

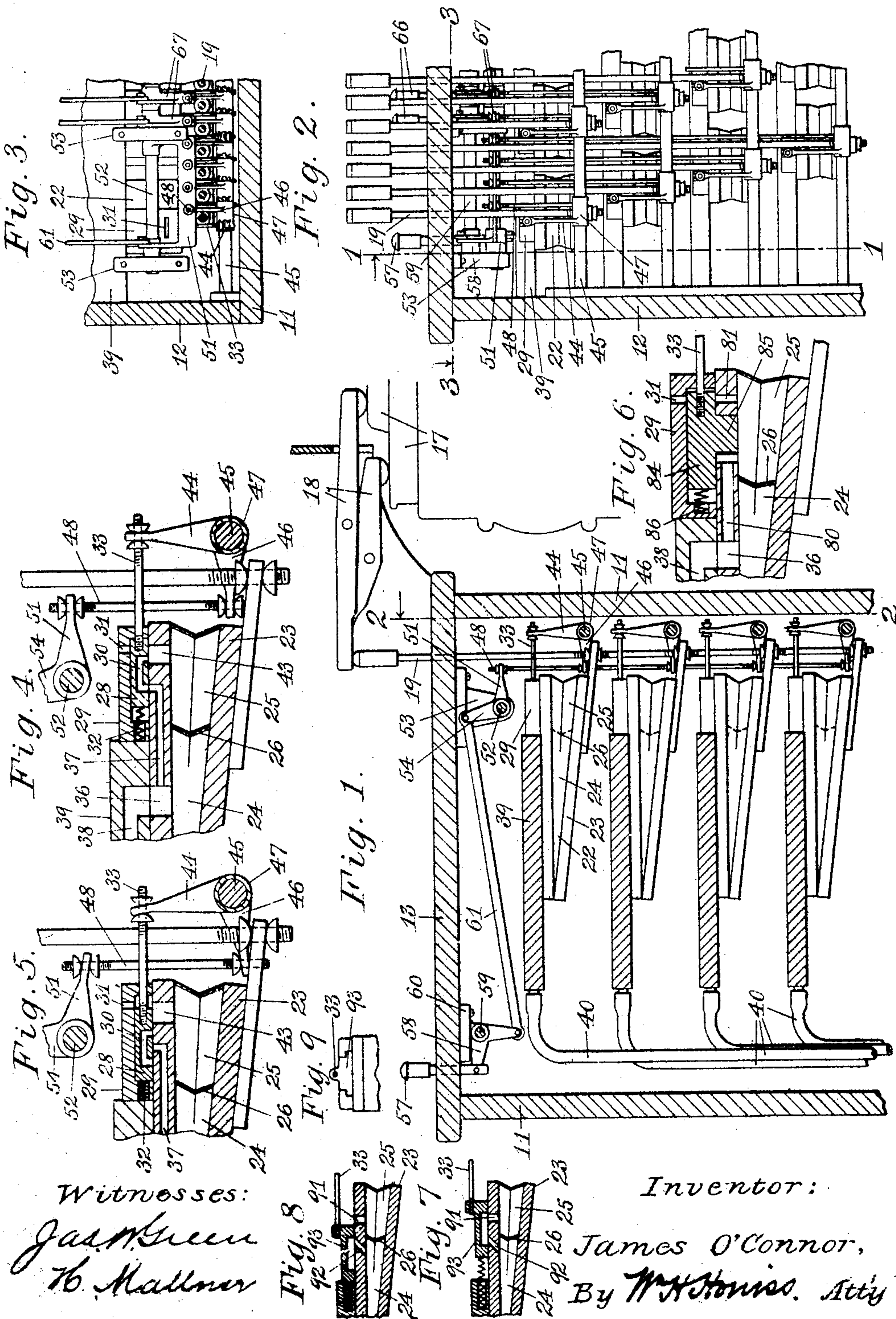
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PATENTED AUG. 29, 1905.

J. O'CONNOR.

TONE MODIFYING DEVICE FOR MECHANICAL MUSICAL INSTRUMENTS.

APPLICATION FILED SEPT 30, 1904.





# UNITED STATES PATENT OFFICE.

JAMES O'CONNOR, OF NEW YORK, N. Y.

TONE-MODIFYING DEVICE FOR MECHANICAL MUSICAL INSTRUMENTS.

No. 798,442.

Specification of Letters Patent.

Patented Aug. 29, 1905.

Application filed September 30, 1904. Serial No. 226,611.

*To all whom it may concern:*

Be it known that I, JAMES O'CONNOR, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Tone-Modifying Devices for Mechanical Musical Instruments, of which the following is a full, clear, and exact specification.

10 This invention relates to pneumatically-operated mechanical piano-players and instruments of that class; and it consists of improved means for either modulating or accenting the tones of particular notes or groups  
15 of notes at the will of the performer. The effect of this is to diminish the potentiality or inherent capacity of the bellows 22.

The invention is here shown as a modulating device, though it may with equal facility be  
20 used as an accenting device by a reversal of a portion of its connections. It is here shown in connection with a well-known type of mechanical piano-player which operates by means of an exhaust mechanism.

25 Figure 1 is a sectional end view of a portion of a mechanical piano-player with the improvements attached thereto, the section being taken on the line 1 1 of Fig. 2. Fig. 2 is a partial side view of the instrument in  
30 section on the line 2 2 of Fig. 1. Fig. 3 is a partial plan view in section on the line 3 3 of Fig. 2. Figs. 4 and 5 are fragmentary sectional side views of a motor-bellows, showing the regulating-valve in its two extreme positions. Fig. 6 is a fragmentary sectional side  
35 view of a motor-bellows, showing a modified form of valve. Figs. 7 and 8 are fragmentary sectional side views of another modified form of valve and show the valve in two different positions. Fig. 9 is an end view of  
40 Fig. 8.

The common way of modulating the tones of a piano in connection with a piano-player is to provide an attachment by which the performer may operate the soft pedal of the  
45 piano by means of mechanical devices placed conveniently within his reach. The soft pedal in most pianos operates by muffling the strings, and it thereby produces a tone which,  
50 while diminished in loudness, is also altered in character from what the string would produce if left free to vibrate naturally. For this reason the soft pedal is but little used by competent pianists when playing modulated  
55 passages. What the pianist does is to strike the keys with diminished force, thus produc-

ing a tone which is reduced in volume, but which retains at the same time the full richness of the free vibration of the strings.

It is the object of the present invention to  
60 provide a modulating device which closely approximates the variable touch of the human fingers by reducing the power applied to the key-actuating devices, thereby reducing also the force of the blow struck upon the  
65 keys.

The piano-key 17 is operated by a pivoted finger 18, the inner end of which is disposed adjacent to and directly over the top of the  
70 finger-rod 19. The rod 19 extends through the top 13 of the casing of the instrument and is attached to and operated by the movable leaf 23 of the motor-bellows 22. The latter is secured to the under side of the shelf 39,  
75 which is supported on the ends 12 of the casing. The shelf 39 is provided with a number of passages 38, Fig. 4, each of which leads to a bellows similar to 22. A tube 40, Fig. 1,  
80 connects each passage 38, Fig. 4, to the exhaust-chest and actuating mechanism.

In the present invention each bellows 22 is divided by a partition 26 into two compartments 24 and 25, one of which is thrown into or out of communication with the exhaust-chest by means of a valve, which in the present instance is manually controlled by the performer. As herein shown, the compartment  
85 24 is connected with the passage 38 by means of the passage 36. From the passage 36 another passage 37 leads to the valve 28, which  
90 is mounted to slide to and fro within the casing 29, secured to the upper side of the bellows 22. The compartment 25 is connected to the under side of the valve 28 by the passage 43. An opening 31 leads through the  
95 casing 29 from the outer air to the top of the valve 28. The latter is provided with a port 30, so disposed as to connect the passages 37 and 43 when the valve is at one end of its stroke, thus putting the chamber 25 in communication with the exhaust-passage 38.  
100 When the valve is at the other end of its stroke, as shown in Fig. 5, the compartment is cut off from communication with the passage 37 and put in communication with the outer air  
105 through the passage 43 and the opening 31 in order to allow outside air to pass in and out freely, and thus avoid impeding the free action of the bellows under the impulses imparted by means of the single compartment  
110 24. The passages 37 and 43 and the port 30 are preferably so arranged that the end of the



passage 37 will be closed before the passage 43 is opened to the outer air. A spring 32 tends to hold the valve in the position shown in Fig. 4, so that the compartment 25 is normally connected with the exhaust-passage 38, thus operating the full capacity of the bellows.

The valve 28 is operated by the performer, in this case through the medium of the rod 33, which extends through the casing 29, and is connected with the upper end of the vertical valve-lever 44. The latter is integral with or secured to the hub 47, which is loosely supported on the shaft 45 and has secured to it the horizontal valve-lever 46. The outer end of the latter is connected with one end of the connecting-rod 48, the other end of which is connected to the outer end of the bell-crank rocker 51, which is connected also to a number of similar connecting-rods 48 for the respective bellows. The rocker 51 is loosely mounted on the shaft 52, supported in the brackets 53, secured to the under side of the top 13. The rocker 51 has an arm 54 extending from its upper side, the end of which arm is connected, by means of a rod or bar 61, to the lower end of the bell-crank 58. The latter is loosely mounted on the shaft 59, supported in brackets 60, secured to the under side of the top 13. The other end of the bell-crank 58 is connected with the lower end of the push-button 57, which extends through the top 13 to a position within convenient reach of the operator.

Both compartments 24 and 25 of the bellows 22 being normally connected with the exhaust through the passage 38, the full area of the bellows 22 operates upon the finger-rod 19. When it is desired to modulate the tone, the button 57 is depressed by the operator, thus moving the connecting-rod 48 downward by means of the arm 54 and the rocker 51. This pushes the valve-rod 33 inward and slides the valve 28 from the position shown in Fig. 4 to that shown in Fig. 5, thus closing the passage 37 and connecting the compartment 25 with the outer air through the opening 31. If now the bellows 22 is operated in the usual manner, the force of the action on the finger-rod 19 will be very much reduced, as the effective area of the bellows 22 is now reduced by the amount represented by the compartment 25. A blow of diminished force will therefore be struck on the piano-key 17 by the finger 18 and the tone correspondingly modulated. The air passing freely in and out of the compartment 25 through the passages 43 and 31 interposes no check upon the expansion and collapsing of the bellows 22.

The rocker 51 is here shown connected to four of the connecting-rods 48, thus enabling each to operate the valves in four of the motor-bellows simultaneously. It may, however, be formed to operate as many bellows as desired or may be made in the form of the rocker 67, Fig. 3, so as to operate but one

bellows at a time, each push-button, as 66, controlling, therefore, the action of but one motor-bellows.

In Fig. 6 is shown a modified form of slide-valve. In this case the valve 84 is provided with an extension 85, which when the rod 33 is pushed in will close the end of the passage 80, extending from the compartment 25 to the passage 36. The spring 86 is provided to hold the valve normally away from the passage 80. The opening 81 permits the outer air to enter the chamber 25 through the opening 31, as before, when the valve is pushed back against the spring.

In Figs. 7, 8, and 9 is shown another modification of the slide-valve. The upper leaf of each motor-bellows is provided with two ports 91 and 92, connecting, respectively, with the compartments 23 and 24. These ports are controlled by the slide-valve 93, operated by the rod 33. When the valve is in the position shown in Fig. 7, the compartment 23 is exhausted simultaneously with the compartment 24, while in the position shown in Fig. 8 the port 91 is open to the atmosphere and the compartment 25 is therefore inoperative. The ports should be placed so that they cannot be closed by the partition 26 when the motor-bellows collapses, as such closing would interfere with the rapid recovery of the bellows after action.

This invention is applicable to bellows operated either by exhaust or by pressure.

The collapsing partitions 26 may be extended lengthwise of the bellows in a direction substantially at right angles to that herein shown, and the areas into which these bellows are thus divided by the partition may be varied in relative dimensions, so as to properly proportion the areas of the respective compartments, and thereby vary the force of the respective blows. In other ways it will be obvious to those familiar with this art that this invention may be modified to suit different requirements or different conditions of service.

I claim as my invention—

1. In a mechanical musical instrument, a motor-bellows, and means for varying the area of the bellows-surface exposed to the action of the operating pressure.

2. In a mechanical musical instrument, the combination of a pneumatic motor having a plurality of compartments and means for rendering one or more of the compartments inoperative.

3. In a mechanical musical instrument, the combination of a pneumatic motor connected with a wind-chest and having a plurality of compartments, and means for varying the area of surface exposed to the operating pressure by cutting one of the compartments into and out of communication with the wind-chest.

4. In a mechanical musical instrument having a wind-chest, the combination of a pneu-



matic motor having a plurality of compartments, and means for varying the area of surface exposed to the operating pressure by connecting one of the compartments with either  
5 the outer air or the wind-chest.

5. In a mechanical musical instrument, the combination of a pneumatic motor having a plurality of compartments and means for varying the potentiality of the motor by cutting one of the compartments into and out of communication with the outer air.  
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6. In a mechanical musical instrument, the combination of a series of pneumatic motors, and means for simultaneously varying, in a plurality of the motors, the area of surface exposed to the operating pressure.  
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7. In a mechanical musical instrument, the combination of a series of pneumatic motors each having a plurality of compartments, and means for simultaneously rendering one compartment of each motor inoperative.  
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8. In a mechanical musical instrument, the combination of a wind-chest, a series of pneumatic motors each having a plurality of simultaneously-operating compartments connected  
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to the wind-chest, and means for simultaneously cutting one compartment of each motor into and out of communication with the wind-chest.

9. In a mechanical musical instrument, the combination of a series of pneumatic motors, each motor having a plurality of compartments, and means for varying the potentiality of the motors by simultaneously cutting one compartment of each motor into and out of communication with the outer air.  
30 35

10. In a mechanical musical instrument, the combination of a series of pneumatic motors each having a plurality of compartments, and means operable by hand for simultaneously rendering one compartment of each motor inoperative.  
40

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES O'CONNOR.

Witnesses:

GEO. D. ANDREWS,  
E. DOBBIN.