ , contact  $e'$ , contact  $f'$ , contact

$c'$ , wire  $g^2$ , contacts  $f e$ , wire  $e^2$ , the motor-armature  $E'$ , wire  $f^2$ , contacts  $g h$ , wire  $h^2$ , contact  $b'$ , contact  $a'$ , contact  $d'$ , to the return-wire  $b^2$ , thus starting up the motor in the reverse direction from that above described, it being remembered that the contacts  $e f$  and  $g h$  were closed when the bar  $b'$  left its original initial position, and the motor will revolve in the opposite direction. The starting up of the motor under these conditions will cause a travel of arm  $B'$  in the opposite direction—that is, toward the position thereof as shown in Figs. 3 and 4. The initial movement of arm  $B'$  toward the original starting position effects a rocking of switch-blocks  $N$  into the positions thereof indicated in Figs. 3 and 4, thereby closing switch-levers  $P$  into electrical connection with their corresponding contacts  $R$ , thus leaving the circuit closed between contacts  $a b$  and  $c d$  in the diagram in Fig. 5 without disturbing the circuit relations under which the motor is operating, but leaving the circuit connections in proper condition for another reversal of the direction of operation of the motor when it is desired to close the valve, and when bar  $B'$  reaches the limit of its movement the switch-levers  $Q$  are actuated to break the operating-circuits of the motor, thus automatically arresting the motor. Thus the motor is not called upon to exert the enormous starting torque which is necessary to unseat the valve or loosen the same in its seat. Consequently the motor is relieved of the danger of overloading or of burning out its windings in starting the valve toward open position.

The operation will be readily understood and is exceedingly simple and is as follows: The main switch  $F'$  is manipulated to start the motor in one direction or the other, according as it is desired to open or close the valve, and when said switch is properly manipulated the motor starts up and effects the opening or closing movement of the valve quickly and expeditiously. If the movement thus imparted to the valve is toward closed position, the motor is automatically arrested before the valve reaches its final closed position, and the final movement of the valve is effected manually by the manipulation of the hand-wheel. Similarly an initial or starting movement toward open position is effected manually by the manipulation of hand-wheel  $C$ , and the valve is then opened expeditiously and quickly by the power mechanism.

Having now set forth the object and nature of my invention and a construction embodying the principles thereof, I desire to be understood that many variations and changes in the details of construction and arrangement would readily occur to persons skilled in the art and still fall within the spirit and scope of my invention. My invention is therefore not limited to the exact and specific construction shown and described.



What I claim as new and useful and of my own invention, and desire to secure by Letters Patent, is—

1. The combination with a valve, a motor  
5 for actuating said valve, means for automatically arresting said motor before the valve reaches its final position in closing, and auxiliary means for completing the final movement of the valve, as and for the purpose set  
10 forth.

2. The combination with a valve, power mechanism for operating said valve, means for automatically arresting the power mechanism before the valve reaches its closed position, and manually-actuated devices for  
15 completing the closing movement of the valve, as and for the purpose set forth.

3. The combination with a valve and power mechanism for operating the same, of manually-actuated devices for imparting the initial movement to the valve in opening, as and  
20 for the purpose set forth.

4. The combination with a valve and power mechanism for operating the same, of manually-actuated devices for initially starting the valve toward open position, and means for  
25 automatically arresting the power mechanism when the valve reaches its completely open position, as and for the purpose set forth.

5. The combination with a valve, an electric motor for operating said valve, circuits for said motor, means for opening the circuit of said motor before the valve completes its movement toward closed position, and manual  
30 actuated devices for completing the closing movement of the valve, as and for the purpose set forth.

6. The combination with a valve and an electric motor for operating the same, circuits  
40 for said motor, of manually-actuated devices for initially starting the valve toward open position, and means for opening the circuit of said motor when the valve reaches the limit of its opening movement, as and for the  
45 purpose set forth.

7. The combination with a valve, a stem therefor, an operating hand-wheel connected to said stem, power mechanism, and gearing connected to said power mechanism and  
50 valve-stem, the initial movement of the valve in opening being imparted by the hand-wheel and the movement completed by the power mechanism, as and for the purpose set forth.

8. The combination with a valve, of manual actuating devices connected to said valve  
55 for imparting the initial movement to the valve in opening, and power mechanism also connected to said valve for completing the opening movement, as and for the purpose set forth.

9. The combination with a valve having a threaded stem, a motor geared to said valve-stem for actuating the same, a nut mounted  
60 upon said threaded stem and held against rotation, means actuated by the travel of said

nut for automatically arresting said motor before the valve reaches the limit of its movement in closing, and auxiliary means for completing the closing movement of the valve, as  
70 and for the purpose set forth.

10. The combination with a valve having a threaded stem, an electric motor geared to said stem, circuits for said motor, a traveling nut mounted on said stem, means actuated  
75 by said traveling nut for automatically opening the circuits of said motor before said valve reaches the limits of its movement in closing, and auxiliary means for completing the closing movement of the valve, as and for the purpose set forth.

11. The combination with a valve having a threaded stem, a motor geared to said valve, circuits for said motor, a traveling nut mounted on said stem, a bar carried by said nut, and switch-levers arranged in the path of  
80 travel of said bar and arranged to be engaged thereby to be opened or closed, said switch-levers being arranged in the circuits of said motor, as and for the purpose set forth.

12. The combination with a valve having  
90 a threaded stem, a motor geared to said stem, a traveling nut mounted on said stem, a bar carried by said nut, switch-blocks arranged to be engaged by said bar at the limits of travel thereof, and switch-arms carried  
95 by said switch-blocks and operating to automatically open the motor-circuits to arrest the motor at the limits of travel of said bar, as and for the purpose set forth.

13. The combination with a valve having  
100 a threaded stem, of a motor geared to said valve-stem, a traveling nut mounted on said stem, a bar carried by said nut, oppositely-presented switch-blocks arranged respectively at the limits of travel of said nut to be  
105 engaged by said bar as it approaches the limits of its travel, whereby in the initial movement of said bar the adjacent switch-block is left in position to close a circuit of the motor, and in the final movement of said bar a  
110 switch-block is actuated to open the circuit of the motor, as and for the purpose set forth.

14. The combination with a valve, a threaded stem therefor, a nut mounted on said threaded stem, a hand-wheel connected to  
115 said stem, a motor geared to said stem, contacts arranged in the circuits of said motor and arranged to be engaged and actuated by said traveling nut to open and close the motor-circuits, said contacts being arranged to  
120 open the motor-circuits before the valve, in closing, reaches its final closing movement, as and for the purpose set forth.

In witness whereof I have hereunto set my hand, this 7th day of November, 1901, in the  
125 presence of the subscribing witnesses.

CHARLES G. Y. KING.

Witnesses:

S. E. DARBY,  
CHAS. H. SEEM.