

Dec. 24, 1929.

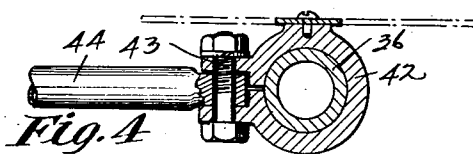
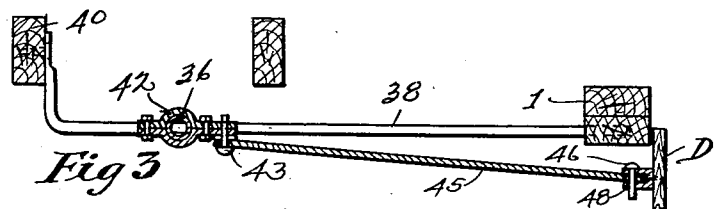
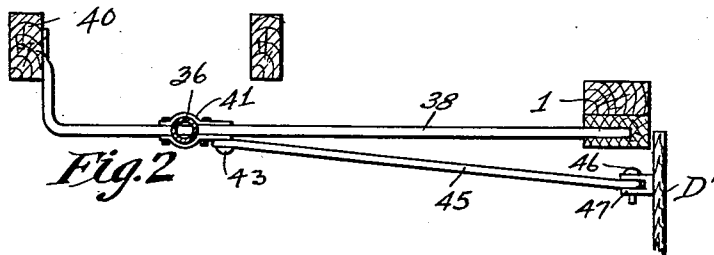
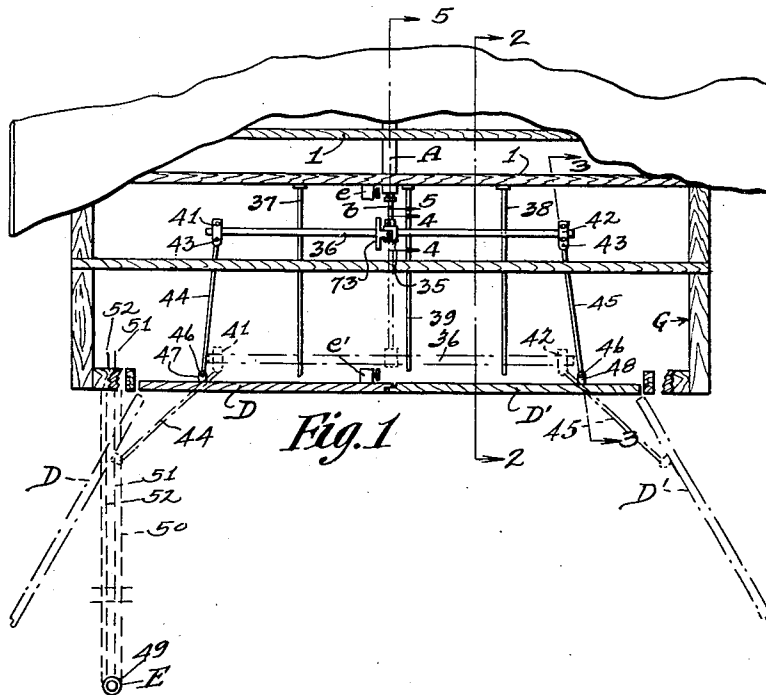
T. C. SHARP

1,740,877

GARAGE DOOR OPENING DEVICE

Filed May 25, 1927

3 Sheets-Sheet 1



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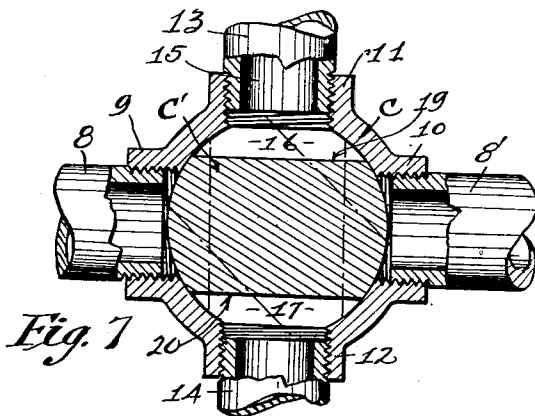
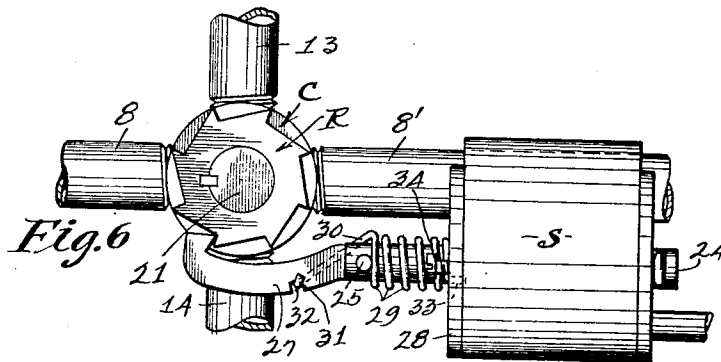
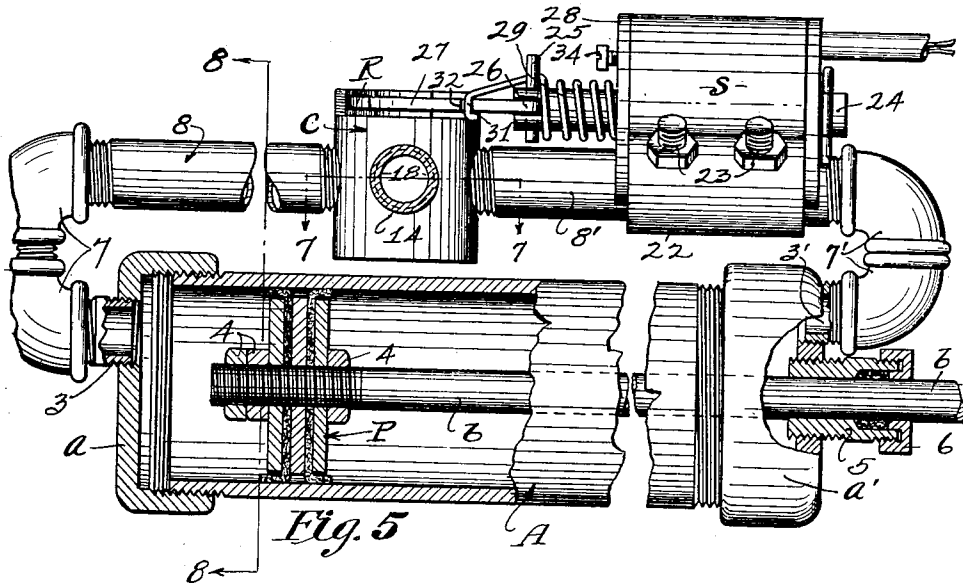
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3 Sheets-Sheet 2



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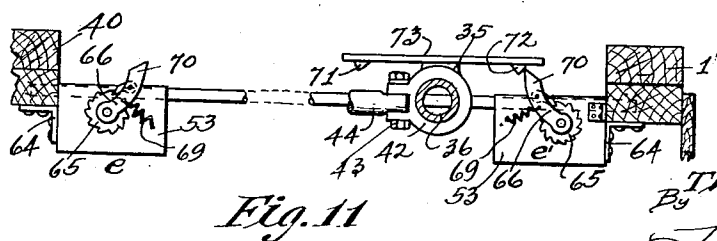
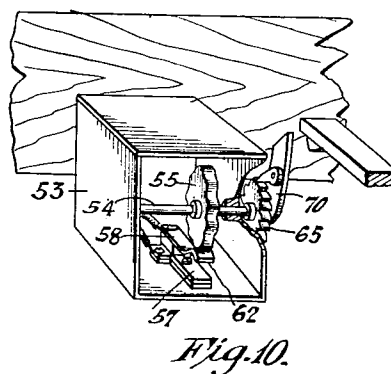
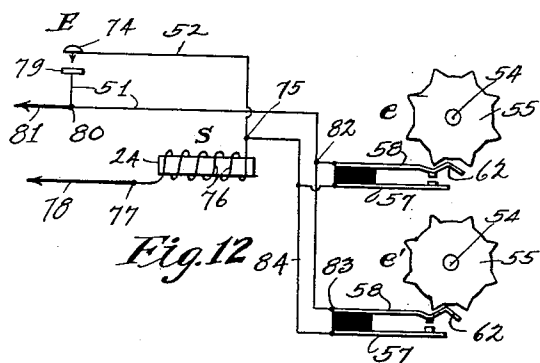
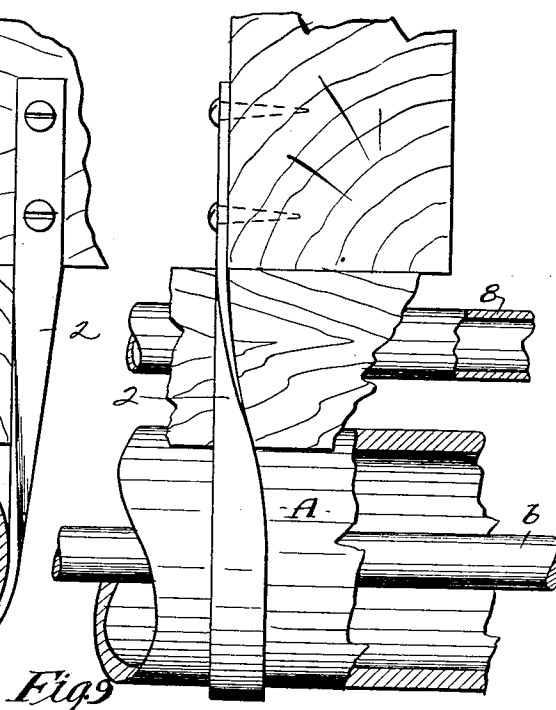
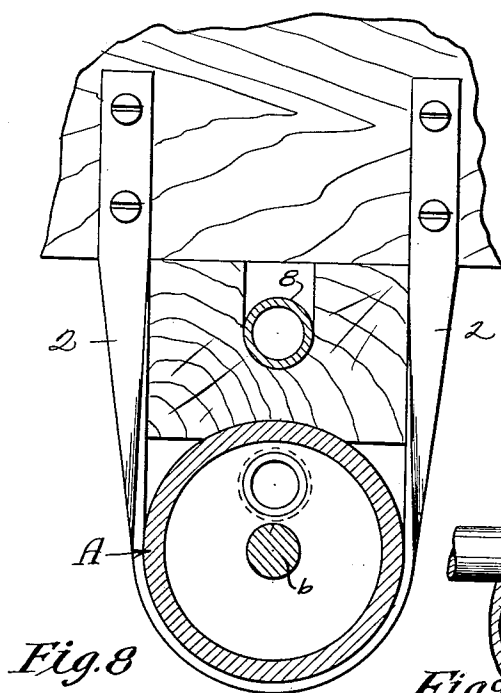
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GARAGE DOOR OPENING DEVICE

Filed May 25, 1927

3 Sheets-Sheet 3



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GARAGE-DOOR-OPENING DEVICE

Application filed May 25, 1927. Serial No. 194,200.

This invention relates to means for opening and closing garage doors and the like, and the main object is to provide an improved electro-hydraulic mechanism embodying hydraulic means connected with and for opening and closing the doors, and electrical means for controlling the operation of the hydraulic actuating means.

In this invention it is contemplated to provide a simple, efficient and comprehensive mechanism, capable of being readily installed for use, and adapted to be manually operated by the closing of a switch for energizing a solenoid whereby a valve may be opened for admitting a fluid to a cylinder in a door opening and closing operation.

It is further contemplated to provide automatically operable electric devices whereby at the end of an opening and closing movement the solenoid will be deenergized for stopping the flow of fluid to the cylinder.

Other objects will appear as the description progresses.

In the accompanying drawings I have shown a single embodiment of my invention, arranged in a preferred form for accomplishing the hereinabove named objects.

In said drawings:

Fig. 1 is a sectional plan of a garage with my mechanism installed therein and operatively connected with the doors thereof.

Figs. 2, 3 and 4 are sectional elevations of the door opening mechanism, on lines 2—2, 3—3 and 4—4 of Fig. 1, respectively.

Fig. 5 is an enlarged side elevation, partly in section, of the hydraulic cylinder and connections, partly in section, on line 5—5 of Fig. 1.

Fig. 6 is a plan view of the operating connections for the cylinder shown in Fig. 5.

Fig. 7 is a sectional plan of the valve arranged for connection with and for controlling the fluid to the cylinder, as seen on line 7—7 of Fig. 5.

Fig. 8 is a transverse sectional elevation on line 8—8 of Fig. 5; and

Fig. 9 is a fragmentary side elevation of the same.

Fig. 10 is a perspective view of a suitable switch of the momentary type, arranged for

automatically operating the valve shown in Fig. 7 at the end of each opening and closing operation;

Fig. 11 is a reduced scale elevation showing a pair of the switches shown in Fig. 10 arranged at the opposite extremities of movement of the opening and closing means; and

Fig. 12 is a circuit diagram, showing the electrical connections of my system.

Briefly described, my invention includes a hydraulic cylinder A, suitably mounted in the upper portion of a garage as at G, and adapted to be connected with the doors D and D' thereof. Cylinder A may be supported on one or more beams or rafters 1, near the ends thereof, by means of hangers 2, 2, as shown in Figs. 8 and 9. The cylinder A is provided with end closures *a* and *a'* which are threaded thereon as shown in Fig. 5, and which have combined inlets and outlets as at 3 and 3' therein.

A piston P of suitable character is provided within the cylinder A and has a piston rod *b* suitably connected therewith by nuts 4, 4, or otherwise threaded onto the end of the rod *b*. Said rod is extended at one end of the cylinder through an end closure as at *a'*, and is provided with a packing gland consisting of members 5 and 6 attached to the end member *a'* and encompassing the rod *b*.

Cylinder A is connected at its opposite ends *a* and *a'* with a cylindrical valve body C which operatively holds a valve C'. The outlet 3 of the end closure *a* connects with elbows 7, 7, which in turn connect with a section of pipe 8 which is threaded into a boss 9 on the valve body C. Similarly, the end closure *a'* is connected with the valve body C' by means of elbows 7' and a pipe 8', said pipe connecting with a boss 10 diametrically opposite the boss 9 of member C.

The valve body is provided with an inlet 11 and an outlet 12, which connect, respectively, with the pipes 13 and 14 by means of which a fluid such as water for a water supply system is introduced through the passage 15 of pipe 13 to the chamber 16 on one side of valve C'. The fluid is discharged from another chamber 17 of valve body C through a passage 18 in pipe 14, which may extend to and

connect with a sewer or other suitable drain.

The valve composed of the members C and C' is a four-way device, with the member C' flattened at diametrically opposite points 19 and 20 in parallel planes. Said valve is so arranged that when communication is afforded between pipes 8 and 13 through chamber 16, communication will be simultaneously effected between pipes 8' and 14, through chamber 17. Also, when communication is effected between pipes 8' and 13 chamber 16, communication will be effected between pipes 8 and 14 and chamber 17.

The valve C' is adapted to be operated always in a given direction and moves one-eighth of a revolution at each operation. The operation of said valve is effected by means of a ratchet R which is mounted at one end of the body C on a stem 21 connected with the valve C' and extending through the upper end of the body C.

Ratchet R is adapted to be operated by means of a solenoid S which is mounted on one of the pipes as at A' connected to the valve body C by means of a bracket 22 clamped onto said pipe by means of bolts 23 or otherwise. Said solenoid has an armature 24 slidably mounted therein and extended substantially therefrom at the end adjacent the valve body C, where it is pivotally connected by means of a pin 25 with one end 26 of a pawl 27 adapted to operatively engage the ratchet R.

The extended portion of the armature 24 intermediate the pin 25 and the end plate 28 of the solenoid carries a compression spring 29 which serves to normally hold the pawl 27 outwardly in the position shown in Fig. 6, preparatory to an operation of the valve C'. When the solenoid S is energized the armature is drawn inwardly against the tension of the spring 29 and the pawl 27 is correspondingly moved for operating the ratchet R one point at each operation.

The forward extremity 30 of spring 29 may be bent downwardly and provided with a hook portion 31 seated in a notch 32 in the edge of pawl 27 for holding said pawl resiliently in engagement with the ratchet R. The inner end 33 of said spring 29 may be held in a suitable perforation in the end plate 28 of the solenoid. Thus the said spring serves the dual purpose of normally holding the armature in extended position and of resiliently holding the pawl 27 in engagement with ratchet R.

The end plate 28 is provided with an adjusting screw 34 which is adapted to engage one end of the pin 25 in armature 24 for limiting the inward movement of the armature 24 to an extent to correspond to the movement of the ratchet R at each operation thereof, for properly positioning the valve C' with respect to the pipes 8, 8', 13 and 14.

The piston rod *b* is connected by means of

a suitable fitting 35 with the central portion of a horizontal tube 36 which extends for equal distances on opposite sides of said piston rod. Said tube is pierced transversely to receive guide rods 37 and 38, over which the tube moves in planes paralleling and with the rod *b*. An additional guide rod 39 may be provided, if necessary, and all of said rods, as shown in Figs. 2 and 3, may be supported at their rear ends on the beams 1 and at their forward ends on beams 40 near the front end of the garage G.

The opposite ends of the tubes 36 carry clamps 41 and 42 which are pivoted by means of bolts 43 to links 44 and 45, respectively. The outer ends of said links are pivotally attached at points 46, 46, with brackets 47 and 48 on the doors D and D', respectively, of the garage G. Thus as rod *b* and tube 36 move forwardly, the doors D and D' will open outwardly, as shown in Fig. 1, and when said rod moves inwardly said doors will close and assume the position shown in Fig. 1 in full lines.

At a point substantially outwardly from the garage G, I provide a tubular standard 49 connecting beneath the ground with a pipe 50 leading to the interior of the garage G. On top of the standard 49 I provide a push button momentary or sustained contact switch E, which is adapted to be connected by means of wires 51 and 52 with the electric control system hereinafter described, for initially energizing said solenoid from a point externally of the garage for effecting the operation of the piston P and cylinder A, and the resultant opening of the doors D and D' outwardly.

Internally of the garage and at opposite extremes of movement of and adjacent the piston rod *b*, I provide other momentary or sustained contact switches *e* and *e'* of the character shown in Fig. 10. Said switches embody a suitable case as at 53, carrying a horizontal shaft 54 therein on which is mounted a corrugated wheel 55, preferably formed of insulating material. Said wheel is adapted to engage a switch 56 composed of normally spaced contact members 57 and 58 separated by insulating blocks 59, and connected respectively with wires 60 and 61. The wheel 55 in each case is so arranged that the curved end 62 of the upper terminal 58 will rest in one of the depressions thereof, while the wheel is inoperative for holding the contact 58 disengaged from contact 57. When said wheel is rotated, however, the convex portions of the wheel intermediate said depressions will force the ends 62 of the contacts 58 downwardly into contact with the member 57. The cases 53 of the switches *e* and *e'* are attached by means of brackets 64, 64 to the beams 1 and 40, as shown in Fig. 11.

The shaft 54 in each of the switches is

provided with a ratchet 65, externally of the case, having teeth thereon corresponding in number to the corrugations on the wheel 55, said ratchet being fixed to and for rotation with the shaft 54. On the outer end of shaft 54 an arm 66 is pivotally mounted, which carries a pawl 67 pivoted thereto by means of a pin or screw 68 and adapted to engage the teeth on ratchet 65 for operating said ratchet for a given distance at each movement of the arm 66. Said arms 66 are resiliently held normally in a position shown in Fig. 11 by means of springs 69, connected at opposite ends with the arms and with the sides of the cases 53.

Arms 66 have upwardly extended portions 70, 70 respectively, arranged for engagement with portions 71 and 72 on a bar 73, which is carried on the fitting 35 connected with piston rod *b*. Thus as the piston P moves forward in the cylinder A and near the end of its stroke, the points 71 on member 73 will engage the portion 70 of arm 66 connected with switch *e* and will move the ratchet 65 and wheel 55 in said switch for one point, so as to make contact between the members 57 and 58 therein. When the piston moves rearwardly in cylinder A, a portion 72 of member 73 similarly engages the portion 70 of arm 66 connected with member *e'* and operated in the same manner and to the same extent for energizing the solenoid S.

Referring to the circuit diagram, it will be noted that the manually operable switch E is connected through the button 74 thereof and wire 52 at a point 75 with one end of the winding 76 of said solenoid, the other end of said winding being connected at 77 with a service wire 78 leading to a source of power. The contact 79 of switch E is connected by means of the wire 51 at a point 80 with a service wire 81 leading to a source of current.

Wire 51 is extended to and connected with the upper contacts 58, 58 of switches *e* and *e'* at points 82 and 83, respectively, while the winding 76 is connected at points 75 by means of a wire 84 with the contacts 57, 57 of said switches *e* and *e'*. Thus it will be observed that when the switch E is closed, the current will flow through wires 81 and 51, contacts 79 and 74, wire 52 to the solenoid and through said solenoid and wire 78, where it connects again with the main circuit.

When the switch E is opened and the switch *e* closed current will flow from service wire 81, through wire 51, contacts 58 and 57 of switch *e*, and thence through wire 81 and solenoid S to service wire 78. When switch *e'* is closed and switch E is open, current will flow from service wire 81 through wire 51, contacts 58 and 57, wire 84 and solenoid S to the other service wire 78. Accordingly, the solenoid S may be energized by the operation of either of the switches E, or *e'*.

Referring to Fig. 7, it will be noted that fluid to the cylinder A will be shut off while the valve is in the position shown in said figure, and also while said valve is in the position indicated by broken lines, extending at right angles to the flattened sides of the valve shown in full lines.

In operation, when the switch E is operated and the doors D and D' are closed, the valve C' is turned one-eighth of a revolution in a clock-wise direction as shown in Fig. 7, so as to open communication between pipes 13 and 8', through the chamber 16, and the fluid will then flow through pipe 8' and inlet 3' to the right hand end of the cylinder A for moving the piston P therein to the left, as shown in Fig. 5. In such case the pipe 8 will be open to communication with pipe 14, through chamber 17, and the fluid discharged from the left hand end of cylinder A will flow through pipe 8 and chamber 17 and will be discharged through pipe 14.

At the completion of the door opening operation the operation of the switch *e* by member 73, as hereinbefore described, will effect the energization of the solenoid S and will operate the ratchet R for one-eighth of a revolution, which will dispose the valve C' in the body C so that the chamber 16 will be opposite pipe 8' and chamber 17 opposite pipe 8, while the inlet and outlet pipes 13 and 14 will be closed, thus discontinuing the flow of water to the cylinder.

When the doors are closed by the operation of switch E valve C' is operated so as to provide communication between pipes 8' and 14 and pipes 8 and 13. Thus the water will flow from pipe 13, through chamber 17 and pipe 8 to the left hand end of the cylinder for moving the piston P to the right, as shown in Fig. 5, and in such case the water discharged from the cylinder through pipe 8' will be moved through chamber 16 to pipe 14. Near the completion of the closing movement of the doors the switch *e* is operated for energizing the solenoid S and moving the valve again into position shown in Fig. 7, but with the chambers 16 and 17 reversed as to position.

While I have provided a practical and efficient form of device for the purpose stated, I conceive it to be possible to modify the details of structure and operation within the scope of the appended claims without departing from the spirit thereof.

What I claim is:

1. An opening and closing mechanism for a pair of doors comprising a hydraulic cylinder, a piston reciprocable therein, a cross arm connected with one end of said piston and adapted to be connected with a pair of doors, a valve connected with the opposite ends of said cylinder for regulating the application of pressure to opposite sides of said piston, electromagnetic means for continuously rotating said valve in one direction to alternate-

ly open and close said doors, an electric circuit therefor, and a pair of spaced circuit closing devices spaced proportionately to the movement of said piston for opening and closing said doors, and means connected and movable with said piston and adapted to engage and operate said circuit closing devices in door opening and closing operations.

2. The combination with a pair of doors, a hydraulic cylinder, a piston movable therein, a cross arm connected with said piston, means for operably connecting said cross arm with said doors, a valve connected with the opposite end of said cylinder, electromagnetic means for continuously rotating said valve in a given direction for alternately applying pressure to the opposite end of said piston, and a pair of circuit opening and closing devices adapted to be operated at the extremes of action of said piston for operating said valve, and means associated with the piston for alternately opening and closing said circuit.

3. In combination with a pair of doors, a hydraulic cylinder, a piston movable therein, a cross arm connected with said piston, means for operably connecting said cross arm with said doors, a valve connected with the opposite end of said cylinder, electromagnetic means for continuously rotating said valve in a given direction for alternately applying pressure to the opposite end of said piston, and a pair of circuit opening and closing devices adapted to be operated at the extremes of action of said piston for operating said valve, and means associated with the piston for alternately opening and closing said circuit, said circuit opening and closing means including a member continuously rotatable in one direction and intermittently operable, for the purpose stated.

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