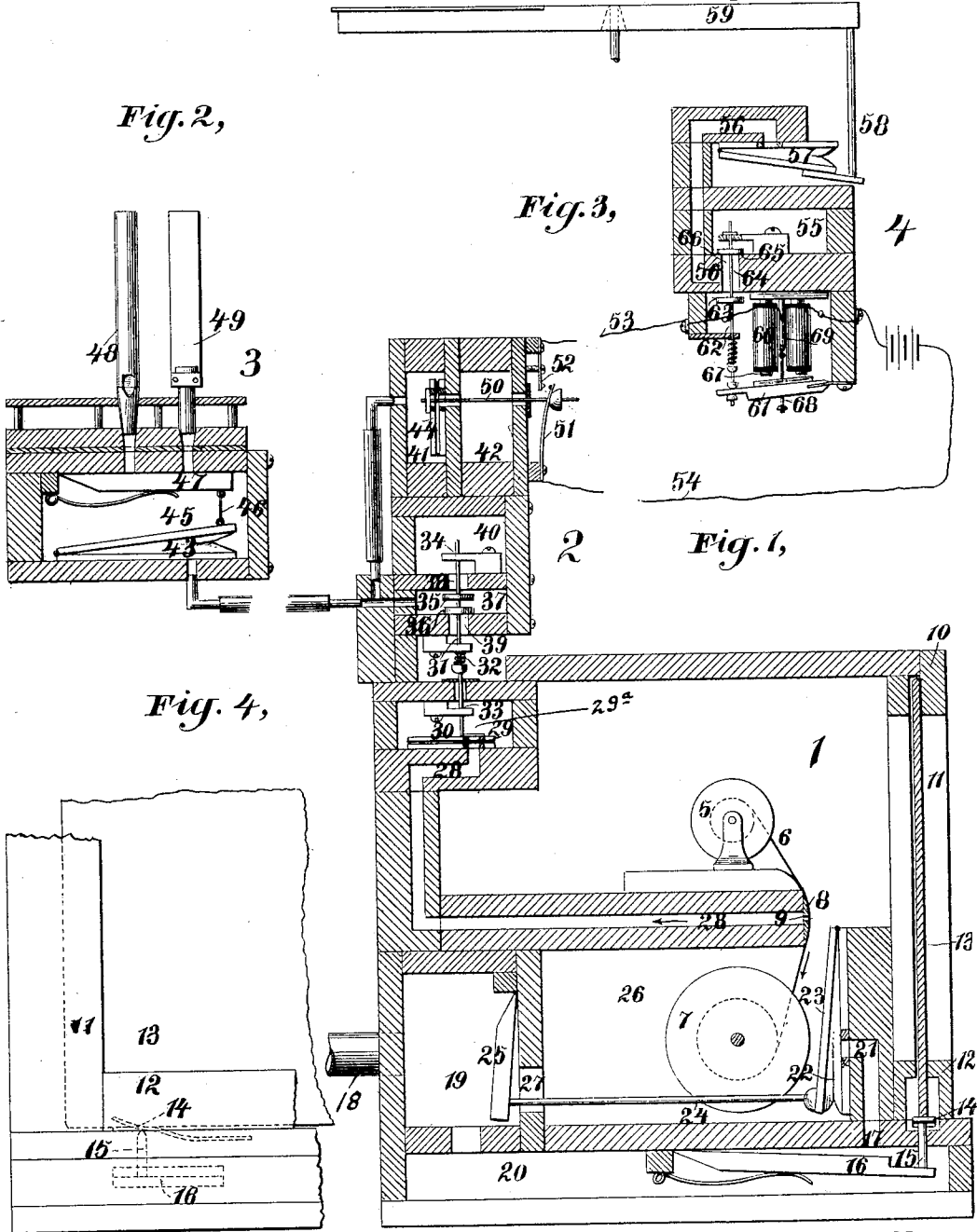


(No Model.)

R. W. PAIN.
ELECTROPNEUMATIC MUSICAL INSTRUMENT.

No. 589,535.

Patented Sept. 7, 1897.



WITNESSES:

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ROBERT W. PAIN, OF NEW YORK, N. Y., ASSIGNOR TO THE AEOLIAN COMPANY, OF SAME PLACE.

ELECTROPNEUMATIC MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 589,535, dated September 7, 1897.

Application filed May 13, 1896. Serial No. 591,344. (No model.)

To all whom it may concern:

Be it known that I, ROBERT W. PAIN, a citizen of the United States, residing at New York, in the county of New York and State

of New York, have invented a certain new, useful, and valuable Improvement in Electropneumatic Musical Instruments, of which the following is a full, clear, and exact description.

My present invention relates to electropneumatic musical instruments, and particularly to that class of such instruments as are operated by a perforated music-sheet which travels over a tracker-board and controls a series of pneumatic keys, which in turn bring into operation the respective sounding devices of one or more musical instruments.

Heretofore serious difficulty has been experienced in effecting the proper operation of the perforated music-sheet directly under the pressure system, whereas my invention obviates such difficulties.

As a further object my invention provides the special combination and arrangement of parts such as will be hereinafter fully described.

In the accompanying drawings, Figure 1 is a transverse vertical section of my primary action. Fig. 2 is a similar view of a pipe-organ action. Fig. 3 is a similar view of a piano-action, and Fig. 4 is a detailed front view of the lower left-hand corner of my music-holder.

Like numerals of reference indicate corresponding parts differently shown in the several views.

Proceeding with a detailed description of my invention I will first take up my primary action which comprises the music-sheet chamber 1, into which air is led under pressure, and the intermediate action 2, which latter pneumatically controls the pipe-organ 3 and electrically controls the piano-action 4, all as will be hereinafter fully described. Within the said music-sheet chamber or pressure-box 1 is arranged the delivery-spool 5, to which one end of the music-sheet 6 is permanently secured, and the take-up roller 7, to which the other end of the music-sheet is detachably secured and which is given movement through any suitable system of gears,

whereby it propels said music-sheet and drags it over the tracker-range 8, having a series of apertures or air-ducts 9, with which the perforations in the said music-sheet register in passing thereover. In front of said music-chamber 1 is arranged, in suitable guideways 10 11 12, a sliding door 13, preferably made of some transparent material, and the lower left-hand corner of which, when the door is being closed, rides upon and depresses the blade-spring 14, which in turn bears down the pin 15 and depresses the valve 16, opens the valve-seat 17, which allows the air under pressure to enter through the inlet-pipe 18 (the air-pressure is always in the chambers 19 and 20) into the primary chamber 19, into the lead-chamber 20, through the said valve-seat 17 and duct 21 into the primary pneumatic 22, which it instantly expands, its leaf 23 in its movement acting upon the valve-rod 24, which in turn throws open the valve 25 and now allows the compressed air to enter the main chamber 26 through the opening 27. Instantly the sliding door starts to open, a complete reversal of the action just described takes place—*i. e.*, the two valves 16 25 close simultaneously with the opening of the sliding door 13 and confine the compressed air within the primary chamber 19 and lead-chamber 20, thus preventing any escape of air, which would otherwise occur whenever the sliding door was opened, and the value of this automatic cutting off and cutting on of air into the main chamber 26 cannot be too highly estimated, especially where a number of instruments are supplied from one main bellows or reservoir, in which case such a large waste of air as would ordinarily take place through the opening of a door in a confining-chamber would prevent the operation of all instruments connected to the main bellows, and even with isolated or independent instruments the waste of air in such case would be such as to require appreciably more pumping by the feet or otherwise to refill the bellows and communicating air-chambers each time the sliding door might be opened, which is frequently done, owing to the fact that no other means is available whenever it is desired to obtain access to the music-sheet, and the door is made transparent for the obvious

purpose of enabling the performer to properly gage the rate of travel of the sheet and see any characters printed thereon to indicate changes of tempo, stops, &c.

5 Having described the automatic operation of my improved sliding door and the functions performed thereby, I will now proceed with a description of the music-chamber or pressure-box 1, inclosed thereby, and more particularly of the action of the music-sheet 6 and parts coacting therewith.

10 We will assume that the sliding door 13 is closed and that the music-chamber 1 is filled with compressed air and that the music-sheet 6 is being propelled slowly by the take-up roller 7. As heretofore explained, the perforations in the music-sheet are arranged to register with the port-holes 9 in the tracker-range 8, each of which port air-duct holes 9 opens into a separate duct 28, leading to the initial pneumatic 29, arranged in a chamber 29^a, having free communication with the atmosphere, as shown. The latter is caused to instantly expand whenever a perforation in the music-sheet registers with its respective port-hole 9 and allows a portion of the compressed air within the main chamber to rush through its duct 28 and act to expand said initial pneumatic 29, which may be considered as completing the action of the music-chamber 1. The particular construction of this chamber is independently valuable, inasmuch as I contemplate adapting it to other uses or combining it to other actions than those shown here.

35 I will now describe what I have termed my "intermediate action" 2. I would first explain that the functions of this action are to receive pulsations of any of the series of initial pneumatics 29, arranged in an open air-chamber, as shown, and transmit them pneumatically to the pipe-organ 3 and electrically to the piano-action 4, as hereinbefore intimated. To these ends I connect to the upper or movable leaf 30 of the initial pneumatic 29 the reciprocating rod 31, normally held downward by the coil-spring 32 and working loosely through the bearings 33 34. To the upper portion of said rod 31 I rigidly secure the upper and lower disks 35 36, forming a double puppet-valve within the chamber 37 and acting to alternately open and close the openings 38 39 therein upon the movement of said rod 31, the opening 39 being normally closed and the opening 38 normally open, as shown in the drawings, in which position the said valve-chamber 37, supply-chamber 40, contact-chamber 41, as well as the pipe-organ pneumatics 43, are all filled with air under pressure from the said supply-chamber 40. Immediately the rod 31 is raised by the pneumatic 29 the valve 35 closes the opening-aperture 38, cutting off the supply of compressed air from supply-chamber 40, unclosing the opening 39, which instantly vents the valve-chamber 37, as well as the contact-chamber 41, thus allowing the pneumatic 44

therein to be expanded by compressed air from chamber 42, and also allowing the pipe-organ pneumatic 43 to be closed by compressed air in the chamber 45, thereby causing the connection 46 to open the valve 47 and sound its pipes 48 49. The effect of the expanding of the pneumatic 44 is to cause its connection-rod 50 to throw the metallic contact-spring 51 against the oppositely-arranged contact 52, thereby completing the electric circuit through the conducting-wires 53 54.

70 The piano-action 4 is preferably located at some distance from the primary action and has an independent exhaust-chamber 55, by which air is exhausted from the duct 56 and the pneumatic 57, causing the latter to collapse and force the connected striker-rod 58 upward against the piano-key 59 whenever the electromagnet 60 becomes energized and attracts its armature 61 upward, thereby raising the valve-rod 62, closing the valve-disk 63, and causing the valve-disk 65 to uncover the opening 66 and allow the duct 56 and pneumatic 57 to be exhausted, as hereinbefore described.

80 In order to prevent the armature 61 from contacting with the poles 67 of the magnets 60, I employ the cushioned bumper-rod 68, adjustably secured in said armature and arranged to impinge the bumper-post 69, located between the magnets, as shown, and adapted to allow the armature to closely approach the poles 67 of the magnets without actually striking them and making a noise.

100 I contemplate connecting any desired number of organs or pianos to my one primary action, and numerous minor changes may be made in the combination and arrangement of parts herein shown without avoiding the spirit of my invention, as what I claim, broadly, is—

1. In a musical instrument the combination with a compressed-air chamber inclosing the operating music-sheet, of a movable door for affording access to the interior of said chamber, and mechanism operated respectively by the opening and closing of said door, to control the entrance of air to said chamber, substantially as described.

2. In a musical instrument, the combination with a compressed-air chamber, the tracker-range, music-sheet and delivery and take-up rollers arranged in said chamber, of a sliding door operating to close said chamber air-tight, and mechanism operated by said door when the latter is closed to effect the admission of compressed air to said chamber from a suitable source of supply, substantially as described.

3. In a musical instrument, the combination with a compressed-air chamber inclosing the operating music-sheet, of a sliding door for affording access to said sheet, and mechanism operated by said door when the latter is closed to effect the admission of compressed air to said chamber from a suitable source of supply, substantially as described.

4. In a musical instrument, the combination with a compressed-air chamber inclosing the operating music-sheet, of a sliding door for affording access to said sheet, a source of

5 supply for normally supplying compressed air to the compressed-air chamber, and mechanism operated by said door when the latter is opened to shut off the supply of compressed air to said chamber, substantially as described.

10 5. In a musical instrument, the combination with a compressed-air chamber inclosing the operating music-sheet, of a movable door for affording access to the interior of said chamber, a primary chamber 19, having a passage leading into the compressed-air chamber, a valve for closing said passage, a pneumatic arranged within the compressed-air chamber, a connection between the said valve and pneumatic, an air-passage leading

20 from the primary chamber to said pneumatic, and a valve 16 controlling the entrance of air to said pneumatic, said latter-named valve being operated by the opening and closing of the door, substantially as described.

25 6. The combination with a compressed-air chamber, of an initial pneumatic, a tracker-range having a duct communicating with said pneumatic, a music-sheet arranged to travel in the compressed-air chamber over the tracker-range and controlling the admission of air to said initial pneumatic, a pneumatically-operated musical instrument, a contact-chamber, a pneumatic arranged in said contact-chamber, and operating to make and

35 break an electric circuit through suitable connections to operate the musical instrument, an intermediate chamber, a duct leading from said contact-chamber to said intermediate chamber, and a double puppet-valve 40 controlling said latter-named chamber, said valve being connected with and raised by the

said initial pneumatic, substantially as described.

7. The combination with a compressed-air chamber, of an initial pneumatic, a tracker- 45 range within said compressed-air chamber having a duct communicating with said initial pneumatic, a music-sheet arranged to travel over said tracker-range and controlling the admission of air to said pneumatic, 50 an intermediate chamber, a contact-chamber, a pneumatic arranged in said contact-chamber and operating to make and break an electric circuit through suitable electric connections, a duct leading from said contact-chamber to said intermediate chamber, a double puppet-valve arranged within said latter-named chamber, said valve being operated by the said initial pneumatic a key 55 59, a pneumatic for operating said key, a striker-rod connecting the pneumatic and key, an exhaust-chamber, a duct connecting said chamber and pneumatic, a double puppet-valve operating to alternately place said duct into communication with the chamber 65 and with the atmosphere, an armature connected with the stem of said valve, and an electromagnet in circuit with the aforesaid electric connections operating when energized to attract said armature and raise said valve 70 and shut off the communication between the said duct and atmosphere and open the communication with the exhaust-chamber, whereby the pneumatic is caused to collapse and actuate the key. 75

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

ROBERT W. PAIN.

Witnesses:

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JAMES MORGAN.