

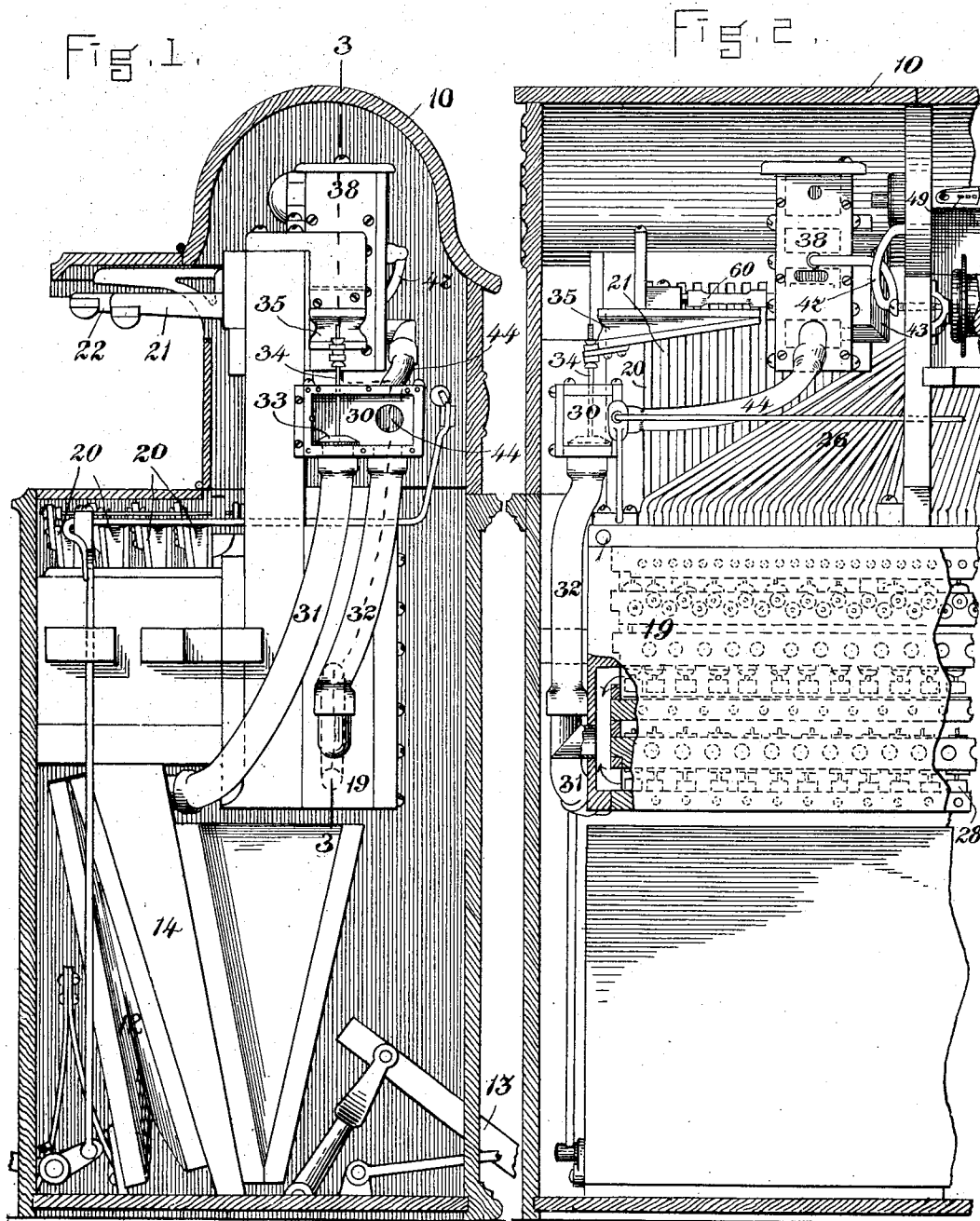
J. W. CROOKS.

PNEUMATIC PIANO PLAYING ACTION.

(Application filed May 16, 1906.)

(No Model.)

5 Sheets—Sheet 1.



WITNESSES

Henry Marsh.
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INVENTOR,

James W. Crooks.
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1875

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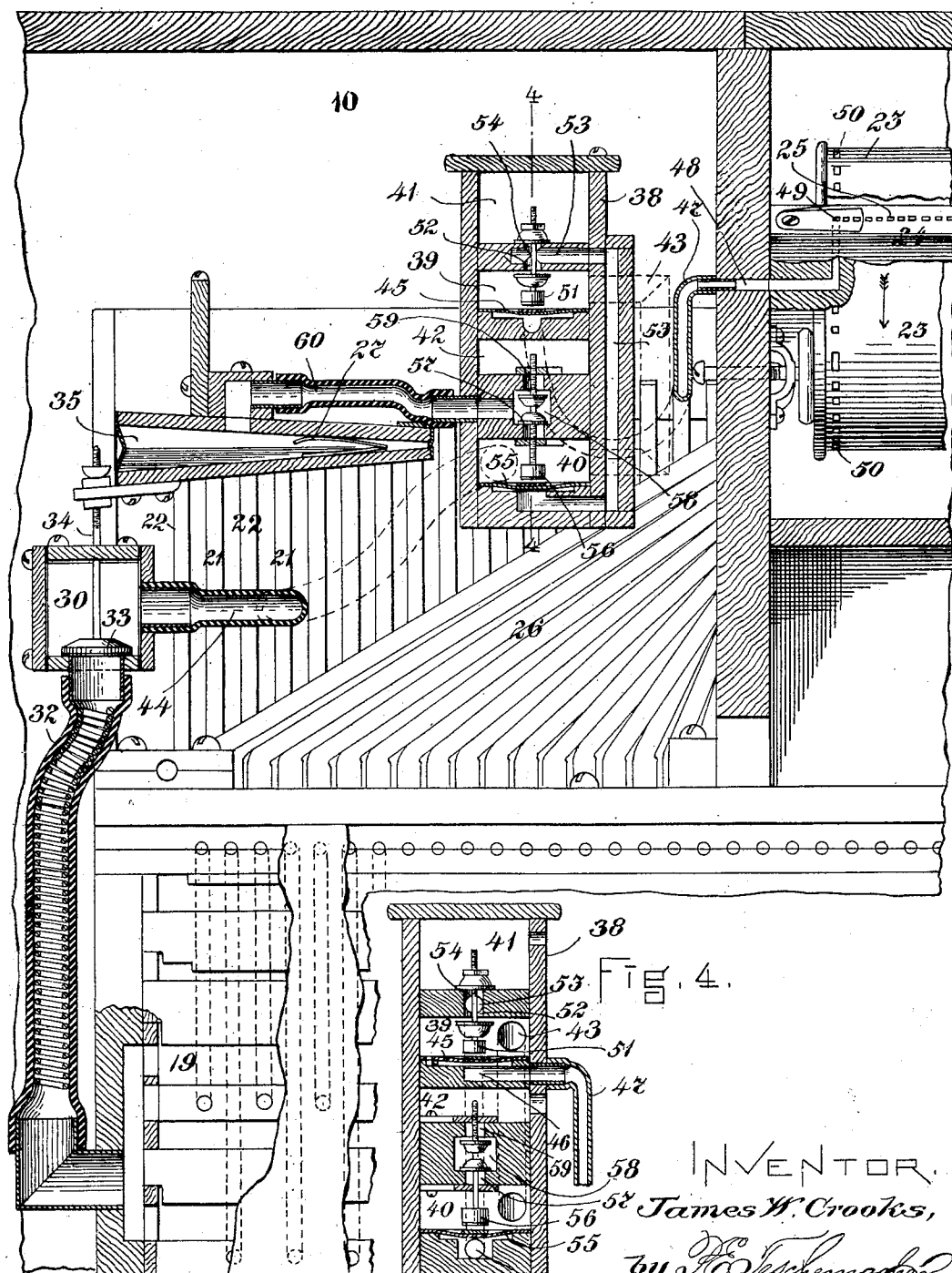
PNEUMATIC PIANO PLAYING ACTION.

(Application filed May 18, 1900.)

(No Model.)

5 Sheets—Sheet 2.

Fig. 3.



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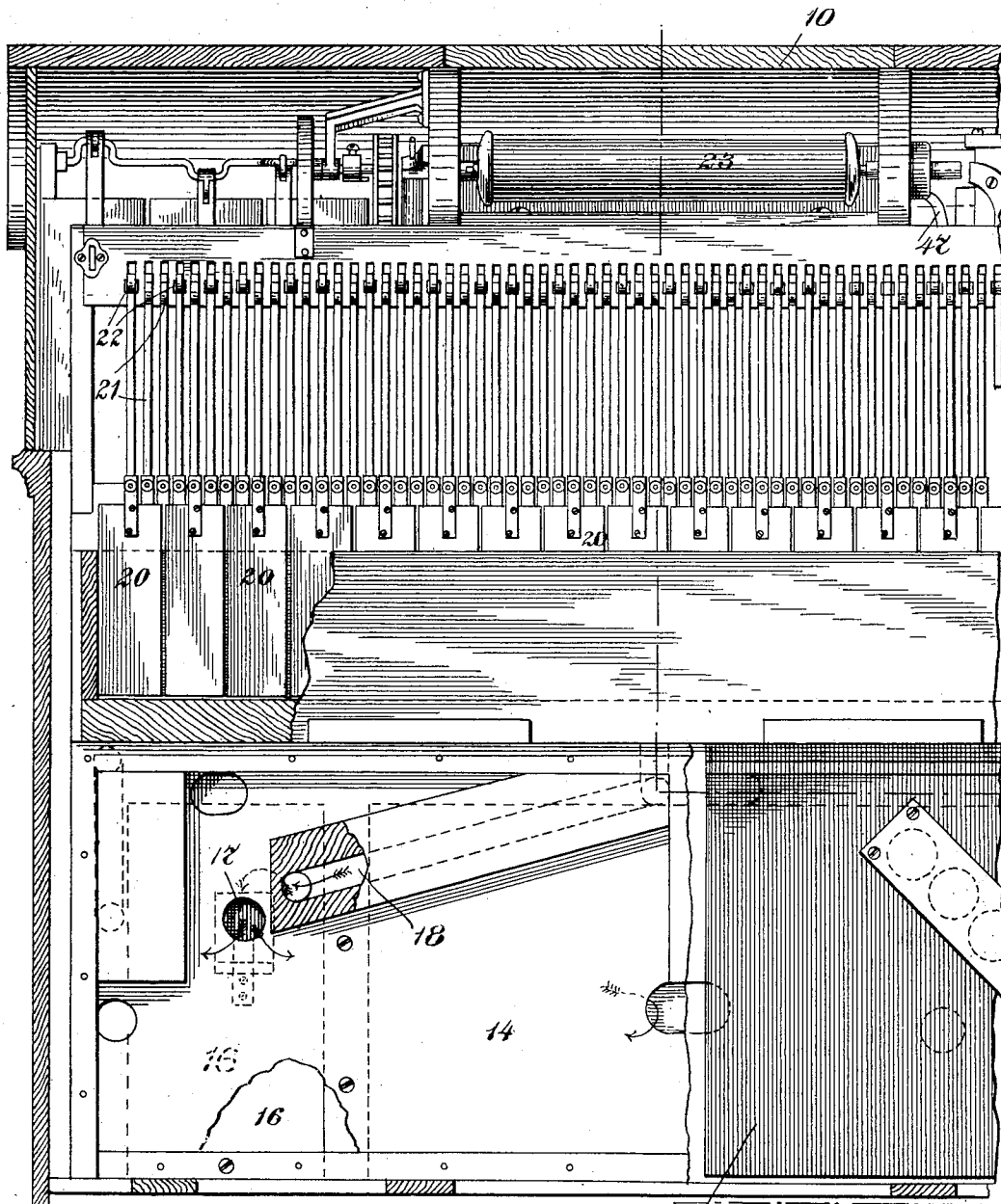
PNEUMATIC PIANO PLAYING ACTION.

(Application filed May 16, 1900.)

(No Model.)

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Fig. 5.



WITNESSES.

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No. 663,118.

Patented Dec. 4, 1900.

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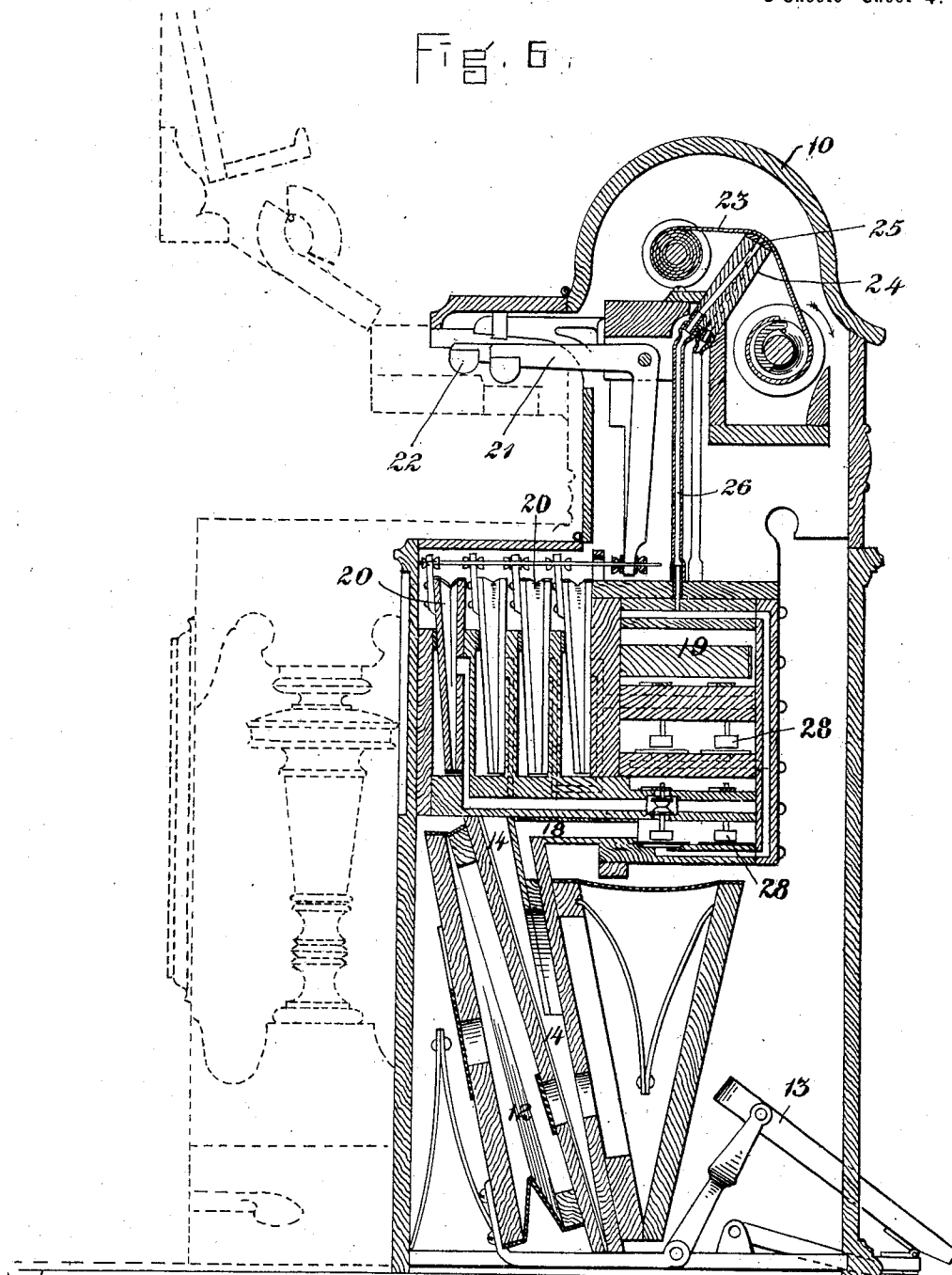
PNEUMATIC PIANO PLAYING ACTION.

(Application filed May 16, 1900.)

(No Model.)

5 Sheets—Sheet 4.

Fig. 6.



WITNESSES.

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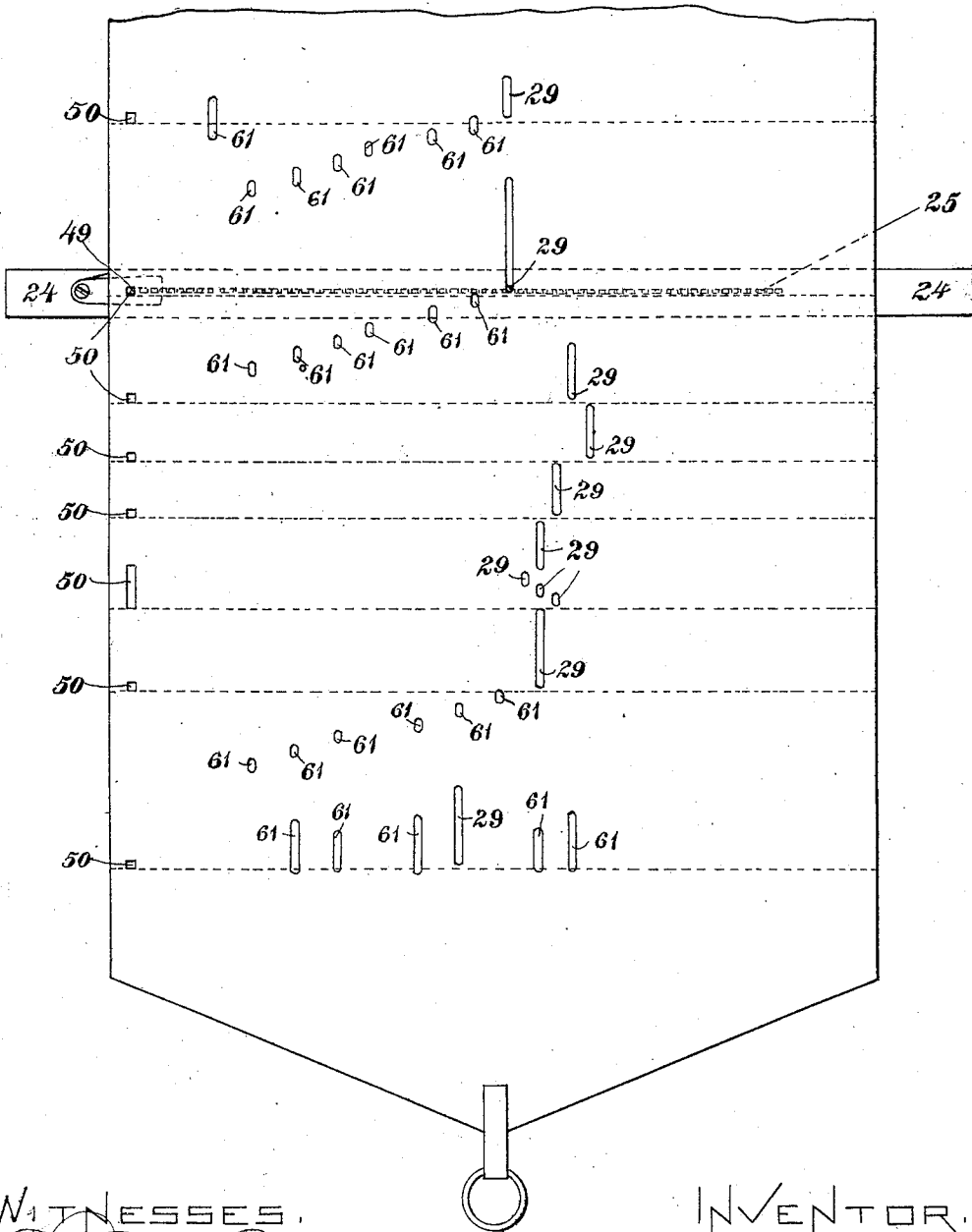
J. W. CROOKS.
PNEUMATIC PIANO PLAYING ACTION.

(Application filed May 16, 1900.)

(No Model.)

5 Sheets—Sheet 5.

FIG. 7.



WITNESSES.

G. Henry Marsh.
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James W. Crooks.

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UNITED STATES PATENT OFFICE.

JAMES W. CROOKS, OF BOSTON, MASSACHUSETTS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO SAID CROOKS, AND ERNEST M. SKINNER AND WINCHESTER VEAZIE, TRUSTEES, OF SAME PLACE.

PNEUMATIC PIANO-PLAYING ACTION.

SPECIFICATION forming part of Letters Patent No. 663,118, dated December 4, 1900.

Application filed May 16, 1900. Serial No. 16,919. (No model.)

To all whom it may concern:

Be it known that I, JAMES W. CROOKS, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Pneumatic Piano-Playing Actions, of which the following is a specification.

To produce the best effects in piano-playing, it is often desirable to emphasize or give expression to the theme, melody, or other notes desired while the accompaniment remains normal or unchanged. To enable this effect to be automatically produced with pneumatic piano-playing mechanism is the object of my invention, which consists in means controlled by the perforated music-sheet whereby an increased degree of exhaustion or vacuum is produced in the wind-chest of the key-operating pneumatics at the instant when the theme-notes are to be played, thereby enabling them to be sounded with additional force, and thus emphasized or accentuated as desired.

My invention also consists in certain novel combinations of parts and details of construction, as hereinafter fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a sectional elevation of one end of an automatic piano-player having my improved pneumatic-action applied thereto, the side of one of the vacuum-boxes being removed to show the valve therein. Fig. 2 is a front elevation of that portion of the instrument shown in Fig. 1, the front of the outer casing being removed to show the interior construction. Fig. 3 is an enlarged vertical section on the line 3 3 of Fig. 1. Fig. 4 is a vertical section on the line 4 4 of Fig. 3. Fig. 5 is a sectional elevation of a portion of the rear side of the instrument, parts being broken away to show the interior construction. Fig. 6 is a vertical section through the tracker-board and wind-chest and mechanism for actuating the levers by which the piano-keys are operated. Fig. 7 is a plan of a portion of the perforated music-sheet and the tracker-board beneath the same, showing the note and supplemental perforations arranged in accordance with my invention.

In the said drawings, 10 represents the cabinet or outer casing of a pneumatic piano-player, within which the operative mechanism is arranged, the back or rear of said cabinet being constructed, as usual, to admit the manual-breast of a piano or similar keyboard instrument, as shown in dotted lines in Fig. 6.

12 represents the exhaust-bellows, arranged in the lower rear portion of the cabinet and operated, as usual, by a treadle 13 to produce a vacuum in the main exhaust-chamber 14, which communicates, as usual, through the medium of the regulating-bellows 16, regulator-valve 17, and passage 18 with the wind-chest 19, with which communicate all of the pneumatics 20, Fig. 6, which actuate the levers 21 22, by which the keys of the piano are operated in the usual manner, it being understood that the degree of exhaustion or vacuum normally maintained in the wind-chest 19 is much less than that in the main exhaust-chamber 14, which difference is produced by exhausting the air from the said wind-chest through the regulator-valve 17 and bellows 16 in the usual well-known manner employed in instruments of this character.

23, Figs. 3, 5, and 7, denotes the perforated music-sheet which is wound from one roll onto another in the usual manner and passes over the tracker-board 24, provided with the usual ducts or passages 25, communicating through pipes or passages 26 with the primary or controlling pneumatics 28, which control the collapse or inflation of the operating pneumatics 20 in accordance with the music-sheet perforations in the usual well-known manner.

The parts thus far described are all of the ordinary well-known construction employed in instruments of this character and form no part of my present invention.

At or an instant before the music-sheet perforations 29, Fig. 7, belonging to the theme or melody notes are brought over their respective ducts 25 in the tracker-boards the degree of exhaustion or vacuum in the wind-chest 19 is suddenly increased by bringing it into direct communication with the exhaust-chamber 14 through a separate or auxiliary passage commanded by a valve, thereby causing the pneumatics 20 of the theme-note levers

to be operated with a sudden and increased force so as to cause the corresponding notes to be emphasized or sounded with additional force. This is accomplished in the following manner:

30 is a tight chest or vacuum-box which communicates through a large pipe 31, Figs. 1 and 2, directly with the main exhaust-chamber 14 and by means of another large pipe 32 directly with the wind-chest 19, the pipes 31 32 in connection with the intermediate vacuum-box 30 forming a single direct passage from the exhaust-chamber to the wind-chest. The upper end of the pipe 31 where it enters the box 30 is provided with a valve 33, the stem 34 of which extends up through the top of the box 30 and is secured to the movable board of a pneumatic 35, which when collapsed in a manner to be presently described serves to lift the valve 33 from the end of the pipe 31 against the resistance of a spring 27 in the said pneumatic, thus opening a direct communication between the main exhaust-chamber 14 and the wind-chest 19, causing the degree of exhaustion in the latter to be suddenly increased, so as to equal that in the exhaust-chamber 14, and consequently the theme-note pneumatics which are at that instant operated will be collapsed with additional force to emphasize said notes as desired.

38 is a box or casing containing two vacuum-chambers 39 40 and two chambers 41 42, open to the outer air. The vacuum-chambers 39 and 40 are connected by a pipe 43, Figs. 2 and 4, and shown dotted in Fig. 3, and the lower chamber 40 is connected by a pipe 44 with the vacuum-box 30, which is under constant exhaust from the wind-chest 19 through the pipe 32. In the bottom of the vacuum-chamber 39 is a flexible diaphragm 45, forming a primary pneumatic, beneath which is a recess connected by a passage 46, pipe 47, and passage 48 with a supplemental duct 49 in the tracker-board 24, adapted to register with supplemental perforations 50, formed in the music-sheet, said perforations being arranged in line with or preferably slightly in advance of the theme-note perforations 29 of the music-sheet in order to insure the desired increased suction in the wind-chest 19 by the time that the theme-note perforations are brought over their respective ducts in the tracker-board. As soon as the outer air is allowed to enter the supplemental duct 49 in the tracker-board it raises the diaphragm 45, which lifts a puppet-valve 51, which closes a port 52, leading from the vacuum-chamber 39 into a passage 53 and opens a port 54, leading from the open-air chamber 41 into said passage 53, through which the air then passes down under another diaphragm 55 in the bottom of the vacuum-chamber 40, which forms a secondary pneumatic. The air thus admitted beneath the diaphragm 55 raises it and lifts a puppet-valve 56, which opens a

port 57, leading from the vacuum-chamber 40 into a chamber 58 and closes a port 59, leading from said chamber 58 into the open-air chamber 42. The chamber 58 communicates through a passage 60 with the pneumatic 35, which pneumatic on the opening of the port 57 is thus brought into communication with the vacuum-chamber 40, when it will be instantly collapsed by the pressure of the external air, causing the valve 33 to be lifted from the end of the pipe 31, thus bringing the main exhaust-chamber 14 into direct communication with the wind-chest 19 to increase the degree of exhaustion therein, and thus cause the theme-notes to be sounded with increased force, as before described. As soon as the supplemental duct 49 of the tracker-board has been closed by the passage thereof of an unperforated portion of the music-sheet the parts instantaneously resume their normal positions, as shown in Fig. 3, ready for a repetition of the operation when succeeding theme-notes are to be sounded, the valve 33 having been closed by the spring 27 and the inflation of the pneumatic 35, causing the vacuum in the wind-chest 19 to be reduced to its normal degree.

In the music-sheet shown enlarged in Fig. 7. the accompaniment-note perforations are arranged a little in advance of the theme-note perforations 29, so that they will have been sounded before the degree of exhaustion has been increased in the wind-chest 19 for the theme-notes, while the supplemental perforations 50 are, as before described, preferably arranged to register with the supplemental tracker-board duct 49 an instant before the theme-note perforations reach their ducts in the tracker-board, and by this novel arrangement of the perforations of the music-sheet the desired effects are produced in the most successful and harmonious manner.

Although I have described my invention as applied to an automatic piano-player or instrument adapted to be moved up to a piano for the purpose of playing the same, it is obvious that my improved pneumatic-action may be applied to a self-playing piano or other keyboard musical instrument without departing from the spirit of my invention.

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

1. A music-sheet for self-playing musical instruments having openings therein for notes to be accented, openings therein for notes which are not to be accented, and supplemental openings therein for controlling the accent of the notes to be accented, the front edges of the openings for the notes to be accented lying in or nearly in a direct transverse line with the front edges of said supplemental openings and slightly to the rear of the front edges of the openings for the notes which are not to be accented, the said supplemental openings being designed to communicate with a supplemental passage in

the tracker-board of the instrument through which the mechanism for operating the keys for the notes to be accented is controlled.

2. In an automatic piano-player, the combination with the tracker-board having a series of main passages therein communicating with the air or vacuum chamber containing the primary or key pneumatics and having a supplemental passage therein through which the tension in said chamber may be varied, of a music-sheet traversing said tracker-board having openings therein for the notes to be accented, openings therein for the notes which are not to be accented and supplemental openings therein for controlling the accent of the notes to be accented, the front edges of the openings for the notes to be accented registering with the main passages in said tracker-board simultaneously with the registration of the front edges of said supplemental openings with the supplemental passage in said tracker-board and slightly after the registration of the openings for the notes which are not to be accented with said main passages.

3. In a pneumatic piano-playing action controlled by a perforated music-sheet, the combination with the wind-chest of the key-operating pneumatics, the exhaust-chamber connected with said wind-chest, and means for normally maintaining a lesser degree of exhaustion in the wind-chest than in the exhaust-chamber, of an auxiliary or independent passage directly connecting the wind-chest with the exhaust-chamber, a valve in said passage for closing the same, a pneumatic for opening said valve to increase the degree of exhaustion in the wind-chest at the instant that the theme-notes are to be sounded, a tracker-board provided with a supplemental duct, pneumatic devices connected with said supplemental duct for controlling the action of the valve-opening pneumatic, and a music-sheet having supplemental perforations arranged to register with the said supplemental duct of the tracker-board, said supplemental perforations being arranged in or nearly in a transverse line with the theme-note perforations, substantially as described.

4. The combination with a tracker-board having a supplemental duct connected with pneumatic mechanism for emphasizing or accentuating the theme-notes of a piece of music, of a music-sheet having the accompaniment-note perforations arranged slightly in advance of the theme-note perforations, and provided with a series of supplemental perforations adapted to register with the sup-

plemental duct of the tracker-board, said supplemental perforations being arranged substantially in a transverse line with the theme-note perforations and in the rear of the accompaniment-note perforations, substantially as described.

5. In an automatic piano-player, the combination with a main passage connecting the wind-chest of the key-pneumatics with the main exhaust-chamber, a second or independent passage also connecting said wind-chest with the main exhaust-chamber, a valve for normally closing said second or independent passage, and a tracker-board having in addition to its main passages, a supplemental duct or passage, of an independent box or chest located outside of the wind-chest of the key-pneumatics and connected with said independent passage and with the supplemental duct of the tracker-board, said independent box or chest containing governing-pneumatics controlled by said supplemental tracker-board duct and acting through intermediate mechanism to actuate the valve of the said independent passage and thereby vary the degree of exhaustion or tension in the wind-chest of the key-pneumatics, substantially as described.

6. In an automatic piano-player, the combination with a main passage connecting the wind-chest of the key-pneumatics with the main exhaust-chamber, a second or independent passage also connecting said wind-chest with the main exhaust-chamber and provided with an intermediate vacuum-box containing a valve for normally closing said second or independent passage, and a tracker-board having in addition to its main passages a supplemental duct or passage, of an independent box or chest located outside of the wind-chest of the key-pneumatics and connected with said independent passage and with the supplemental duct of the tracker-board, said independent box or chest containing governing-pneumatics controlled by said supplemental tracker-board duct and acting through intermediate mechanism to actuate the valve of the said independent passage and thereby vary the degree of exhaustion or tension in the wind-chest of the key-pneumatics, substantially as described.

Witness my hand this 15th day of May, A. D. 1900.

JAMES W. CROOKS.

In presence of—

P. E. TESCHEMACHER,
LILLIAN I. BASFORD.