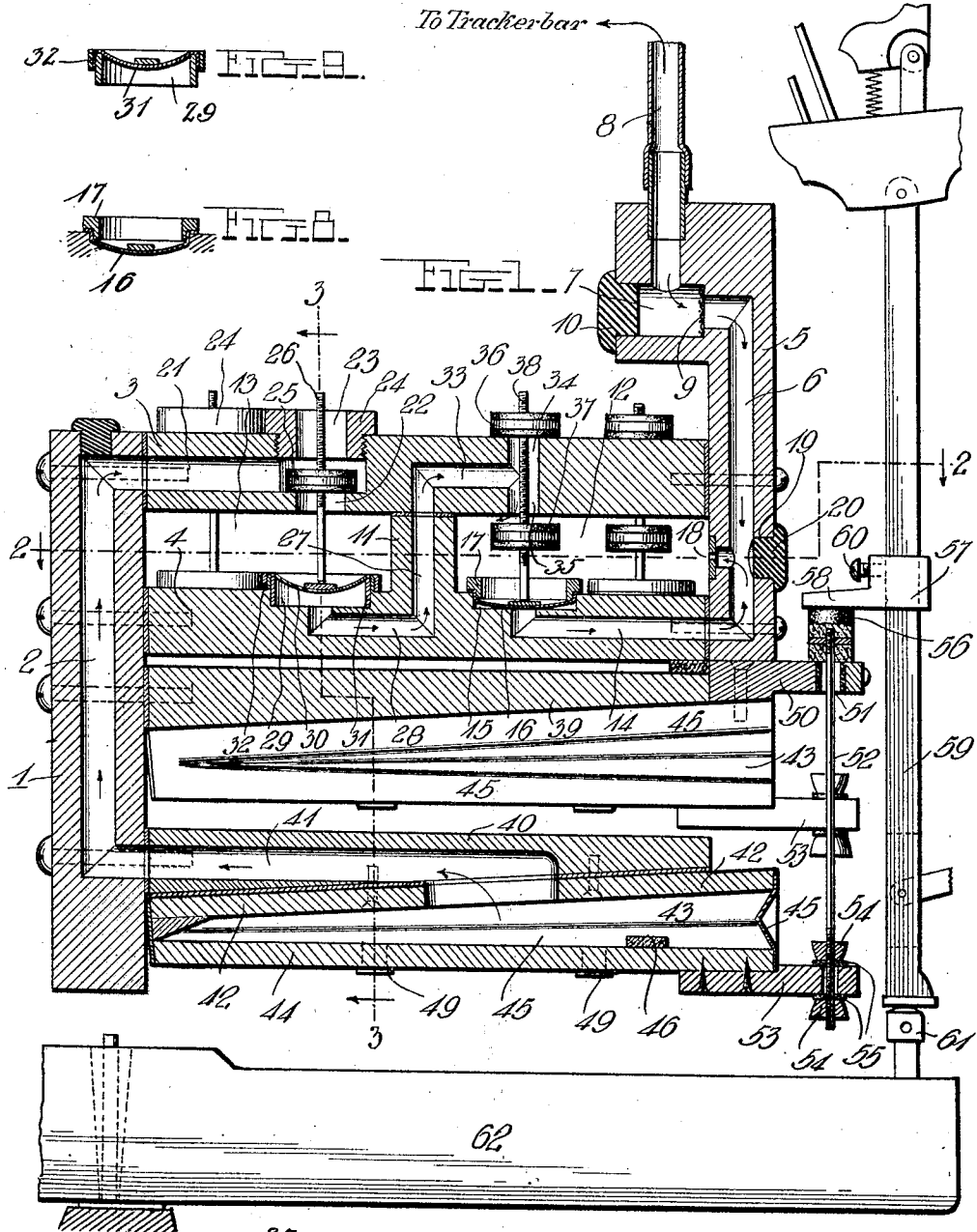


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 N. ANDERSON, ADMINISTRATRIX.
 AUTOMATIC PIANO PLAYER.
 APPLICATION FILED APR. 21, 1911.

1,032,692.

Patented July 16, 1912.

3 SHEETS-SHEET 1.



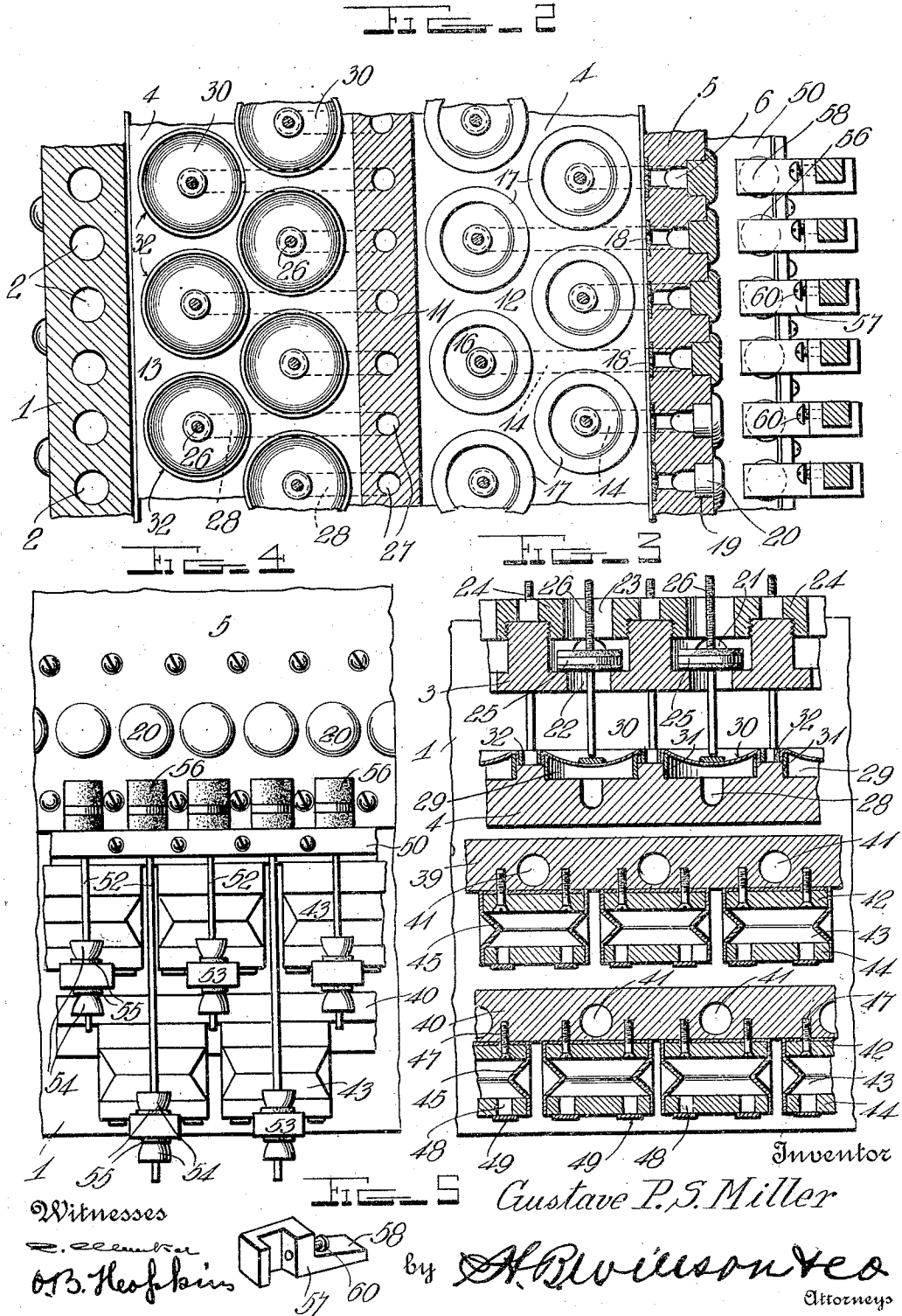
Witnesses *E. Clement*
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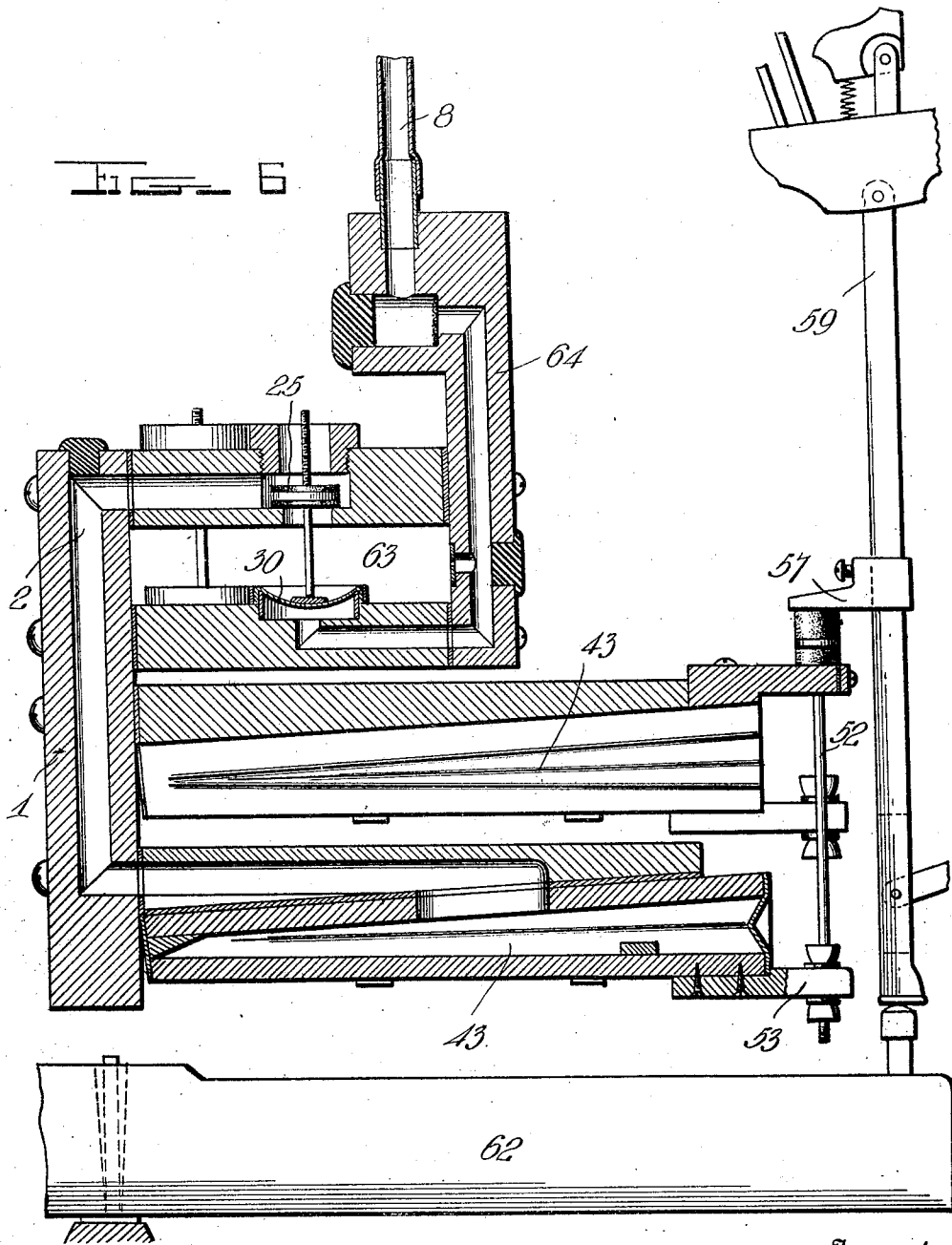


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UNITED STATES PATENT OFFICE.

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AUTOMATIC PIANO-PLAYER.

1,032,692.

Specification of Letters Patent.

Patented July 16, 1912.

Application filed April 21, 1911. Serial No. 622,471.

To all whom it may concern:

Be it known that I, GUSTAVE P. S. MILLER, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Automatic Piano-Players; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in automatic piano players.

One object of the invention is to produce an automatic piano player in which there are primary and secondary vacuum chambers in each of which is disposed two rows of diaphragms and the valves actuated thereby, those in the rows being arranged in staggered relation to each other so that all parts may be made as large as possible with respect to the width of the piano key.

Another object is to employ the same detail of construction with respect to the two rows or series of bellows whose sudden closure actuates the abstracts, so that each bellows may be wider than the width of the key to which it is connected and of nearly the width of two keys, and therefore made smaller proportionately in other dimensions than its width.

Another object is to provide a pneumatic piano action having an improved construction of diaphragms for actuating the air controlling valves.

A further object is to provide a piano action of this character which will be strong, durable and comparatively simple in construction, efficient and reliable in operation and which is designed to be used in connection with any make of piano.

With these and other objects in view, the invention consists of certain novel features of construction, combination and arrangement of parts as will be more fully described and particularly pointed out in the appended claim.

In the accompanying drawings: Figure 1 is a vertical sectional view through my improved pneumatic action showing the manner in which the same is operatively engaged with one of the abstracts of the piano; Fig. 2 is a horizontal section of a portion of the action on the line 2—2 of Fig. 1; Fig. 3 is a vertical section on the line

3—3 of Fig. 1; Fig. 4 is a rear view of a portion of the action; Fig. 5 is a detail perspective view of one of the adjustable abstract lifters of the action; Fig. 6 is a view similar to Fig. 1 showing a modified construction of the action. Fig. 7 is a perspective view of one of the screw rings having the inlet ports for admitting air to the bellows; Fig. 8 is a detail vertical sectional view of one of the diaphragms of the primary vacuum chambers; Fig. 9 is a similar view of one of the diaphragms of the secondary vacuum chambers.

My improved pneumatic action consists of a supporting frame comprising a front plate 1 in which is arranged a series of air passages 2. To the upper portion of the plate 1 are secured the forward ends of rearwardly projecting parallel plates 3 and 4 which are connected at their rear ends to the rear plate 5 of the action, said rear plate having formed therein a series of air passages 6 which communicate at their upper ends with a series of dust collecting chambers 7 formed in the upper opposite end of the plate 5 as shown. To the chambers 7 are connected the lower ends of air conducting tubes 8 the upper ends of which are adapted to be connected with the tracker bar (not shown). In the inner end of each dust collecting chamber 7 is arranged a fine screen 9 through which the air passes before entering the passages 6 and by means of which dust and foreign matter is filtered from the air and thus prevented from entering the action. The outer ends of the chambers 7 are closed by rubber plugs 10 which may be removed to permit the cleaning of the chambers.

In the preferred form of the invention the space between the upper and lower plates 3 and 4 is divided by a central transversely disposed partition 11 to form a primary vacuum chamber 12 and a secondary vacuum chamber 13. In the inner end of the plate 4 are formed a series of passages 14 the outer ends of which communicate with the lower or inner ends of the passages 6 in the plate 5. The inner ends of the passages 14 communicate with recesses 15 in which are arranged flexible diaphragms 16, said diaphragms being held in position in the recesses 15 by annular rings 17. Said recesses, diaphragms, and rings are arranged in two rows as best

seen in Fig. 2, those of the rows being disposed in staggered relation to each other in order to permit the parts to be made as large as possible and yet economize space.

In the inner side of the plate 5 and connecting the passages 6 with the primary vacuum chamber is a series of thin disks in which are formed small bleed holes 18, through which air is drawn from and admitted to the primary vacuum chamber through the passages 6. In the outer sides of the plate 5 opposite the bleed holes 18 are formed clean out openings 19 which are normally closed by rubber plugs 20. By means of the openings 19 access may be readily had to the small bleed openings 18 for the purpose of cleaning said openings when the same become clogged.

In the outer portion of the upper plate 3 opposite to and connecting with the upper ends of the passages 2 in the plate 1 are air passages 21, the inner ends of which communicate with the secondary vacuum chamber 13 through ports 22. The inner ends of the passages 21 also communicate with the outside atmosphere through ports 23 formed in screw rings 24 which are screwed into openings formed in the upper side of the plate 3 above each of the passages 21. The inner ends of the rings 24 form upper valve seats while immediately below the same and at the end of the passages 21 and around the ports 22 are formed lower valve seats, said upper and lower valve seats being adapted to be alternately engaged by the opposite sides of a series of air controlling valves 25 whereby the ports 22 and 23 are opened and closed. Here again, as above, the parts are arranged in two rows with the individual members in each row disposed in staggered relation to those in the other row as best seen in Fig. 2, in order that the parts may be as large as possible and space may yet be economized. The valves 25 are fixedly mounted on stems 26 which project upwardly through the ports 23 in the rings 24 and downwardly into the secondary valve chamber as shown. The outside diameter of said rings 24 is preferably made larger than the diameter of the valves 25, whereby should anything occur to the latter necessitating their removal as for inspection, repair, or cleaning, the ring above the defective valve can be withdrawn and the entire valve lifted out of place.

In the partition 11 are formed a series of vertically disposed air passages 27 the lower ends of which are connected with horizontal passages 28 formed in the plate 4, said passages 28 having their opposite ends connecting with diaphragm recesses 29 in which are secured the valve controlling diaphragms 30 of the secondary vacuum chamber. The diaphragms 30 are secured in position in the

recesses 29 by inner and outer clamping rings 31 and 32 between which the edges of the diaphragms are firmly secured. With the diaphragms 30 are engaged the inner ends of the stems 26 of the valves 25 whereby when said diaphragms are acted upon by the air in the passages 28 and in the secondary vacuum chamber said valves will be opened and closed as will be hereinafter more fully described.

The upper ends of the passages 27 in the partition 11 communicate with short air passages 33 formed in the central portion of the upper plate 3 and communicating at their inner ends with outer air inlet ports 34 and inner ports 35 opening through the outer and inner walls of the plate 3 as shown. The ports 34 and 35 are adapted to be alternately opened and closed by valves 36 and 37 secured to a common valve stem 38. The lower ends of the valve stems 38 project downwardly in the primary vacuum chambers and are engaged with the diaphragms 16 in said chamber whereby when said diaphragms are acted on by the air in the chamber and passages 14, said valves will be opened and closed as will be hereinafter more fully described.

Arranged below the lower plate 4 of the frame are upper and lower pneumatic shelves 39 and 40. In the shelves 39 and 40 are formed a series of air conducting passages 41 the outer ends of which communicate with the air passages 2 in the plates 1. The inner ends of the passages 41 communicate with slots formed in the lower sides of the plates and in the adjacent upper sides of the upper members 42 of small pneumatic bellows 43, which are hung from the two shelves 39 and 40 in staggered relation to each other so that each bellows shall be wider than one key of the piano and nearly as wide as two keys, and yet space is economized. The lower members 44 of the bellows are hingedly connected at one end to the upper members 42 as shown. The members 42 and 44 of the bellows are connected by sides and outer ends 45 formed of any suitable air tight flexible fabric which will permit the lower member 44 of the bellows to be moved up and down by the action of the air when forced into or drawn from the bellows.

On the inner side of one of the members 42 or 44 of the bellows are arranged stop disks 46 which are preferably formed of felt or similar material and which serve to prevent the lower member 44 from coming into such close engagement with the upper member as to prevent the ready admission of the air of the bellows, and to prevent the bellows making a noise when closing. The upper members 42 of the bellows are preferably secured to the lower shell 40 by fastening screws 47 which are passed into place

through openings 48 formed in the lower members 44 and screwed through the upper members 42 into said shelf, said openings being afterward closed by suitable closing disks 49.

On the inner end of the upper members of the upper series of bellows is secured a guide ear 50 having formed therein a series of guide passages 51 with which are slidably engaged striker sticks 52 one of which is provided for each of the bellows. The lower ends of the striker sticks 52 are threaded and said threaded ends are engaged with brackets 53 secured to the lower members 44 of the lower series of bellows and projecting beyond the inner ends thereof as shown. The striker sticks 52 are adjustably connected to the brackets 53 by upper and lower adjusting nuts 54 which are screwed on the ends of said sticks and into engagement with felt washers 55 arranged on the opposite sides of the brackets as shown. On the upper ends of the striker sticks 52 are secured striker heads 56 which are preferably formed of felt and which are engaged with abstract lifters 57. The lifters 57 comprise open sleeves having formed on one side laterally projecting lugs 58 with which the heads 56 on the striker sticks are engaged. The sleeves of the lifters 57 are slidably engaged with the piano abstracts 59 and are adjustably secured to the latter by set screws 60 whereby the lifters may be secured to the abstracts at any desired position. The abstracts 59 are supported in any suitable manner and have arranged on their upper ends the usual or any suitable form of hammer operating mechanism. The lower ends of the abstracts 59 are adapted to be engaged by the adjustable abstract lifting devices 61 on the inner ends of the keys 62 of the piano, whereby said abstracts may be operated and the piano played by hand independently of and without interfering in any manner with the pneumatic action.

In Fig. 6 of the drawings is shown a slightly modified arrangement of the invention wherein the action is shown as being provided with but one vacuum chamber 63 and in which the partition 11 shown in the first form of the invention is dispensed with and the rear wall of said vacuum chamber formed by a back plate 64 corresponding to the back plate 5 in the first form of the invention. In the last form of the invention the vacuum chamber 63 is provided with the same construction and arrangement of air ports and passages and air discharge valves and diaphragms as shown in connection with the secondary vacuum chamber previously described and the back plate 64 is provided with the same arrangement of air passages, bleed hole and dust box as are shown in the plate 5 and a further description and operation of these parts is not thought to be

necessary. This form of the invention is also provided with the same arrangement of pneumatic bellows and abstract operating devices as previously described.

In the operation of the device the air is exhausted from the primary and secondary vacuum chambers and the passages connected therewith through the small bleed holes 18 and from the passages 6 through the tubes 8 by the usual pumping or pedaling mechanism (not shown). The course of the air when thus exhausted is indicated in Fig. 1 of the drawings by one set of the arrows. This exhaustion of the air creates a vacuum in the primary and secondary vacuum chambers and closes the valve 36 and passages leading to the diaphragm 30 in the secondary vacuum chamber which permits the valve 25 to open and allow air to pass in through the port 23 to the passages 21 and 22 and through the latter and the passages 41 to the bellows thus inflating the latter. With the parts in this position, as soon as a hole in the music sheet uncovers a hole in the tracker bar (not shown) the air will rush down the tube 8 thus uncovered and through the dust box and passages connected therewith to the primary diaphragms 16, thus forcing the latter upwardly. This upward movement of the diaphragm lifts the primary valves 36 and 37 thus closing the port 35 leading to the primary vacuum chamber and opening the port 34 leading to the atmosphere. When the port 34 is thus opened the outside air rushes therethrough and into the passages leading to the secondary diaphragm 30 forcing said diaphragm up thus lifting the valve 25 and closing the port 23 thus cutting off the outside atmosphere from the bellows and connecting the passages leading to the bellows with the secondary vacuum chamber. The vacuum in this chamber will immediately suck the air from the bellows connected therewith which will immediately cause said bellows to close from the pressure of the outside air and in thus closing the striker stick carried thereby will engage the lifter of this particular abstract thereby operating the latter to cause the same to actuate its hammer which will sound a note on the strings of the piano. As soon as the hole in the music sheet has passed over the hole in the tracker bar and the solid portion of the sheet thus closes said hole, the air pressure on the diaphragm 16 of the primary vacuum chamber will be released whereupon the pressure in said vacuum chamber will balance the pressure in the passages 14 and 6 by drawing all of the air thereof in through the bleed hole 18. As soon as this air pressure is equalized the diaphragm 16 will drop back to its normal position thus opening the valve 37 and closing the valve 36. When the valve 36 thus closes the diaphragm 30 will be relieved of the out-

side air pressure and the air exhausted from the passages 27 and 28 into the primary chamber through the port 35 whereupon the diaphragm 30 will drop back to its normal position which will permit the valve 25 to drop and close the port 22 of the secondary vacuum chamber and open the port 23 to the outside air thus permitting said outside air to enter the passage 21 and flow through the passages 21 and 41 into the bellows connected thereto which will cause the latter to open and thus allow the piano abstract to drop back ready for another operation which is repeated as soon as the next hole in the music sheet comes over the tube leading to this particular set of operating devices. It will be understood that there is a separate set of operating devices, vacuum chambers and air passages for each separate note or key of the piano each of which is operated in the manner described.

From the foregoing description taken in connection with the accompanying drawings the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of the invention as defined in the appended claim.

Having thus described my invention, what I claim is:

35 In a pneumatic action for player pianos, the combination with a supporting frame comprising a front plate having a series of upright air passages, deflected to the rear

at their upper and lower extremities, a rear plate having a series of air passages communicating with the tracker bar, a plurality of superimposed shelves extending from the front plate rearward beneath and beyond the rear plate and each having an air conducting passage communicating with one of the passages in said front plate and a bellows connected with said air conducting passage, an upper plate fitting between the front and rear plates and having passages communicating with the upper ends of those in the front plate, ports with which said passages communicate, short air passages next in rear of these ports and opening downward and other ports with which said short air passages communicate, and a lower plate connecting said front and rear plates, and having an upright transverse partition producing primary and secondary chambers in rear and in front of it respectively, the partition having passages communicating with said short air passages and with the secondary chamber and this plate having passages connecting those in the rear plate with the primary chamber; of valves for controlling said ports, diaphragms for actuating the valves, and connections between the movable members of said bellows and the abstracts.

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

GUSTAVE P. S. MILLER.

Witnesses:

E. A. RAY,
EARL MINERS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."