

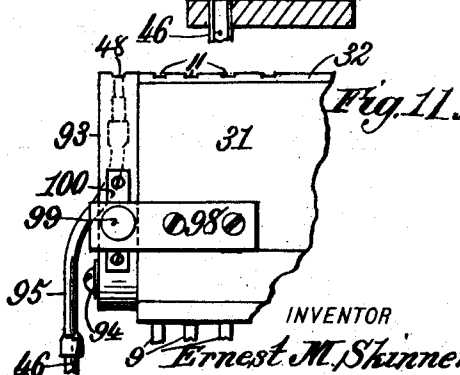
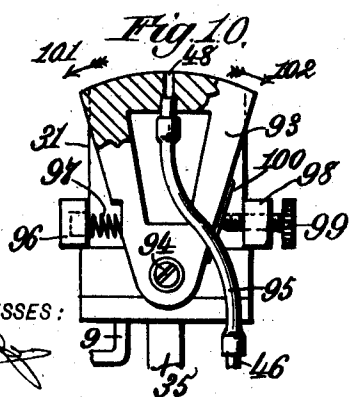
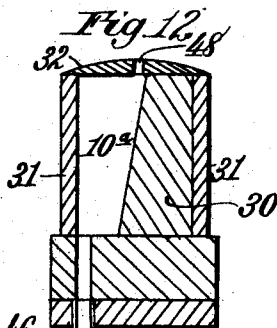
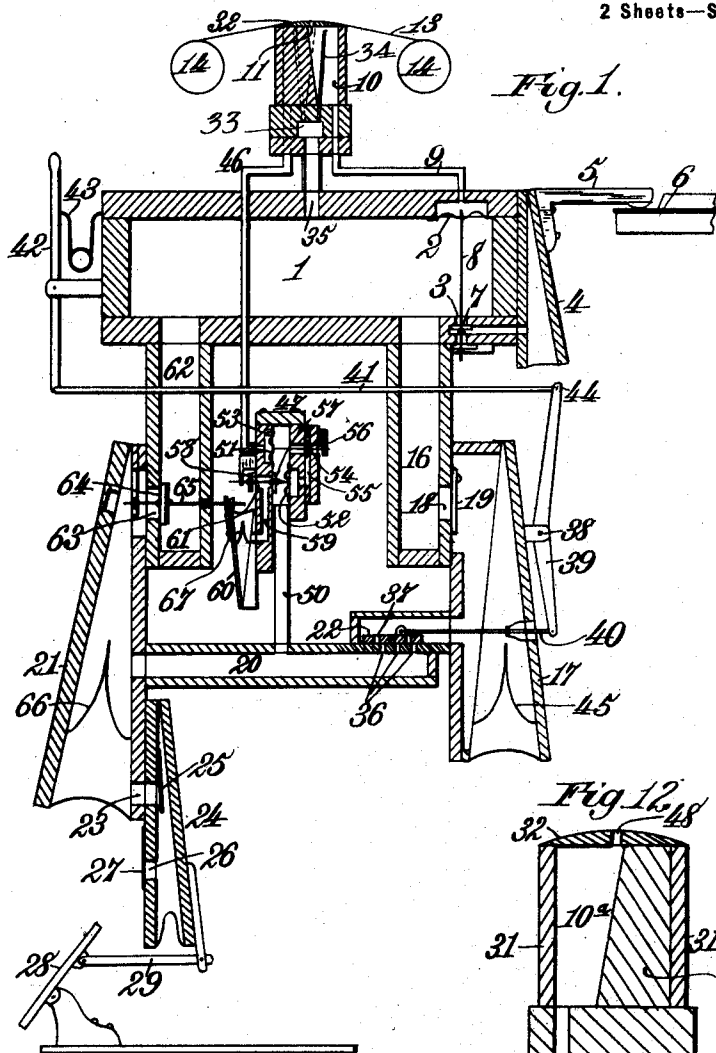
E. M. SKINNER.

AUTOMATIC MUSICAL INSTRUMENT PLAYER.

(Application filed Sept. 12, 1900.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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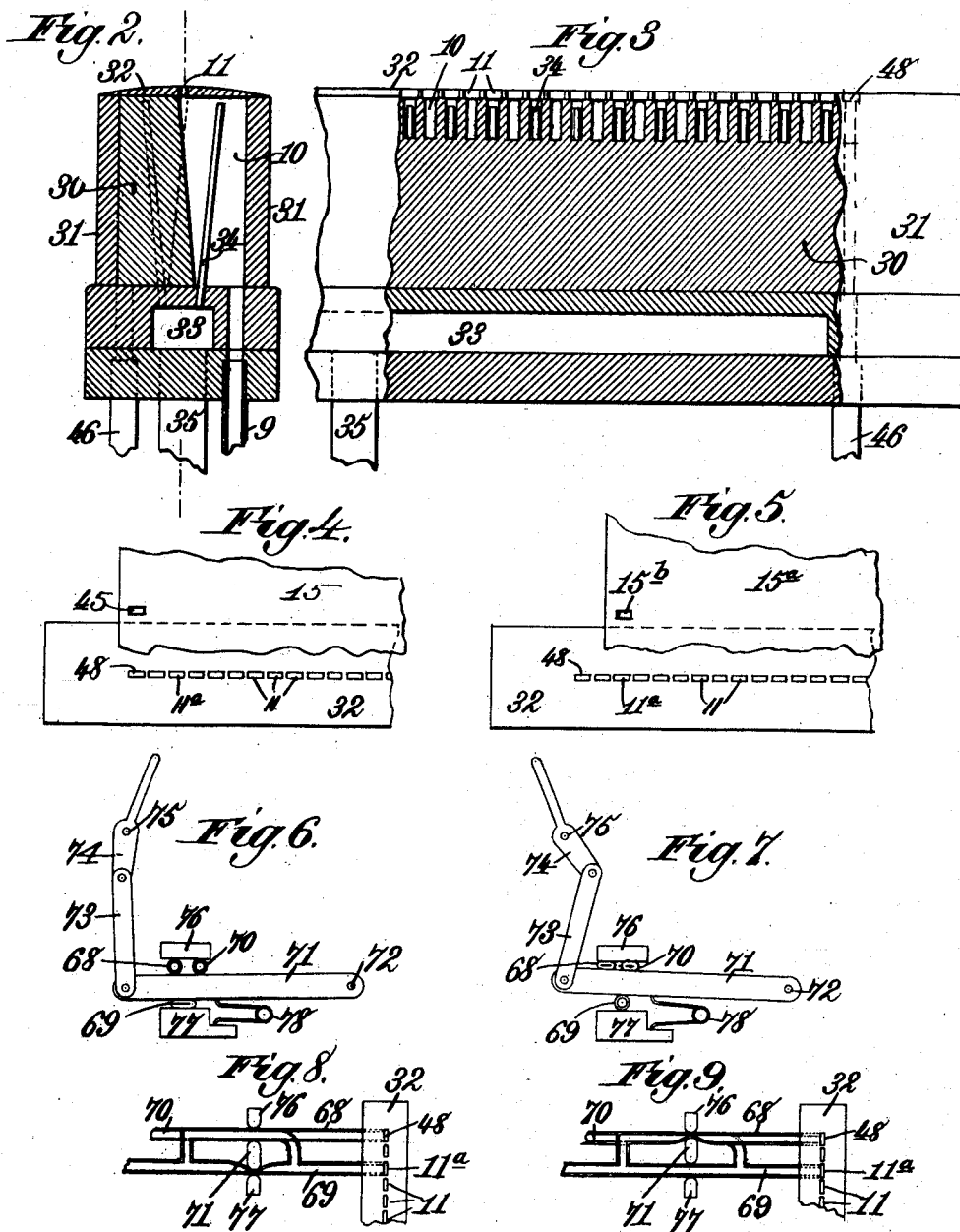
E. M. SKINNER.

AUTOMATIC MUSICAL INSTRUMENT PLAYER.

(Application filed Sept. 12, 1900.)

(No Model.)

2 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

ERNEST M. SKINNER, OF BOSTON, MASSACHUSETTS.

AUTOMATIC MUSICAL-INSTRUMENT PLAYER.

SPECIFICATION forming part of Letters Patent No. 667,039, dated January 29, 1901.

Application filed September 12, 1900. Serial No. 29,842. (No model.)

To all whom it may concern:

Be it known that I, ERNEST M. SKINNER, a citizen of the United States, residing at Boston, (Dorchester,) in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Automatic Musical-Instrument Players, of which the following is a specification.

This invention relates to automatic musical-instrument players, and particularly to piano-players, and is in the nature of an improvement on the piano-player for which I filed an application for Letters Patent of the United States on the 21st day of March, 1900, said application being serially numbered 9,560.

The present invention has for its object to provide an improved construction of the tracker-board and the venting-chamber whereby I am enabled to make the transverse slots or perforations in the tracker-board and music-sheet shorter and the venting operation is rendered more prompt and rapid.

It also has for its object to provide novel and improved means for governing or controlling the low-pressure bellows.

It has for another object to provide means for transposing the accent-aperture in the tracker-board, whereby different widths of music-sheets may be employed.

It has for another object to provide means for adjusting the accenting slot or aperture in the tracker-board to compensate for warping in either the tracker-board or music-sheet.

Finally, it has for its object to improve and simplify the construction and render more efficient, satisfactory, and perfect the operation of this class of devices generally.

To these ends my invention consists in the features and in the construction, combination, and arrangement of parts hereinafter described, and particularly pointed out in the claims following the description, reference being had to the accompanying drawings, forming a part of this specification, wherein—

Figure 1 is a vertical sectional view of my improved piano-player. Fig. 2 is a transverse vertical sectional view of the tracker-board. Fig. 3 is a longitudinal sectional view of the same. Fig. 4 is a diagrammatic view illustrating a sheet of piano-music applied to the tracker-board. Fig. 5 is a similar view illustrating a sheet of organ-music applied

to the tracker-board. Figs. 6 and 7 are detail views showing the lever mechanism controlling the accent-transposing mechanism, said views showing the lever mechanism in its two different positions. Figs. 8 and 9 are sectional views of the parts shown in Figs. 6 and 7. Fig. 10 is a detail end view, partly in section, illustrating the means for adjusting the accent-passage in the tracker-board. Fig. 11 is a side elevation of the parts shown in Fig. 10; and Fig. 12 is a detail transverse sectional view of the tracker-board, illustrating the accent-cell and passages.

Referring to the drawings, wherein like reference-numerals indicate like parts in the several views, the numeral 1 indicates the vacuum-chamber, in which are arranged the primary pneumatics 2, said vacuum-chamber communicating by ports 3 with the key-pneumatics 4. The key-pneumatics 4 are provided with fingers 5, which are disposed over and arranged to operate the piano-keys 6, and each of the ports 3 is normally closed by a valve 7, the stem 8 of which is connected with the corresponding primary pneumatic, as shown. Each of the primary pneumatics 2 communicates by a passage 9 with a chamber or cell 10, and the latter in turn communicates with a slot or aperture 11 in the top or cover 32 of the tracker-board, over which passes the perforated music-sheet 13. The music-sheet is wound on one of two rolls 14 and is adapted to be unwound therefrom onto the other roll, as usual. The music-sheet is provided with the usual note apertures or perforations 15, corresponding to the music to be played, which apertures or perforations, as is usual in devices of this kind, are adapted to register with the proper openings 11 in the tracker-board. The vacuum-chamber 1 also communicates by a wind-trunk 16 with the low-pressure bellows 17 through a port 18, controlled by a check-valve 19. The low-pressure bellows communicates by a wind-trunk 20 with a high-pressure bellows 21 through a valve 22, which controls the communication between the two bellows. The high-pressure bellows 21 is in communication through ports 23 with the exhauster-bellows 24, the said ports 23 being controlled by inwardly-opening check-valves 25, and said exhausters open to the atmosphere through

ports 26, controlled by outwardly-opening check-valves 27. The exhausters are operated by pedals 28 through the medium of links 29, as usual.

5 The construction above described is substantially the same as that shown and described in my said application hereinbefore referred to and operates in a usual and well-known manner. Normally the air is ex-
10 hausted from the vacuum-chamber 1 through the wind-trunk 16 into the low-pressure bellows 17, and said low-pressure bellows is in turn exhausted through wind-trunk 20 into the high-pressure bellows 21, the degree of
15 exhaustion being determined by the regulator-valve 22, as hereinafter explained.

The tracker-board comprises a bar or longitudinal block 30, (see Figs. 1 and 2,) in the opposite edges of which are formed vertical
20 recesses, grooves, or kerfs constituting the cells 10, before referred to. Said recesses or kerfs are wider at the top than at the bottom, as shown, and those on the one side of the block alternate with those on the other side.
25 Imperforate strips 31 are attached to the opposite sides of the block 30, and a cover-strip 32 is attached to the top of the block, said strips 31 and 32 operating to inclose the open sides and tops of the recesses or kerfs. The
30 upper side of the strip 32 is curved or rounded, as shown—that is to say, its upper side is formed on the arc of a circle—so that the music-sheet will closely contact therewith and at the same time move freely thereover, and
35 the slots or apertures 11 are formed centrally in said cover-strip, there being one such aperture for each note. In the bottom of the tracker-board is formed a longitudinal vent-chamber 33, which extends beneath and is
40 common to all the cells 10, and leading from said vent-chamber to the respective cells are tubes or pipes 34 of very small diameter, each of said vent-tubes terminating near the top of its cell and to one side of the slot or aperture 11 opening into said cell. The vent-
45 chamber 33 communicates by a duct 35 with the vacuum-chamber 1. When a slot or aperture 15 in the music-sheet is caused to register with one of the apertures 11, atmospheric
50 air is immediately admitted through the cell 10 and passage 9 behind the primary pneumatic 2 and expands the latter against the vacuum in the chamber 1. The primary pneumatic in expanding opens the valve 7
55 and places the key-pneumatic 4 in communication with the vacuum-chamber, whereupon the key-pneumatic is collapsed and the piano-key 6 is depressed by the finger 5, thereby sounding the proper note. The moment
60 the slot or aperture 15 in the music-sheet passes over or beyond the slot or aperture 11 in the tracker-board, so as to close the aperture 11, the cell 10 is cut off from communication with the atmosphere and the air behind or above the pneumatic 2 is exhausted
65 into the vacuum-chamber 1 through the passage 9, cell 10, tube 34, vent-chamber 33, and

duct 35, putting the pneumatic in equilibrium, whereupon the atmospheric pressure raises the valve 7, thus shutting off communication between the vacuum-chamber and
70 the key-pneumatic 4 and placing the latter in communication with the atmosphere, whereupon the parts are restored to their normal position.

In all automatic musical-instrument players of the general type to which this invention relates the openings in the paper operate to actuate the primary pneumatics in one
75 direction, the action of the latter in the opposite or reverse direction being effected by vents, which permit the air which has previously been admitted through said slots into the pneumatics to be exhausted from the latter into the vacuum-chamber, the vents or
80 vent-passages being necessarily as small as possible, as their influence has first to be overcome by the perforations in the music-sheet before the pneumatics will operate; but they
85 must still be large enough to promptly exhaust the air from the pneumatics to actuate the latter quickly in the reverse direction. The vents are usually placed more or less remote from the openings or apertures 11 in the
90 tracker-board, making their influence still harder to overcome by the air which enters through said orifices, the friction in the air-ducts restraining the passage of the atmosphere to such a degree that were the ducts of
95 sufficient length between the inlet and the vent the pneumatics would not practically work at all.

According to the present invention the upper open ends of the vent-tubes 34 are placed
100 as near the orifices 11 in the tracker-board as possible, whereby the friction between the ends of the vent-tubes and the orifices 11 is reduced to a minimum, as directly the air
105 passes through the orifices 11 it is entirely unobstructed in its course to the passages 9, leading to the primary pneumatics, and notwithstanding the vacuum in the vent-chamber 33 is common to the cells 10 through the
110 passages 35 the air is supplied in such greater quantities owing to the absence of friction that the influence of the vacuum is practically not appreciable. Furthermore, by the
115 described arrangement I am enabled to reduce the cross-sectional area of the openings 11 by nearly one-half and still obtain a perfectly satisfactory result, owing to the before-described advantage resulting from the
120 location of the vents, which enables me to reduce the length of the spaces between the notes in the music-sheet, resulting in an economy of paper and greater expedition in
125 cutting. It also enables me to reduce the lead on accompaniment-notes on accented music, such as described in my said application for patent before referred to. Moreover,
130 by disposing the upper ends of the vent-tubes to one side of the openings 11 they are not liable to be obstructed by dust, dirt, or the like which may pass through said open-

ings, as the enlargement in the air-passage—*i. e.*, cell 10—reduces the velocity of the air which enters at port 11 so greatly that foreign substances fall to the bottom of said cell 10 instead of being drawn into the tube 34.

The collapse of the low-pressure bellows 17 is regulated by the valve 22 in the following manner: As before explained, the low-pressure bellows communicates by a wind-trunk 20 with the high-pressure bellows 21, the air passing through a plurality of ports 36, over which is arranged a slide-valve having a plurality of corresponding ports 37, which may be caused to register with the ports 36 when the valve is moved in one direction and may be closed by said valve when the latter is moved in the other direction. Pivoted intermediate its ends to the movable board of the bellows 17, as at 38, is a lever 39, one end of which is pivotally connected to one end of a link 40, the other end of the link being pivotally connected to the valve 22. To the other end of the lever 39 is connected one end of a link 41, the other end of which is connected to hand-lever 42, which is pivoted intermediate its ends to any suitable fixed support. A spring 43 operates to normally hold the lever 42 in a determinate position. When the hand-lever is held in a fixed position either by the spring or by hand, the fulcrum of the lever 39 will be at 44 and the atmospheric pressure acting against the rarefied air in the bellows 17 will cause the latter to partially collapse against the tension of its spring 45, thereby moving the valve 22 so as to throw the parts 36 and 37 out of register, thus automatically closing the communication between the two bellows 17 and 21. As the key-pneumatics 4 are operated the exhaustion in the vacuum-chamber 1 is maintained uniform by the collapsible bellows 17, as the slightest degree of expansion of the air in the vacuum-chamber caused by the admission of air from the key-pneumatics when the latter are collapsed is compensated by the bellows 17, which immediately expands under the action of its spring 45 and opens the valve 22, whereupon the air is exhausted from the vacuum-chamber until the normal tension of the air therein is again attained, when the bellows 17 will again collapse and close the valve 22.

By shifting the position of the hand-lever 42 the piano-keys may be struck with precisely the same force whether one note or a great number of notes be played. In the device shown and described in my said former application for patent the air tension in the vacuum-chamber 1 is increased by moving a hand-lever which opens a valve that communicates directly between the high-pressure chamber and the vacuum-chamber; but in such arrangement if the said valve is open a certain distance and one of the key-pneumatics is operated it strikes the piano-key with considerable force, whereas if several key-pneumatics are operated simultaneously

the air has to be equally apportioned or divided between them, resulting in a greatly-
lessened blow being struck on each of the
piano-keys, rendering the musical effect erratic. By means of the arrangement immediately above described this objection is obviated. The entire operation of the key-pneumatics 4 is effected through the wind-trunk 16 and check-valve 19, which is sufficient at all times to work any number of pneumatics; but the degree of force with which they are operated does not depend in this device upon a greater or less supply of air, but upon the degree of exhaustion in the bellows 17. If the tension is slight, the key-pneumatics will work with slight force, be there one or several, and their operation will be uniform. If the tension is great, the key-pneumatics will work with great force regardless of the number of pneumatics in operation, the reservoir 17 maintaining a stated degree of exhaustion by its automatic control of the valve 22 through its lever 39. It will be noticed that during the automatic control of said lever 39 the fulcrum of lever 39 is at 44 and the motion of the bellows at the pivot 38 is multiplied on the link 40, causing an action of valve 22 so prompt that the movable side of bellows 17 and its spring 45 scarcely move, which insures a practically even tension with lever 42 at any given point. By means of the described arrangement the tension in the low-pressure bellows may be made practically equal to the tension in the high-pressure bellows or diminished to the least possible degree; but in all cases excepting when influenced by the accent-valve hereinafter described the entire operation of the key-pneumatics is effected through the wind-trunk 20 and check-valve 19, the capacity of which is never altered. As before stated, when the bellows 17 is automatically controlling the valve 22 the fulcrum of the lever 39 will be at the point 44; but whenever the said lever is shifted by the hand-lever 42 the fulcrum is at the point 38 during such movement, so that it will be apparent that the degree of exhaustion in the chamber 1 may be changed at will and kept at any fixed point exactly as determined by the position of the hand-lever 42. Moreover, as has been explained, when the bellows 17 is automatically controlling the valve 22 as the lever 39 is fulcrumed at 44 the movement of the bellows 17 at the point 38 is multiplied at its point of engagement with the link or valve-stem 40, resulting in an accelerated action of the valve 22, which still further maintains a uniform degree of exhaustion in the bellows 17.

It is also desirable at times to accent one or more notes, so that they will be sounded with greater force or volume. As described in my former application for patent, this is accomplished by forming in the tracker-board a supplemental passage and in the music-sheet supplemental accent perforations or apertures adapted to register with the sup-

plemental passage in the tracker-board and by providing means controlled by these parts for shutting off the low-pressure bellows from the vacuum-chamber and putting it in communication with the high-pressure bellows. According to the present invention this is accomplished in the manner and by the means which I will now describe. The endmost cell 10^a at one end of the tracker-board instead of communicating with a primary pneumatic through a passage 9, as do the other cells 10, communicates through a pipe or tube 46 with a chest 47 (see Figs. 1 and 12) and is provided at its top with a passage or aperture 48, that is adapted to register with supplemental slots or apertures 49, formed at one edge of the music-sheet 13. The chest 47 communicates by a passage 50 with the wind-trunk 20 and has arranged therein two pneumatics 51 and 52. The pneumatic 51 is disposed between the end of the tube or pipe 46 and the interior of the chest and is provided with a relatively small vent 53, and attached to said pneumatic is a valve-stem carrying a double-acting valve 54. A passage 55 leads from the interior of the chest 47 to behind the pneumatic 52, and said passage is provided with a port 56, which opens to the atmosphere. The valve 54 is so arranged that when in one position it closes the communication between the interior of the chest and the passage 55, and when in the other position it closes the communication between said passage and the atmosphere. A valve-stem is attached to the pneumatic 52 and carries two valves 57 and 58, the valve 57 controlling a passage 59, leading from the interior of the chest to a pneumatic 60, and the valve 58 controlling a port 61, leading to the atmosphere. Leading from the vacuum-chamber 1 is a wind-trunk 62, which communicates by a port 63 with the high-pressure bellows 21, and controlling said port is a valve 64, which is carried by a stem 65, connected to the movable board of the pneumatic 60. The high-pressure bellows 21 is expanded by a spring 66, which is stronger or requires more pressure to compress than the spring 45 of the low-pressure bellows 17. Normally the supplemental accent-aperture 48 in the tracker-board is closed by the music-sheet, and hence no air can enter the passage 46, and as the air is exhausted from the interior of the chest 47 through the passage 50 and wind-trunk 20 the air left remaining in the passage 46 will be vented therefrom through the vent 53. The pressure of the atmosphere will then hold the valve 54 closed in such a manner as to shut off the communication between the interior of the chest and the passage 55, and the pressure of the atmosphere will then also operate on the pneumatic 52 so as to close the valve 57 and shut off communication between the chest and the pneumatic 60, as shown in Fig. 1 of the drawings. A spring 67 will under these conditions hold the pneumatic 60 expanded and the valve 64

closed, and hence the high-pressure bellows 21 will have no communication with the trunk 62. When one of the accent-apertures 49 in the music-sheet registers with the supplemental aperture or passage 48 in the tracker-board, the atmospheric air will enter the passage 46 behind the pneumatic 53 and will press the latter inward against the vacuum in the chest 47, thereby opening the communication between the interior of the chest and the passage 55 and closing communication between the latter and the atmosphere. The air will then be exhausted from behind the pneumatic 52, whereupon the pressure of the atmosphere on the valve 57 will open the latter and close the valve 58. The air will then be exhausted from the pneumatic 60 through the passage 59, the chest 47, passage 50, and wind-trunk 20, whereupon the pneumatic 60 will be collapsed and will open the valve 64. The high-pressure bellows 21 will then exhaust the air directly through the wind-trunk 62 from the vacuum-chamber 1, and owing to the more perfect vacuum formed thereby in the vacuum-chamber the notes sounded by the key-pneumatics which are set in operation by the perforations or apertures 15 in the music-sheet opposite the accent aperture or opening 49 will be emphasized or increased in volume, as described in my previous application for patent before referred to. When the passage 48 is again closed by the music-sheet, the atmosphere will be shut off from the passage 46, whereupon the air will be vented from the said passage through the vent 53, thereby putting the pneumatic 51 in equilibrium, whereupon the atmospheric pressure will restore the parts to their normal position.

In automatic musical instruments the number of notes in piano-music is somewhat greater than in organ-music, as the piano compass is greater than the organ compass; but as automatic piano-players are made to accommodate themselves to organ-music I have provided means whereby the organ-music may be arranged for the accenting mechanism of the piano-player. This is accomplished by providing mechanism for transposing the accent passage or aperture 48, so that it will come within the compass of the accent-perforation of the narrow organ-music, as shown in Figs. 4 to 9 of the drawings. Referring to said figures, the numeral 32 indicates the top of the tracker-board, and 11 the note apertures or orifices therein. In Fig. 4 I have illustrated a piano-music sheet 13 in connection with the tracker-board, and the latter is provided with the accent-passage 48, which is adapted to register with the accent slot or perforation 49 in the music-sheet in the manner and for the purpose before described. In Fig. 5 I have illustrated an organ-music sheet 15^a in connection with the tracker-board, and in this instance one of the note apertures or orifices, as 11^a, is caused to register with the accent-slot and actuate the pneumatic 60

to accent the notes in the manner and by the means as follows: Communicating with the passages or apertures 48 and 11^a, respectively, are two elastic tubes 68 and 69, the tube 68 communicating at one end with the passage 48 and at the other end with the tube 69, intermediate the ends of the latter, while the tube 69 leads from the passage 11^a to the pneumatic controlling the valve 64 of the high-pressure bellows before described. A branch tube 70 communicates at one end with the tube 69 and leads to one of the key-pneumatics 4. Arranged between the group of tubes 68 and 70 and the tube 69 is a cut-off lever 71, pivoted at one end, as at 72, to any suitable fixed support, and at its other end it is pivotally connected to the end of one member 73 of a toggle-lever, the other member 74 of said toggle-lever being pivoted, as at 75, to any convenient fixture. The free end 75 of the toggle-lever constitutes a handle by means of which said lever may be conveniently operated. Arranged adjacent to the tubes 68 and 70 is a fixed abutment 76, and correspondingly arranged relatively to the tube 69 is a similar abutment 77. When the toggle-lever is moved by its handle 75 into such a position that its two members 73 and 74 are substantially in alignment, then the tube 69 will be compressed between the lever 71 and the abutment 77, as shown in Fig. 6, cutting off the communication between the passage 11^a and the pneumatic controlling the valve 64. When the toggle-lever is released, however, by moving its handle in the direction of the arrow, then the lever 71 will be thrown over in the opposite direction by a spring 78, and the two tubes 68 and 70 will be compressed between said lever and the abutment 76, thereby closing these tubes and opening the tube 69. The operation of this portion of my invention is as follows: When a wide piano-music sheet 15 is used on the instrument, as shown in Fig. 4, the lever 71 will be moved to the position shown in Figs. 6 and 8, thereby closing the tube 69. The passage 48 will then be the accent-passageway and will communicate with the pneumatic controlling the valve 64 through the tubes 68 and 69, as shown in Fig. 8. The passage 11^a will then communicate with its speaking key-pneumatic 4 through the tube 69 and the branch tube 70. When the narrow organ-music sheet 15^a, however, is used, as shown in Fig. 7, the lever 71 will be moved to the position shown in Figs. 7 and 9, closing the tubes 68 and 70 and opening the tube 69. The passage 11^a then becomes the accent-passageway and will communicate with the pneumatic controlling the valve 64 through the tube 69, while the tubes 68 and 70 will be cut out of action.

It will be apparent from the foregoing that when the wide piano-music sheet is used the accent-openings 15 in said sheet will register with the accent-passageway 48, and when the relatively narrow organ-music sheet is used the

accent-openings 15^b therein will register with the passage 11^a, which is then put into communication with the pneumatic controlling the valve 64 and becomes the accent-passageway, while the former accent-passageway 48 is thrown out of action.

It sometimes happens that owing to warping, twisting, or shrinking or other distortion of either the tracker-board or the music-sheet the accent perforations or slots 49 in the music-sheet will not accurately or properly register with the passage 48 in the tracker-board, the result being that the notes will not be properly accented or emphasized. With a view to preventing such objectionable result I provide the following means: Instead of forming the accent-passageway 48 in an integral portion of the tracker-board I provide the tracker-board at one end with an independent oscillatory segment 93, that is pivoted at its lower end, as at 94, to the end of the tracker-board, as most clearly shown in Figs. 10 and 11 of the drawings. The accent-passageway 48 is formed in the upper end of the segment 93, which upper end, as shown, is formed on the arc of the same circle as the top of the tracker-board proper. Communicating with one end of the passage 48 in the segment is a flexible tube 95, the other end of which is connected with the upper end of the pipe 46, leading to the chest 47, before described. Arranged between a bracket-arm 96, fixed to one side of the tracker-board or other suitable stationary support, and the adjacent side of the segment 93 is a coiled spring 97, that operates to move said segment about its pivot in one direction, and arranged in a corresponding bracket arm or support 98 is a set-screw 99, that is arranged to bear at its inner end against a wear-plate 100, attached to the adjacent side of the segment 93, as most clearly shown in Fig. 10 of the drawings. Should the accent-perforations 49 for any of the reasons before stated fail to register accurately with the passage 48 in the segment 93, the position of said passage may be readily altered or adjusted to cause it to accurately register with the said perforations by turning the set-screw 99 in one direction or the other, for it will be readily seen that by setting up the set-screw the segment will be swung about its pivot in the direction of the arrow 101 in Fig. 10, while if the set-screw be retracted the coiled spring 96 will swing the segment in the direction of the arrow 102, thus shifting the aperture or passage 48 in front or rear, more or less, of the line of note-apertures 11, and thereby regulating or adjusting the location of the accent-passageway.

I have shown and described my improved automatic playing apparatus as being particularly designed for playing pianos; but it will be evident that it is equally well adapted to playing keyboard musical instruments of various different types or kinds. I also wish it to be understood that while I have shown and described simple and convenient means for

carrying the several objects of the invention satisfactorily into effect I do not limit myself to the specific details of construction or the exact arrangement of the parts shown, as it
 5 will be readily apparent to those skilled in the art that such may be modified and altered without departing from the spirit of my invention.

Having described my invention, what I
 10 claim is—

1. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, an expandible bellows in communication therewith, means
 15 for exhausting the air from the bellows, and a spring for expanding the bellows, of a wind-trunk leading from the bellows to the exhausting mechanism, a valve controlling said wind-trunk, means actuated by the expansion and
 20 contraction of the bellows for opening and closing said valve, and mechanism under the control of the operator for causing the bellows to actuate the valve at different periods of the movement of the bellows at will, substantially as described.

2. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of an expandible bellows in communication therewith, means
 30 for exhausting the air from the bellows, a wind-trunk leading from the bellows to the exhausting mechanism, a valve for controlling said wind-trunk, a lever pivoted intermediate its ends to the movable board of the bellows
 35 and connected at one of its ends with said valve, and mechanism under the control of the operator for oscillating the other end of said lever, substantially as described and for the purpose specified.

3. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of an expandible bellows in communication therewith, means
 45 for exhausting the air from the bellows, a wind-trunk leading from the bellows to the exhausting mechanism, a valve for controlling said wind-trunk, a lever pivoted intermediate its ends to the movable board of the bellows
 50 and connected at one of its ends with said valve, a link connected to the other end of said lever, and a hand-lever connected to said link, whereby the valve may be actuated by hand independently of the bellows, substantially as described.

4. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of an expandible bellows in communication therewith, means
 60 for exhausting the air from the bellows, a wind-trunk leading from the bellows to the exhausting mechanism, a valve for controlling said wind-trunk, a lever pivoted intermediate its ends to the movable board of the bellows
 65 and connected at one of its ends with said valve, a link connected to the other end of said lever, a hand-lever connected to said

link, whereby the valve may be actuated by hand independently of the bellows, and means for holding said hand-lever in a predetermined position, substantially as described. 70

5. In an automatic piano-player, the combination with the vacuum chamber containing the primary pneumatics, an expandible bellows in communication therewith, means
 75 for exhausting the air from the bellows, and a spring for expanding the bellows, of a wind-trunk leading from the bellows to the exhausting mechanism, a valve controlling said wind-trunk, means actuated by the expansion and contraction of the bellows for opening and closing the valve, and means under
 80 the control of the operator for actuating the valve independently of the bellows, substantially as described and for the purpose specified. 85

6. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of a tracker-board having a plurality of cells each provided with a passage leading to one of the
 90 primary pneumatics and having an aperture controlled by the music-sheet, of a plurality of vent-tubes of relatively small diameter, one such tube being arranged in each cell and terminating at its upper end in proximity to the top of the tracker-board, and a vent-chamber common to all said tubes, substantially as described and for the purpose specified.

7. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of a tracker-board having a plurality of cells each provided with a passage leading to one of the
 100 primary pneumatics and having an aperture controlled by the music-sheet, of a plurality of vent-tubes of relatively small diameters, one such tube being arranged in each cell and terminating at its upper end in proximity to the top of the tracker-board and to one
 105 side of the corresponding aperture in the latter, and a vent-chamber common to all of said tubes, substantially as described and for the purpose specified. 110

8. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of a tracker-board having a plurality of cells each provided with a passage leading to one of the
 115 primary pneumatics and having an aperture controlled by the music-sheet, of a plurality of vent-tubes of relatively small diameter, one such tube being arranged in each cell and terminating at its upper end in proximity to the top of the tracker-board and to one
 120 side of the corresponding aperture in the latter, a vent-chamber common to all of said tubes, and a duct connecting said vent-chamber with the vacuum-chamber, substantially as described and for the purpose specified. 125

9. In an automatic piano-player, the combination with the vacuum-chamber contain-

ing the primary pneumatics, of a tracker-board comprising a longitudinal block provided on its opposite sides with a plurality of kerfs, the kerfs on one side alternating with those on the opposite side and extending from top to bottom of the block, said kerfs being deeper at their upper ends than at their lower, imperforate strips attached to the opposite sides of the block, a cover-strip attached to the top of the block and provided with a plurality of slots or apertures respectively communicating with the cells, passages leading from the cells to the primary pneumatics, a vent-chamber, and tubes leading from the cells to said vent-chamber, substantially as described.

10. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of a tracker-board having a plurality of cells each provided with a passage leading to one of the primary pneumatics and having an aperture controlled by the music-sheet, mechanism for intensifying the vacuum in the vacuum-chamber, an accent-passage in the tracker-board for controlling the said mechanism, and means for shifting the position of said accent-passage, substantially as described and for the purpose specified.

11. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of a tracker-board having a plurality of cells each provided with a passage leading to one of the primary pneumatics and having an aperture controlled by the music-sheet, mechanism for intensifying the vacuum in the vacuum-chamber, an accent-passage in the tracker-board for controlling said mechanism, and means for shifting said accent-passage transversely relatively to the tracker-board, substantially as described and for the purpose specified.

12. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of a tracker-board having a plurality of cells each provided with a passage leading to one of the primary pneumatics and having an aperture controlled by the music-sheet, mechanism for intensifying the vacuum in the vacuum-chamber, an oscillatory segmental section pivotally attached to one end of the tracker-board and provided with a passage controlling the said vacuum-intensifying mechanism which mechanism is controlled by supplemental apertures in the music-sheet, and means for moving said section to transversely adjust the location of the accent-passage relatively to the tracker-board, substantially as described and for the purpose specified.

13. A tracker-board for automatic piano-players, provided with a plurality of passages controlled by the music-sheet for actuating the primary pneumatics, and having a supplemental passage adjustably arranged relatively to the first-named passages the admis-

sion of air to said supplemental passage being controlled by supplemental apertures in the music-sheet, substantially as described and for the purpose specified.

14. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of a tracker-board having a plurality of cells each provided with a passage leading to one of the primary pneumatics and having an aperture controlled by the music-sheet, of a segmental block forming a section of the tracker-board and pivotally connected to one end of the latter, said section having an accent-aperture formed in its upper end, a spring for moving said section in one direction about its pivot, a set-screw for moving it in the opposite direction, and a flexible tube leading from the said accent-aperture to a pneumatic valve-controlling mechanism for regulating the exhaustion of the air from the vacuum-chamber, substantially as described.

15. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of a tracker-board having a plurality of passages each communicating with one of the primary pneumatics and controlled by the music-sheet, mechanism for intensifying the vacuum in the vacuum-chamber, an accent-passage in the tracker-board for controlling said mechanism, and means for closing the accent-passage and for cutting off the communication between one or the other of said passages and its primary pneumatic and placing it in communication with the said intensifying mechanism, substantially as described and for the purpose specified.

16. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of a tracker-board having a plurality of passages each communicating with one of the primary pneumatics and controlled by the music-sheet, mechanism for intensifying the vacuum in the vacuum-chamber, a supplemental passage in the tracker-board normally in communication with the intensifying mechanism, and means for cutting off the communication between said accent-passage and the intensifying mechanism and between one of the other passages and its primary pneumatics and for simultaneously establishing communication between said last-mentioned passage and the intensifying mechanism, substantially as described and for the purpose specified.

17. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of a tracker-board having a plurality of passages each communicating with one of the primary pneumatics and controlled by the music-sheet, mechanism for intensifying the vacuum in the vacuum-chamber, and means for cutting off the communication between one of said passages and its primary pneumatic and put-

ting it in communication with the intensifying mechanism, substantially as described and for the purpose specified.

18. In an automatic piano-player, the combination with the vacuum-chamber containing the primary pneumatics, of a tracker-board having a plurality of passages each communicating with one of the primary pneumatics and controlled by the music-sheet, mechanism for intensifying the vacuum in the vacuum-chamber, a supplemental accent-passage in the tracker-board, a tube leading from the accent-passage to the intensifying mechanism, a tube leading from one of the first-named passages to the intensifying mechanism and having a branch tube leading to its primary pneumatic, and means for closing said branch tube and accent-tube and simultaneously opening the tube leading from the primary-pneumatic passage to the intensifying apparatus, substantially as described and for the purpose specified.

19. In an automatic piano-player, the combination with the tracker-board having a plurality of note-passages and an accent-passage, of a flexible tube leading from one of the note-

passages to an exhauster, a flexible tube leading from the accent-passage and communicating with the note-tube, a flexible branch tube leading from the note-tube to its primary pneumatic, and a lever arranged to compress and close the said accent and branch tube and open the note-tube, substantially as described and for the purpose specified.

20. In an automatic piano-player, the combination with the tracker-board provided with a plurality of apertures communicating with the primary pneumatics and having a supplemental accent-passage, of means for closing the accent-passage and placing one of the passages leading to the primary pneumatics in communication with the accenting mechanism, substantially as described and for the purpose specified.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ERNEST M. SKINNER.

Witnesses:

EDWARD H. CARPENTER,
ARTHUR S. PEVEAR.