

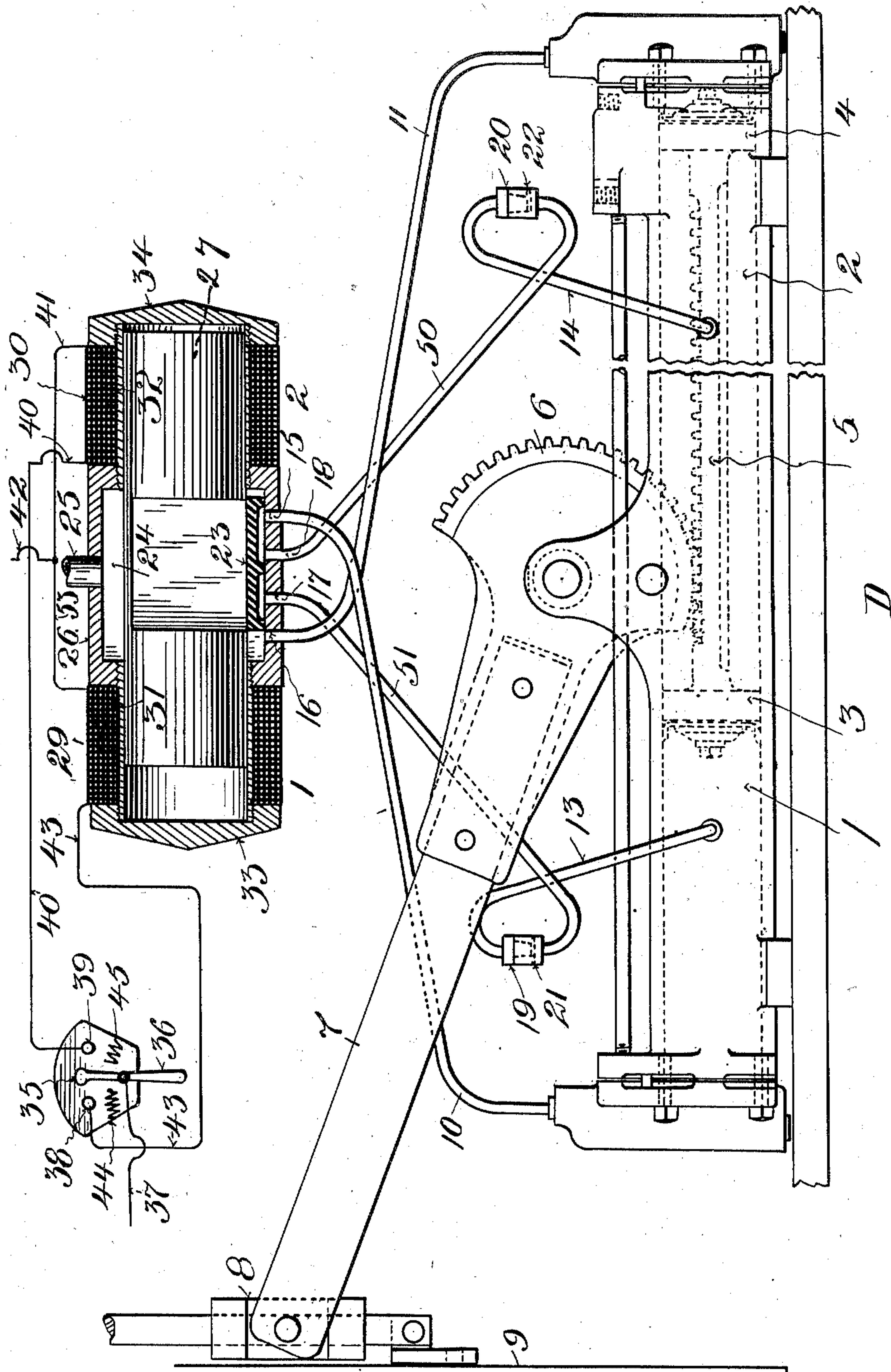
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ELECTRICALLY OPERATED CONTROL MECHANISM FOR PNEUMATIC OPERATING DEVICES.

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967,245.

Patented Aug. 16, 1910.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

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NATIONAL PNEUMATIC COMPANY, A CORPORATION OF WEST VIRGINIA.

ELECTRICALLY-OPERATED CONTROL MECHANISM FOR PNEUMATIC OPERATING  
DEVICES.

967,245.

Specification of Letters Patent.

Patented Aug. 16, 1910.

Application filed April 2, 1908. Serial No. 424,845.

*To all whom it may concern:*

Be it known that I, HAROLD ROWNTREE, a citizen of the United States, residing at Chicago, in the county of Cook, State of Illinois, have made a certain new and useful Invention in Electrically-Operated Control Mechanism for Pneumatic Operating Devices, of which the following is a specification.

10 The invention relates to electrically operated control mechanism for pneumatic operating devices.

15 The object of the invention is to provide an electrically operated control mechanism for pneumatic operating devices for doors or other purposes which is simple in construction and efficient in operation.

20 A further object is to provide an electrically operated valve for controlling the supply and exhaust of air to and from the power cylinder of pneumatic door operating mechanism for doors or other purposes.

25 A further object is to provide means for efficiently cushioning the final movements of the piston.

A further object is to provide an electrically operated valve mechanism for pneumatic operating devices wherein a valve operating solenoid is employed and so arranged as to avoid the use of stuffing boxes or glands, and wherein the solenoid windings are protected from the access of the pressure medium thereto.

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

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

45 The drawing shows a view in elevation, parts in central section, and parts somewhat diagrammatic, of a pneumatic operating device showing the application thereto of electrical control mechanism in accordance with my invention.

50 Reference signs 1, 2, designate respectively the two ends of a double cylinder, and 3, 4, single acting pistons respectively operating in said cylinder, said pistons being

connected together by an intermediate rack 5. A gear 6, operating through an opening in the double cylinder at a point intermediate its ends meshes with and is operated 55 by the rack, an operating arm 7, being connected to said gear, and having suitable connection, as at 8, with a door or other closure or device, 9, to be operated. The pistons 3, and 4, being single acting, are exposed on one side to the atmosphere through 60 the opening in the cylinder through which the gear 6, extends, and on the other side to the pressure medium supplied to the cylinders. This pressure medium is supplied to 65 the remote ends of the cylinder portions 1, 2, through supply pipes or connections, 10, 11, or otherwise, as may be convenient. At a point about midway the length of each portion 1, 2, of the cylinder, or rather, mid- 70 way the stroke of the pistons therein, are connected the pipes 13, 14, respectively. The pipes 10, 11, 13, 14, respectively communicate with ports 15, 16, 17 and 18, in the valve chamber or casing, presently to 75 be described. Arranged in each of the pipes or other connections 13, 14, is a check valve 19, 20, on the under side of each of which check valves is a small or restricted opening to the atmosphere, as indicated at 21, 22. 80

The valve 23, which controls the several ports 15, 16, 17, 18, is arranged to operate in a closed chest or chamber 24, to which the pressure medium is supplied through supply 85 pipe 25, said pipe delivering through the casing 26, the interior of which forms the chest or chamber 24. Extending longitudinally through the casing 26, is a shiftable metallic mass, which, if desired, and in one form of practical embodiment of my inven- 90 tion, is an iron rod, 27, arranged to engage the valve 23, in any suitable or convenient manner, whereby, when the said rod is shifted endwise said valve is moved to control the ports 16, 17, 18, 15. When said 95 valve is shifted or moved in one direction the ports 15, 18, are brought into communication with each other, while, at the same time the port 17, is closed to the chamber 24, and the port 16, is opened to the cham- 100 ber 24. This is the position of the valve as shown in the drawing. When, however, the



valve is shifted in the opposite direction the ports 16, 17, are brought into communication with each other, while the port 18 is closed and port 15 is opened to said chamber.

In accordance with my invention I propose to operate the valve 23, electrically, and hence I employ the metallic mass, or rod 27, above referred to, and I arrange said rod in the embodiment shown, to form, at the respective ends thereof, the cores of solenoid coils 29, 30. These coils are respectively carried upon tubes or sleeves 31, 32, which at their inner ends are screwed into the ends of casing 26, and upon the outer ends of said tubes are mounted the screw caps 33, 34. By this construction and arrangement I am enabled to avoid the necessity of providing stuffing boxes and I am also enabled to prevent access of the operating medium for the pistons of the door operating devices to the coils of the solenoid, thereby protecting such coils from the injurious effects of any dampness that might be carried by such medium.

The circuits of the solenoid coils are controlled by a switch blade 35, having an operating handle 36. The blade 35, is in electrical connection with a source of current through circuit wire 37, and it may be moved into coöperative relation with either of the contacts 38, 39. Suppose the switch blade is moved into connection with contact 39; thereupon circuit is completed from live wire 37, through blade 35, contact 39, wire 40, solenoid coil 30, wire 41, to return circuit wire 42. The completion of this circuit will cause the solenoid coil 30, to become energized, and the core thereof to be shifted or moved toward the right, and into the position shown in the drawing. Suppose, however, the switch blade is shifted or moved into connection with contact 38; thereupon circuit is completed from the live wire 37, through blade 35, contact 38, wire 43, the coils of solenoid 29, wire 53, and return wire 42, thereby energizing coil 29, and causing the core thereof to move toward the left from the position shown in the drawing, and hence causing the valve 23, to be shifted toward the left and into position for the ports 16, 17, to be brought into communication with each other, and the port 18, to be closed, as above explained, and the port 15, to be brought into communication with the chamber 24.

In order to automatically cause the switch blade 35, to break its connection with either contact 38, 39, as soon as the hand of the operator is removed from the switch handle 36, I provide the springs 44, 45, against the action of one or the other of which said switch acts when moved in one direction or

the other, and which springs operate to insure the return or restoration of the switch to neutral or cut-off position as soon as the hand of the operator is removed from the handle 36.

The operation of the apparatus is very simple, and will be readily understood, and, briefly, is as follows: Suppose the switch blade is moved to position to complete circuit with contact 39. Thereupon the solenoid 30 is energized and the core 27 is moved, and with it the valve 23, into the position shown in the drawing. In this position the ports 15, and 18, are brought into communication with each other and port 16 is opened to the chamber 24, and the pressure medium admitted to chamber 24, through supply connection 25, flows through port 16, and pipe 11, to the closed end of cylinder 2, thereby initiating a movement of the double or connected pistons 3, 4, toward the left from the position thereof as shown, and hence actuating the rack 5, and gear 6, thereby rocking the arm 7, and moving the door 9. The exhaust from the closed end of cylinder 1, passes out through pipe 10, port 15, port 18, pipe 50 and to the atmosphere, partly through the restricted opening 22, and freely through the check valve 20, pipe 14, and the open end of cylinder 2, and hence a rapid movement of the door is initiated. As soon, however, as the piston 4, in its travel reaches and passes the point where the exhaust connection 14 communicates with the cylinder, it cuts off the free exhaust through the pipe 14, while the pressure behind said piston closes the check valve, and thereafter the exhaust is permitted only through the restricted opening 22, and hence securing an efficient cushioning of the final movement. The same operation takes place in the cylinder 1 and pipe 13, when the switch blade is moved into position to complete the circuit of solenoid 29, thereby shifting the core and valve toward the left and opening port 15, to the chamber 24. Thereupon the pressure medium is admitted to the left hand end of cylinder 1, while the exhaust from the remote end of cylinder 2, is permitted through pipe 11, port 16, port 17, pipe 51, restricted opening 21, and check valve 19, pipe 13 and the open end of cylinder 1. This continues until the piston 3, reaches and passes the point where the exhaust connection 13 communicates with the cylinder where the check valve 19, will be closed and the exhaust is permitted only through the restricted opening 21, thereby securing a rapid initial and a cushioned final movement of the door.

Many variations and changes in the details of construction and arrangement may readily occur to persons skilled in the art and still fall within the spirit and scope of



my invention. I do not desire, therefore, to be limited or restricted to the exact details shown and described. But

Having now set forth the object and nature of my invention, and a construction embodying the principles thereof, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent is:—

1. In an electrically controlled door operating mechanism, power devices, and means for controlling the supply and exhaust of the operating medium to and from such devices including a chamber, a valve inclosed in said chamber, a rod connected to said valve, electric means located outside of said chamber for moving the rod to operate said valve, and means for controlling the circuits of said electric means.

2. In an apparatus of the class described, power devices, a valve for controlling the supply and exhaust of operating medium to and from said devices, a closed chamber in which the valve operates, solenoids for operating said valve, the coils of said solenoids being located outside of the chamber, and means for controlling the circuits of said solenoids.

3. In an apparatus of the class described, power devices, a valve for controlling the supply and exhaust of the operating medium to and from said power devices, a closed chamber in which said valve operates, a metallic mass directly connected to said valve, and forming the core of solenoid coils, said coils being located outside of said chamber and means for controlling the circuits of said coils.

4. In an apparatus of the class described, power devices, a valve for controlling the supply and exhaust of the operating medium to and from said power devices, a closed chamber in which said valve operates, a metal bar connected intermediate its ends to said valve, and forming at its ends the core for solenoid coils, said coils being located outside of said chamber and means for controlling the circuits of said coils.

5. In an apparatus of the class described, power devices, a valve for controlling the supply and exhaust of the operating medium to and from said power devices, a closed chamber in which said valve operates, a solenoid core extending through said chamber and connected to said valve, solenoid coils for the projecting ends of said core, and means for controlling the circuits of said coils.

6. In an apparatus of the class described, power devices, a valve for controlling the supply and exhaust of the operating medium to and from said power devices, a casing for said valve, extensions connected to the ends of said casing, a solenoid core ex-

tending through said casing and having its ends received in said extensions, solenoid coils carried by said extensions, and means for controlling the circuits of said coils.

7. In an apparatus of the class described, power devices, a controlling valve therefor, a casing in which said valve operates, tubular extensions connected to the ends of said casing, a solenoid core extending through said casing and connected to said valve, the ends of said core operating in said tubular extensions, solenoid coils carried by said tubular extensions, caps carried by the ends of said extensions and means for controlling the circuits of said solenoid coils.

8. In an apparatus of the class described, power devices, a controlling valve therefor, a closed casing in which said valve operates, electrical devices arranged outside of said casing and a core or armature therefor located within the casing for operating said valve.

9. In an apparatus of the class described, power devices, a controlling valve therefor, a casing in which said valve operates, a solenoid core inside the casing and connected to said valve to operate the same, and solenoid coils arranged outside of said casing for operating said core.

10. In an apparatus of the class described, a power mechanism including double cylinders, connected pistons operating in said cylinders, and means for controlling the supply and exhaust of the operating medium simultaneously to and from said cylinders, said means including a valve and ports.

11. In an apparatus of the class described, a power mechanism including double cylinders, pistons connected together and respectively operating in said cylinders, and electrically operated devices including a valve for controlling the supply and exhaust of the operating medium to and from said cylinders.

12. In an apparatus of the class described, a power mechanism including double cylinders, pistons respectively operating in said cylinders, a rack connecting said pistons, gearing operated by said rack, and electrically operated means including a valve for controlling the supply and exhaust of the operating medium to and from said cylinders.

13. In an apparatus of the class described, a power mechanism including double cylinders, pistons respectively operating in said cylinders, and connected together, gearing actuated by said cylinders, and electrically operated means including a valve for controlling the supply and exhaust of the operating medium to and from said cylinders.

14. In an apparatus of the class described, a power mechanism including a cylinder



having a closed end, a piston operating in said cylinder, a supply connection for the operating medium to the closed end of the cylinder, an exhaust connection to the cylinder intermediate its ends, and a valve for controlling said supply and exhaust connections.

15. In an apparatus of the class described, a power mechanism including a cylinder closed at one end, a piston operating in said cylinder, a supply connection to the closed end of the cylinder and an exhaust connection to the cylinder intermediate its ends, said exhaust connection having a restricted opening to the atmosphere, and a valve for controlling said supply and exhaust connections.

16. In an apparatus of the class described, a power mechanism including a cylinder having a closed end, a piston operating in said cylinder, a supply connection to the closed end of the cylinder, an exhaust connection to the cylinder intermediate its ends, said exhaust connection having a restricted opening to the atmosphere, a valve for controlling said supply and exhaust openings, and electrical devices for operating said valve.

17. In an apparatus of the class described, a power mechanism including a cylinder having a closed end, a piston operating in said cylinder, a supply connection to the closed end of the cylinder, an exhaust connection to the cylinder intermediate its ends, a check valve arranged in said exhaust connection, and means including a valve for controlling the supply and exhaust connections.

18. In an apparatus of the class described, a power cylinder having a closed end, a piston operating in said cylinder, a supply connection to the closed end of the cylinder, an exhaust connection communicating with the cylinder at a point intermediate its ends, said exhaust connection having a restricted opening to the atmosphere, a check valve arranged in said exhaust connection, and a valve for controlling said supply and exhaust connections.

19. In an apparatus of the class described, double cylinders, each closed at one end, connected pistons operating in said cylinders, a supply connection to the closed end of each cylinder, an exhaust connection communicating with each cylinder at a point intermediate its ends, and a valve for controlling said supply and exhaust connections.

20. In an apparatus of the class described, double cylinders, each closed at one end, connected pistons operating in said cylinders, a supply connection to the closed end of each cylinder, and means including a valve arranged to control said connections whereby

when pressure is supplied to the closed end of one cylinder the exhaust from the other cylinder is effected through the open end of the cylinder receiving the pressure supply.

21. In an apparatus of the class described, a double cylinder, each closed at one end, connected pistons operating in said cylinders, a supply connection to the closed end of each cylinder, and an exhaust connection communicating with each cylinder at a point intermediate its ends.

22. In an apparatus of the class described, a double cylinder, each being closed at one end, connected pistons operating in said cylinders, a pressure supply connection to the closed end of each cylinder, an exhaust connection communicating with each cylinder at a point intermediate its ends, each exhaust connection having a restricted opening to the atmosphere, and means including a valve for controlling said supply and exhaust connections.

23. In an apparatus of the class described, a double cylinder, each being closed at one end, connected pistons operating in said cylinders, a pressure supply connection to the closed end of each cylinder, an exhaust connection to each cylinder at a point intermediate its ends, each exhaust connection having a restricted opening to the atmosphere, a check valve arranged in each exhaust connection and a valve for controlling said supply and exhaust connection.

24. In an apparatus of the class described, a double cylinder, each closed at one end, connected pistons operating in said cylinders, and means including a valve and pipe connections between the same and the cylinders whereby when pressure is supplied to the closed end of one cylinder, the piston in said cylinder controls the area of exhaust from the closed end of the other cylinder.

25. In an apparatus of the class described, power devices, a valve for controlling the supply and exhaust of the operating medium to and from said power devices, a closed chamber in which said valve operates, solenoid coils arranged outside said chamber, a common core for said coils, said core being arranged within said chamber and connected to the valve, and means for controlling the circuits of said coils.

26. The combination with pneumatically actuated power devices, of a controlling valve therefor, electrical devices for operating said valve, said valve and power devices coöperating to restrict the exhaust of the power medium to cushion the final movements of the power devices.

27. The combination with a power cylinder and piston, a valve for controlling the supply and exhaust of the operating me-



dium to and from said cylinder, and means including a restricted opening also controlled by said valve for cushioning the final movements of the piston.

5 28. The combination with power devices, a controlled valve to control the supply and exhaust of the actuating medium to and from the power devices, whereby said power devices are operated, an electrical device  
10 for operating the valve, of means also con-

trolled by the valve for cushioning the final movements of said power devices.

In testimony whereof I have hereunto set my hand in the presence of the subscribing witnesses, on this 24th day of March A. D., 15 1908.

HAROLD ROWNTREE.

Witnesses:

ALBERT T. DARCHE,  
M. H. MARTIN.