

Patented Jan. 7, 1913.

2 SHEETS-SHEET 1.

1,049,443.

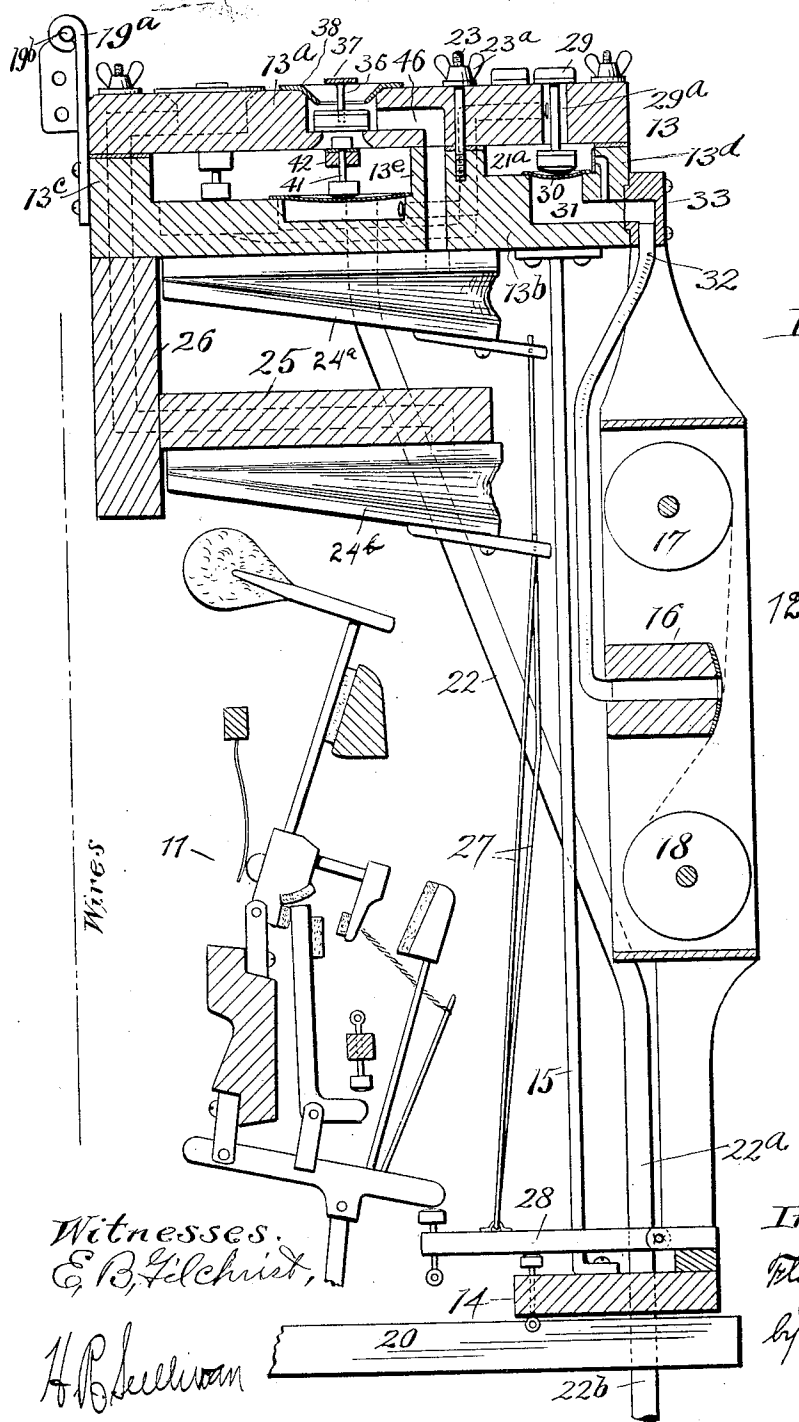


Fig. 1.

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2 SHEETS—SHEET 2.

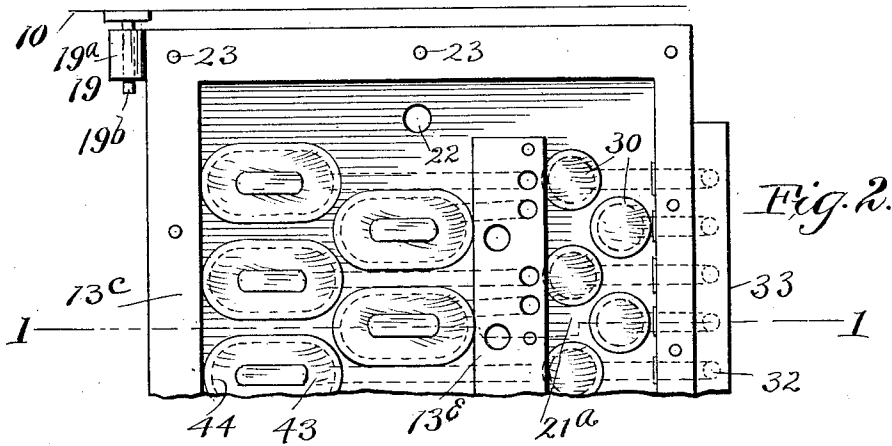


Fig. 2.

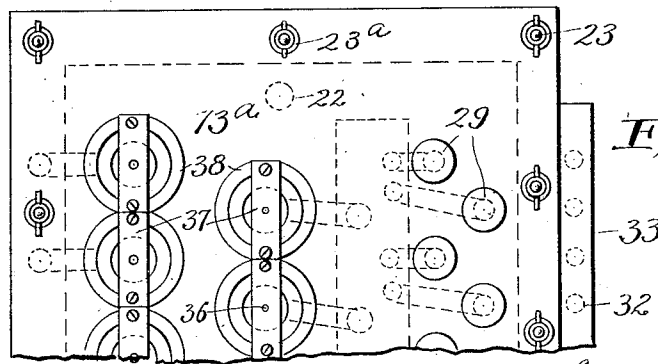
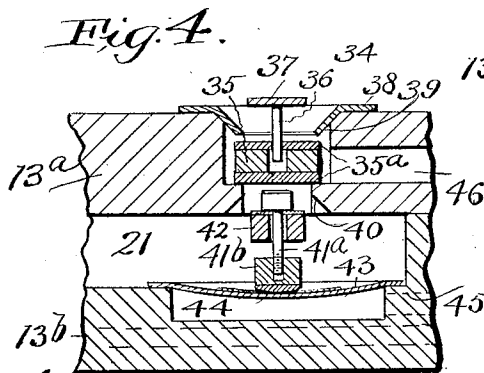


Fig. 3.



Witnesses.  
E. B. Gilchrist.

H. B. Sullivan.

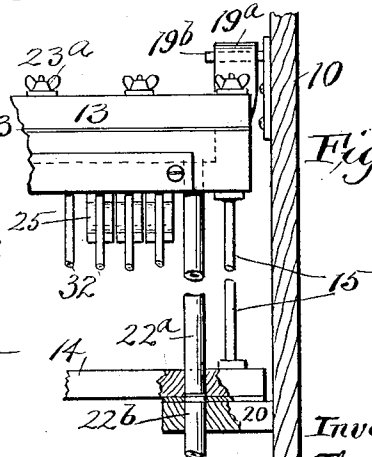


Fig. 5.

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# UNITED STATES PATENT OFFICE.

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## PNEUMATIC PIANO-PLAYER.

1,049,443.

Specification of Letters Patent.

Patented Jan. 7, 1913.

Application filed July 2, 1910. Serial No. 570,039.

*To all whom it may concern:*

Be it known that I, FLOYD W. BORDNER, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented a certain new and useful Improvement in Pneumatic Piano-Players, of which the following is a full, clear, and exact description.

This invention relates to pneumatic piano players and particularly to the construction of the vacuum chest, arrangement of the valves and pneumatics with reference thereto, the construction of the secondary valves and the arrangement and manner of supporting the player action with reference to the piano action.

The object of the invention is to provide a piano player having great efficiency, and especially to arrange, support, and construct the player action so that access can be readily had to the strings and piano action for the purpose of tuning or adjustment, and to construct the vacuum chest and arrange the valves and pneumatics so that the chest can be easily taken apart and so that the valves and pouches or diaphragms are easily accessible for repairs and adjustment.

A further object is to provide a player action which is simple in construction and arrangement, satisfactory in operation, and which can be placed in practically any make of upright piano without making extensive alterations.

These and other objects are attained by my invention which may be briefly summarized as consisting in certain novel details of construction and combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the drawings, Figure 1 is a transverse vertical sectional view of a piano equipped with my invention, the player action being shown in normal position with respect to the piano action and piano casing, part of which is shown, the section being taken substantially along the line 1—1 of Fig. 2; Fig. 2 is a top plan view of a portion of the vacuum chest with the cover or valve board removed; Fig. 3 is a similar view with the valve board in normal position; Fig. 4 is an enlarged sectional view through a portion of the vacuum chest, showing particularly the construction of one of the secondary valves;

and Fig. 5 is a vertical sectional view through the end of the piano casing, showing part of the player action in front elevation, portions being broken away.

Referring to the figures of the drawing, 10 represents the piano casing, 11 a portion of the piano action, and 12 designates as a whole the player action, the construction, manner of supporting and arrangements of the parts which form the main features of my invention. The player action includes a vacuum chest 13, which is normally horizontal as shown in Fig. 1, and extends across the instrument near the top thereof above the piano action. The player action also includes a normally horizontal shelf or board 14, which extends across the front of the instrument below and slightly forward of the vacuum chest in front of the player action and is rigidly secured to the former by supporting arms or rods 15. Supported between the vacuum chest and shelf 14 in a suitable frame or casing is a tracker 16 and music and take-up rolls 17 and 18. The entire player action is hung as shown above and in front of the piano action so that it may be swung upwardly and rearwardly upon the top of the piano, after the front of the piano casing has been removed, and the top has been removed or folded rearwardly, and for this purpose, the player action is supported from the ends of the casing by hinges 19, shown in Figs. 1, 2 and 5, each hinge consisting of a member 19<sup>a</sup> secured to the rear part of the vacuum chest, and a member 19<sup>b</sup> secured to the end of the piano casing. When the player action is lowered to normal position, the lower shelf 14 rests firmly on flanges 20 projecting inwardly from the ends of the piano casing, as shown in Figs. 1 and 5. For a purpose to be referred to presently, the shelf and at least one of the flanges are preferably separated by a layer of soft leather or other soft fibrous material, so as to form an air tight joint for the ends of a suction tube extending between the pump and vacuum chest. When the player action is in normal lowered position, the shelf 14 and flanges 20 may be clamped together by screws, and therefore to raise the player action, all that will be necessary to do is to remove these screws, after which the player action can be swung upwardly and outwardly, leaving the strings

and piano action unobstructed for tuning and repairs or adjustments.

The vacuum chest in accordance with my invention includes two principal parts, a cover or valve board 13<sup>a</sup> which carries all the valves, and a lower portion or pouch board 13<sup>b</sup> which carries all the pouches or valve actuating diaphragms. These two parts are separated by vertical flanges 13<sup>c</sup>, 13<sup>d</sup> and 13<sup>e</sup>, in this case integral with the pouch board and arranged respectively at the rear, front and intermediate the front and rear, as shown in Fig. 1, thereby forming the usual vacuum space or chamber 21 and 21<sup>a</sup>, from which the air may be withdrawn or pumped by a suitable pump located preferably at the bottom of the piano and connected to the vacuum chamber by a tube 22. This tube is formed in two sections 22<sup>a</sup> and 22<sup>b</sup>, the former being connected to the chest and having its lower end received in an opening in the shelf 14, and the latter being connected to the pump and having its upper end received in an opening in one of the flanges 20, which opening registers with the opening in the shelf when the latter is in normal position. This construction which is shown in Fig. 5, permits the parts of the tube to be readily separated or united when the player action is raised or restored to normal position, without requiring the use of a special coupler.

The valve board and pouch board of the vacuum chest are removably clamped or secured together by means of threaded rods 23 which extend rather loosely through the valve board, and extend through the flanges 13<sup>c</sup>, 13<sup>d</sup> and 13<sup>e</sup> into the pouch board, and by thumb nuts 23<sup>a</sup> screwed onto the ends of the rods.

Arranged below the vacuum chest are two series of power pneumatics 24<sup>a</sup> and 24<sup>b</sup>, the upper series 24<sup>a</sup> being glued or otherwise secured to the bottom of the vacuum chest, and the lower series being secured in a like manner to a horizontal strip 25 secured at its rear end to a vertical strip 26 which in turn is secured to the bottom of the vacuum chest near the rear edge thereof. These pneumatics when being deflated pull upwardly on rods 27 which are connected at their upper ends to the pneumatics and at their lower ends to pivoted members 28 which cause the actuation of the hammers in the well known manner. In this case all the primary and secondary valves are carried by the valve board 13<sup>a</sup> and all the pouches which actuate the primary and secondary valves are carried by the pouch board. The primary valves 29 which are arranged for movement in the primary valve openings 29<sup>a</sup> in the valve board, and which may be of any suitable or well known construction, are in staggered relation, as shown in Fig. 3 and are arranged above the so-

called primary pneumatics, including the pouches or diaphragms 30 carried by the pouch board and forming covers for chambers 31 which are connected by tubes 32 to the tracker. The upper ends of these tubes are fixed in openings in a strip 33 which is removably fastened to the front of the pouch board and is provided with separate passageways or openings leading from the ends of the tubes 32 to the chambers 31.

The secondary valves, each designated as a whole by the reference character 34, are also staggered as shown in Fig. 3 and each in the preferred construction includes a disk 35 arranged for movement in the secondary valve opening 35<sup>a</sup>. The disk is provided with a fibrous facing at the top and bottom and loosely engages a fixed guide pin 36 which extends downwardly from a cross member 37 of a cap 38 which is removably secured to the top of the valve board and is provided with a downwardly extending contracted portion 39 forming a seat for the upper face of the valve disk when the latter is lifted. Normally the valve disk rests on a seat formed by an annular shoulder 40 on the valve board. Directly below each valve member 35 is a movable device 41 which I call a follower and which is loosely mounted and guided in a cross piece 42 secured to the bottom of the valve board. This follower consists of a pin or stem 41<sup>a</sup> having enlargements or heads 41<sup>b</sup> at both ends, the upper of which is adapted to engage and raise the valve disk 35 against the upper valve seat, and the lower of which is adapted to be engaged by a secondary pneumatic including a pouch or diaphragm 43 forming the top or cover for a chamber 44 which is located in the upper portion of the pouch board and to which air is supplied by a duct or passageway 45, when the corresponding primary valve is actuated, each of said passageways 45 extending to a chamber 44 from a valve opening 29<sup>a</sup>, so that when the primary valve is raised by the movement of the corresponding pouch 30, air is admitted from the exterior of the vacuum chest to the chamber 44 in the well known manner. Preferably, one of the heads or enlargements of the follower 41 is adjustable on the pin or stem so that the action or pressure of the follower on the valve disk 35 when the follower is raised by the pouch 43 may be readily varied or adjusted.

From the secondary valve openings, ducts or passageways 46 extend to the power pneumatics, and in this case, from the forward row or series of valve openings, the passageways 46 extend forwardly, thence downwardly, through the vertical flange 13<sup>e</sup> to the upper series of pneumatics secured to the bottom of the pouch board, and from the rear row or series of valve openings, the

passageways extend rearwardly, thence downwardly through the vertical flange 13<sup>c</sup> and vertical strip 26 and then forwardly through the horizontal strip 25 to the lower row or series of power pneumatics secured to the bottom of the strip 25.

It will be noted that the entire player action is in the form of a unit having its parts arranged and supported in a manner such that not only can the player action be placed in almost any make of upright piano, but the unit can be very readily swung upwardly and rearwardly, so that access can be had to the player action and other parts. When the player action is swung from normal position, the parts of the suction tube 22 is separated, and when the player action is restored to normal position, the parts of the tube are again connected in a manner such as to form an air tight joint.

My improved form of secondary valve has an important advantage over most of the secondary valves now in use, in that it will seat evenly and accurately on either its upper or lower seat and at the same time it moves freely. Furthermore, each valve is separately removable for the purpose of repairs or adjustment.

In case it is desired to inspect the pouches or diaphragms, all that is necessary is to remove the thumb nuts 23<sup>a</sup> and take off the valve board, after which all the pouches are exposed to view. Also, the entire player action is easy to assemble or take apart, and easy to install in almost any upright piano.

Having thus described my invention, what I claim is:

1. In combination with a piano having a casing and piano action, a player action comprising a single vacuum chest provided with primary and secondary valves and with pouches for actuating the same, a tracker, and power pneumatics, said vacuum chest being supported at the top of the casing above the piano action, and comprising a bottom portion or pouch board carrying all the pouches for actuating the valves, an upper portion or valve board removably secured to the pouch board and supporting all the primary and secondary valves, the power pneumatics being supported by and arranged beneath the vacuum chest, and the tracker being supported from the vacuum chest beneath the same and in front of the piano action.

2. In combination with a piano having a piano casing and piano action, a player action comprising a single substantially horizontal vacuum chest provided with primary and secondary valves and with pouches for actuating the same, a substantially horizontal shelf below and rigidly attached to the vacuum chest, a tracker supported between the vacuum chest and the shelf and arranged in front of the player action,

power pneumatics supported by and arranged beneath the vacuum chest, said vacuum chest comprising a bottom portion or pouch board carrying all the pouches for actuating the valves, and an upper portion or valve board removably secured to the pouch board and supporting all the primary and secondary valves, the series of primary valves, the series of secondary valves, and the corresponding pouches being arranged in staggered relation so that they may be accommodated or supported by the valve board and the pouch of a single vacuum chest.

3. In combination with a piano having a casing and piano action, a player action on the interior of the casing and pivotally supported near the top thereof so that it may be swung upwardly and rearwardly out of the casing, said player action comprising a single substantially horizontal vacuum chest arranged at the top of the casing above the piano action, a lower substantially horizontal shelf rigidly connected to the vacuum chest, a tracker supported between the vacuum chest and shelf in front of the piano action, power pneumatics supported by and arranged beneath the vacuum chest, hammer actuating members pivotally supported on said shelf, and rods connecting said members with the power pneumatics, the vacuum chest comprising a lower portion or pouch board provided with pouches for operating all the valves, and an upper portion or valve board removably secured to the pouch board and provided with primary and secondary valves, all the valves and all the pouches of the player action being carried by the valve board and by the pouch board respectively.

4. In combination with a piano having a piano casing and piano action, a player action normally arranged above and in front of the piano action and pivotally supported at the top of the casing so that it may be swung upwardly and rearwardly away from the piano action, said player action comprising a single substantially horizontal vacuum chest arranged above the piano action, a substantially horizontal shelf arranged below the tracker in front of the player action and rigidly connected to the vacuum chest, a tracker supported between the vacuum chest and the shelf, a flange extending inwardly from the end of the casing and forming a seat for the shelf when the player action is in its normal position, said vacuum chest comprising a lower portion or pouch provided with pouches or pneumatics for actuating the valves and an upper portion or valve board removably secured to the pouch board and provided with all the primary and secondary valves of the player action, power pneumatics arranged on the lower side of the vacuum chest, hammer ac-

tuating members pivotally supported by said shelf, and rods connecting said members and the pneumatics.

5 In combination with a piano having a piano casing and piano action, a player action normally arranged above and in front of the piano action and pivotally supported on the interior of the casing near the top thereof so that it may be swung upwardly and rearwardly, said player action comprising a single vacuum chest above the piano action, a horizontal shelf below the vacuum chest in front of the piano action and rigidly connected to the vacuum chest, a tracker supported between the vacuum chest and shelf, a flange extending inwardly from an end of the casing and forming a seat for said shelf and player action when the latter is in normal position, said vacuum chest having a vacuum chamber, primary and secondary valves, pneumatics for operating the same, and power pneumatics supported on the lower side of the chest, hammer actuating members supported by said shelf and rods connecting the power pneumatics and hammer actuating members, said shelf and flange having openings which are in alignment when the player action is in normal position, and a suction tube connected to the vacuum chamber and extending downwardly from the vacuum chest through the shelf and flange, said suction tube comprising two sections, the lower end of the upper section being secured in the opening of the shelf and the upper end of the other section being secured in the opening of the flange.

6. The combination with a piano having a piano casing and a piano action, a player action normally arranged above and in front of the piano action and pivotally supported on the interior of the casing near the top thereof so that it may be swung upwardly and rearwardly, said player action comprising a single vacuum chest above the piano action, a shelf below the vacuum chest in front of the piano action rigidly connected to the vacuum chest, a tracker supported between the vacuum chest and shelf, said vacuum chest comprising a lower portion or pouch board, and a removable upper portion or valve board and having a vacuum chamber, primary and secondary valves all carried by the valve board and pneumatics for actuating the same all carried by the pouch board, power pneumatics arranged on the

lower side of the vacuum chest, hammer actuating members on the shelf connected to the power pneumatics, a flange extending inwardly from the end of the casing and forming a seat for the shelf when the latter is in normal position, a strip of soft material arranged between the shelf and flange so as to form a substantially air-tight joint when the shelf is seated on the flange, and a suction tube extending from the lower part of the piano casing through the flange and shelf and connected to the vacuum chamber, said tube being formed in sections, the lower end of one section being secured in the shelf and the upper end of the other section being secured in the flange.

7. In a pneumatic piano player, a vacuum chest having a secondary valve opening, a secondary valve member arranged in said opening, upper and lower valve seats adapted to be engaged by said valve member, a stationary guide pin extending centrally into the valve member and forming a guide therefor, a valve actuating diaphragm arranged below the valve, a follower between the diaphragm and valve, and a stationary device loosely supporting said follower independently or free of said diaphragm and valve.

8. In combination, in a pneumatic piano player, a vacuum chest having a valve opening and secondary valve therein, a lower valve seat on which the valve is normally seated, a removable cap arranged above the valve and having a pin extending downwardly therefrom and loosely entering said valve centrally thereof so as to guide the same in its movements, a valve actuating diaphragm arranged below the valve, and a follower between the diaphragm and valve comprising a stem having enlargements at its ends, one of said enlargements being adjustable on the stem, the lower enlargement being adapted to be engaged by the diaphragm and the upper enlargement being adapted to engage and lift the valve, and a stationary device loosely supporting said follower.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

FLOYD W. BORDNER.

Witnesses:

M. E. DOERSCH,  
E. C. NATHAN.