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R. A. GALLY.

MUSICAL DEVICE PNEUMATIC APPARATUS.

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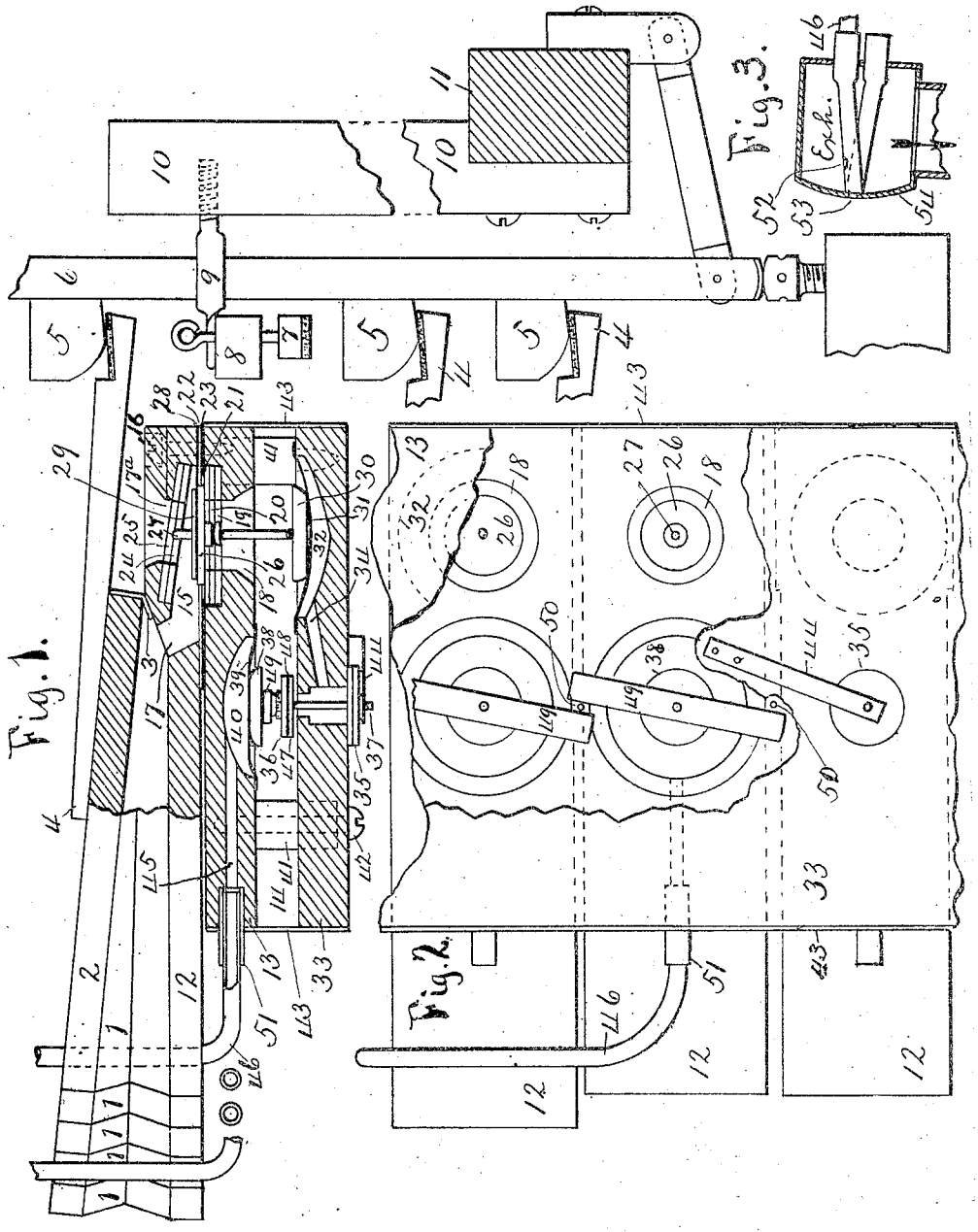

Fig. 1.



Fig. 2.



Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## MUSICAL-DEVICE PNEUMATIC APPARATUS.

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Original application filed January 6, 1906, Serial No. 409,473. Divided and this application filed January 16, 1908. Serial No. 411,118.

*To all whom it may concern:*

Be it known that I, ROBERT A. GALLY, a citizen of the United States, residing at Brooklyn, New York, have invented certain new and useful Improvements in Musical-Devices Pneumatic Apparatus, of which the following is a specification.

The object of my invention is the construction of a simpler and more direct acting and effective pneumatic action for musical apparatus, it being especially adapted in its general arrangement for use in player-pianos.

In the accompanying drawings Figure 1 is a sectional view from the treble end of my pneumatic action, showing its co-action with the piano action; Fig. 2, is a plan of the pneumatic chest from the under side near the treble end, the bottom board of said action being partly cut away to show inside detail on under side of upper board; and Fig. 3 an end section of the tracker bar and its vents for controlling the pneumatic valves.

Most player-pianos have used various levers, stickers, etc., between their striker-pneumatics and the keys, abstracts or wippens, causing loss of power by friction, liability of rattling or sticking from wear and weather changes, and much bother of getting out of regulation, even to the extent of interfering with the correct regulation for manual performance, while the few designs avoiding the complicated connections have had their power-pneumatics directly engaging the abstracts at the opening ends of the pneumatics, thereby failing to obtain any increase of leverage such as is requisite for a firm "touch" of the notes and a reasonably low air tension for operation. Also, the windways connecting the valves and pneumatics have usually been somewhat tortuous, causing frictional loss of power, and slowness of speech, except when an undesirably high air tension was employed. I overcome these faults in the following simple, easy working, and economical manner:—I place my striker-pneumatics 1 in horizontal rows (preferably three) with their open ends facing to the front of the piano or other instrument, the moving-board 2 of each pneumatic being at the top of each with its hinge 3 at the rear, and on top of the moving-board 2 is fastened an extension or heel-lever 4 extending to the rear of the pneumatic and having its rear end felted and resting up against a lug 5 fast on the abstract 6 of that particular note of the tone-producing action, the heel-lever 4 reversing the downward stroke of pneumatic 1 to an upward lift on the lug 5 and abstract 6 to produce a tone.

The above described general arrangement of power-pneumatics, and their relation to the action abstracts, are not claimed herein, being claimed in a divisional application hereof, #418,834, filed March 2/08, wherein are also included and claimed the disposition of the tubes 46, and the grading of the power-pneumatics, secondary pneumatics and secondary valves; the valve-seat, anti-friction valve washer and yielding hinging of the valve-flap being erased herefrom for insertion in another divisional application.

My striker-pneumatics 1 have their fixed-boards 12 fastened to the upper-board 13 of each action-chest 14, (preferably by screws) each fixed-board 12 extending to the rear of the moving-board of that pneumatic and having a valve-chamber 15 formed in its heel part, and capped by a cover 16 of wood having its grain crosswise of the longitudinal grain of the wooden fixed-board 12, to insure the heel part against warping. From chamber 15 a passage 17 slants up to the interior of its pneumatic 1. The upper face of the inside of chamber 15 is also slanted upwardly towards the interior of the striker-pneumatic, so that the air when passing from the outside port $17^a$ into the striker-pneumatic has the least possible angle to its path, also that when the valve in said chamber 15 is raised, the air exhausted from the interior of pneumatic 1 through port 18 will have the most straight draft possible, all for avoidance of loss by air friction.

The valve 26 is of hard, permanently true surface material as aluminum, and is rockably mounted on its rod 27, and on top of this valve is a flexible hinge-flap 28 of thin "hollands" cloth or the like which extends in a narrow flap to the rear and is there attached to the upper board 13 of the chest, preferably at the top of the packing leather 22 when that is attached to the chest, thereby the hinge of the flap 28 being at a level for easy movement up and down. The flap 28 thus guides the valve 26 centrally to the ports 17 and 18 without friction or noise of the ordinary valve-rod guides, and the valve readily changes plane from one seat to the angle of the other. When necessary, as with great angle of valve seats, or with the valve-

rod lying horizontally, a flap similar to 28 may connect the follower button 30 or rod 26 at that part of the rod, to the upper board 13 for extra guidance as in Fig 5, but in its vertical position the lower end of valve-rod 27 is usually held central to the diaphragm 31 by the frictional grip of said diaphragm on follower button 30.

The valve-rod 27 depends from valve 26 in a substantially vertical line, and has a follower or button 30 screwed to its lower end, which button is entirely free from attachment to the diaphragm leather 31 of the secondary pneumatic 32 of lower board 33.

A duct 34 leads from secondary pneumatic-socket 32 to its corresponding primary pneumatic-valves. The primary pneumatic-valves 35, 36, have a valve-rod 37, and screwed to the top of the rod a follower or button 38, which latter is free from attachment to the diaphragm 39 of primary pneumatic 40. The primary and secondary valve gear being each complete in itself, the primary valve gear carried and guided by the lower board 33 free from the upper board 13, and the secondary valve-gear carried and guided by the upper board 13 free from the lower board 33, each valve gear can be easily assembled complete on its own board and the two boards be afterward combined, and thus the entire primary and secondary action be complete in a single chest of but two pieces, which has the advantage of being separable at any time without disturbing any adjustments of valves and pneumatics, and there are no duct joints from one board to another.

The two boards 13, 33 of chest 14 are preferably held in relative position by vertical grain wood dowels or posts 41 intermediate the two boards and adjacent to the longitudinal lines of the primary and secondary valves respectively, thus insuring the constant distance between the two boards at those important points irrespective of the atmospheric changes which alter the distance when wooden separating rails were used. It is desirable to have the posts 41 with their ends at the important planes of regulation of the pneumatics and valves, as is that post adjacent to the primary in Fig. 1 where the upper end of that post 41 is in the plane of the face of upper board 13 to which the pneumatic diaphragm is attached, and its lower end countersunk in board 33 as near as possible to the constant-seat lower face thereof. To complete a durably air-tight chest, sealing strips 43 of duck or rubber-cloth are coated over with glue and laid over the edges of the chest boards 13, 33, from top to bottom, and afterwards varnished.

The valve-rod 37 is guided centrally with the valve hole by a spring 44 fastened to the lower face of the lower board 33, and the lower valve 35 being driven tight on rod 37, said rod is held centrally throughout the valve hole and with its button 38 central to the diaphragm 39 and its socket 40, all without the use of any guide inside the chest. When the primary diaphragm 39 is thrown down by the air pressure inflating its socket 40 through duct 45 and tube 46 connecting to the tracker and its perforated music sheet, the pressure of said diaphragm 39 on the button 38 serves to hold that button and its rod 37 in its original central alinement with the valve hole while the rod and its valves are being actuated, but to make certain of an accurate seating of inner valve 36 to its seat, that valve 36 has its hole loose to the rod 37 so that the valve 36 may rock slightly and so surely seat itself to the inner face of board 33. The soft leather facing disk 47 is snug on the rod 37 to prevent valve 36 from dropping of its own weight, but is loose from its valve 36 so that said valve is free to rock a trifle.

As the primary diaphragm 39 drops freely onto the follower button 38, no lost motion or crowding between these parts is ever possible, thus doing away with any adjusting means between them, and also permitting of the regulating of distance of motion of the primary valves 35, 36 without disarranging a correct coöperation with diaphragm 39. Such regulating of the primary valves 35 and 36 is made possible without opening the chest, and even while the air-tension is on and the valves operable for test, by means of a detent piece 49 fast to the button 38 into which the rod 37 is secured. Detent pins 50 stand firmly in board 33 near the ends of the detents 49, one pin serving for each adjacent pair of detents, and thus the button 38 is held from turning while the operator turns the rod 37 from the outside of chest and thereby works the screw thread of the rod in the button and changes the distance of button 38 and its valve 36 relative to the outer valve 35.

The connecting tubes 46 are often of soft rubber, and such are commonly attached at their ends by being crowded over a metal thimble, with the ultimate result that the strain on the rubber at such places causes the tubes to crack and the notes to "cipher" or "drag." The metal thimbles 51 of the present structure are made large enough for the rubber tubes 46 to snugly slip inside of the bore of the thimbles, with a slight compression of the rubber which holds the tube to place without cementing, thus allowing removal, and yet no straining, breakage or leakage of the tubes can ever occur.

The return-vents 52 are preferably disposed nearer to the operating-vents 53 of the tracker 54 to which tubes 46 connect the pneumatic action, than to the pneumatics, according to the invention claimed in my Patent #545,156 of August 27th, 1895, this being more effective than the old form of placing the return-vents in the action chest. The tracker 54 shown in Fig. 3 hereof is an

adaptation of said former invention to a metal tracker, and is of novel excellence, but not being claimable herein is reserved for a separate application in that class.

The novel general arrangement of the chests, pneumatics and levers relative to the abstracts and keys has been shown in my prior application #409,473, but not being claimable therein was then reserved for future application, the present one being the one meant thereby.

What I claim as my invention is:—

1. A bellows pneumatic having a fixed board and a moving board, its fixed board extending at one end beyond its moving board, and a valve chamber comprised within said extended part of the fixed board and opening to the interior of the pneumatic.

2. A hinged bellows pneumatic having a fixed board and a moving board, its fixed board extending beyond the hinged end of its moving board, and a valve chamber comprised within said extended part of the fixed board, and opening to the interior of the pneumatic.

3. A bellows pneumatic having a fixed board and a moving board, its fixed board extending at one end beyond its moving board and a valve chamber within said extended part of the fixed board and opening to the interior of the pneumatic, at an upward slant.

4. A bellows pneumatic having a fixed board and a moving board, its fixed board extending at one end beyond its moving board and a valve chamber within said extended part of the fixed board and opening to the interior of the pneumatic, said chamber having the inner surface of its top slanted upwardly from its rear to its opening into the pneumatic.

5. A bellows pneumatic having a fixed board and a moving board, its fixed board extending at one end beyond its moving board and a valve chamber comprised within said extended part of the fixed board and opening to the interior of the pneumatic, the top of said chamber consisting of a wooden cap having its grain transverse to the longitudinal grain of the fixed board, and firmly glued thereto.

6. A bellows pneumatic having a fixed board and a moving board, its fixed board extending at one end beyond its moving board, and a valve chamber comprised within said extended part of the fixed board and opening to the interior of the pneumatic, the top of said chamber consisting of a wooden cap having its grain transverse to the longitudinal grain of the fixed board and firmly glued thereto, and a hinge to the moving-board supported on said cap.

7. A hinged bellows pneumatic having an extension beyond its hinge containing a valve chamber opening into said pneumatic, a valve in said chamber normally seated at the bottom plane of said chamber, and a port in the chamber above said valve, and a seat to said port at an angle slanting upwardly towards the interior of the main part of the pneumatic.

8. A pneumatic chest consisting of two boards facing each other and having pneumatics and valves co-acting from one board to the other, separating posts of unchanging dimension between said two boards, and a cemented sheet-like edge seal extending from the edge of one board to the edge of the other.

9. A pneumatic-action having two boards facing each other, and valves on one board actuated by pneumatics on the opposite board, and permanent distance separating means between the two boards and extended into the valve board to approximately the plane of the seating face of the valve.

10. A pneumatic-action having two boards facing each other, and valves on one board actuated by pneumatics on the opposite board, and permanent distance separating means between the two boards having terminals respectively approximately in the planes of the normally seated valve and the controlling pneumatic.

11. A pneumatic action having an interior pneumatic diaphragm, a follower button opposite thereto, but free of attachment therewith, a valve-adjusting means having adjusting screw-thread engagement with said button and extending to the exterior of the action, and an anti-revolution check-means co-acting with said button.

12. A pneumatic action having an interior pneumatic diaphragm, a follower button opposite thereto but free of attachment therewith, a valve-adjusting means having adjusting screw-thread engagement with said button and extending to the exterior of the action, an anti-revolution check-means co-acting with said button, and an action board opposite to said diaphragm and with which said check-means coöperates.

13. A pneumatic action having pneumatics with controlling ducts thereto, thimbles at the exits of said ducts, and continuing tubes entered snugly inside the bore of said thimbles.

14. A pneumatic chest consisting of two boards facing each other and having pneumatics and valves co-acting from one board to the other, separating means holding said boards apart with space between the edges of said boards, and a sheet like seal from the edge of one board to the edge of the other.

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