

1,271,188.

Patented July 2, 1918.
2 SHEETS—SHEET 1.

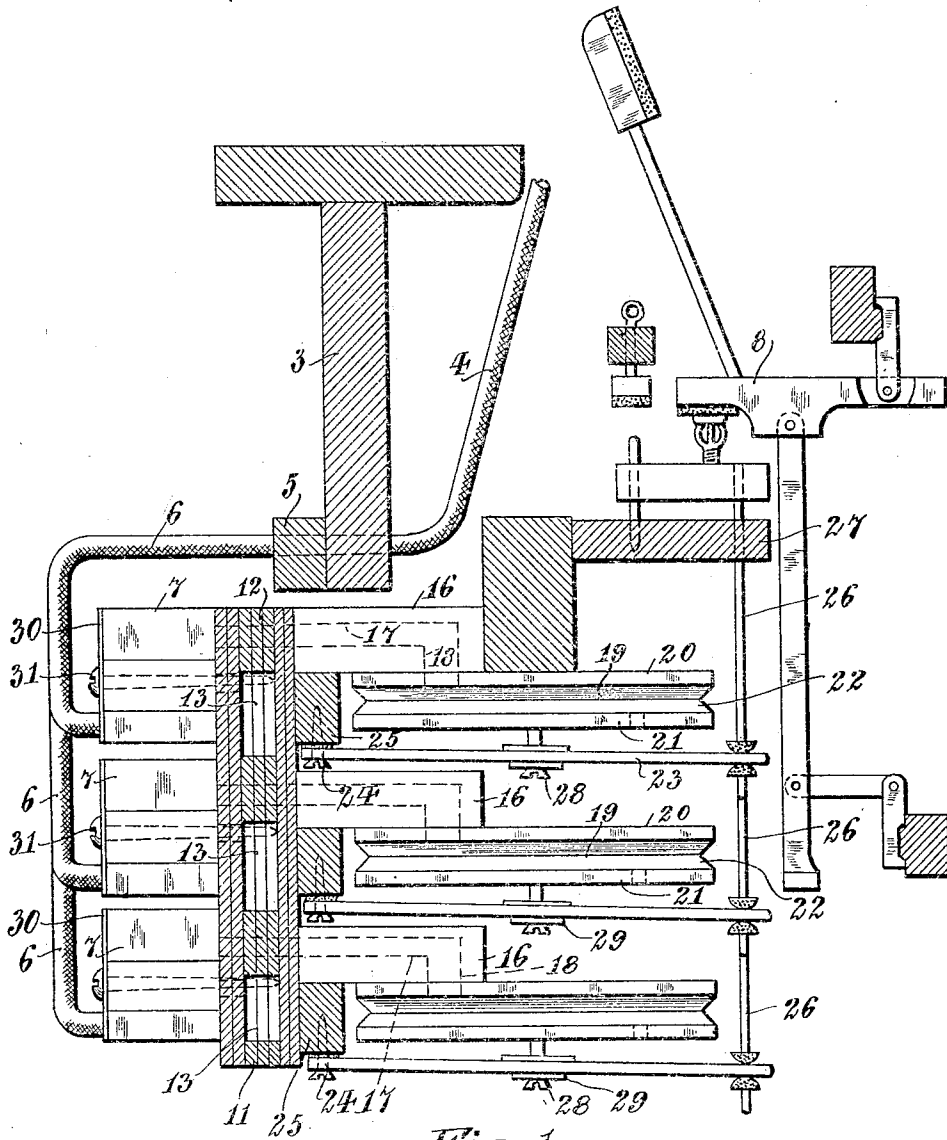


Fig. 1.

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2 SHEETS—SHEET 2.

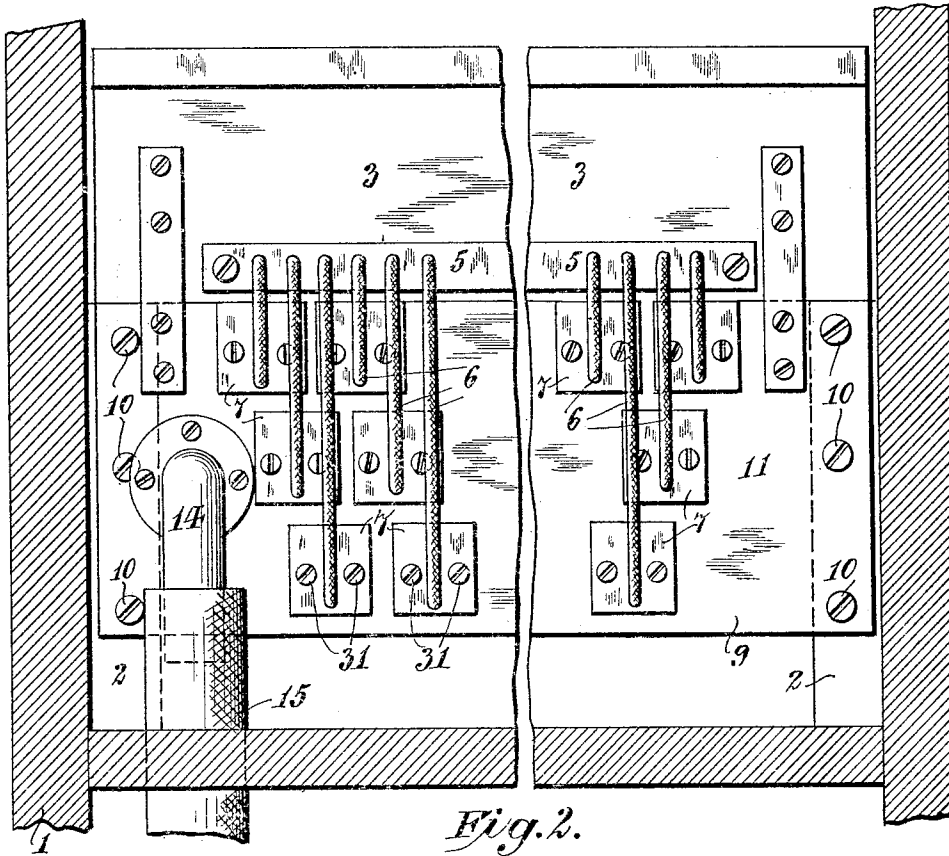


Fig. 2.

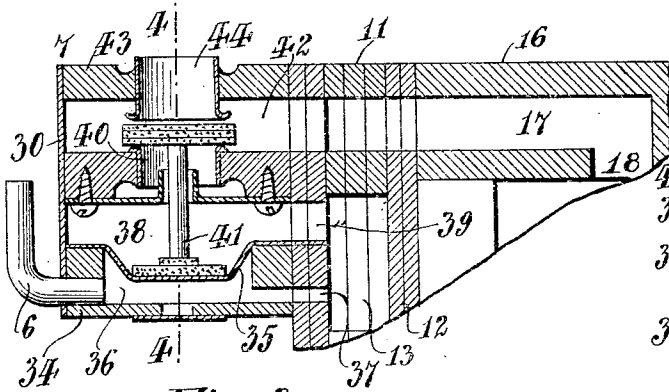


Fig. 3.

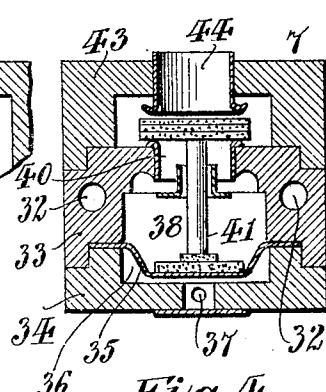


Fig. 4.

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PNEUMATIC ACTION.

1,271,188.

Specification of Letters Patent.

Patented July 2, 1918.

Application filed February 20, 1914. Serial No. 819,883.

To all whom it may concern:

Be it known that I, FRANK G. LYNDE, a citizen of the United States, residing in the city of Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Pneumatic Actions, of which the following is a specification.

My invention relates to automatic musical instruments, such as player pianos, and particularly relates to the pneumatic action of these instruments.

In devices of this character it has been a desideratum to make the action part of the piano of minimum dimensions so as to preserve as far as possible the proportions of the conventional makes of piano-casing and at the same time provide a mechanism of sufficient power to actuate forcibly the hammer actions. These instruments as heretofore constructed have necessitated a material enlarging of the casing in order to accommodate the player action. Accordingly, it is one of the objects of the invention to preserve the normal relative location of the hammer action and front board and to reduce the number and size of parts heretofore considered necessary so that the action may be located in this limited space.

Another object is to provide an action which can readily be removed as a unit from the piano without disturbing any of the other parts so as to permit convenient access to the several parts of the action.

Instruments of this character are very sensitive to climatic changes which cause the parts to warp and creep on each other so that in addition to a minimum number of parts it is another object of the invention to arrange these parts so as to offer the greatest possible resistance to distorting strains without adding any material particularly for this purpose.

Another object of the invention is to provide for a quick yet powerful actuation of the hammer pneumatics.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one form of mechanism embodying the invention, and the invention also consists in certain new and novel features of construction

and combination of parts hereinafter set forth and claimed.

Referring to the accompanying drawings:

Figure 1 is a transverse sectional view through a preferred embodiment of the invention showing certain parts in side elevation and certain portions of the piano being shown fragmentarily;

Fig. 2 is a front elevation of the device shown in Fig. 1 with the central portion broken away so as to show the ends thereof on a larger scale;

Fig. 3 is a vertical sectional view through one of the valvular members and through an adjacent portion of the tension box; and

Fig. 4 is a vertical sectional view taken through one of the valvular members taken substantially on the line 4—4 of Fig. 3.

The piano includes a frame or casing 1 having side standards 2 which may be boards fastened to or forming a substantial part of the casing and adapted to transmit strains thereon direct to the floor. There is also included the upper portion of the usual front board 3 which has apertures extending transversely therethrough connected to the tubing 4 from the vents in the tracker-bar (not shown). Affixed to the front face of the board 3 and readily removable therefrom is a plate 5 adapted to support the upper ends of the tubes 6 which form continuations of the tubes 4 to place the valvular elements 7 hereinafter described in communication with the tracker-bar or other controlling device. The piano also includes the hammer actions 8 which are adapted to be brought into operative position to sound the piano strings (not shown) as is usual with devices of this character.

A unitary piano action 9 is bridged across the front of the piano in advance of the hammer actions and in rear of the front board and has opposite ends thereof removably affixed to the standards 2 by any suitable and ready accessible means, such as the screws 10. This action comprises a vertically disposed tension box 11 preferably in the form of a flat board having a material beam depth to take up vertical strains and constituting the main supporting member of the action. The inner-ply 12 of this board is slotted therethrough to form a plurality, in this disclosure shown to be three, of longitudinally disposed pas-

sageways or tension reservoir chambers 13 connected by means of a plug 14 with some suitable source of pneumatic power indicated diagrammatically by the hose connection 15.

Extending laterally from the rear face of the tension board 11 suitably fastened thereto as by gluing and coinciding substantially therewith in length is a plurality of vertically spaced pneumatic supporting boards 16. The boards have a plurality of passageways 17, one for each hammer action, extending horizontally therethrough, which passageways are continued transversely through the tension box 11. A depending portion 18 of each passageway communicates with a hammer pneumatic 19 which forms a part of the action and extends rearwardly from the tension box 11 toward its actuated hammer-action. The tension box or board 11 is preferably veneered of at least three-ply well seasoned wood glued together and arranged with the grain crossed so as to offer the greatest resistance to warping action. If desired each ply may be formed of a thin board but preferably each ply is in turn formed of two or more plies. Each ply is slotted or drilled transversely therethrough to form the several passages and ports before the parts are glued together.

These pneumatics 19 comprise small rectangular horizontal bellows, the top boards 20 of which are fixed to the underside of the boards 16 as by gluing the parts together and the bottom floating boards 21 of which are maintained in parallel relation thereto by means of the accordion folds 22.

Each pneumatic has a lever 23 with one end thereof loosely pivoted, as by means of the screw and slot connection 24, to a strip 25 disposed in the angle between each of the boards 16 and the box 11 and fastened thereto by any suitable means as by gluing. The free ends of these levers underlap the jacks 26 which are guided for vertical movement into operative engagement with the hammer actions 8 through a guide board 27. The levers are attached intermediate their lengths to the central portion of the floating bottom 21 by some suitable connection, such as the screw 28 which passes through slots in the lever and are threaded through the reinforcing blocks 29 disposed on opposite sides of the lever and into the bottom board 21.

Removably positioned on the front face of the box 11 are pneumatic controlling valvular elements 7, one for each pneumatic. Each of these elements includes three superposed blocks, the inner end face of which abuts the box 11 and the outer end face of which is closed by a plate 30 preferably of metal, fastened in place by the screws 31 which pass through the screw

holes 32 in the middle block to hold the element in position. The two lower blocks 33 and 34 have recesses therein facing each other and have a tongue and groove interlocking fit to prevent relative side play. A diaphragm 35 is held between the blocks and forms a pressure chamber 36 in communication with the tracker-bar through the tubing 6, and in communication with the reservoir chamber 13 through the bleeder port 37 bored through the outer ply of the tension board. The diaphragm 35 also forms a vacuum chamber 38 in communication with the reservoir chamber 13 through the ports 39 also bored through the outer ply. A valve opening 40 through the block 32 is controlled by a diaphragm actuated valve 41 which places the chamber 38 in communication with the recess 42 which is formed by the channel of the upper block 43 and constitutes an extension from the passageway 17. The recess 42 is adapted to be placed in communication with the outside atmosphere through the port 44 extending through the web of the block 43, which port is controlled by the valve 41 as is usual with devices of this character.

In operation, with the parts in the position shown in Fig. 1 and a pressure within the tension box 11 different from the atmospheric pressure, the admission of atmospheric pressure through the tracker-bar vents actuates the valve 41 to cause a collapsing of the pneumatic 19 as is usual with devices of this character.

The exhaustion of air from the pneumatic 19 permits a relatively quick movement of the lever 23 as the entire floating board 21 takes part in this collapsing movement of the pneumatic.

The entire action including the tension box 11, the banks of pneumatics 19, the corresponding banks of pneumatic actuating valvular members 7 and guiding board 27 together with its hammer actuating jacks is removable as a unit from the piano casing by loosening the screws 10. By this means ready access is obtained to all of the pneumatics and the jacks together with the boards 16 mounted on the rear face of the tension box 11.

Without removing the action ready access is attained to the valvular elements as they are mounted on the front face immediately in rear of the front board and by loosening the screws 31 these elements may be readily removed to obtain access to the ports 39 and 37, the latter of which is particularly apt to become clogged with dust drawn in through the port to the actuating bellows, or through the vents in the tracker-bar.

Should it be desired to obtain access to the valve, the valve seats or the passageways in the valvular elements 7, the loosening of the screws 31 will permit the sliding

apart of the blocks 33, 34 and 43, which will facilitate the installation of a new diaphragm 35 which element is most apt to become worn in devices of this character.

- 5 By means of a structure of this character the tension box 11 may have a beam depth relatively great compared to its thickness to take up vertical strains on this member, but need not be of any material thickness as the
10 boards 16 which are positioned edgewise on this box are capable of withstanding any lateral strains on the box and assist the box 1 in transmitting these strains to the relatively heavy and substantial side members 2.
15 This unit also assists in bracing the frame and permits the elimination of the usual longitudinal braces thereby offering a free space in front of the hammer actions to contain the pneumatic actions.
20 By making the box 11 of three-ply boards the different openings may be bored there-through before the boards are assembled thereby facilitating and simplifying the construction of this member and at the same
25 time provides a tension box in which the openings are all straight from some open side. A device of this character may be cheaply constructed and at the same time provide a hermetically tight connection between its several parts.
30

While I have shown and described, and have pointed out in the annexed claims, certain novel features of my invention, it will be understood that various omissions, substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.
35
40 Having thus described my invention, I claim:

1. In a player piano, an element constituting a removable unit comprising a three-ply veneered board having an inner and
45 two outer plies, said board having a lateral extension from one face thereof adapted to support a pneumatic and to prevent warping of said board in the direction of its least dimension, the inner ply having a passageway therein, adapted to be connected
50 with a source of pneumatic power, the ply opposite the extension having ports extending transversely therethrough communicating with said passageway and adapted to
55 lead to valvular pneumatic controlling members positioned exteriorly of the boards and said board having ports extending transversely therethrough for placing the valvular members in communication with
60 the pneumatics.

2. A piano action forming a unitary structure and comprising a tension box, having a pneumatic affixed to one face and a pneumatic controlling valve element
65 mounted on the opposite face thereof, a

guide board mounted on the side of the box having the pneumatic, a hammer actuating jack guided for movement in said board, and operatively connected to said pneumatic to be actuated thereby, said action being
70 bodily removable from the piano without affecting its parts.

3. In a player piano, the combination with a member adapted to be removed from the piano as a unit, means at opposite ends
75 for removably supporting said member in place, said member having a longitudinally extending passageway contained entirely therein and constituting a pneumatic reservoir having a conduit leading therefrom to
80 one face of the member and having a straight uninterrupted passageway extending transversely within said member adjacent the reservoir, a hammer actuating pneumatic carried by the member and opening
85 into said passageway, a unitary valvular member in the form of a block removably affixed to said member containing all of the necessary mechanism for controlling communication between the conduit leading
90 from said reservoir and the passageway leading to said pneumatic, and means passing through the block member for removably securing the same in place.

4. A piano action forming a unitary structure and comprising a tension box, having
95 a pneumatic affixed to one face and a pneumatic controlling valvular element mounted on the opposite face thereof, a guide board mounted on the side of the box having
100 the pneumatic and having means for guiding the hammer actuating mechanism, said action being bodily removable from the piano as a unit.

5. A pneumatic action for musical instruments having, in combination, a suction
105 chest, a bellows, a tracker board tubing, a valve shell detachably secured to said chest comprising two ports opening into said chest, one of said ports being connected by
110 a channel extending through said shell to said bellows, the other of said ports being connected by passages extending through said shell to said tracker board tubing, a single valve for controlling said channel and
115 a diaphragm arranged within said shell adapted to be moved in one direction by the admission of air through the port connected with said tracker board tubing, to open
120 said bellows to the suction chest, said diaphragm adapted to be moved in the opposite direction by the cutting off of the supply of air from said tracker board tubing, to move said valve in the opposite direction.

6. In a player piano, a pneumatic action
125 comprising a board having a chamber therein adapted to be connected with a source of pneumatic power, a plurality of banks of hammer pneumatics mounted on one face of said board, corresponding banks of val-
130

5 vular members removably secured to the front face of said board, each of said members being in operative communication with said chamber and with one of said pneumatics, a tube supporting plate, a plurality of tracker bar tubes, each tube having one end operatively connected to one of said valvular members through the front face thereof and the other end attached to said plate whereby the connecting tubes are disposed in position accessible from the front of the piano.

10 7. In a player piano, the combination of a tension chest, a plurality of separate valvular members demountably affixed to the front of said tension chest in position convenient to access from the front of the piano, each of said valvular members being formed of readily demountable parts, the separating of which parts permits the demounting of the elements comprising the valve and a face plate for holding the parts of the valvular member in place, said face plate being readily accessible from the front of the piano and providing a means for permitting of an inspection of the interior of the valvular members when the plate is loosened or removed.

15 8. In a piano action, a valvular member provided with a front end and a tension box engaging end and comprising three superimposed blocks with certain of the blocks provided with recesses opened at opposite ends, the two lower blocks having recesses facing each other said lower blocks interfitting to prevent relative side play, a diaphragm held between said two lower blocks to form a pressure chamber in the lower block, said lower block being provided with a bleeder port opening from said pressure chamber and extending therethrough to one of the ends of the member, said diaphragm also acting to form a vacuum chamber in the intermediate block, said chamber opened to the outside of the member through said tension-box-engaging-end, the upper block provided with a channel facing the intermediate block to form a recess designed to open to a player pneumatic, a port providing communication between said recess and said vacuum chamber, a valve actuated by said diaphragm for controlling said port

and means for closing the front ends of said blocks.

55 9. In a piano action, the combination of a front board having a plurality of passageways extending therethrough from front to rear, the rear end of each of said passageways adapted to be connected to one of the ducts in the tracker bar, a tension box paralleling said front board and having a plurality of valvular elements demountably affixed to the front face of said box, and a plurality of tubes, each having one end detachably connected to the outer or front end of one of said passageways and the other end operatively connected to one of said valvular elements through an outer face thereof, said tubes being accessible from the front of the action and removable with the demountable valvular elements.

60 10. A valvular element comprising three superposed open ended channel blocks, the two lower blocks having their channels facing each other, a diaphragm held between the flanges of said lower blocks, the upper block having its channel facing the middle block, and provided with a port opening to the outside, the middle block having a valve-opening therethrough, a valve operatively connected to said diaphragm for controlling said opening and a plate for closing one end of the compartments formed by said channel blocks.

65 11. A valvular element comprising three superposed open ended channel blocks, the two lower blocks having their channels facing each other, a diaphragm held between the flanges of said lower blocks, the upper block having its channel facing the middle block, the middle block having a valve opening therethrough, the upper block having a port extending therethrough, a valve operatively connected to said diaphragm for controlling said opening and port and a plate for closing one end of the compartments formed by said channel blocks.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

FRANK G. LYNDE.

Witnesses:

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S. B. CAIRNS.