

H. ROWNTREE.
 PNEUMATIC OPERATING MECHANISM FOR DOORS OR OTHER DEVICES.
 APPLICATION FILED APR. 9, 1908.

913,853.

Patented Mar. 2, 1909.
 2 SHEETS—SHEET 1.

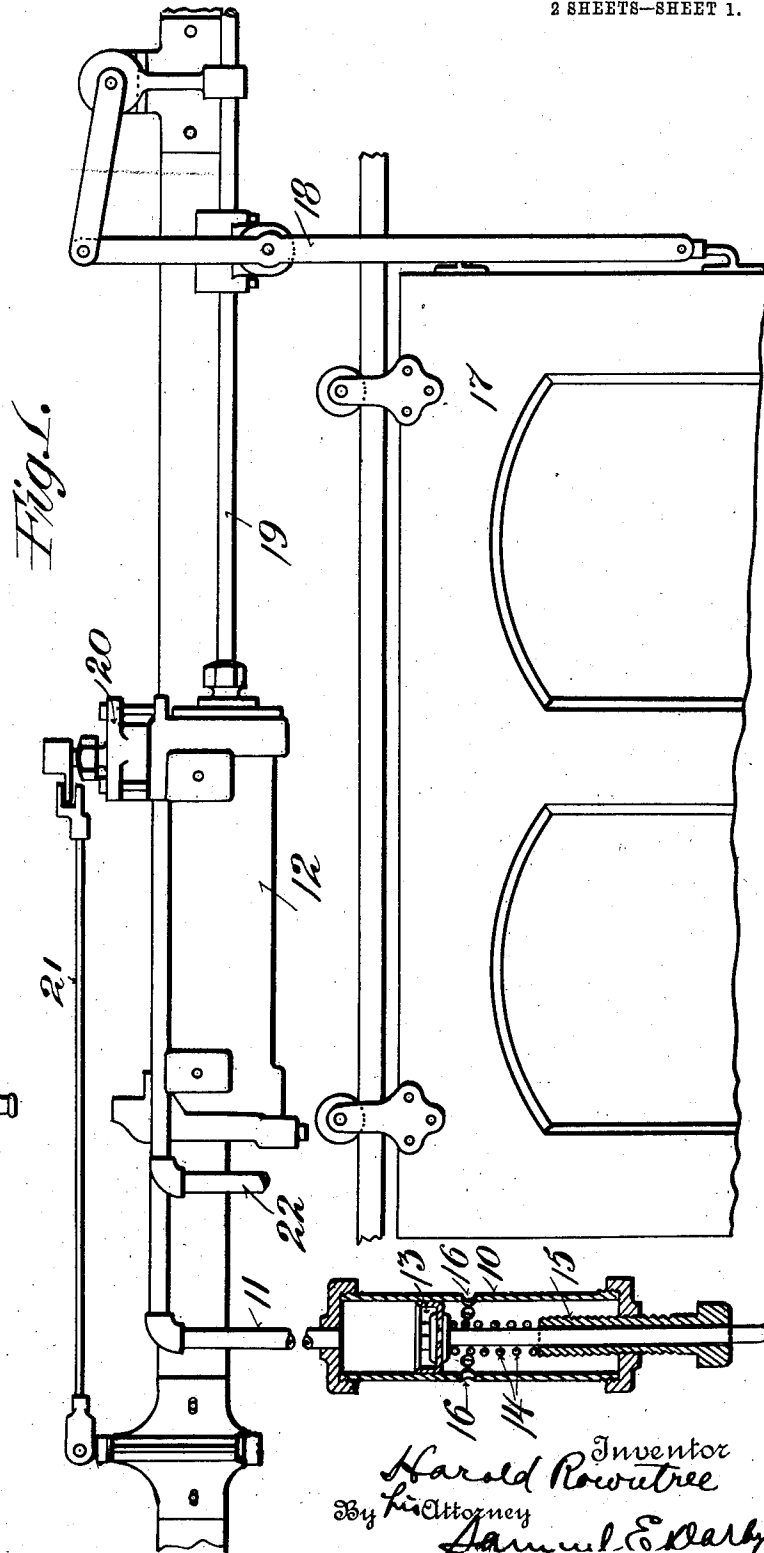
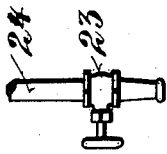


Fig. 5.



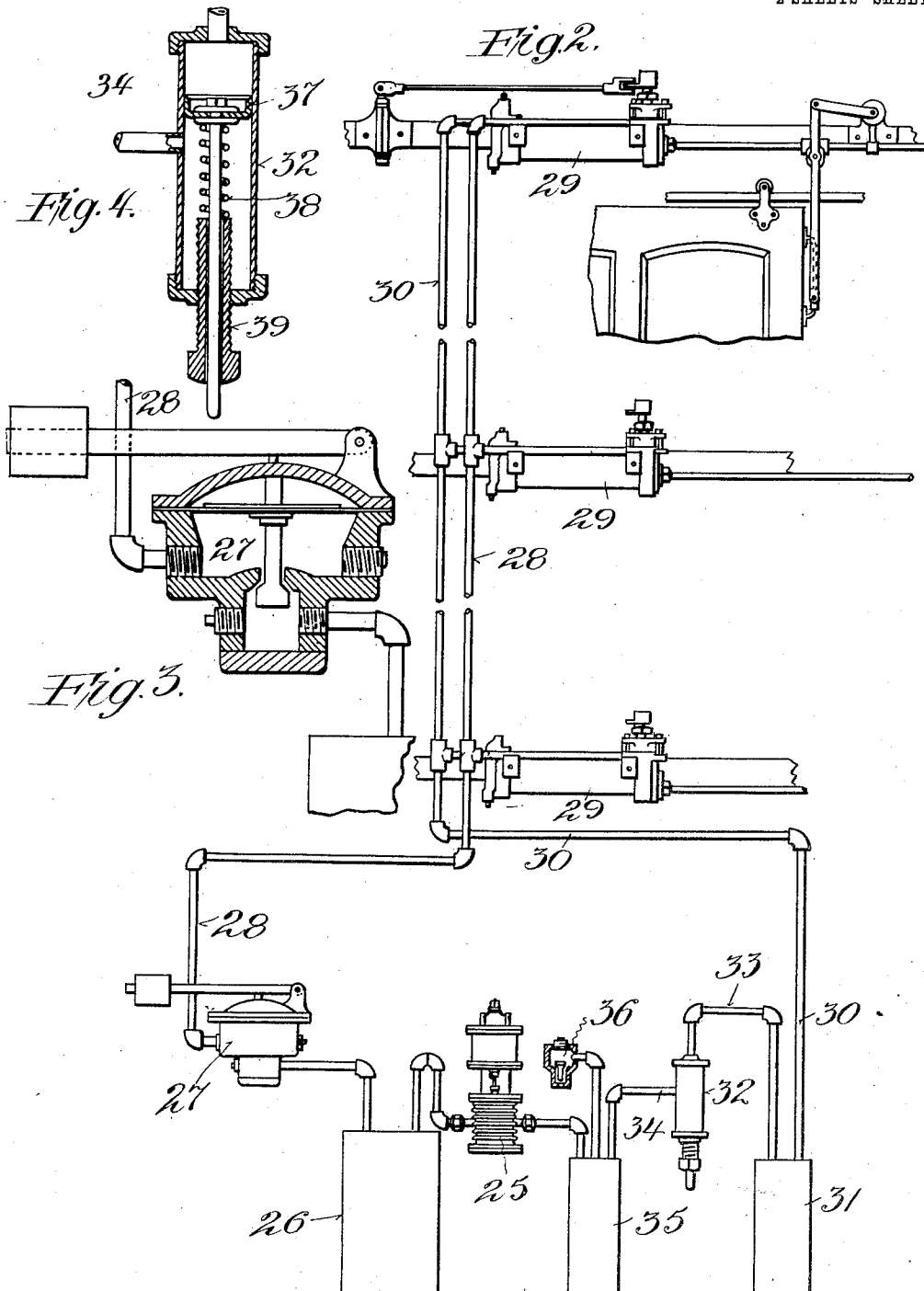
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UNITED STATES PATENT OFFICE.

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PNEUMATIC OPERATING MECHANISM FOR DOORS OR OTHER DEVICES.

No. 913,853.

Specification of Letters Patent.

Patented March 2, 1909.

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To all whom it may concern:

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

This invention relates to pneumatic operating mechanism for doors or other devices.

The object of the invention is to provide pneumatic operating mechanism for doors or other devices, which is simple and efficient, and wherein the door or other device to be operated is moved under the combined influence of a pressure medium supplied to the operating devices and tending to move such door or other device, and a back pressure or counterbalancing pressure tending to resist such movement.

A further object is to provide means for regulating the back or counterbalancing pressure against which the operating pressure acts.

Other objects of the invention will appear more fully hereinafter.

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 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 elevation, parts in section, and parts broken off, showing a construction of pneumatic operating mechanism embodying the principles of my invention. Fig. 2 is a similar view showing the application of my invention to the operation of a plurality of doors or other devices, with a common back pressure arrangement for all of them. Fig. 3 is a detail view showing a pressure regulator employed in connection with the arrangement shown in Fig. 2. Fig. 4 is a broken detail view in section showing the back pressure regulating device employed in connection with the arrangement shown in Fig. 2. Fig. 5 is a broken view showing a modified arrangement embodying the principles of my invention.

The same part is designated by the same

reference sign wherever it occurs throughout the several views.

I will describe my invention in its application to elevator or other doors, but I desire it to be understood that the invention is equally applicable to the operation of other devices besides doors.

In the operation of doors, for illustration, by compressed air it is sometimes very desirable to provide for arrest of the movement of a door before it has completed its movement to completely opened or closed position, as, for instance, should a pneumatically operated door on a street or other car be forcibly arrested in its closing movement by a passenger. In such case the door may be held in its arrested position long enough to permit the air on the exhaust side of the door operating mechanism to be more or less completely exhausted, so that when the door is finally released the pressure on the operating side of the operating mechanism will have little or no exhaust pressure for cushioning the door, and hence the door, when released, will complete its movement with a violent slam or jar.

It is among the special purposes of my present invention to provide means for preventing such a result, and in carrying out my invention I propose to restrict the escape of the exhaust side of the operating mechanism until a predetermined pressure is attained therein, and I also correspondingly increase the operating pressure. In other words I provide means for opposing the pressure medium supplied to the operating side of the operating cylinder by a pressure in the exhaust, which opposing pressure is controlled so as to attain a predetermined degree. To illustrate, suppose a pressure of twenty pounds above atmospheric pressure is required to properly operate the door, then, in accordance with my invention, I employ an operating pressure of, say, sixty pounds, and oppose the same with a pressure on the exhaust side of, say, forty pounds, thereby leaving a net operating pressure of twenty pounds which is the amount required to operate the door, but with a marked advantage in the control of the door movements. If, with the exhaust pressure ordinarily maintained in mechanism of this nature the movement of the door, is arrest-

ed and the door is retained in arrested position until the exhaust escapes, the door will move at least two thirds or more of the remaining distance it must travel to complete its movement, to opened or closed position, before the air on the exhaust side can again build up to counterbalance the twenty pounds of operating pressure to effect a cushioning of the door movement. In accordance with my invention, however, where a predetermined pressure of forty pounds, in the example above given, is maintained on the exhaust side of the operating apparatus, and the door is arrested in its movements and is then liberated, there is the counterbalancing pressure in the exhaust ready to instantly check the movement of the door and to prevent the same from slamming in its final movement.

20 My invention may be carried out in many specifically different ways.

In the form shown in Fig. 1, I provide a pressure retainer in the form of a small chamber or cylinder 10, which is in free communication with the exhaust pipe 11, from the power cylinder 12. In this retainer chamber is arranged a suitably packed piston 13, which is subjected to the exhaust pressure on one side and to an adjustable yielding tension on the other side. This tension is afforded, in this instance, by a coiled spring 14, the tension of which may be adjusted and regulated by the adjusting sleeve 15. The chamber 10 is provided with openings to the atmosphere through the wall thereof, as indicated at 16. When the exhaust pressure in chamber 10 exceeds the degree as predetermined by the adjustment of the spring 14, the piston 13, will be shifted into position to uncover the atmospheric openings 16, and permit the exhaust air to escape. When, however, the exhaust pressure falls below the point as determined by the adjustment of the spring 14, the piston 13 will again move into position to close the openings 16, and consequently I maintain at all times an exhaust pressure against which the operating pressure acts and which will afford an efficient cushion for the door movements whether the door is arrested in its movement or not, and no matter how long the door may be held in its arrested position. The door 17, may be operated by any suitable connections, such as indicated at 18, from the piston rod 19 of the piston which operates within the power cylinder pressure supply connection 22 and exhaust connection 11 may be controlled by any suitable arrangement of valve and operating mechanism therefor, as indicated at 20, 21.

A modified arrangement embodying the broad principles of my invention is shown in Fig. 5, wherein, instead of employing an exhaust chamber with a balanced piston therein, I use an air cock 23, in the exhaust pipe

24, and which is adjustable to vary and control the area of an opening from the exhaust pipe to the atmosphere. In this construction, in which the exhaust pipe forms the chamber for the pressure in the exhaust side, and with the air cock partially closed, when pressure is supplied to one end of the power cylinder 12 to move the door, the partially closed air cock in the exhaust connection from the other end of the cylinder secures the desired back pressure to effect the cushioning of the door, and should the door be arrested in its movements, the restriction in the exhaust which the air cock provides enables a sufficient amount of exhaust air to be retained in the exhaust pipe to enable such pressure to again build up rapidly when the door is released thereby securing the desired cushioning effect for the final movement of the door.

In Figs. 2, 3 and 4, I have shown my invention applied in the form of a common back pressure retainer for a plurality of power cylinders. In this form of application of my invention, a pump 25, is employed to maintain an air pressure of, say, eighty pounds in the tank 26. This tank delivers through a pressure regulator 27, to the supply pipe 28, from which the power cylinders 29, are supplied with operating pressure, the pressure regulator 27 serving to maintain a constant pressure of, say, sixty pounds in the supply pipe 28. The exhaust from all the power cylinders is effected through the exhaust pipe 30, into an exhaust tank 31. The adjustable pressure retainer 32, which communicates with the exhaust tank 31, through pipe 33, serves to maintain a pressure of, say, forty pounds in the exhaust pipe 30, and tank 31. The exhaust pressure retainer 32, delivers through a pipe 34, into an auxiliary tank 35, from which the pump 25 returns the air into the pressure supply tank 26. Communicating with the auxiliary tank 35, is an intake check valve 36 through which the pump 25, may draw air from the atmosphere in case, through leakage or otherwise, the pump is required to draw in air at a faster rate than the air is supplied to the auxiliary tank 35. It will be observed that the pressure retainer 32 has the same construction and arrangement, see Fig. 4, as that described with reference to the retainer shown in connection with Fig. 1, except that instead of openings 16, to the atmosphere, the retainer or chamber 32 is provided with the pipe connection 34, which delivers to the auxiliary tank 35. The piston 37, spring 38, and adjusting sleeve 39, remain the same as the corresponding parts shown in Fig. 1, and perform the same functions.

The advantage of the construction and arrangement shown in Figs. 2, 3 and 4, in addition to affording a common back pressure or exhaust cushioning pressure for a plurality of power cylinders, is that the power required

to compress the air to a higher degree of pressure into the supply tank 26, is reduced by reason of the pump taking the air from auxiliary tank 35, into which such air is already under greater pressure than atmospheric pressure. At the same time, of course, all the advantage of maintaining a predetermined exhaust pressure is secured, as above noted.

In Fig. 3 I have shown the details of a form of pressure regulator which may be employed to maintain the constant supply pressure in pipe 28. The particular construction of this regulator, however, is not of consequence so far as my invention is concerned so long as it performs its function of maintaining the required constant pressure in the supply pipe.

Having now set forth the object and nature of my invention and various constructions embodying the principles thereof, and having set forth the purposes, functions and mode of operation of such constructions, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent is:—

1. In a pneumatic operating mechanism for doors or other devices, the combination with a power cylinder having pressure supply and exhaust connections, of means for maintaining a pressure in the exhaust connections to partially counterbalance the operating pressure in the supply connection.

2. In a pneumatic operating mechanism for doors or other devices, the combination with a power cylinder, having pressure supply and exhaust connections, of means for maintaining a substantially uniform pressure in the exhaust connection to partially counterbalance the operating pressure in the supply connection.

3. In a pneumatic operating mechanism for doors or other devices, the combination with a power cylinder having pressure supply and exhaust connections, and a valve for controlling said connections, of means for maintaining a pressure in the exhaust connection, and means for varying such pressure.

4. In a pneumatic operating mechanism for doors or other devices, the combination with a power cylinder having pressure supply and exhaust connections, of a pressure chamber arranged in the exhaust connection, and means for controlling the exhaust of pressure from said chamber.

5. In a pneumatic operating mechanism for doors or other devices, the combination with a power cylinder having pressure supply and exhaust connections, of a pressure chamber arranged in the exhaust connection, said chamber having an exhaust opening, and means arranged in said chamber for controlling said opening.

6. In a pneumatic operating mechanism for doors or other devices, the combination with a power cylinder having pressure sup-

ply and exhaust connections, of a pressure chamber arranged in the exhaust connection and automatic means for maintaining a constant pressure in said chamber.

7. In a pneumatic operating mechanism for doors or other devices, a power cylinder having pressure supply and exhaust connections, of a pressure chamber arranged in exhaust connection, and having an exhaust opening, a piston arranged in said chamber and exposed on one side to the pressure in said chamber, and yielding means applied to the other side of said piston, said piston operating to control said exhaust opening.

8. In a pneumatic operating mechanism for doors or other devices, a power cylinder having pressure supply and exhaust connections, of a pressure chamber arranged in the exhaust connection and having an exhaust opening, a piston for controlling said opening, and an adjustable spring operating against said opening.

9. In a pneumatic operating mechanism for doors or other devices, a plurality of power cylinders, a pressure supply pipe and an exhaust pipe connections common to all of said cylinders, and means arranged in the common exhaust pipe connection for maintaining substantially uniform pressure therein.

10. In a pneumatic operating mechanism for doors or other devices, a plurality of power cylinders, a common pressure supply connection and a common exhaust connection for all of said cylinders, means associated with each cylinder for controlling said connections to said cylinder, and means arranged in the common exhaust connection for maintaining substantially uniform pressure therein.

11. In a pneumatic operating mechanism for doors or other devices, a plurality of power cylinders, a common pressure supply connection and a common exhaust connection for all of said cylinders, means associated with each cylinder for controlling said connections thereto, and automatic means arranged in the exhaust connection for maintaining substantially uniform pressure therein.

12. In a pneumatic operating mechanism for doors or other devices, a plurality of power cylinders, a pressure supply connection and a common exhaust connection for said cylinders, a pressure chamber arranged in said exhaust connection, and automatic means arranged in said chamber for maintaining substantially uniform pressure therein.

13. In a pneumatic operating mechanism for doors or other devices, a power cylinder, a pressure supply and an exhaust connection therefor, and means for maintaining substantially uniform pressure in the exhaust connection in definite relation to the pressure in the supply connection.

14. In a pneumatic operating mechanism for doors or other devices, a power cylinder, a pressure supply and an exhaust connection therefor, and means for returning the exhaust
5 pressure to the supply connection under a greater degree of pressure.

15. In a pneumatic operating mechanism for doors or other devices, power mechanism, means for supplying a power medium there-
10 to, and means for opposing such power medium by a predetermined back pressure.

16. In a pneumatic operating mechanism for doors or other devices, power mechanism, means for supplying a power medium thereto,
15 and means for automatically maintaining an opposing medium to the power medium in definite predetermined relation thereto.

17. In a predetermined operating mechanism for doors or other devices, a power cylinder having supply and exhaust connections,
20 a supply tank with which the supply connection communicates, an exhaust tank with which the exhaust connection communicates,

and a pump interposed between said tanks to deliver from the latter to the former. 25

18. In a pneumatic operating mechanism for doors or other devices, a power cylinder having supply and exhaust connections, a supply tank and an exhaust tank, a pump interposed between said tanks, said pump
30 having an auxiliary atmospheric intake.

19. In a pneumatic operating mechanism for doors or other devices, a power cylinder having supply and exhaust connections, a supply tank and an exhaust tank, a pump
35 interposed between said tanks, and means for automatically maintaining a predetermined pressure in the exhaust tank.

In testimony whereof I have hereunto set my hand in the presence of the subscribing
40 witnesses, on this 4th day of April, A. D. 1908.

HAROLD ROWNTREE.

Witnesses:

L. M. SHIELDS,
M. H. MARTIN.