No. 779,716. PATENTED JAN. 10, 1905.

E. DE KLEIST.

PNEUMATIC ACTION FOR MUSICAL INSTRUMENTS.

APPLICATION FILED MAR. 23, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

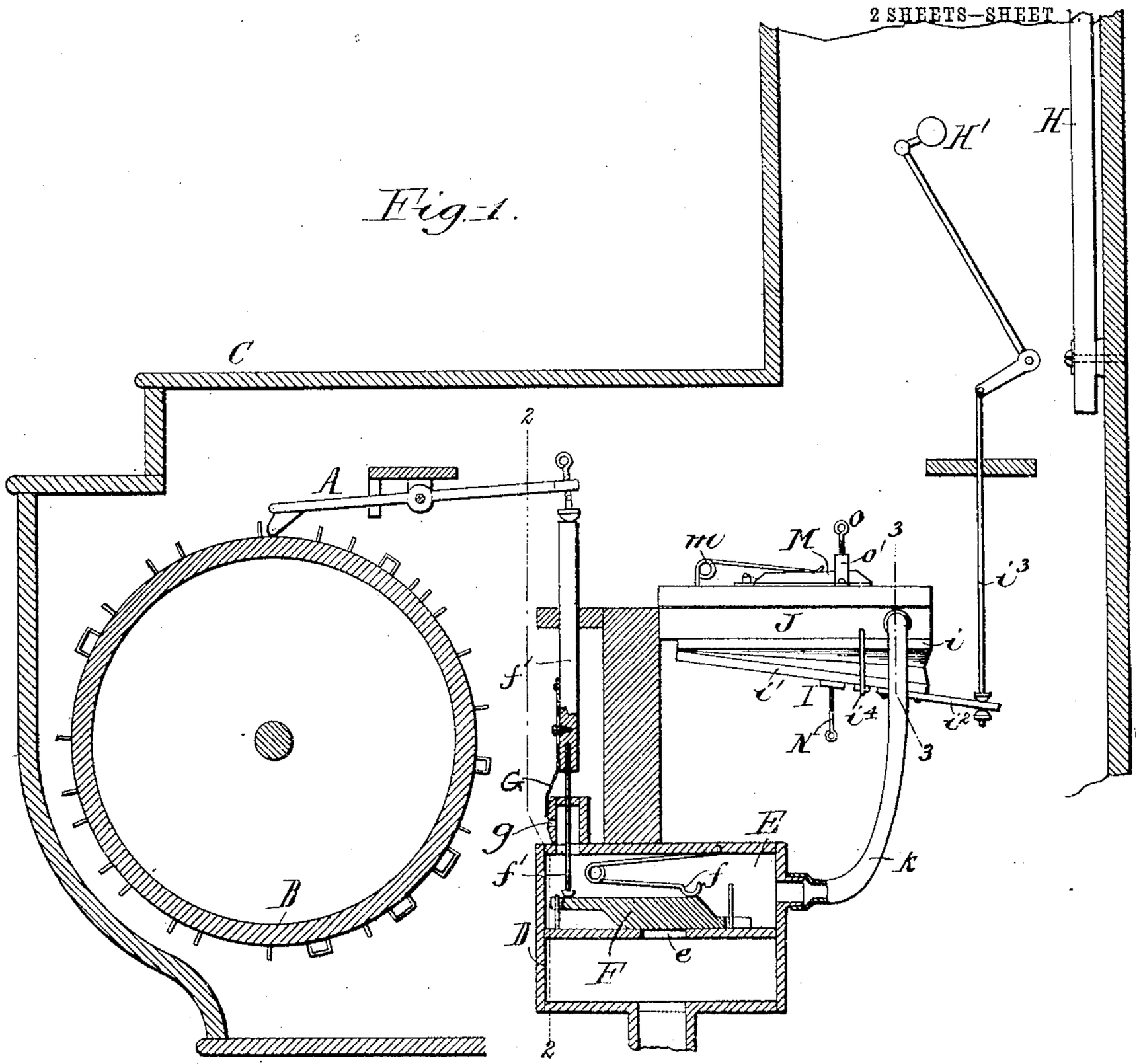


Fig. 2.

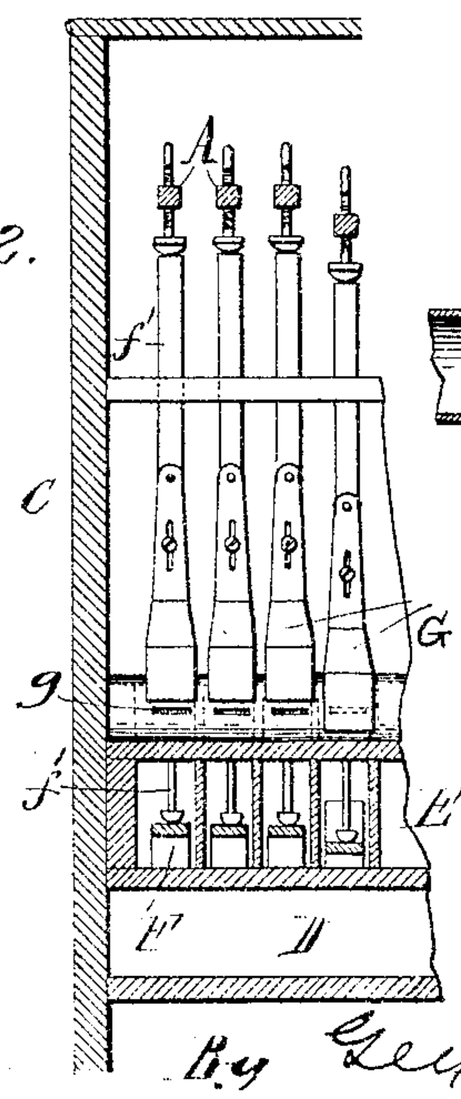
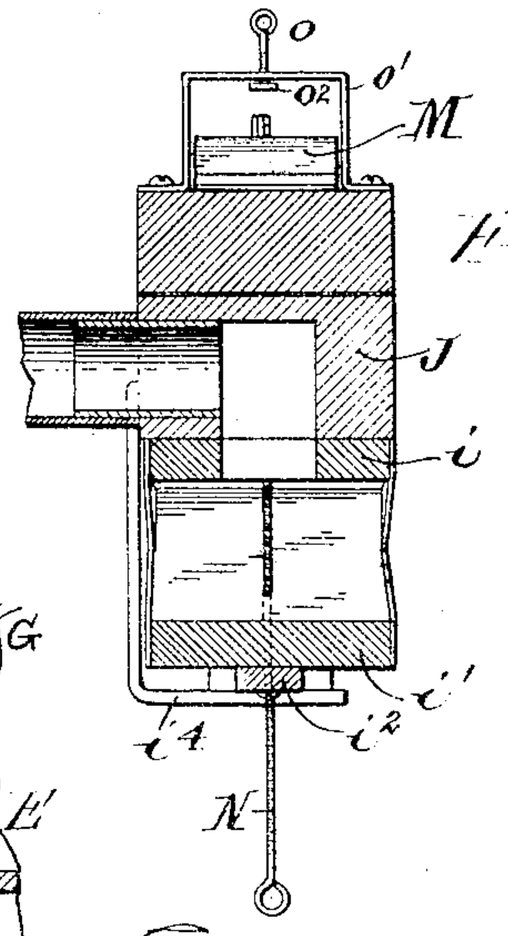


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

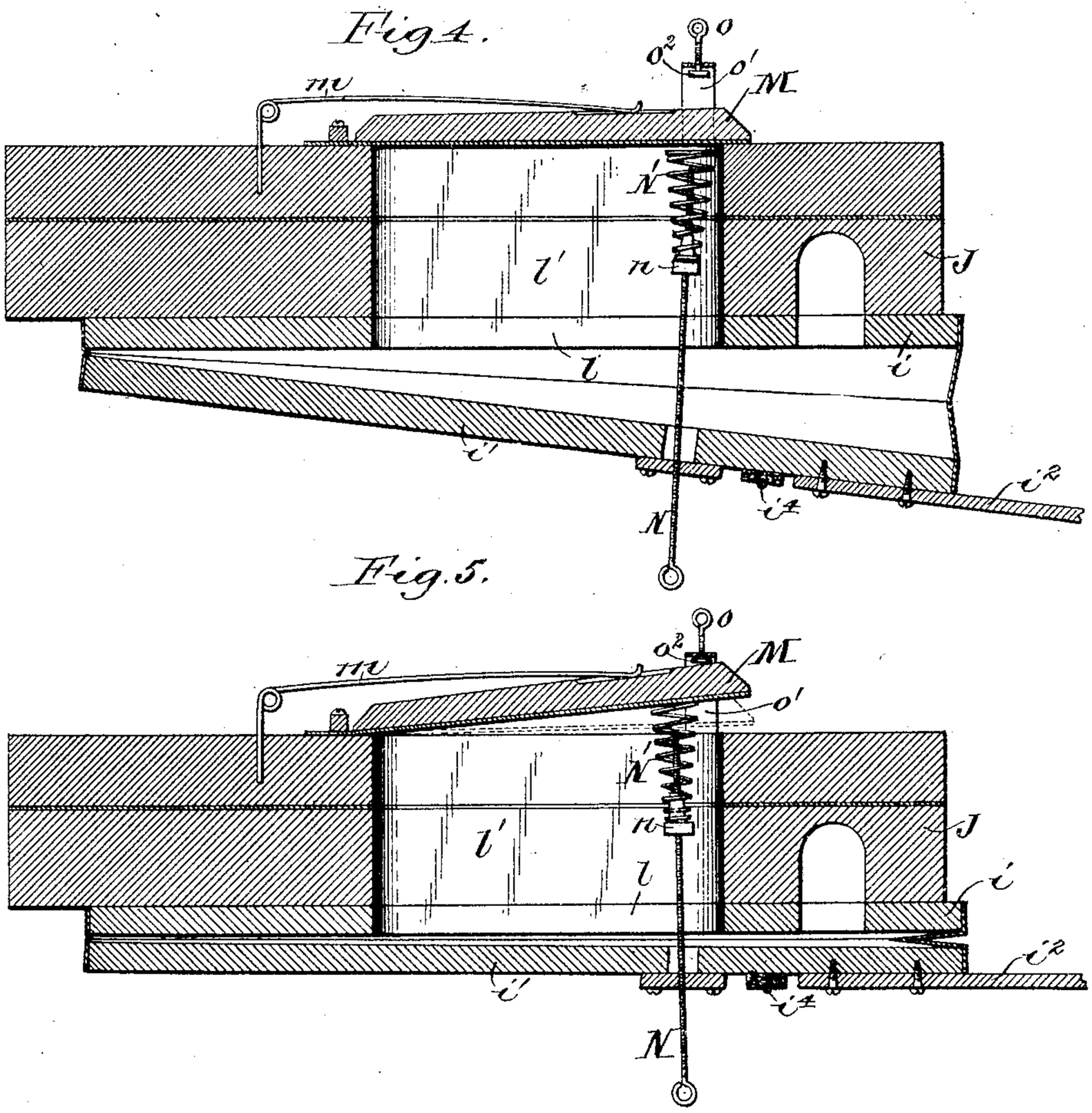
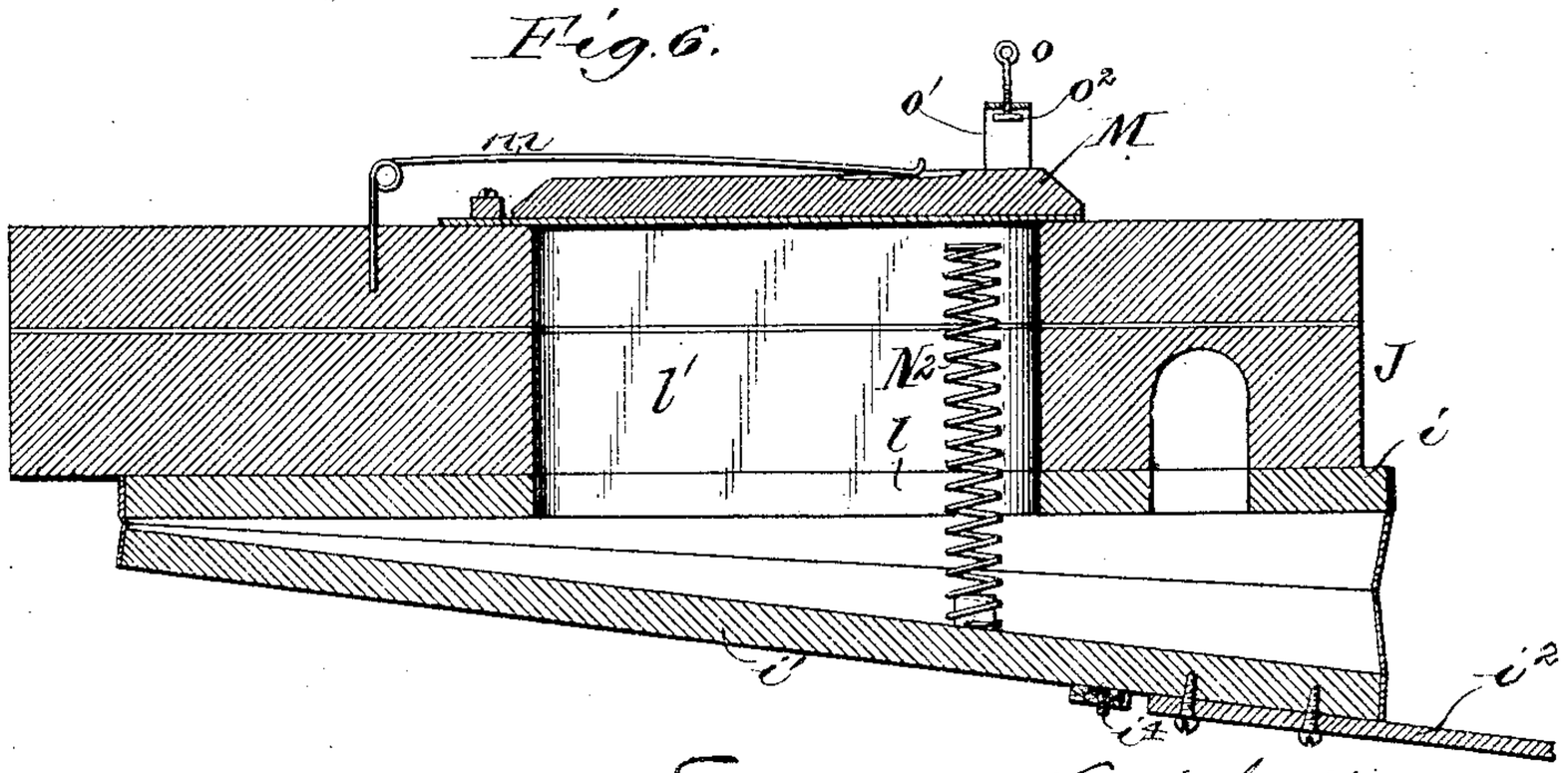


Fig. 5.

Fig. 6.



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No. 779,716. Patented January 10, 1905.

UNITED STATES PATENT OFFICE.

EUGENE DE KLEIST, OF NORTH TONAWANDA, NEW YORK.

PNEUMATIC ACTION FOR MUSICAL INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 779,716, dated January 10, 1905.

Application filed March 23, 1904. Serial No. 199,528.

To all whom it may concern:

Be it known that I, EUGENE DE KLEIST, a citizen of the United States, residing at North Tonawanda, in the county of Niagara and State of New York, have invented new and useful Improvements in Pneumatic Actions for Musical Instruments, of which the following is a specification.

This invention relates to pneumatic actions for automatic musical instruments, but more particularly to an action which produces a tremolo effect, rendering the same especially desirable for vibrating the hammers or striking members of chimes, xylophones, and other percussion instruments.

The object of my invention is to provide a simple and effective action of this class which can be conveniently regulated to compensate for imperfections or inequalities of different units of the action, so as to obtain a uniform stroke or blow of the several hammers or percussion members.

In the accompanying drawings, Figure 1 is a transverse vertical section of the upper portion of a self-playing musical instrument embodying my invention. Fig. 2 is a fragmentary longitudinal section in line 2 2, Fig. 1. Fig. 3 is a cross-section, on an enlarged scale, in line 3 3, Fig. 1. Fig. 4 is an enlarged longitudinal section of one of the motor-pneumatics, showing its vent-valve closed. Fig. 5 is a similar view showing the valve fully open. Fig. 6 is a section similar to Fig. 4, showing a modification of the invention.

Similar letters of reference indicate corresponding parts throughout the several views.

In the drawings the invention is shown as applied to an automatic instrument in which the valves which control the exhaust-passages leading to the motor-pneumatics are operated by pivoted keys A, which are tripped by a rotary pin-barrel B, of well-known construction.

C indicates the inclosing case of the instrument, and D the wind or exhaust chest, arranged horizontally in rear of the barrel.

E indicates a row of valve-chambers arranged above the wind-chest and communicating therewith by the usual individual ports *e*, and F indicates the exhaust-valves arranged in said chambers and applied to said ports. These valves are closed by the usual springs *f* and opened by the rods or stickers *f'*, which bear upon the rear ends of the valves and are depressed by the keys A.

G indicates sliding vent-valves carried by the stickers *f'* and applied to the vent-ports *g*.

The devices so far described form no part of my present invention and are substantially like those shown and described in Letters Patent of the United States No. 715,484, granted to me December 9, 1902.

H indicates a row of xylophone-bars or similar sound-producing parts, and H' the hammers adapted to strike said bars. I indicates a series of motor-pneumatics for vibrating these hammers. Such a pneumatic is provided for each hammer, and each of the same is constructed as follows: The pneumatic consists of a small bellows, the upper stationary board *i* of which is secured to the under side of a horizontal wind-board, shelf, or support J, while its lower movable board *i'* has an arm i^2, which actuates a sticker i^3, which in turn actuates the corresponding hammer H'. A suitable stop i^4 may be employed for limiting the opening movement of the movable board *i'*. The pneumatic is connected with one of the valve-chambers E by a tube *k* or other suitable conduit, so that when the exhaust-valve of said chamber is opened the pneumatic is collapsed and caused to elevate the sticker. In the construction shown in the drawings the wind-board J is provided in one side with a port or passage which leads to the interior of the pneumatic and with which the tube *k* is connected. The top board of the pneumatic is provided with a comparatively large vent-port *l*, which registers with a similar port *l'*, arranged in the wind-board. To the upper end of the last-named vent-port is applied an upwardly-opening valve M, which is hinged at one end to the upper side of the wind-board. A spring *m* bears upon this valve and aids in closing the same.

N is a rod or stem extending upwardly through the movable board of the pneumatic and its vent-port *l* and carrying at its upper end a spring N', which extends normally above the upper end of the stem and is adapted to bear against the under side of the vent-

valve when the pneumatic is collapsed. The stem N is preferably in the form of a screw, so that it can be adjusted lengthwise in the movable board of the pneumatic, and it carries a nut or adjustable button *n*, upon which the spring N′ rests.

o indicates an adjustable stop which positively limits the opening movement of the vent-valve M. This stop may consist of a vertical screw arranged in a yoke or bridge-piece *o*′, which is secured to the upper side of the wind-board J and extends across the free end of the valve, this screw being provided at its lower end with a head or button o^2, against which the valve strikes when opened.

In the operation of the action when one of the exhaust-valves F is opened the air is exhausted from the corresponding pneumatic I through the conduit *k*, collapsing the pneumatic and causing its movable board to actuate the corresponding hammer H′. The exhaustion of the air from the pneumatic causes the vent-valve M to be held against its seat by the atmospheric pressure, as well as by its spring *m*. During the first portion of the upward stroke of the movable board *i*′ the opening-spring N′ is compressed, the resistance of the atmospheric pressure against the upper side of the vent-valve being sufficient to keep the valve closed. During the final portion of the upward stroke of the movable board *i*′ the upper end of the screw-stem N comes in contact with the valve and partly but positively opens the same, the atmospheric pressure against the movable board overcoming that against the valve, owing to the fact that the former is of greater area than the latter. As soon as the valve is thus partly opened the atmospheric pressure against opposite sides of the valve is equalized, and the compressed spring N′ reacts and fully opens the valve, permitting the inrush of a large volume of air into the pneumatic and quickly expanding the same. By the descent of the movable board of the pneumatic the screw-stem N and the opening-spring N′ are lowered to their former position, allowing the vent-valve M to close by gravity, aided by its spring *m*. In this manner the pneumatic is alternately expanded and contracted with great rapidity as long as the corresponding exhaust-valve F remains open, the fluttering action of its movable board resulting from the rapid vibrations causing the hammer to produce a tremolo effect in striking the xylophone-bars or other sound-producing parts.

The action can be regulated to obtain a greater or less number of hammer-strokes in a given time by adjusting the stop *o* toward or from the wind-board J. This increases or diminishes the amplitude of the vibrations of the vent-valve and produces a more or less rapid vibration of the movable board of the pneumatic and the hammer actuated by the same. This regulating capacity of the vent-valves of the pneumatics also permits the same to be adjusted to compensate for irregularities of workmanship and other variations in different units of the action, thus securing a uniform stroke of all of the hammers.

The valve-adjusting device *o* illustrated in the drawings is shown as an example. Other equivalent devices will suggest themselves to the skilled mechanic, and I do not, therefore, wish to limit myself to the particular devices herein shown and described.

While the screw-rod N is preferably employed in connection with the spring N′ for opening the vent-valve, this rod is not indispensable. The same effect may be produced, though in a less desirable manner, by omitting that rod and employing a comparatively long spring, which rests upon the movable board of the pneumatic, as shown at N^2 in Fig. 6. In this case the vent-valve remains closed during the initial compression of the spring; but by the time that the movable board of the pneumatic nearly reaches the limit of its upward stroke the resistance due to the continued compression of the spring overcomes the atmospheric pressure against the vent-valve and opens the same, the expansion of the spring opening the valve quickly and fully, as hereinbefore described.

I claim as my invention—

1. In a pneumatic action for musical instruments, the combination of a motor pneumatic or bellows having an exhaust-port and a vent-port, a valve controlling said vent-port, a spring connected with the movable board of the pneumatic and adapted to bear against said vent-valve, and an adjustable stop arranged to limit the opening movement of said valve, substantially as set forth.

2. In a pneumatic action for musical instruments, the combination of a motor pneumatic or bellows having an exhaust-port and a vent-port, a valve, a yoke or bridge-piece extending across said vent-valve and a stop-screw carried by said yoke and arranged to limit the opening movement of said valve, substantially as set forth.

3. In a pneumatic action for musical instruments, the combination of a wind-board or support having a vent-port, a motor pneumatic or bellows carried by said board and having an exhaust-port and a vent-port which communicates with the vent-port of said wind-board, a valve applied to the last-named port, a rod or stem carried by the movable board of the bellows and arranged to strike said vent-valve for opening the same, a spring mounted on said rod and arranged to come in contact with said vent-valve in advance of the upper end of the rod, and an adjustable stop for limiting the opening movement of said valve, substantially as set forth.

4. In a pneumatic action for musical instruments, the combination of a wind-board or support having a vent-port, a motor pneu-

matic or bellows carried by said board and having an exhaust-port and a vent-port which communicates with the vent-port, of said wind-board, a valve applied to the last-named port, a rod or stem carried by the movable board of the bellows and arranged to strike said vent-valve for opening the same, a spring mounted on said rod and arranged to come in contact with said vent-valve in advance of the upper end of the rod, a yoke secured to said wind-board and extending across the vent-valve, and a stop-screw arranged in said yoke, substantially as set forth.

Witness my hand this 9th day of March, 1904.

EUGENE DE KLEIST.

Witnesses:
C. F. GEYER,
EMMA M. GRAHAM.