

UNITED STATES PATENT OFFICE.

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AUTOMATIC PIANO-PLAYER.

SPECIFICATION forming part of Letters Patent No. 673,736, dated May 7, 1901.

Application filed December 31, 1900. Serial No. 41,670. (No model.)

To all whom it may concern:

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

In United States Patent granted to me on the 4th day of December, 1900, No. 663,368, I have shown and described certain improvements in automatic piano-players, the same having for its object to provide means whereby greater facility in expression in devices of this kind may be obtained. The same comprises, in addition to the primary or key pneumatic chamber and a low-pressure bellows communicating therewith, a supplemental high-tension bellows and means for throwing said high-tension bellows into communication with the primary or key pneumatic chamber and simultaneously cutting out the low-tension bellows. To accomplish this result, a supplemental passage or duct in the tracker-board is employed in connection with an accent-valve for opening communication between the high-tension bellows and the primary or key pneumatic chamber, which supplemental passage or duct is normally closed by an imperforate portion of the music-sheet and is opened for the purpose of throwing into operation said high-tension bellows and simultaneously cutting off the low-tension bellows by the registration therewith of a supplemental or accent perforation in the music-sheet cut directly opposite the front edges of the perforations for the notes to be accented, which latter perforations are slightly in the rear of the front edges of the perforations for the notes which are not to be accented.

According to my present invention the apparatus is constructed the same as before, except that the supplemental passage or duct in the tracker-board, through which the high-tension bellows is thrown into operation, is normally uncovered or open, and the music-sheet is provided with elongated slots separated by imperforate portions, which imperforate portions are located directly opposite the front edges of the perforations for the notes to be accented. In other words, according to the invention disclosed in my former patent the high-tension bellows is thrown

into operation by the registration of a supplemental or accent perforation in the music-sheet with the supplemental duct or passage in the tracker-board, whereas according to my present invention the high-tension bellows is thrown into operation by the registration with the supplemental duct or passage in the tracker-board of an imperforate portion of the music-sheet.

The details of the invention will hereinafter appear, and the novel features thereof will be set forth in the claims.

In the drawings forming a part of this specification, Figure 1 is a vertical sectional view of my improved instrument. Fig. 2 is a plan view of the tracker or channel board. Fig. 3 is a face view of a portion of the music-sheet. Fig. 4 is a similar view showing an alternative arrangement.

The air or vacuum chamber 1 contains the key-pneumatic 2 and communicates through the ports 3 with the large pneumatics 4, having the fingers 5 thereon for operating the piano-keys 6. Each of the ports 3 is normally closed by a valve 7, whose stem 8 is connected with the pneumatic 2, as shown. Each of the key-pneumatics 2 communicates through a passage 9 with an opening 10 in the upper surface of the tracker or channel board 11, over which passes the perforated music-sheet 12. Said music-sheet is wound on one of the rolls 13 and unwound from the other. It is provided with the usual note-perforations 14, corresponding to the music to be played, which perforations, as is usual in devices of this kind, are adapted to register with the proper openings 10 in the tracker-board 11. The air or vacuum chamber 1 also communicates through the wind-trunk 15 with the low-pressure air-reservoir or bellows 16 through a port 17, controlled by a check-valve 18, which opens inwardly or toward the low-pressure reservoir 16. The latter—that is, the low-pressure reservoir 16—communicates through a wind-trunk 19 with the high-pressure reservoir or bellows 20, the automatic valve 21 in the low-pressure reservoir controlling the passage through the trunk 19. The main or high-tension bellows 20 is in communication through the ports 22 with the feeding-bellows 23, the said ports 22 being controlled by an inwardly-opening check-

valve 24 and the feeders 23 being open to the atmosphere through the ports 25, having valves 26 controlling the same. Said feeders are operated from the pedals 27 through the link or pitman 28, as shown.

Constructed as above described the apparatus will operate in the usual manner, all of the keys being actuated from the low-tension reservoir 16 and all of the notes being struck with equal force.

My invention consists in forming in the tracker or channel board 11 a supplemental normally open duct or passage 29, in forming in the music-sheet 12 successive openings 30, adapted to register with the passage 29 for maintaining said duct or passage normally open, and imperforate portions 31 between said slots, also adapted to register with said duct or passage 29 for closing the same when they come opposite said duct, and in providing means controlled by these parts for cutting off the low-pressure reservoir 16 from the air or vacuum chamber 1 and cutting in the high-tension reservoir or bellows 20, so that the notes accented thereby will be struck with greater force than those actuated from the low-pressure reservoir 16. In the event of a number of notes being struck simultaneously, the note-perforations 32 in the music-sheet 12 corresponding to the notes to be accented are cut a short distance behind the other note-perforations and exactly opposite the imperforate portions 31 between the openings 30. The higher air tension operating the pneumatics for the accented notes causes them to move the piano keys and hammers so much more quickly than those operated by the low-tension bellows for the notes not to be accented that it results in a simultaneous or practically simultaneous attack upon the instrument of the hammers for the accented and unaccented notes. In the first chord on the music-sheet 12 (shown in Fig. 3 of the drawings) the three slots 14 in advance of the slot 32 register first with the openings 10 in the tracker-board 11. (Shown in Fig. 2.) The piano-hammers are then moved, say, one-half the distance toward the piano-strings. The balance of the chord, comprising the slot 32, then registers in conjunction with the imperforate portion 31 on the tracker-board. The pressure in the key-pneumatic chamber 1 is instantly raised to double (by way of illustration) the tension obtaining when the first keys were acted upon. It will therefore be clear that this latter note, or rather the hammer for striking the same, will be acted upon with much greater rapidity, overtaking the others. It is true that the high tension is also acting upon the keys first struck, but they have progressed so far that the effect of the high pressure is lost on them.

In lieu of the successive openings 30 in the music-sheet 12 I may employ elongated slots 30^a, as in the modification shown in Fig. 4 of the drawings.

The passage or duct 29 at one end of the

tracker or channel board 11 communicates with an accent-controlling pneumatic 33, which has connected to the moving part thereof the stem 34 of a valve 35, normally closing the port 36 between the air or vacuum chamber 1 and the passage 37, leading to the pneumatic 38 for the accent-valve 39. The said accent-valve 39 normally closes the port 40, leading from the main or high-tension bellows 20 to the wind-trunk 41, which communicates at its upper end with the air or vacuum chamber 1, and the stem 42 of said valve is connected to the movable part of the pneumatic 38. In the accent-controlling pneumatic 33 is a spring 43, which tends to hold the movable part of said pneumatic in its raised position. A leak-vent 44 is also provided in the movable portion of the pneumatic 33 to prevent the formation of an air-cushion in said pneumatic and in the duct 29, which would prevent the deflation of said pneumatic when the upper end of said duct 29 is sealed by an imperforate portion of the music-sheet. When, however, the upper end of the duct 29 is open, as it is when one of the slots 30 in the music-sheet 12 registers therewith, atmospheric pressure, acting against the low pressure in the primary-pneumatic chamber 1, serves to force the movable part of the accent-controlling pneumatic 33 downwardly, so as to maintain the valve 35 in its closed position. When, however, one of the imperforate portions 31 in the music-sheet 12 registers with the duct or passage 29, the spring 43 acts to raise the movable part of the pneumatic 33, and thereby open the valve 35.

Constructed as above described, the operation of the device is as follows: When the imperforate portion 31 in the music-sheet 12, which lies opposite the note-perforation 32 in said sheet of the note to be accented, registers with the duct or passage 29 in the tracker or channel board 11, the said duct or passage is cut off from the pressure of atmospheric air from without and the pneumatic 33 is collapsed by the action of the spring 43 therein. This causes the elevation of the valve 35 and the opening of communication between the air or vacuum chamber 1 and the pneumatic 38 through the port 36 and passage 37. The influence of the air tension from the low-pressure reservoir 16 causes the deflation of the pneumatic 38, which serves to open the accent-valve 39 and open communication between the main or high-tension bellows 20 and the air or vacuum chamber 1 through the port 40 and the wind-trunk 41. The tension or pressure from the high-tension bellows 20, being greater than that from the low-tension bellows 16, causes a quicker depression of the key-pneumatic 2 corresponding to the note on the music-sheet 12 opposite the imperforate portion 31, and also causes the key corresponding to said pneumatic 2 to be actuated with greater force, and thus accent the same. As soon as the high-tension bellows

20 is opened to communication with the air or vacuum chamber the check-valve 18 is automatically closed in order that a sudden change in the air tension in the chamber 1 may not be neutralized by the low-tension bellows 16. The check-valve 18, which controls the passage through the port 17, is an important feature of the apparatus, as the instant an increase in the tension takes place in the air or vacuum chamber 1 said valve is closed and prevents the impulse from distributing the tension in the low-tension bellows 16 and also from wasting itself by simply collapsing the low-tension bellows. As the duration of the impulse is but a fraction of a second, this is a matter of no small consideration.

All of the advantages of the apparatus described in my patent above referred to may be obtained by that herein described. In addition it may be stated that one of the advantages of the present apparatus over the former is in the fact that when the music-sheet becomes loose or slackened, as it does during the time that it is being rerolled or is running backward, there is no danger of causing the notes to sound. When the supplemental duct or passage in the tracker-board is normally closed, as it is in the construction described in my former patent above referred to, the pneumatics are permitted to work, notwithstanding the fact that the wind-trunk 15 is closed by a valve, (not shown,) as the operation of the accenting mechanism when the paper loosens or slackens allows the air to gain access to the primary pneumatic chamber. When the supplemental passage or duct in the tracker-board is normally open, as it is in the present construction, the loosening of the paper has no effect, as when the duct 29 is uncovered the valve 39 is in its closed position.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an automatic piano-player, the combination with the air or vacuum chamber containing the primary or key pneumatics and a low-tension bellows normally in communication therewith, of a high-tension bellows and means for throwing said high-tension bellows into communication with said chamber and simultaneously cutting off the low-tension bellows therefrom, the means for throwing in said high-tension bellows comprising a tracker or channel board having a supplemental normally open duct or passage therein, means thrown into operation by the closing of said duct for opening the passage from said high-tension bellows to said chamber, and a music-sheet provided with imperforate portions adapted to close said supplemental duct.

2. In an automatic piano-player, the combination with the air or vacuum chamber containing the primary or key pneumatics and a low-tension bellows normally in communication therewith, of a high-tension bellows, a tracker or channel board having a series

of passages therein communicating, respectively, with the several primary or key pneumatics and having a supplemental normally open duct or passage therein, means thrown into operation by the closing of said duct for opening the passage from said high-tension bellows to said chamber, a music-sheet passing over said tracker-board having imperforate portions therein designed to register with and close said supplemental duct for throwing said high-tension bellows into communication with said chamber, and means for cutting out said low-tension bellows when said high-tension bellows is thrown into communication with said chamber, whereby one, only, of said high and low tension bellows will be in communication with said air or vacuum chamber at the same time.

3. In an automatic piano-player, the combination with the air or vacuum chamber containing the primary or key pneumatics, a tracker or channel board having a series of passages therein communicating, respectively with the several primary or key pneumatics and having a supplemental normally open duct or passage therein, and a low-tension bellows normally in communication with said chamber, of a high-tension bellows, means for throwing the same into communication with said chamber, and means for simultaneously cutting out said low-tension bellows, the means for throwing in said high-tension bellows comprising a normally closed accent-valve controlling the passage between said high-tension bellows and said chamber, a pneumatic for opening said accent-valve, a passage connecting the latter pneumatic with said chamber, a valve normally closing the latter passage, a pneumatic for actuating the latter valve, communicating with the supplemental duct or passage in said tracker-board, and a music-sheet passing over said tracker-board having imperforate portions therein adapted to register with and close the said supplemental duct, as and for the purpose set forth.

4. A music-sheet for self-playing, musical instruments having openings therein for the notes to be accented, openings therein for the notes which are not to be accented, and supplemental openings therein in longitudinal line with each other and separated by imperforate portions, the said imperforate portions controlling the accent of the notes to be accented, the front edges of the openings for the notes to be accented lying in a direct transverse line with the front edges of said imperforate portions and slightly to the rear of the front edges of the openings for the notes which are not to be accented.

5. In an automatic piano-player, the combination with the air or vacuum chamber, the primary or key pneumatics therein, the tracker-board having a series of main passages therein communicating, respectively, with the primary or key pneumatics and having a supplemental normally open passage

therein, and means thrown into operation by the closing of said duct for varying the tension in said chamber, 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 in longitudinal line with each other and separated by imperforate portions, the said imperforate portions adapted to close said supplemental passage 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 said imperforate portions with the supplemental passage in said tracker-board, and slightly after the registration with said main passages of the openings for the notes which are not to be accented.

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

ERNEST M. SKINNER.

Witnesses:

GEORGE H. TAYLOR,
DANIEL W. SULLIVAN.