No. 704,782. Patented July 15, 1902.

J. H. DICKINSON.

AIR PRESSURE REGULATOR.

(Application filed June 25, 1901.)

(No Model.)

Fig. 1.

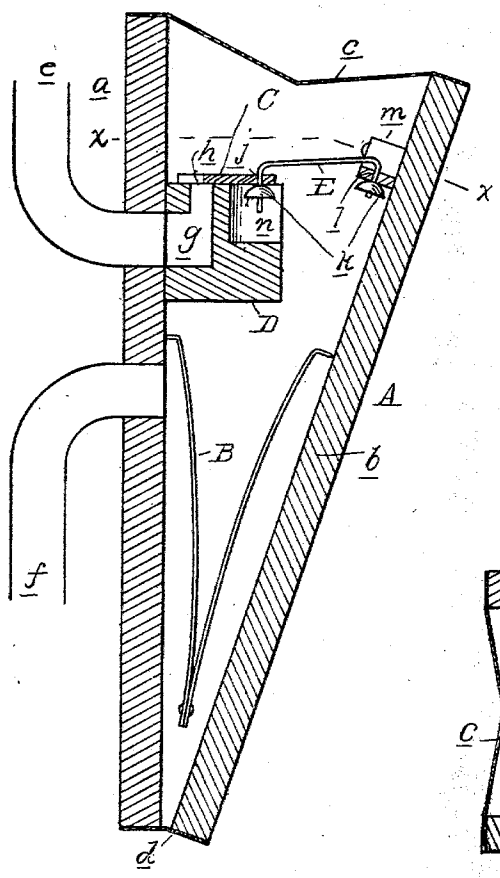
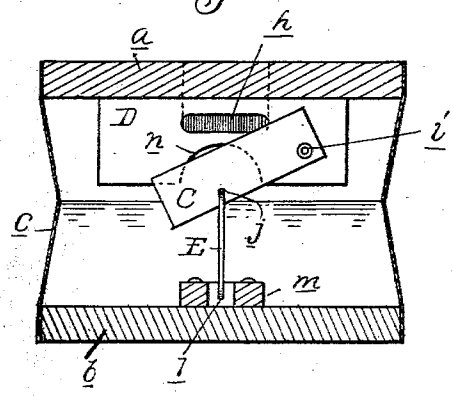


Fig. 2.



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UNITED STATES PATENT OFFICE.

JOSEPH H. DICKINSON, OF DETROIT, MICHIGAN.

AIR-PRESSURE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 704,782, dated July 15, 1902.

Application filed June 25, 1901. Serial No. 65,946. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH H. DICKINSON, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Air-Pressure Regulators, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to air-pressure regulators especially designed for use in connection with pneumatic-actions for musical instruments and self-playing attachments therefor.

It is the object of the invention to obtain a device by means of which uniform air-pressure is maintained on certain parts of the action regardless of the pressure developed by the wind-pumping devices. Heretofore regulators for this purpose have been devised comprising, essentially, a collapsible wind-chamber or bellows, the interior of which is connected with the wind-pumping devices or main store-bellows, and which is provided with suitable springs or counter-tension devices acting counter to the pressure of the air. Thus where the device is used in connection with a wind-suction pumping-bellows (which is usual in this class of instruments) the springs are placed so as to expand the collapsible chamber, while the air-suction tends to collapse said chamber against the tension of the spring. The conduit leading to the action or pneumatics which are to be regulated also connects with said collapsible chamber, and to maintain a constant pressure in said conduit a valve is arranged controlling the passage leading to the pumping-bellows, whereby when said chamber is wholly or partially collapsed said passage will be restricted to a greater or less extent. The usual construction of valve employed is in the form of a spring-flap arranged in proximity to the bellows-connecting passage, the spring normally holding said flap in a position to open said port, while a stop on the movable side of said collapsible chamber will press down said flap to close said port when the chamber is collapsed. This will restrict or close the connection leading to the action and will diminish the suction thereon. Inasmuch as the chamber is expanded by spring-pressure and collapsed by air-pressure and as the springs are of less tension relative to the area acted upon than the air-pressure, it is evident that in the normal operation the chamber will be partially collapsed. This will cause the restriction of the suction-passage, so as to diminish the suction within the chamber until it balances the pressure of the springs. If the suction of the pumping device is increased, the collapsible chamber will be further collapsed to form a greater restriction to the port. If, on the other hand, the suction is diminished, said chamber will expand to open said port, thereby always maintaining a uniform pressure within the chamber.

A serious objection to the construction above described is that it is difficult to adjust the flap-valve so as to obtain just the restriction required. Another objection is that the valve is itself a spring which changes the tension resisting the air-pressure, and, further, if the flap is completely drawn down over the port it is liable to be held in this position, when it is necessary to open the port to maintain the pressure within the chamber. The present construction is designed to overcome these objections; and the invention consists, first, in the peculiar construction and arrangement of the regulating-valve whereby an accurate restriction is obtained and whereby the counter tension on the collapsible chamber is not disturbed.

The invention further consists in the peculiar construction, arrangement, and combination of parts, as hereinafter claimed, and described in the drawings, in which—

Figure 1 is a longitudinal section through the regulator, illustrating diagrammatically the air-connecting conduits. Fig. 2 is a cross-section on line *x x*, Fig. 1.

A is the collapsible chamber, which is preferably in the form of a bellows comprising the stationary side *a*, the movable side *b*, and the flexible connecting material *c*. The latter is so arranged as to form a hinge for the bellows, as at *d*.

e is the air-suction conduit connecting the regulator with the pumping-bellows or store-bellows, and *f* is a conduit leading to the action or pneumatics to be controlled.

As the present invention has no reference to either the construction of the pumping and

store bellows or the pneumatic-action, these parts have been omitted from the drawings.

B is the spring forming the counter tension for normally expanding the bellows, which, as shown, is arranged within the chamber A.

C is the regulating-valve, which is adapted to move in opening or closing transversely to the axis of the port controlled. As shown, the block D is arranged within the chamber in which is formed the port *g*, connecting with the suction-conduit *e*, and the connecting-port *h*, opening into the chamber. The latter port is preferably in the form of a long and comparatively narrow slot for the purpose of forming a more gradual restriction, as hereinafter set forth.

The valve proper, C, is in the form of a plate or slide pivotally secured at *i* to the block D and adapted to be moved to close or uncover the port *h*.

E is a connecting-link between the valve C and the movable side *b* of the collapsible chamber. As shown, this link comprises a wire having its opposite ends bent at right angles to respectively engage with an aperture *j* in the valve and an aperture *l* in the bearing-block *m*, secured to the side *b* of the chamber. The link may be held in position by suitable washers or leather heads, such as *k*, and to provide room for the movement of the latter the block D is preferably cut away at *n*.

In the arrangement of the regulator in the instrument it is preferably placed in an upright position, so that the ported side of the block D will lie in a substantially horizontal plane and the valve C will rest upon the face of the block containing the port *h*. Thus the valve may be loosely pivoted to the block and at the same time will always be held against the face of said block by gravity, so as to form an air-tight joint.

The device being constructed as shown and described in operation the suction developed in the conduit *f* will be communicated through the ports *g* and *h* to the interior of the chamber A. This will cause an external atmospheric pressure to collapse said chamber against the tension of the spring B. In thus collapsing the sides *b* of the chamber will actuate the link E, which in turn will move the valve C over the port *h*, gradually restricting the area of the latter. As the port is thus restricted the suction within the chamber is diminished until it balances the pressure of the spring, whereupon further collapsing of the chamber is arrested. It is to be noted that only a comparatively small degree of movement of the side *b* is required to fully close the port *h*, thus the counter-tension of the spring B will not appreciably vary, as would be the case if the chamber were collapsed to a greater degree. It is further to be observed that the air-pressure acting upon the valve C does not tend to interfere with its movement in either direction, for the reason that its movement is transverse to the axis of the port. The result is that a perfect regulation of pressure is obtained, the device responding instantly to any change either in the pressure of the suction-bellows or in alteration in demand of the pneumatics or action regulated.

What I claim as my invention is—

1. An air-pressure regulator comprising a collapsible bellows having an elongated exhaust-port, a valve pivoted at one end adjacent to said port and a connection between the opposite end of said valve and the movable wall of the bellows adapted to cause the gradual closing of said port by the collapsing of the bellows.

2. An air-pressure regulator comprising collapsible bellows, a block arranged within said bellows and connected to the fixed wall thereof, said block having an elongated port therein, a valve resting upon said block and pivoted thereto at one end in such a position as to gradually open or close said elongated port, and a link directly connecting the other end of said valve with the movable wall of said bellows.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH H. DICKINSON.

Witnesses:
L. J. WHITTEMORE,
H. C. SMITH.