J. E. OSMER.

# FLUID PRESSURE MOTOR.

APPLICATION FILED OCT. 8, 1906.

**899,795.** Patented Sept. 29, 1908.

2 SHEETS—SHEET 1.

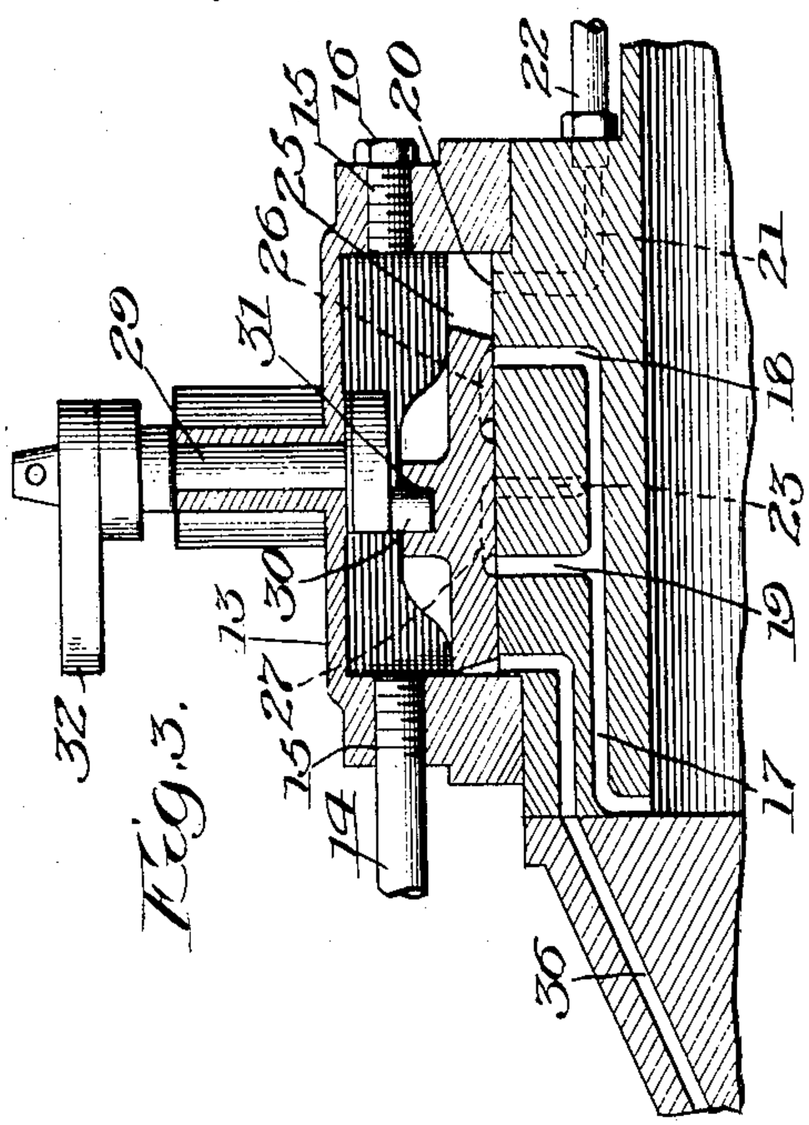


Fig. 3.




Fig. 2.

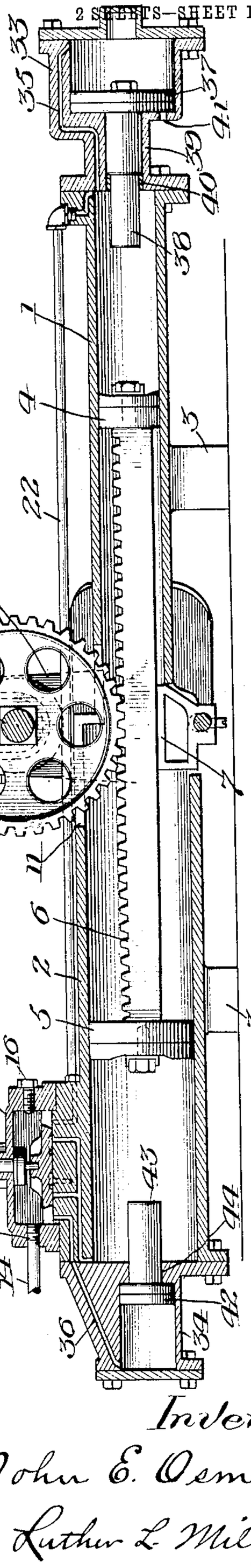


Fig. 1.

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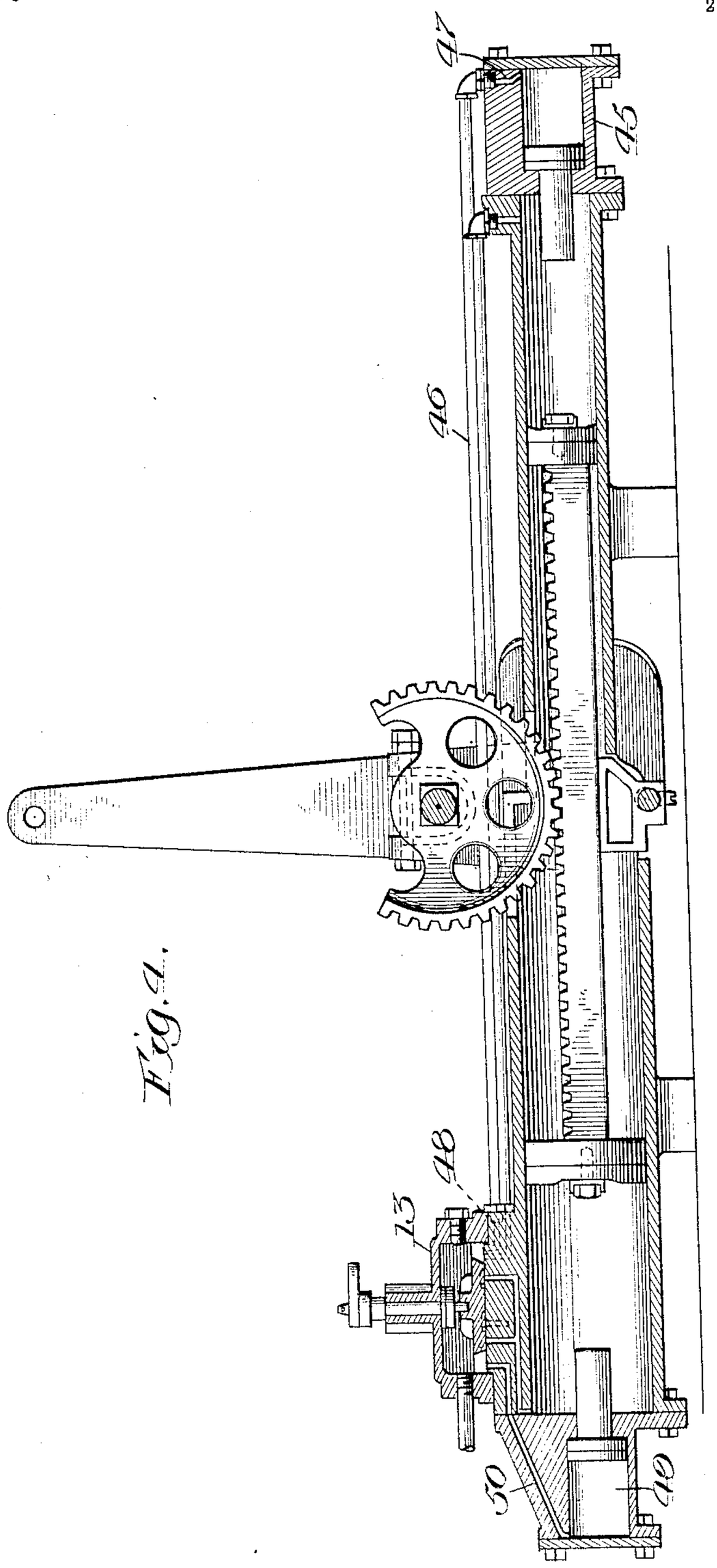


Fig. 4.

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# UNITED STATES PATENT OFFICE.

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## FLUID-PRESSURE MOTOR.

No. 899,795. Specification of Letters Patent. Patented Sept. 29, 1908.

Application filed October 8, 1906. Serial No. 337,847.

*To all whom it may concern:*

Be it known that I, JOHN E. OSMER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Fluid-Pressure Motors, of which the following is a specification.

This invention relates to a motor adapted to be actuated by fluid pressure, which may be used for opening and closing doors, for operating railway switches, and, generally, for giving a reciprocatory movement to a device.

The object of this invention is the provision of means for cushioning or retarding the movement of the part operated by the motor at the ends of the reciprocatory movement of said part.

The embodiment herein shown of my invention is especially designed for opening and closing the sliding doors commonly used upon elevated and other railway cars, and the special function of the retarding or cushioning devices is to prevent slamming of the door and to obviate injury to the hand or other part of the person of a passenger that may be in the doorway when the door is being closed.

In the accompanying drawings Figure 1 is a longitudinal central section through a fluid-pressure motor embodying the features of my invention. Figs. 2 and 3 are sectional detail views of the valve mechanism in the two operative positions thereof. Fig. 4 is a longitudinal central section through a motor generally similar to that shown in Fig. 1, but comprising a slightly different arrangement of the cushioning devices.

In the embodiment herein shown, the motor comprises a high-pressure cylinder 1 and a low-pressure cylinder 2 arranged in tandem, said cylinders, in this instance, being formed of an integral casting. Lugs 3, cast integral with the cylinders 1 and 2, provide means for securing the motor to its support. Within the cylinders 1 and 2 are mounted pistons 4 and 5, respectively, said pistons being secured to the opposite ends of a rack bar 6 having rack teeth upon its upper side. The pistons 4 and 5 are provided with suitable packing (not shown) to prevent leakage of the pressure fluid past said pistons. The rack bar 6 is supported intermediate its ends upon a shoe 7 adjustably mounted in the cylinder frame. In bearing lugs 8 (only one of which is shown in the sectional Fig. 1), preferably cast integral with the cylinders 1 and 2, is rotatably supported a shaft 9. Said shaft has fixed thereto a sector 10 adapted to mesh with the rack bar 6, the cylinders 1 and 2 having a slot 11 formed therein for the reception of said sector. A lever 12 is rigidly mounted at one of its ends upon one end of the shaft 9, the other end of said lever being operatively connected with the door or other device to be moved.

Upon one of the cylinders, in this instance the low-pressure cylinder 2, is located the valve mechanism that controls the passage of pressure fluid to and from both cylinders. The pressure chest 13 upon said cylinder is connected with any suitable source of pressure fluid, such as an air compressor, by means of an inlet pipe 14 adapted to be screwed into either one of two threaded openings 15 formed in the walls of said chest, the unused opening being closed by the plug 16. A port 17 formed in the cylinder walls communicates at one end with the interior of the low-pressure cylinder 2. An inlet port 18 and an exhaust port 19 communicate with the port 17 and open upon the valve face 20. Communication between the pressure chest 13 and the high-pressure cylinder 1 is established by means of a port 21 and a pipe 22. An exhaust port 23 formed in the walls of the cylinder 2 extends from the valve face 20 to the atmosphere. A slide valve 24 is slidably mounted between guides 25 formed upon the valve face 20, said slide valve having upon its face a groove 26 adapted to connect the ports 18 and 21, and a groove 27 adapted to connect the ports 19 and 23. The slide valve 24 is given a reciprocatory movement by means comprising a crank disk 28, said crank disk being mounted upon the lower end of a vertical shaft 29 rotatably supported in the upper wall of the pressure chest 13. Upon its under side the crank disk 28 carries a crank pin 30 adapted to lie within a transverse groove 31 formed in the upper side of the slide valve 24. The shaft

29 is arranged to be rocked to reciprocate the slide valve 24 by means of a crank arm 32 fixed to said shaft, said crank arm being operatively connected with a controller (not shown) located within convenient reach of the operator.

The means for retarding or cushioning the door when said door approaches the extremities of its travel, comprises retarding cylinders 33 and 34 fixed to the outer ends of the cylinders 1 and 2, respectively. The retarding cylinder 33 is of the same internal diameter as the low-pressure cylinder 2, while the retarding cylinder 34 is of slightly less internal diameter than the high-pressure cylinder 1. The retarding cylinder 33 is at all times connected with the high-pressure cylinder 1 by means of a port 35, and the retarding cylinder 34 is constantly in communication with the interior of the pressure chest 13 by means of the port 36. In the retarding cylinder 33 is slidably mounted a piston 37 having a stem 38 extending through an axial opening 39 in one end of said cylinder into the high-pressure cylinder 1. A leather bucket or other suitable packing 40 upon the stem 38 serves to prevent leakage through the opening 39. A leakage opening 41 is provided in the retarding cylinder 33 to permit of the escape of any pressure fluid which may leak past the piston 37 or the stem 38. A piston 42 in the retarding cylinder 34 has fixed thereto a stem 43 extending through an opening 44 in the end of said cylinder into the low-pressure cylinder 2.

Assuming the parts to be in the position shown in Fig. 1, the operation of the motor is as follows: The operator moves the slide valve 24 into the position represented in Fig. 3, in which position the port 21 is connected with the interior of the pressure chest 13 and pressure fluid passes to the high-pressure cylinder 1 through said port and the pipe 22. The groove 27 in the face of the slide valve 24 connects the port 19 with the exhaust passage 23, permitting any pressure fluid within the low-pressure cylinder 2 to escape into the atmosphere. The expansion of the pressure fluid within the high-pressure cylinder 1 forces the pistons 4 and 5 toward the left, swinging the lever toward the right and moving the door or other device. As the piston 5 nears the end of its movement, it strikes against the end of the stem 43 of the piston 42, and the remainder of the movement of said piston 5 is retarded or cushioned by the pressure of the fluid in the retarding cylinder 34, said fluid being forced back into the pressure chest 13 as the piston 5 continues to move. When it is desired to move the door in the opposite direction, the operator moves the slide valve 24 into the position shown in Fig. 2, wherein the groove 26 connects the ports 18 and 21, thus establishing communication between the high-pressure cylinder 1 and the low pressure cylinder 2. In this position of the valve 24 the groove 27 is out of register with the port 19 and the exhaust port 23, breaking communication between the atmosphere and the low-pressure cylinder. The piston 5 within the low-pressure cylinder having a larger area than the piston 4 in the high-pressure cylinder, the total pressure upon the piston 5 will be greater than that upon the piston 4, causing a movement of said pistons toward the right. As the piston 4 approaches the limit of its movement, it impinges upon the end of the stem 38 of the piston 37, and its further movement is cushioned by the pressure at the outer side of said piston 37.

It is obvious that the form and arrangement of the retarding devices may be changed in various ways. In Fig. 4 I have illustrated an embodiment of the invention wherein both retarding cylinders are connected at all times with the source of pressure fluid. The retarding cylinder 45 is connected with the pressure chest 13 by means of a pipe 46 and ports 47 and 48. Cushioning fluid at a higher pressure thus being used than in the cylinder 33 (Fig. 1) the cylinder 45 is made of a smaller internal diameter than said cylinder 33. The retarding cylinder 49 is connected with the interior of the pressure chest by means of a port 50, as in the embodiment first described. It will be noted that in the construction shown in Fig. 4, the air used for cushioning purposes is not wasted, being used over and over again.

I claim as my invention:

1. In a fluid pressure motor, in combination, a high-pressure cylinder and a low-pressure cylinder arranged in tandem; a piston in each of said cylinders, said pistons being arranged to move together; a source of fluid pressure; means for placing said high-pressure cylinder in connection with said source of fluid pressure, for connecting said cylinders together, and for connecting said low-pressure cylinder with the exhaust; a retarding cylinder connected at all times with said source of pressure fluid; a retarding cylinder connected at all times with said high-pressure cylinder; and pistons in said retarding cylinders arranged to be moved by the pistons in said high and low-pressure cylinders.

2. A fluid pressure motor comprising a high pressure cylinder, a low pressure cylinder, pistons for said cylinders, a retarding cylinder, a valve chest provided with a valve for controlling the passage of motor fluid to said first-mentioned cylinders, channels connecting said valve chest with said high and

low pressure cylinders, and a channel connecting said retarding cylinder to said valve chest, whereby said valve chest is retained in constant communication with said retarding cylinder, said retarding cylinder being provided with a piston having an extension passing through the end of the adjacent cylinder and into the path of the piston moving therein.

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