

(No Model.)

O. H. NEEDHAM.

MECHANICAL MUSICAL INSTRUMENT.

No. 250,833.

Patented Dec. 13, 1881.

Fig 1.

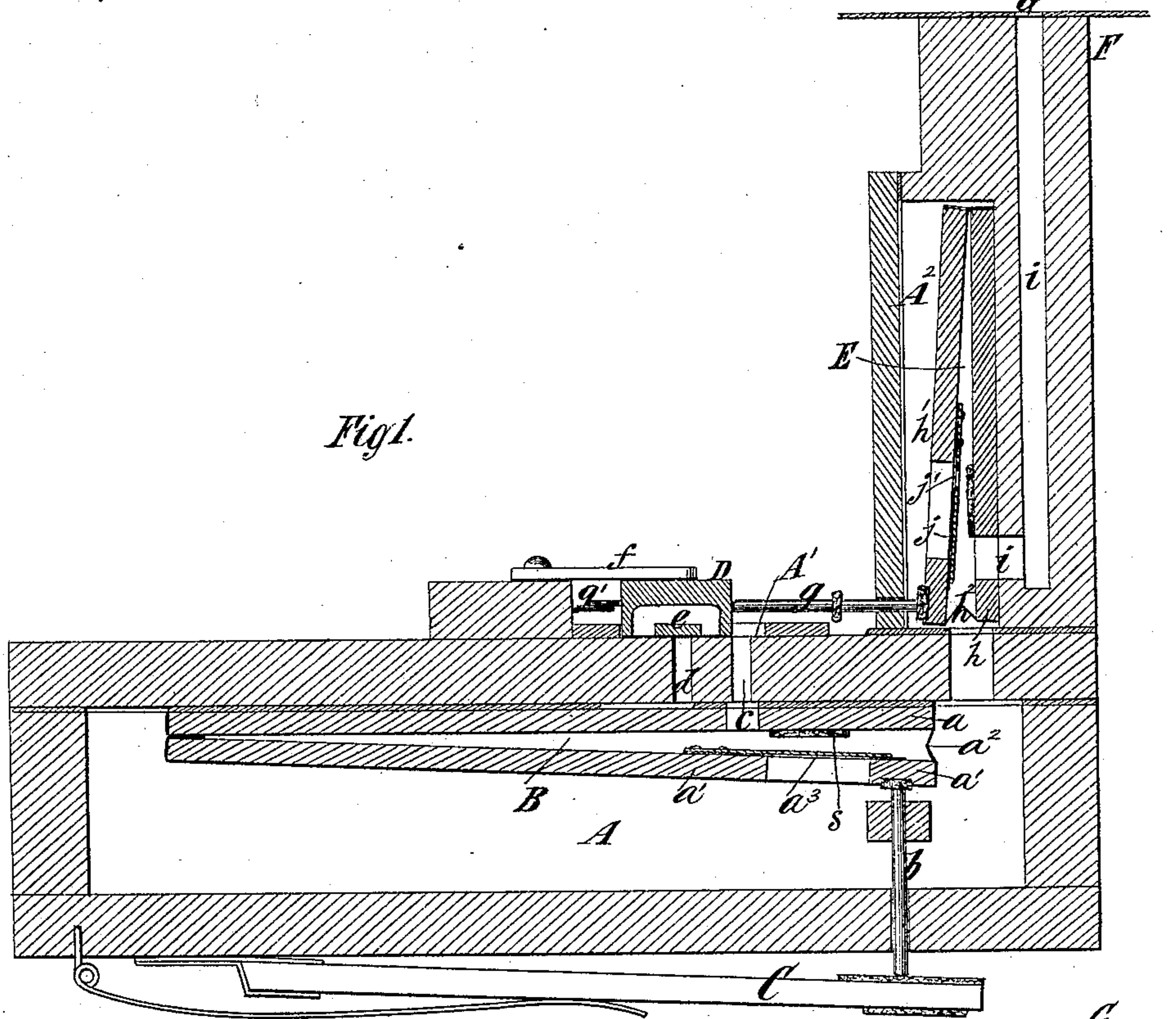
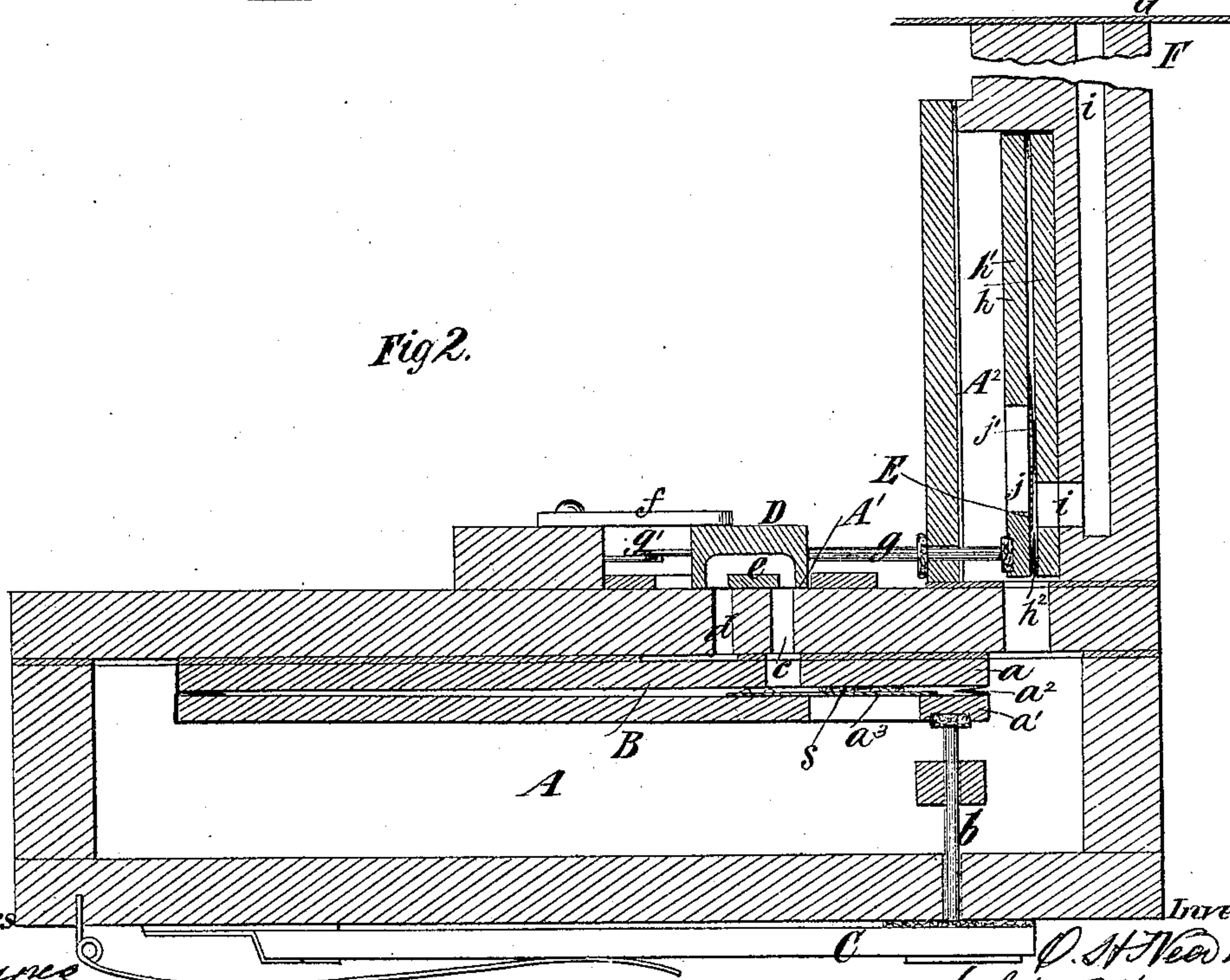


Fig 2.



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ORWELL H. NEEDHAM, OF NEW YORK, N. Y., ASSIGNOR TO ELIAS P. NEEDHAM AND CHARLES A. NEEDHAM, BOTH OF SAME PLACE.

MECHANICAL MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 250,833, dated December 13, 1881.

Application filed July 23, 1881. (No model.)

To all whom it may concern:

Be it known that I, ORWELL H. NEEDHAM, of the city and county of New York, in the State of New York, have invented certain new and useful Improvements in Musical Instruments, of which the following is a specification.

My invention relates to musical instruments in which the sound-producing devices are operated or have their operation controlled by means of pneumatic motors, which are caused to expand or operate by admitting air to them of a different pressure from that outside them. Frequently such a motor is arranged in an exhaust chest or chamber, and has an inwardly-opening valve, and when the port leading to the atmosphere is opened to admit air to the motor said valve is of course closed and the motor expands by the pressure within it. In order to provide for contracting or collapsing the motor, a small hole is made in said valve, and when the port leading from the motor to the atmosphere is closed the air is exhausted from the motor through said hole until the pressure therein is so far reduced that the valve opens and the motor collapses. In the operation of such a motor there is a constant leakage of air through the hole in said valve during the time that the motor is expanding and until it commences to collapse, and therefore a larger bellows and more power are required to keep the exhaust chest or chamber in which the motor is situated at the desired reduction of pressure. Another defect is that the motor is not operated as positively as is desirable, and as the air contained in the motor and the port leading to the atmosphere must all be exhausted through the small hole in the aforesaid valve the motor cannot be collapsed quickly, and therefore cannot be operated as frequently as is desirable.

The object of my invention is to remedy these defects; and to this end the invention consists in the combination of an exhaust chest or chamber, a pneumatic motor arranged therein, a tracker-pin extending from the motor to the outside of the chest or chamber, ports leading from said motor to the chest or chamber and to the atmosphere, a valve controlling said ports, means for operating said valve posi-

tively to place said motor in communication with the atmosphere, or in communication with said chest or chamber, and a spring acting through the tracker-pin to aid in collapsing said motor when it is placed in communication with said chest or chamber. The said valve may consist simply of a slide-valve operated positively in one direction and returned by a spring, and the means for operating it may consist of a second pneumatic motor the operation of which is controlled by a traveling perforated music card or tablet in a well-known manner, or may consist of a pegged barrel or manual keys or levers.

In the accompanying drawings, Figure 1 represents a vertical section of a pneumatic motor operated according to my invention, and appurtenances thereof, the said motor being expanded or inflated; and Fig. 2 represents a similar view of the motor collapsed.

Similar letters of reference designate corresponding parts in both figures.

A designates a wind chest or chamber, which may be embodied in a musical instrument, and is exhausted of air by any suitable means. (Not here represented.) In the chest or chamber A is a pneumatic motor, B, of the usual construction, composed of a fixed board, *a*, a movable board, *a'*, and flexible sides *a²*. When the motor is expanded or inflated the movable board *a'* acts upon a tracker-pin, *b*, which is arranged in suitable guides, and through said pin the motor depresses or operates a lever, C, which may constitute the valve of a reed-organ, or may cause the operation of piano-jacks, bells, or other sound-producing devices. The lever C is returned after depression by a spring acting upon its under side, and clearly shown in Fig. 1; and it is obvious that said spring, acting through the lever and tracker-pin *g*, will serve to collapse the motor B.

In the movable board *a'* of the motor B is an opening closed by a flap-valve, *a³*, which will be hereinafter fully described. The fixed board *a* of the motor B is secured to the top of the chest A; and *c* designates a port leading from the motor, through the top of the chest, to the atmosphere.

I also form in the top of the chest a second port, *d*, which terminates above the fixed board

a; but at that point a space is left between said board and the top of the chest or chamber A, so that the port is in free communication with the said chest or chamber. The ports *c* and *d* terminate at the top of and outside the chest or chamber A in a valve-seat, A', upon which is arranged a slide-valve, D, which is adapted to be reciprocated or shifted, so as to control the ports *c* and *d*. The valve D is made somewhat in the form of the letter B, it having a cross-bar, *e*, extending across its cavity; and *f* designates a button employed as a means of holding the valve to its seat. The valve is represented as being moved in one direction by a push-pin, *g*, and is returned by means of a spring, *g'*.

A pegged barrel, manual-keys, or other devices may be employed to move the valve D; but in this example of my invention such movement is effected by a second pneumatic motor, E, arranged in a chamber, A², which communicates with the chamber A, and is therefore a part of the said chest or chamber.

The motor E is composed of fixed and movable boards *h h'*, the latter of which operates on the push-pin *g* and a flexible wall, *h²*, and from the motor a port, *i*, leads upward and terminates in a seat or rest, F, for a perforated music card or tablet, G, whereby the operation of the motor E is controlled.

In the movable board *h'* of the motor E is a valve, *j*, having in it a small hole or opening, *j'*; but as the motor E is very small, and need only have power enough to move the valve D, the amount of air leaking through the hole *j'* will be very small. When a perforation in the card or tablet G uncovers the port *i* air enters the motor and closes the valve *j*, and the motor expands and moves the slide-valve D. As soon as the card or tablet G again covers the port *i* the air in the motor is exhausted through the hole *j'* until the air therein becomes so reduced in pressure that the valve *j* springs open, after which the exhaustion takes place through the valve. When the slide-valve D is moved into the position shown in Fig. 1 air enters through the port *c* and closes the valve *a³* in the movable board *a'* of the motor B, and as said valve is imperforate no air can escape through it into the chest or chamber A. The motor, by its expansion, operates the lever C and effects the operation of the sound-producing device.

It will be observed that when the port *c* is open the port *d* is closed by the cross-bar *e*, as seen in Fig. 1, and no air can escape. When the pressure is taken off the push-pin *g* the valve is instantly returned by the spring *g'* into the position seen in Fig. 2, so as to cover the two ports *c d* and place them in communication, and thus establish communication between the motor B and the exhaust chest or chamber A, while the communication of the former with the atmosphere is cut off. This provides for the exhaustion of air from the motor, and as soon as the air therein becomes

sufficiently reduced in pressure the valve *a³* springs open and the exhaustion of the motor is completed through said valve. The valve, in opening, strikes against a cushion, S, which prevents any sound.

It will be understood that when communication is established between the motor B and the atmosphere no air can escape from the motor into the exhaust chest or chamber A, and hence the movable board of the motor is operated strongly and quickly, and held immovable in its outward position, thus giving a very uniform action, and the vacuum in the exhaust chest or chamber remains unimpaired.

It will also be understood that when the valve D is shifted to place the motor in communication with the exhaust chest or chamber A a large passage or opening is afforded, and the motor may be collapsed far more quickly than when the first exhaustion of air from the motor takes place through a small hole in the valve *a³*, as is the case with the motor E, and for that reason a more rapid action of the motor can be obtained.

I have herein termed the chest or chamber A a "wind chest or chamber," because the air is exhausted from the pneumatic motors into and through the same, and for this reason it may also be termed an "exhaust-chamber."

The cross-bar *e* in the valve D is very desirable, because when the valve is moved by the push-pin *g* the port *d* is entirely covered by the bar *e* before the port *c* is open to the atmosphere, and hence air is prevented from entering the wind-chest. It is also evident that when the valve returns the port *d* is not uncovered by the bar *e* until the port *c* is entirely closed by the valve.

In some cases the pneumatic motors might be operated by admitting to them air under pressure in excess of the atmospheric pressure, while they are surrounded by air of the atmospheric pressure. In such case the slide-valve might be arranged in a pressure wind-chest, with which the motor B communicates through the port *c*, and the motor would communicate with the atmosphere through the ports *c d* when the slide-valve is shifted to cover both said ports.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of an exhaust chest or chamber, a pneumatic motor arranged therein, a tracker-pin extending from the motor to the outside of said chest or chamber, ports leading from said motor to the chest or chamber and to the atmosphere, a valve controlling said ports, means for operating said valve positively to place said motor in communication with the chest or chamber, or in communication with the atmosphere, and a spring acting through the tracker-pin, to aid in collapsing said motor when it is placed in communication with said chest or chamber, substantially as specified.

2. The combination of a wind chest or chamber, a pneumatic motor, a valve-seat contain-

ing ports leading to said chest or chamber and
said motor, a slide-valve working upon said
seat and adapted to be shifted to place said
motor in communication with the atmosphere,
5 or in communication with said chest or cham-
ber, and means for operating said valve posi-
tively, substantially as and for the purpose
specified.

3. The combination of a wind chest or cham-
10 ber, a pneumatic motor arranged therein, ports
leading from said chest or chamber and from
said motor to the atmosphere, and terminating
outside the chest or chamber in a valve-seat,
a slide-valve working upon said seat for con-
15 trolling said ports, means for operating said
valve positively in one direction to place said
motor in communication with the atmosphere,
and a spring for returning said valve to place

said motor in communication with said chest
or chamber, substantially as and for the pur- 20
pose specified.

4. The combination of a wind chest or cham-
ber, a pneumatic motor arranged therein, ports
leading from said chest or chamber, and from
said motor to the atmosphere, and terminating 25
outside the chest or chamber in a valve-seat,
a slide-valve working on said seat for control-
ling said ports, a second pneumatic motor for
operating said valve, and a perforated music
card or tablet for controlling the operation of 30
said second motor, substantially as and for the
purpose specified.

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