L. H. MAIER.

SELF PLAYING MUSICAL INSTRUMENT.

APPLICATION FILED MAR. 22, 1906.

961,724.

Patented June 14, 1910.

3 SHEETS—SHEET 1.

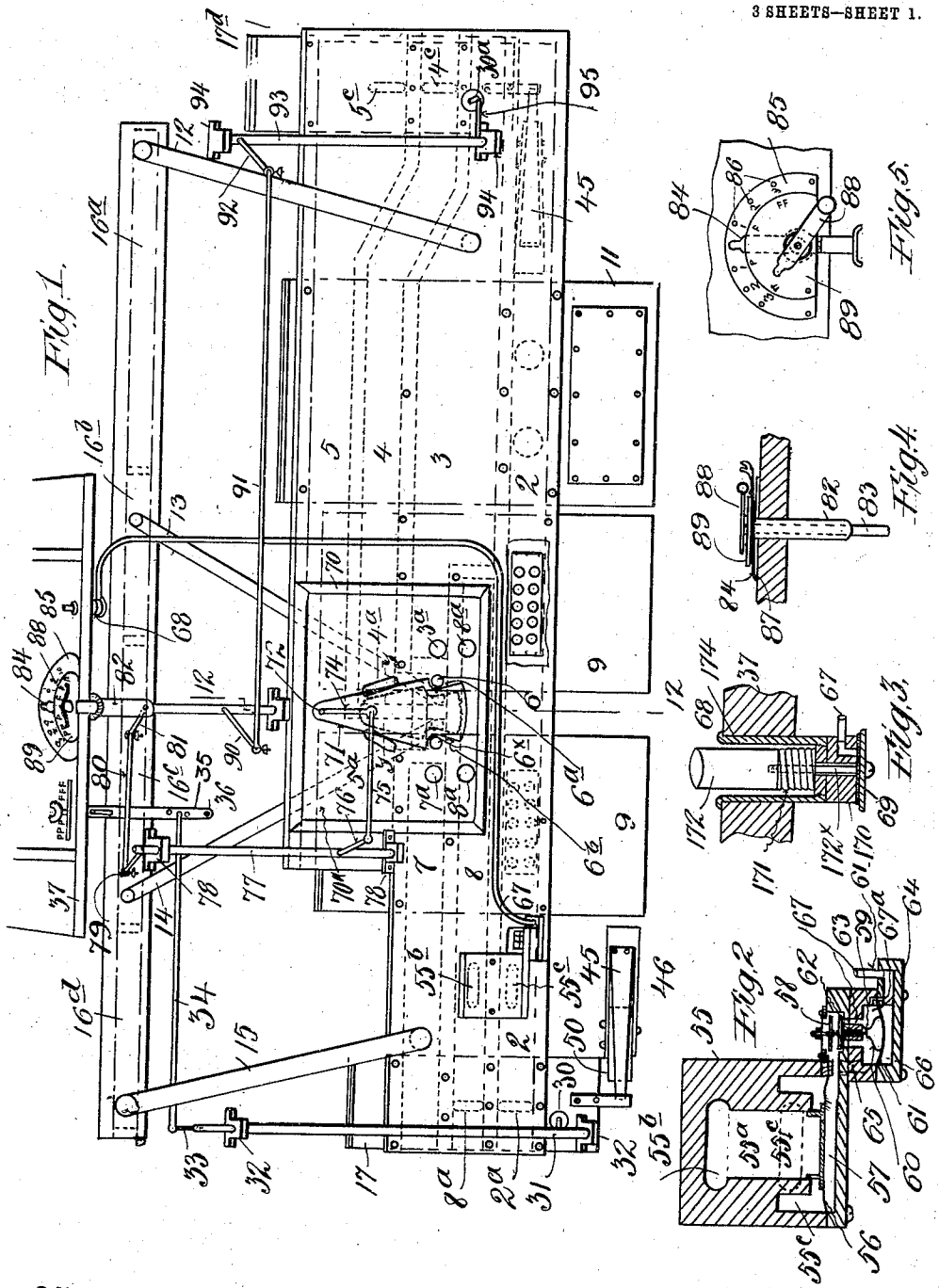


Fig. 1.

Fig. 5.

Fig. 4.

Fig. 3.

Fig. 2.

Witnesses.

W. M. Benjamin

Marie S. Wainright

Inventor

L. H. Maier

By his Attorney

T. F. Bourne

L. H. MAIER.

SELF PLAYING MUSICAL INSTRUMENT.

APPLICATION FILED MAR. 22, 1906.

961,724. **Patented June 14, 1910.**

3 SHEETS—SHEET 2.

Fig. 6.

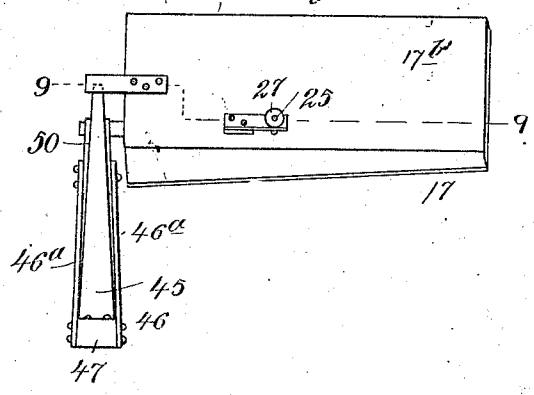


Fig. 7.

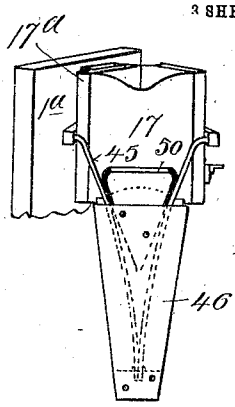


Fig. 9.

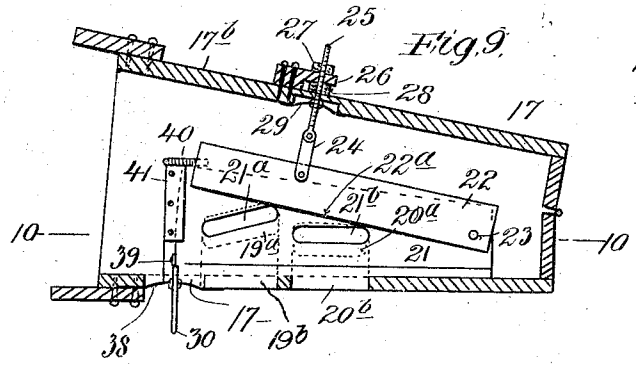
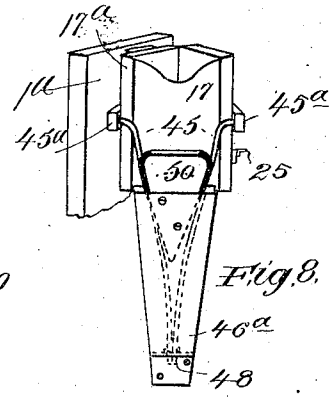


Fig. 8.



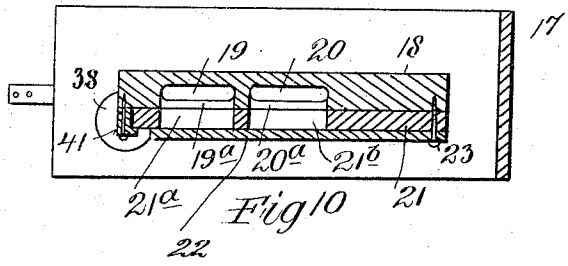


Fig 10

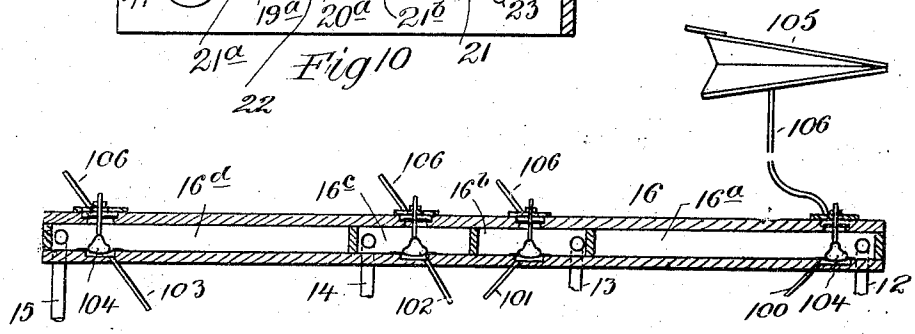


Fig. 11.

Witnesses:
W. M. Benjamin
Marie J. Wainright.

Inventor
L. H. Maier.
By his Attorney
F. F. Bourne

L. H. MAIER.

SELF PLAYING MUSICAL INSTRUMENT.

APPLICATION FILED MAR. 22, 1906.

961,724.

Patented June 14, 1910.

3 SHEETS—SHEET 3.

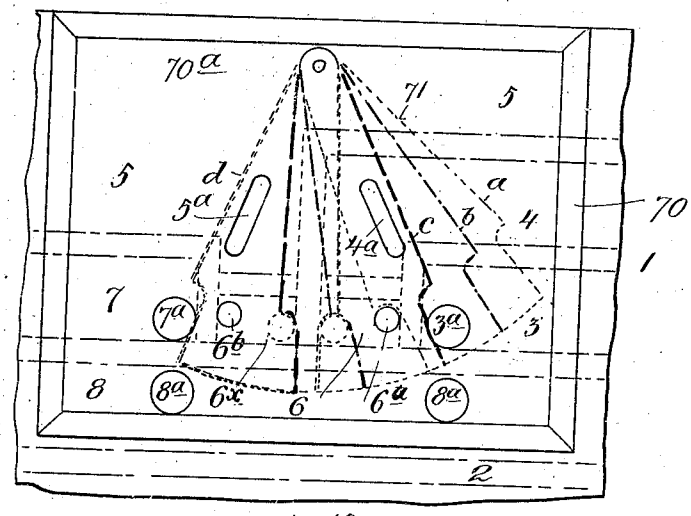


Fig. 13.

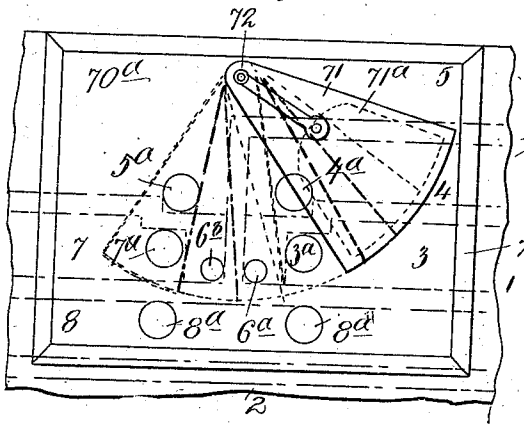


Fig. 14.

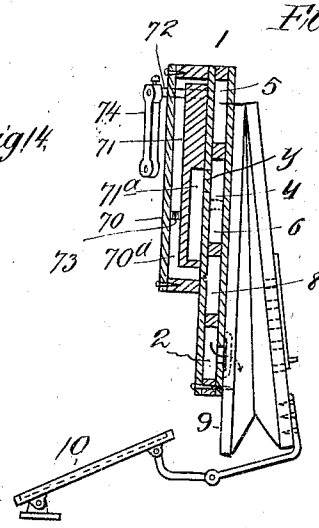


Fig. 12.

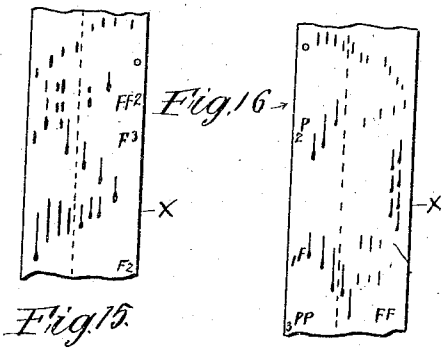


Fig. 16.

Fig. 15.

Witnesses:
Lo M. Benjamin
Marie L. Wainright

Inventor
L. H. Maier
By his Attorney
T. F. Bourne

UNITED STATES PATENT OFFICE.

LOUIS H. MAIER, OF NEW YORK, N. Y., ASSIGNOR TO JOHN H. LUDWIG, OF NEW YORK, N. Y.

SELF-PLAYING MUSICAL INSTRUMENT.

961,724. Specification of Letters Patent. Patented June 14, 1910.

Application filed March 22, 1906. Serial No. 307,342.

To all whom it may concern:

Be it known that I, LOUIS H. MAIER, a citizen of the United States, residing in New York city, borough of Manhattan, New York, have invented certain new and useful Improvements in Self-Playing Musical Instruments, of which the following is a specification.

The object of my invention is to provide improved means for regulating and controlling the volume of sound desired in rendering musical compositions in self playing musical instruments to the end that notes produced in different groups or individual notes of the instrument may be varied in degree of tone as desired.

The invention comprises the novel details of improvement that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings forming part hereof, wherein,

Figure 1 is a front view illustrating my improvements, showing wind inducing apparatus, and its channels and other parts, Fig. 2 is a sectional view of expression valve 55, etc., Fig. 3 is a detail section, enlarged, of valve controlling device 68, Fig. 4 is a detail section of a controlling device, shown in Fig. 1. Fig. 5 is a detail face view thereof; Fig. 6 is a perspective view of a tension controlling bellows; Figs. 7 and 8 are end views thereof, looking from the left in Fig. 6, showing different positions of collapse of the bellows; Fig. 9 is a section substantially on the line 9, 9 in Fig. 6. Fig. 10 is a section on the line 10, 10 in Fig. 9. Fig. 11 is a partly sectional detail view of the valve wind-chest and connections. Fig. 12 is a sectional view on the line 12, 12 in Fig. 1 showing the foot bellows and the associated channels; Fig. 13 is a detail view enlarged illustrating the ports connecting with the wind channels 3, 4 etc., Fig. 14 is a similar view of a modification thereof. Figs. 15 and 16 indicate music sheets.

Similar numerals of reference indicate like parts in the several views.

In the drawings, the numeral 1 indicates, generally, a chest, which is indicated as divided by suitable partitions into channels 2, 3, 4, 5, 6, 6^x, 7 and 8, as indicated in Figs. 1, 13, and 14. At 9 are suitable foot bellows, shown having treadle 10, (see Fig. 12) and connected with the main exhaust channel 2, and at 11 is an equalizing chamber or bellows connected with channel 2, all in any well known manner, whereby exhaust may be maintained in channel 2. The channels 3, 6, 6^x, and 7 are respectively connected by pipes 12, 13, 14 and 15 with the suction chest 16 for the operating pneumatics, provided with separate chambers 16^a, 16^b, 16^c and 16^d. Said chambers are adapted to control different groups of notes of a piano-action, as, for instance, chamber 16^b corresponds to middle G# and, say, nine notes above in the treble scale; the chamber 16^a corresponds to the remaining higher treble notes; the chamber 16^c corresponds to the middle G note next at the left of G#, and, say nine notes to the left in the upper bass, and the chamber 16^d corresponds to the remaining lower notes in the bass, but it will be understood that said arrangement of groups of notes or keys of the instrument may be altered with respect to said chambers if desired.

I provide means for regulating the flow of air from channel 8 to channel 2, by an expression bellows, and a regulating expression bellows controlling the air passing either from channel 4 to 5 or from 5 to 4. I have shown similar bellows used in both said relations, but the air passing from 8 to 2 may be controlled by any well known expression bellows. To this end I provide the devices more fully shown in Figs. 6 to 10 inclusive, as follows:—A suitable bellows 17 has its stationary board 17^a attached to the board 1^a of the chest 1, and said bellows is provided with an interior board or block 18 having passages 19, 20 that open into the interior of the bellows by side ports 19^a, 20^a shown in Fig. 10, and whose outer ports 19^b, 20^b, communicate, respectively, with ports 2^a, 8^a of the channels 2 and 8 and a similar bellows 17^d has similar ports connected with ports 4^c, 5^c of channels 4 and 5, respectively, as indicated in Fig. 1. Within bellows 17, pivoted so as to slide along the side of block 18, is an adjustable board or valve 21 having passages 21^a, 21^b, adapted to co-act, respectively, with the ports 19^a, 20^a in block 18.

At 22 a cut-off or regulating valve or plate is pivotally supported, (as by screw 23 which also supports the valve 21) and is located at the side of valve 21 so as to cross the ports 21^a, 21^b during the movements of the board 17^b of bellows 17 to cut-off the flow of air

through said bellows according to the collapse of said bellows. The valve 22 is shown connected by a link 24 and screw 25 with board 17b so as to reciprocate with said board, and said screw 25 is made adjustable to vary the action of the valve 22 with respect to ports 21a, 21b as desired. For this purpose I have shown screw 25 passing through a block 26 on board 17b and provided with nuts 27, 28 for adjustment, a flexible or leather piece 29 connecting the screw 25 with board 17a to prevent the passage of air while permitting adjustment of said screw. As the valve 22 reciprocates on an arc described around its axis 23, I have shown the port 21b as arranged parallel with board 17a, and the port 21a at an acute angle thereto, whereby when bellows 17 is expanded both of said ports may be substantially equally uncovered by valve 22, and as the edge 22a of valve 22 crosses said ports, as the bellows is collapsed, said valve will cut off said ports substantially in equal degree, whereby the passage of air into and from the bellows through said ports may be maintained substantially equal in area during the reciprocations of valve 22. To adjust the position of valve 21 as desired with respect to valve 22 I have shown an arm 30 connected with a rock shaft 31 suitably journaled, as in bearings 32, and having a crank 33 connected by a link 34 with an arm or lever 35, pivotally supported as at 36, and having its upper end shown located adjacent the shelf 37 of a piano case (see Fig. 1), whereby by adjusting lever 35 to the left or right of the central position the valve 21 will be moved upwardly or downwardly in Fig. 9. When lever 35 is moved to the left valve 21 will be raised in Fig. 9 to produce the desired low tension, and when valve 21 is moved down in Fig. 9 it will shift ports 21a, 21b downwardly away from valve 22 for producing high tension exhaust, lever 35 being then moved to the right in Fig. 1. A leather piece 38 connected with arm 30 and with board 17a (see Fig. 9) prevents the passage of air at opening 17c in board 17a. Arm 30 is shown secured to valve 21 by screw 39. At 40 is a piece of felt secured upon block 18 against which board 17b may bear to limit extreme collapse of the bellows. A clip 41 secured to block 18 and extending in front of valve 21 keeps said valve against block 18, (see Fig. 10).

I have shown means to control the collapsing of bellows 17 and 17d, or in other words to regulate the degree of tension maintained in the channels; as follows:—the spring 45 is shown in usual V-form connected with the bellows in well known manner, and at 46 is a frame or box consisting of side plates 46a having a block 47 provided with a notch 48 receiving the end of the spring, whereby the spring is covered on its edges and free to vibrate between the side plates 46a, and to said side plates is secured, as by screws, a block or wedge 50, shown in tapering form, located between the leaves of the spring, and having its apex facing the apex of the spring and of such width as to permit the spring to contract freely for a suitable distance and to cause the leaves of the spring to have increasing tension by gradually bearing on wedge 50 as the bellows collapses. When valve 21 is raised, say to its highest point, the spring 45 will be free to allow the bellows to collapse, and thereby the valve 22 will cut-off air from flowing through the ports 21a, 21b, whereby a decreased suction passes through the bellows, producing low tension, and when valve 21 is raised, as stated, the relation of wedge 50 to spring 45 is such that it does not interfere with the collapsing of the bellows as the spring will not engage the wedge while such low tension is being produced while valve 21 is raised. This condition is shown in Fig. 7, where the bellows is indicated as partly collapsed producing a decreased tension. When valve 21 is moved down to its low limit (from its position in Fig. 9) the ports 21a, 21b are thus adjusted lower from the high position of valve 22, and thereby during the collapsing of the bellows valve 22 will be checked in its descent by reason of the leaves of the spring 45 engaging wedge 50, and the ports 21a, 21b will not be cut-off by valve 22 to so great a degree as before mentioned, and thereby the greatest tension of spring 45, increased by block or wedge 50, is caused to act on the bellows, thereby allowing the greatest quantity of exhaust or suction to pass through the ports 21a, 21b giving high tension exhaust in the channels. Intermediate positions of valve 21 cause varying exhaust in the channels to a greater or less degree, by reason of the sooner or later contact of the leaves of the spring 45 with wedge 50.

From the foregoing it will be understood that as the normal or intermediate exhaust tension from bellows 9 is being drawn from chamber 8 into chamber 2 such tension may be varied by moving arm 35 to the right or left and thereby shifting the position of the valve 21 and its ports 21a and 21b with relation to valve 22, the valve 22 serving to cut off both of said ports simultaneously in substantially equal degree during the collapsing of bellows 17, 17d and thus the flow of air can be in either direction through the bellows and be equally controlled at all times because both ports can be controlled by valve 22.

To enable quick full tension from bellows 11 to be created in channel 8, irrespective of bellows 17, to suddenly increase the tension in the operative pneumatics as desired, such as to suddenly accentuate a part of a composition being rendered, I provide the arrange-

ment shown in Figs. 1 and 2, as follows:—Fitted upon chest 1 is a block 55 having a chamber 55^a and passages 55^b, 55^c that communicate with channels 8 and 2 respectively, and the communication between 55^a and 55^c is controlled by a diaphragm 56 that is controlled on one side by suction in channels 2 and 55^c and on the opposite side by air in a chamber 57 that communicates with the atmosphere through a normally open valve 58 carried by a stem 59 having a bumper 60 operating with a diaphragm 61. The stem 59 also has a valve 62 normally closing a port or ports 63 that communicates with suction chamber 64 that is in communication with channel 55^c by a passage 65 of the block shown bored in one corner, and beneath diaphragm 61 is a chamber 66 that is connected by a pipe 67 with a controlling valve 68 shown supported at the shelf 37. The valve 68 normally closes pipe 67 and thereby the normal suction in chamber 64 keeps valve 62 closed and valve 58 open, whereby communication between channels 2 and 8 through chamber 55^a is normally cut off by diaphragm 56. Valve 68 is shown as having a valve head 69 and a block 170 receiving pipe 67, the end of which is controlled by valve 69, the latter being held pressed against said pipe by a spring 171 acting on a thumb piece or push button 172 carried by stem 172^x within the shell 174 that is carried by shelf 37 (see Fig. 3). When the button 172 is pressed valve 69 opens the end of pipe 67 and the air thus entering chamber 66 through pipe 67 raises diaphragm 61 and opens valve 62 and closes valve 58, whereupon the suction then caused in chamber 57 through port 63 draws down diaphragm 56 and suddenly opens communication between channels 2 and 8 through 55^a, 55^b, and 55^c, thus throwing the high tension exhaust of channel 2 directly into communication with channel 8 to cause quick accentuation of a portion or portions of the composition being rendered. When button 172 is released the valve 69 shuts pipe 67 and diaphragm 56 thereupon closes communication between channels 2, 55^a, and 8, which may then remain in the normal position, a bleed 67^a being provided to drain the air in pipe 67, after it is closed at 69, to atmosphere.

To cause the channel 8 to communicate at will with channels 3, 4, 5, 6, 6^x and 7 I provide the following arrangement:—Upon the chest 1, over the part where said channels are adjacent to each other, I provide a box 70 having a chamber 70^a from which ports 3^a, 6^a, 6^b, 7^a and 8^a communicate respectively with channels 3, 6, 6^x, 7 and 8 and elongated ports 4^a, 5^a, connect the chamber 70^a with channels 4 and 5 respectively. Within the chamber 70^a is a valve 71, shown pivotally supported by a shaft 72 and provided with a cavity 71^a adapted to co-act with said ports 3^a, etc., when swung from side to side in chamber 70^a, a suitable spring 73 (see Fig. 12) serving to hold valve 71 upon its seat. The arrangement is such that when valve 71 is shifted to the position shown by dotted lines *a* in Fig. 13 the ports 3^a, 4^a will be connected by cavity 71^a; when valve 71 is in the position shown by dotted lines *b* in said figure ports 3^a, 4^a and 6^a will be connected by cavity 71^a; when the valve is in the position shown by dotted lines *c* the ports 4^a and 6^a will be connected, and when the valve is in the position shown by the dotted lines *d* the reverse port 5^a will be connected by cavity 71^a with port 6^b; other positions of valve 71, corresponding to those described on the right of Fig. 13, may be caused at the left, to cause the cavity 71^a to connect ports 5^a, 6^b and 7^a in one instance, and ports 5^a and 7^a in the last instance. When valve 71 is in central position channel 8 communicates, through chamber 70^a to all the channels specified simultaneously. Ports 4^a and 5^a serve as reverse ports because sometimes the reverse air current is in one direction and sometimes in a other.

Shaft 72 of valve 71 is shown provided with an arm 74 connected by a link 75 with a crank 76 on a rock shaft 77, suitably journaled as in bearing 78, and provided with a crank 79 connected by a link 80 with a crank 81 carried by a sleeve 82 surrounding a shaft 83 said sleeve being shown provided with a pointer or operating finger 84 adapted to travel over an indicator 85 shown carried by shelf 37 and provided with holes 86 receiving a pin 87 to hold the pointer set. The shaft 83 carries a finger or pointer 88 to travel over an indicator plate 89 carried by shelf 37. In Fig. 1 the indicators 85 and 89 are shown in perspective for convenience of illustration, but may be parallel with shelf 37 as indicated in Figs. 4 and 5. Shaft 83 also has a crank arm 90 connected by a link 91 with a crank 92 on a rock-shaft 93, journaled in suitable bearings 94, and having a crank arm 95 adapted to operate a stem 30^a that is similar to stem 30 of bellows 17 and controlling a valve, similar to valve 21 of bellows 17, in bellows 17^d which is constructed in the manner shown with respect to Figs. 6 to 10 inclusive, the bellows 17^d being connected by its ports (such as 19^b, 20^b) with the ports 4^c, 5^c that communicate with channels 4, 5, (see Fig. 1), whereby the tension in passing from 4 to 5 or from 5 to 4 may be decreased by said bellows 17^d, in manner similar to the control of the tension between the channels 2 and 8 by bellows 17 and its valve devices. The suction passing through bellows 17^d is normally decreased with relation to the degree of tension maintained in channel 8. By means of pointer 88 and the connections therefrom to the valve, as 21, in bellows 17^d, the operator may

at will vary the amount of said decrease of suction in bellows 17^d to a greater or less degree.

Pipes 100, 101, 102 and 103 connect with the appropriate orifices of a tracker or bridge in well known manner, and as shown in Fig. 11 said pipes lead to corresponding valve devices 104 for controlling the corresponding pneumatics 105 for the action in any well known manner, pipes 106 connecting the pneumatics with said valve devices, there being one such valve device in each of the chambers 16^a, 16^b, 16^c, 16^d for each corresponding tracker orifice and the corresponding pneumatic only one of said valve devices 104 being shown in each said chamber for the sake of clearness.

A musical instrument provided with my improvements may be operated as follows:— Suction being maintained in channel 2 by the wind inducing bellows 9, and valve 71 set in the central or normal position (as in Fig. 1) suction will be produced in the various channels for producing suction in pipes 12, 13, 14 and 15 for the operating pneumatics, the degree of such suction being regulated at will by lever 35 being shifted to produce the tonal effects desired, for instance, by shifting lever 35 to the left in Fig. 1 bellows 17 will produce low tension and when shifted to the right will produce high tension in manner before described.

It will be understood that the flow of air between channels 8 and 2 through bellows 17 is always in one direction and not reversible. Now, by shifting pointer 84 to the extreme left in Fig. 1, valve 71 will be shifted to the right and shut off communication from channel 8 through chamber 70^a to ports 3^a and 4^a, leaving communication from said chamber through the remaining ports thereof, and thereby causing suction from chamber 3, controlling the extreme treble notes through pipe 12, to be drawn through the cavity 71^a in valve 71 and thence through port 4^a, through channel 4, and through reducing bellows 17^d, channel 5, and port 5^a back to chamber 70^a, and thence to the wind-inducing bellows 9 through channels 8 and 2, thus producing a low tension for the extreme treble, or in other words, the remaining three sections or groups of notes become accentuated with relation to the extreme treble; the middle treble may be similarly diminished in connection with the extreme upper treble by shifting pointer 84 to the second hole from the left in Fig. 1, whereby ports 3^a, 6^a and 4^a will be brought into communication by the cavity in valve 71 and diminished suction will then be produced simultaneously through pipes 12 and 13 for all the treble notes by means of reducing bellows 17^d controlling, as before stated, the flow of air from channel 4 to channel 5; to reduce solely the middle treble the pointer 84 is shifted to the hole one point next to the center at the left in Fig. 1, whereupon the cavity of valve 71 will connect ports 6^a and 4^a thereby inducing reduced suction in pipe 13 from channels 4 and 6 through bellows 17^d and channel 5, as before explained, and accentuating the other notes in the entire base and extreme treble.

It will be seen from the foregoing that in the three positions mentioned the suction is through reducing bellows 17^d from the channel 4 to channel 5, and it will be understood, further, that when valve 71 is shifted to the three positions at the left in Fig. 1, pointer 84 being moved to the right for the purpose, the suction will be reversed through bellows 17^d, that is to say, the suction will pass from channel 5 through bellows 17^d to channel 4. When pointer 84 is moved one point to the right of the center in Fig. 1 the cavity 71^a in valve 71 connects ports 6^b and 5^a, inducing wind from pipe 14 and its operating pneumatics, through the port 6^b and chamber 6^x and the cavity in the valve, through port 5^a and channel 5, thence through the reducing bellows 17^d and through channel 4, port 4^a and chamber 70^a, through ports 8^a and channel 8 to the wind-inducing apparatus, thereby reducing the tension of the middle base and accentuating the lower base and entire treble; bellows 17^d will operate as a reducing bellows to reverse the direction of the flowing air under similar tension by reason of the fact that both ports leading into the bellows are simultaneously regulated by the valve 22 and both in substantially equal degree, as distinguished from a bellows in which a single port is controlled by a valve thereby permitting suction in one way only through the bellows, for in such case when suction passes reversely the bellows collapses and entire passage through the bellows is cut off by its valve. A maximum collapse of the bellows, at which time there would be no suction therein, may be referred to as such time when valve 22 fully covers both ports 21^a and 21^b, which would be the condition in a piano player equipped with my improvements when an extreme reduction of exhaust is desired, but the maximum collapse may also be in accordance with the tension of the spring 45 and such position of valve 22 in which both ports are not absolutely covered, when there would be some air passing in the bellows and consequently less reduction. So far as an air inlet is required to break the partial vacuum immediately after the maximum collapse first above defined, which in the piano player art is commonly called a bleed, any suitable air inlet or bleed may be provided, and this may be established by reason of the ordinary fitting of the parts 21 or 22, or both, with respect to the corresponding surface against which the act, such

as is usually present in the woodwork used in bellows of piano players. I have found such fitting of the parts as sufficient for the practical purpose of my present invention in a piano player.

When pointer 84 is moved two points to the right in Fig. 1, ports 6^b, 7^a and 5^a will be brought into communication by the cavity 71^a in valve 71, thereby reducing suction simultaneously through pipes 14 and 15 and accentuating the entire treble by reason of reducing bellows 17^d, and when pointer 84 is moved to the extreme right in Fig. 1, ports 7^a and 5^a will be brought into communication by the cavity in the valve 71 inducing reduced suction through pipe 15 only, by reason of reducing bellows 17^d, and the middle base and the entire treble will be accentuated. In any position of valve 71 the highest possible tension induced from the bellows 9 to the operating pneumatics may be suddenly produced by operating valve 68, whereupon channel 8 will be thrown into direct communication with channel 2, irrespective of bellows 17, and all channels having their ports then in free communication with chamber 70^a will be affected by such full exhaust from the wind inducing apparatus and corresponding accentuation, but any channels that are then controlled by valve 71 will not be materially affected by the action of such direct communication between channels 8 and 2 by reason of the fact that the reducing bellows 17^d governs the degree of exhaust through said channels. If a variation in the degree or degrees of suction that is controlled by the bellows 17^d be desired, the pointer 88 may be shifted to the left or right to thereby control the valve 21 in said bellows for producing more or less change from the normal governing suction in bellows 17.

In Fig. 14 I have shown a modification by which a different grouping for accentuation of groups or sections of notes may be provided, for instance, valve 71 (which in Fig. 14 is shown in normal central position so that all the ports communicate with chamber 70^a giving high exhaust through all channels) is shown at the extreme right for uncovering all ports that communicate with chamber 70^a, and valve 71 may be shifted to the left so that its cavity 71^a can connect ports 3^a and 4^a, or ports 6^a, 3^a and 4^a of the treble, or to include ports 6^b, 6^a, 3^a and 4^a of the middle base and the full treble, and then may be shifted one position farther to the left and the exhaust will be reversed, that is to say taking in ports 6^a, 6^b, 7^a and 5^a for the base and middle treble, the suction passing then into 5^a, port 4^a being open to chamber 70^a, the suction being drawn into chamber 70^a through 4^a and 4, through the reducing bellows 17^d and from 5 through 5^a, 7^a, 6^b and 6^a, instead of as before being drawn through 5^a and 5 to and through the reducing bellows 17^d from channel 4, and its port 4^a from 3^a, 6^a or 6^b as the case may be; by further shifting valve 71 to the left its cavity may connect ports 6^b and 5^a, or 7^a and 5^a, for producing varying suction in different groups of pneumatics as desired.

In order to guide the operator as to the shifting of pointers 84, 88, one or both, the perforated music sheets to be used may be provided with symbols in suitable manner which will indicate when and to what position said pointers are to be shifted for producing the accentuation desired in the musical composition being rendered.

In Figs. 15 and 16 I have represented perforated music sheets upon which are symbols to indicate accentuation of the composition being rendered by means of the pointers 84 and 88 and the lever 35.

The letters PP, P, F, FF, indicate that pointer 88 is to be adjusted to a position to the right or left of the center according to the position of such letters upon the music sheet X, and the numerals upon the said music sheet indicate the position correspondingly to the right or left to which the pointer 84 should be adjusted with respect to the group or groups of operating pneumatics that are to be accentuated through the medium of valve 71.

The large letters F, FF, on the music sheet indicate when the lever 35 is to be operated to the right or left for loud or soft playing as represented by the letters PP, P, F, FF, FFF, in Fig. 1. As represented in Figs. 15 and 16, also, the perforations in the music sheet, corresponding to the notes to be accentuated I have indicated by the letters *x*.

Having now described my invention what I claim is:—

1. In a self playing apparatus for musical instruments, the combination of a plurality of operating pneumatics, a plurality of suction chambers each connected with suitable groups of said pneumatics, wind-inducing means, a regulating bellows interposed between said wind-inducing means and said plurality of chambers, and a controlling valve and connections to govern the exhaust from said chambers through said bellows from one or more groups of said pneumatics at will arranged to direct suction through said bellows in one direction for one or more groups of said pneumatics and to direct suction through said bellows in a reverse direction for one or more other groups of said pneumatics.

2. In a self playing apparatus for musical instruments, the combination of a plurality of operating pneumatics, a plurality of suction chambers each connected with suitable groups of said pneumatics, channels connected with said chambers respectively, a

regulating bellows connected with a plurality of said channels, wind inducing apparatus in communication with one of said channels, a chamber, and suitable connections between said chamber and channels, including ports, and a valve in said chamber to control said ports, whereby said valve is adapted to connect certain of said ports at will to direct suction through said bellows in one direction for one or more groups of said pneumatics and to direct suction through said bellows in a reverse direction for one or more other groups of said pneumatics.

3. In a self playing apparatus for musical instruments, the combination of a plurality of operating pneumatics, a plurality of suction chambers each connected with suitable groups of pneumatics, channels connected with said chambers respectively, a regulating bellows connected with a plurality of said channels, wind-inducing apparatus in communication with one of said channels, a chamber, and suitable connections between said chamber and channels, including ports, and a valve in said chamber to control said ports, whereby said valve is adapted to connect certain of said ports at will to direct suction through said bellows in one direction for one or more groups of said pneumatics and to direct suction through said bellows in a reverse direction for one or more other groups of said pneumatics, said valve being arranged to open all of said ports to said valve-chamber in a certain position for producing similar suction through all of said chambers for such pneumatics simultaneously.

4. In a self playing apparatus for musical instruments, the combination of a plurality of operating pneumatics, a plurality of suction chambers each connected with suitable groups of pneumatics, channels connected with said chambers respectively, a regulating bellows connected with a plurality of said channels, wind-inducing apparatus in communication with one of said channels, a chamber, and suitable connections between said chamber and channels, including ports, and a valve in said chamber to control said ports, whereby said valve is adapted to connect certain of said ports at will to direct suction through said bellows in one direction for one or more groups of said pneumatics and to direct suction through said bellows in a reverse direction for one or more other groups of said pneumatics, said valve being arranged to open all of said ports to said valve-chamber in a certain position for producing similar suction through all of said chambers for such pneumatics simultaneously, and means to at will vary the degree of suction through said bellows.

5. In a self playing apparatus for musical instruments, the combination of a plurality of operating pneumatics, a plurality of suction chambers each connected with suitable groups of said pneumatics, wind-inducing means, a regulating bellows interposed between said wind-inducing means and said plurality of chambers, and a controlling valve and connections to govern the exhaust from said chambers through said bellows from one or more groups of said penumatics at will arranged to direct suction through said bellows in one direction for one or more groups of said pneumatics and to direct suction through said bellows in a reverse direction for one or more other groups of said pneumatics, and means to at will control the degree of exhaust through said bellows in either direction.

6. In a self playing apparatus for musical instruments, the combination of a plurality of operating pneumatics, a plurality of suction chambers each connected with suitable groups of said pneumatics, channels connected with said chambers respectively, a regulating bellows connected with a plurality of said channels, wind-inducing apparatus in communication with one of said channels, a chamber connected by ports with said channels, and a valve in said chamber and connections to control said ports, whereby said valve is adapted to connect certain of said ports at will to direct suction through said bellows in one direction for one or more groups of said pneumatics and to direct suction through said bellows in a reverse direction for one or more other groups of said pneumatics, and means to at will cause the full exhaust of the wind-inducing means to communicate with said chamber and thence to the different suction chambers.

LOUIS H. MAIER

Witnesses:
T. F. BOURNE,
L. A. SWINTON.