W. G. MacARTHUR.

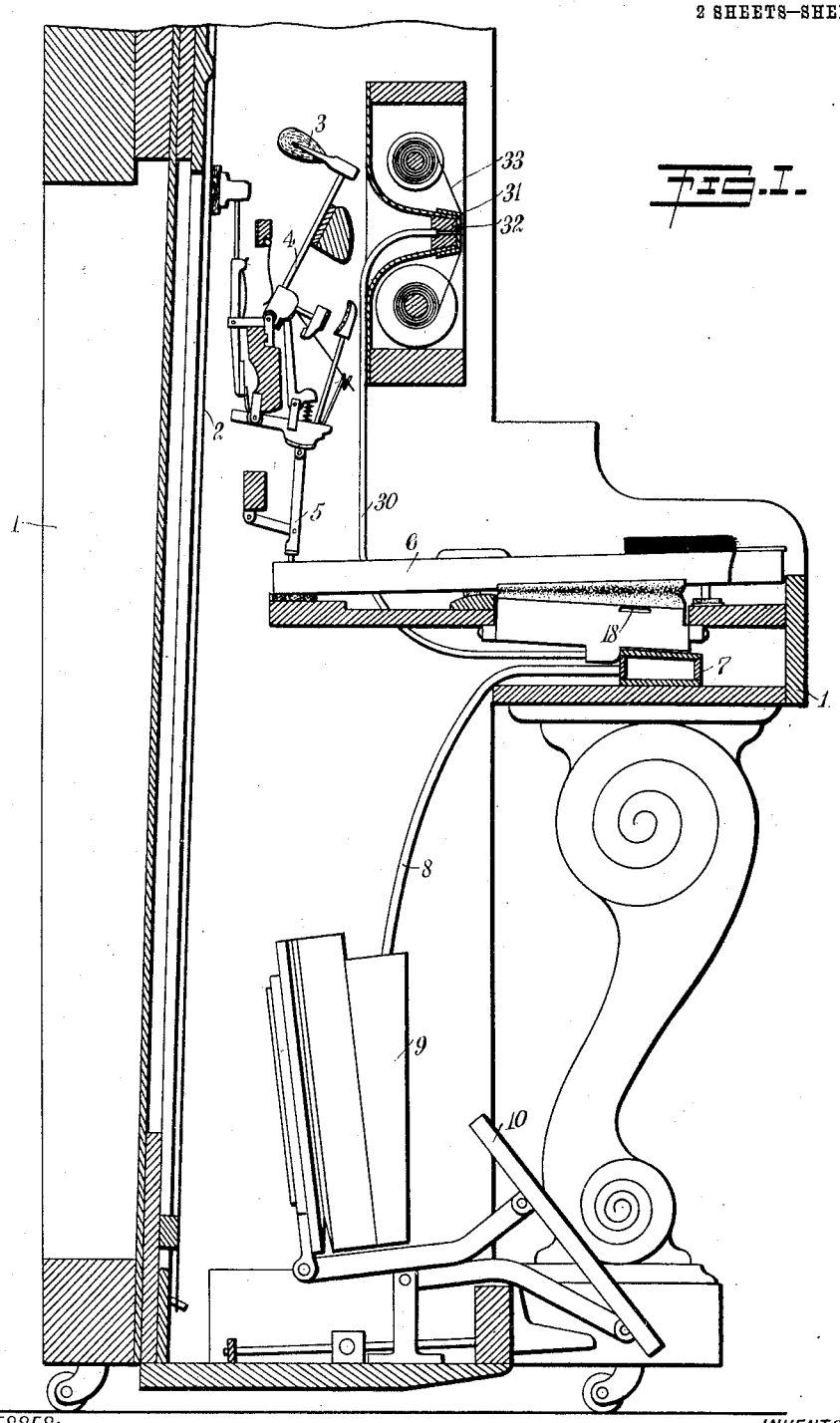
PNEUMATIC PIANO PLAYER.

APPLICATION FILED AUG. 13, 1910.

1,003,279. **Patented Sept. 12, 1911.**

2 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:

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2 SHEETS—SHEET 2.

Fig. 2.

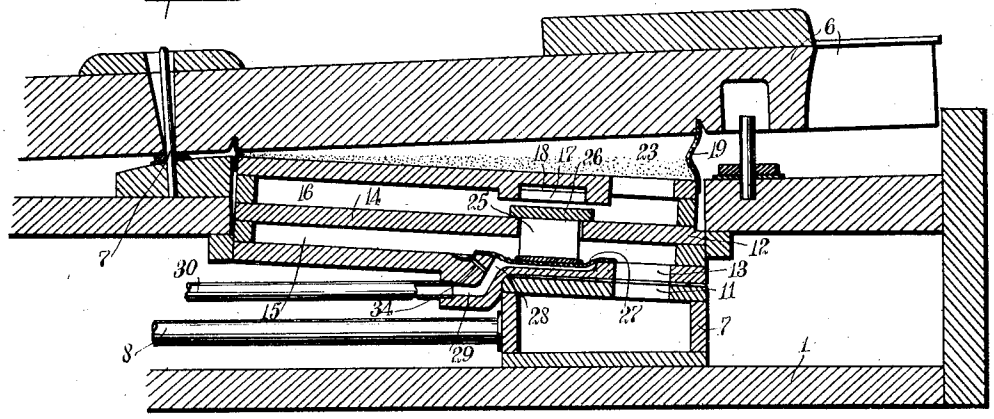


Fig. 3.

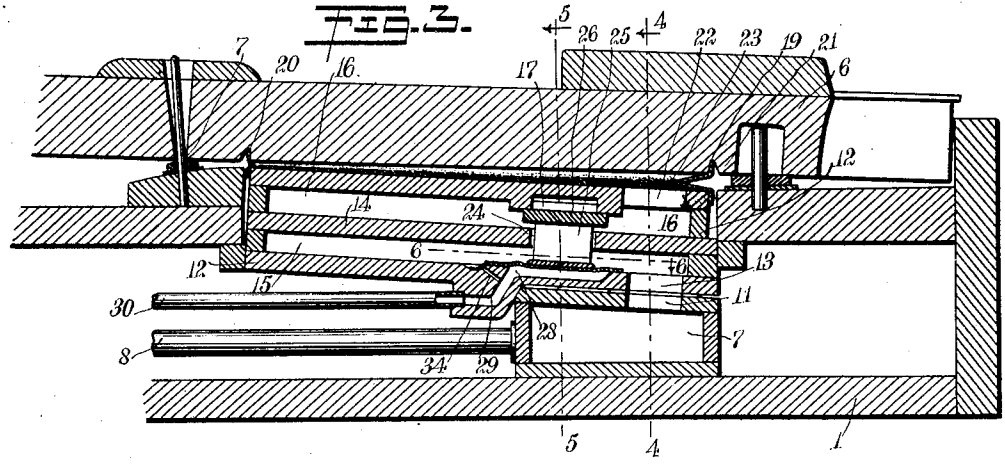


Fig. 4.

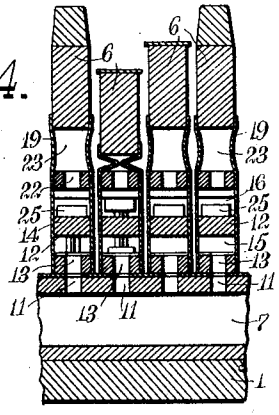
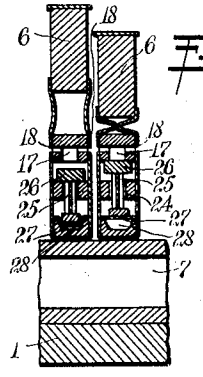


Fig. 5.



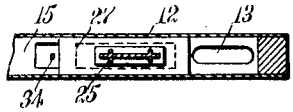


Fig. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM GIFFORD MacARTHUR, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO LOUIS MEYER, OF NEW YORK, N. Y.

PNEUMATIC PIANO-PLAYER.

1,003,279. Specification of Letters Patent. Patented Sept. 12, 1911.

Application filed August 13, 1910. Serial No. 576,989.

To all whom it may concern:

Be it known that I, WILLIAM G. MacARTHUR, a citizen of the United States, and a resident of the city of New York, borough of the Bronx, in the county and State of New York, have invented a new and Improved Pneumatic Piano-Player, of which the following is a full, clear, and exact description.

This invention relates to a new and improved piano-player of the pneumatic type.

An object of this invention is to provide a device which will be simple in construction, inexpensive to manufacture, strong, durable and both quick and positive in its action.

A further object of this invention is to provide a piano playing attachment in which the pneumatic portion is attached directly to the keys, whereby a great saving in space and more positive and sensitive movement is obtained.

These and further objects, together with the construction and combination of parts, will be more fully described hereinafter and particularly set forth in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a vertical section through a piano with my attachment thereon; Fig. 2 is an enlarged section through one of the keys and the pneumatic connected thereto, showing the key in its raised position; Fig. 3 is a view similar to Fig. 2, showing the key in its depressed position; Fig. 4 is a section along the line 4—4 of Fig. 3, showing a plurality of keys; Fig. 5 is a vertical section on the line 5—5 of Fig. 3; and Fig. 6 is a horizontal section on the line 6—6 of Fig. 3, looking in the direction of the arrow.

Referring more particularly to the separate parts of the device, 1 indicates the casing of the piano, which is provided with the usual strings 2, which are adapted to be sounded by hammers 3, forming a part of the piano action 4, which may be of any suitable character. The lowermost member of the piano action 4, indicated at 5 in each case, rests on one of a plurality of keys 6, which may be of any suitable form, preferably pivoted intermediate their ends, as indicated at 7. The weight of the action and the spring tension thereon normally holds the rear ends of the keys 6 depressed and the forward ends raised, as is usual.

Extending transversely of the keys 6, and supported by the casing 1 in any well known manner, there is provided an air-box 7, which is connected in any suitable manner, as by means of a tube 8, to a suitable source of suction, such as that indicated by the bellows 9, which may be operated in any suitable maner, as for example by the pedals 10.

For each of the keys 6, there is provided an opening 11 in the top of the air-box 7. For each of the openings 11 and each of the keys 6, there is provided a casing 12, each of which has an opening 13 extending in alinement with the openings 11. The casing 12 is divided into two compartments by means of a partition 14. These compartments are indicated by means of the numerals 15 and 16. The former may be termed the vacuum compartment, and the latter, the atmospheric compartment, inasmuch as the former is connected to the vacuum air-box 7 and inasmuch as the latter is connected to the atmosphere by means of a passage 17 and passages 18, the latter letting out of the side of the casing 12 to the atmosphere.

The top of each of the casings 12 and the bottom of each of the keys 6 form the top and bottom walls of a pneumatic chamber 23, the side walls of which are formed of an accordion-plaited flexible member 19, formed of any suitable impervious material, such as rubber sheeting.

For the purpose of securing each of the members 19 to each of the keys 6, the keys are cut out at 20 and 21 to form slight grooves in which the edges of the flexible members 19 are inserted and secured. The chamber 23, which is formed between the bottom of the key and the top of the casing, may be termed a pneumatic, and is connected in each case by an opening 22, to the atmospheric compartment 16. When any one of the keys 6 is in its normal raised position, the compartment 16 is connected to the atmosphere, and therefore the chamber 23 is also connected to the atmosphere.

In order to connect the chamber 23 and the compartment 16 to the vacuum chamber 15, and thus to the source of suction, there is provided in the partition 14 an opening 24, which forms a means of communication between the compartments 15 and 16. This

opening 24 is normally closed by means of a single valve 25, which extends through and is free to move in the opening 24 and has an upper flange or head 26, which is adapted to close tightly in the surrounding surface of the opening when the valve is in its lowermost position. The valve 25 rests at its lower end on a flexible diaphragm 27, which may be of any suitable form and material, and covers a cavity 28 in the casing 12. This cavity 28 is connected by means of a passage 29 to a tube 30. There is one of these tubes 30 for each of the casings 12 and each of the keys 6, and they are connected at their opposite ends to a tracker 31 provided with suitable openings 32. For the purpose of operating the device, these openings 32 are normally closed by a music sheet 33, which is provided with perforations at suitable intervals corresponding to the notes to be played, and these openings are adapted to be brought into alinement with the openings 32, so as to permit atmospheric pressure to enter the tubes 30 and thus come under the diaphragm 27. When atmospheric pressure has been admitted beneath the diaphragm 27, in view of the lower pressure on the top of the diaphragm 27 it will overcome the weight of the valve 25, raising it, so that its head 26 shuts off the opening of the passage 17, cutting off communication between the compartment 16, the chamber 23 and outside atmosphere, and simultaneously opening communication between the vacuum compartment 15 and both the compartment 16 and the chamber 23. When this has been done, the chamber 23 will be submitted to the suction or negative pressure of the vacuum air-box 7, and the key 6 will be drawn down and caused to actuate the piano action 4.

For the purpose of drawing out the air in the cavity 28 and the tube 30 when the opening 32 corresponding thereto has been again covered by the music sheet 33, there is provided a bleed passage 34, which connects the passage 29 to the vacuum compartment 15. When the negative pressure on both sides of the diaphragm 27 has been equalized, the weight of the valve 25, plus the atmospheric pressure on its head, will cause the valve to force down the diaphragm 27, seating its head around the opening 24, thereby simultaneously opening the chamber 23 to atmospheric pressure and cutting it off from the source of suction.

The operation of the device will be readily understood when taken in connection with the above description.

When it is desired to play the piano, a reel having a music sheet 33 with perforations therein corresponding to the notes of the piece which is to be played, is placed in coöperative relation with the tracker 31. At the same time the air-box 7 is placed under a negative pressure or vacuum by means of a suitable device, such as the bellows 9, operated by any suitable force, such as the pedals 10. When an opening in the sheet 23 comes in opposition to an opening in the tracker 31, the atmospheric pressure is admitted to the under side of the corresponding diaphragm 27, so that the valve 25 is raised, cutting off communication of the compartment 16 and the chamber 23 with the air, and simultaneously opening up communication between the vacuum box 7, the vacuum compartment 15 and the compartment 16 and the chamber 23, so that the member 19 is collapsed, and the key 6 drawn down, causing the opposite end of the key to be raised, and actuating the action 4, so that the hammer 3 comes in contact with the strings 2, thereby sounding the strings. When the opening in the music sheet 33 has passed out of alinement with the opening 32 in the tracker 31, the atmosphere will be cut off from communication with the under side of the diaphragm 27, and the air in the cavity 28, the passage 29 and the tube 30 will be sucked out through the bleed passage 34, so that the valve 25 will be forced down by the atmospheric pressure on its head and by its weight, so as to close the opening 24, thus shutting off communication between the source of vacuum and the chamber 23, and simultaneously opening communication between the atmosphere and the chamber 23, so that the action 4 will force the rear end of the key 6 down, raising the forward end of the same. This operation will be repeated in the case of each of the keys as many times as there are openings in the music sheets 33 and with frequencies corresponding to the position of these openings.

It will thus be seen that there is provided a new and improved piano player, which will minimize the space occupied, by connecting the operating mechanism directly to the keys, and thus also increase the positiveness of the action.

While I have shown one embodiment of my invention, I do not wish to be limited to the specific details thereof, but desire to be protected in various changes, modifications and alterations which I may make within the scope of the appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. In a piano player, the combination with a plurality of keys arranged in juxtaposition, of a series comprising a plurality of air compartments and an air chamber located subjacent each of said keys in superposed relation, the bottom wall of each of said keys forming a wall of said chamber, the top wall of one of said compartments

forming a wall of said chamber, a passage between said compartments, a valve controlling said passage, and a suction-operated diaphragm for operating said valve.

2. In a piano player, the combination with a plurality of keys arranged in juxtaposition, of a series comprising a plurality of air compartments and an air chamber located subjacent each of said keys in superposed relation, the bottom wall of each of said keys forming a wall of said chamber, the top wall of one of said compartments forming a wall of said chamber, a passage between said compartments, a valve controlling said passage, a suction-operated diaphragm for operating said valve, and a common suction air-box extending transversely beneath said keys and connected to the bottom compartment in each of said series.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM GIFFORD MACARTHUR.

Witnesses:
IRENE S. FLAM,
DAVID FLAM.

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