

L. C. SMITH & M. A. BLUMENBERG.
PLAYER PIANO.

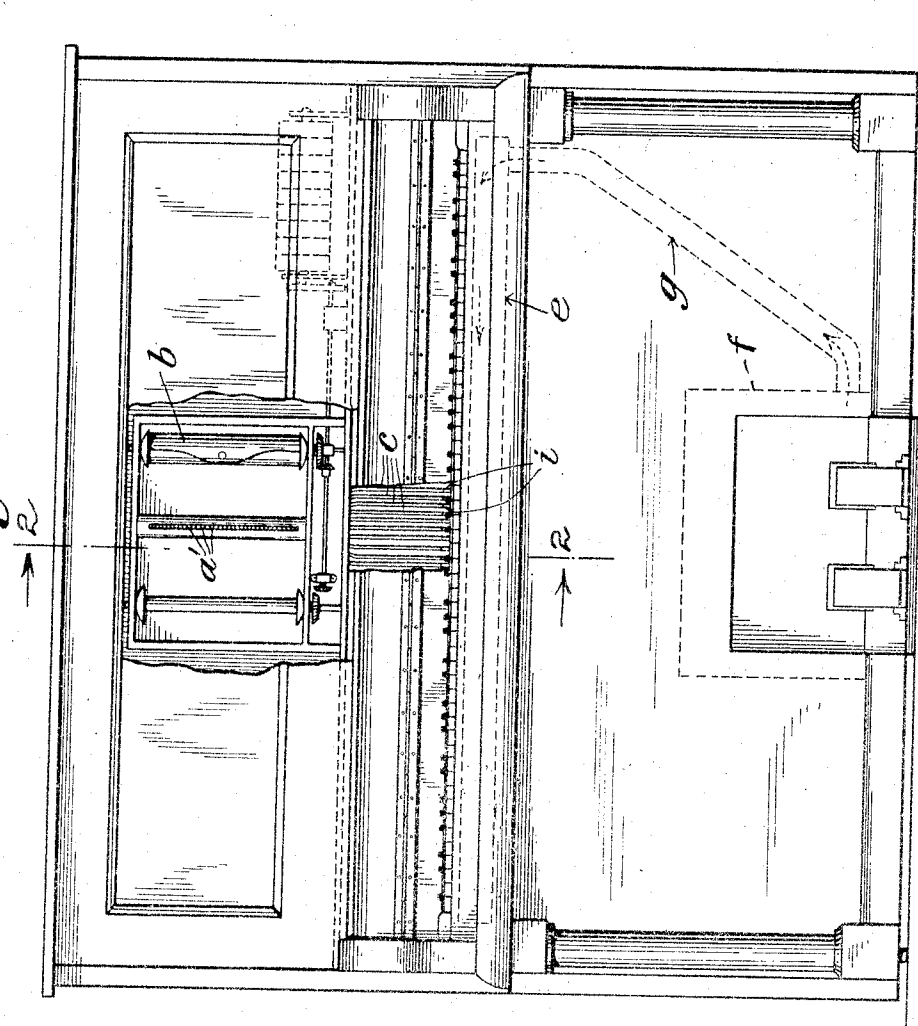
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Patented Nov. 12, 1912.

3 SHEETS-SHEET 1.

1,044,092.

Fig. 1.



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3 SHEETS—SHEET 2.



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3 SHEETS-SHEET 3.

Fig. 5.

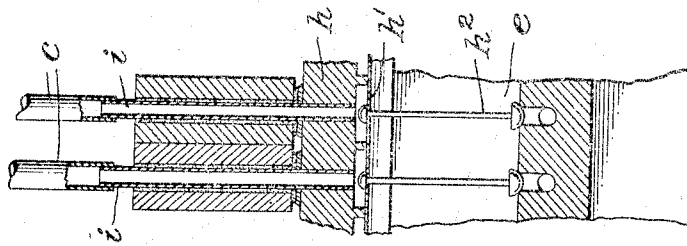
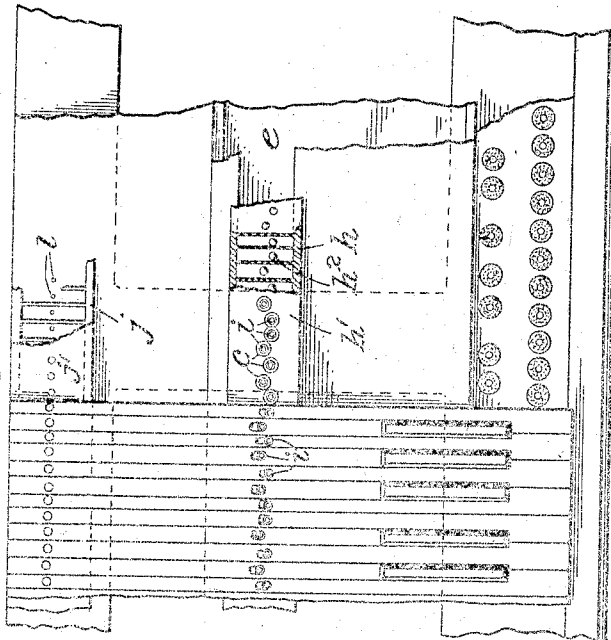


Fig. 4.



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UNITED STATES PATENT OFFICE.

LEWIS CASS SMITH AND MARC A. BLUMENBERG, OF NEW YORK, N. Y.; SAID SMITH
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PLAYER-PIANO.

1,044,092.

Specification of Letters Patent.

Patented Nov. 12, 1912.

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To all whom it may concern:

Be it known that we, LEWIS CASS SMITH and MARC A. BLUMENBERG, citizens of the United States, and residents of the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Player-Pianos, of which the following is a specification.

This invention relates to player pianos or piano-players, and the principal features of our improvements may be briefly summarized as follows:

First: Means communicating movement to the piano action corresponding in practice and effect with the finger key operation of a skilled performer. Second: The disposal of the air chest and valves in the piano bed beneath the finger keys, leaving the tracker board unencumbered, and the piano case interior free from the space-occupying mechanism hitherto therein contained. Third: The utilization of the usual finger key pivot posts as ducts in the system of pneumatic control and actuation. Fourth: The simplification of mechanism, reduction of pneumatic parts to a minimum, and great increase in efficiency of operation.

Our improved method of pneumatic operation for pianos may be briefly referred to as comprising a relay system, wherein a pneumatic column, in which a hollow key pivot is included, is governed by the perforated music sheet, and thereby controls a second pneumatic column, which operates the hammer action through the action-extension or abstract and finger-key.

In the drawings accompanying this application, Figure 1 is a front elevation of a piano showing in dotted lines the air chest in the key board frame, and the connection between said air chest and the bellows. Fig. 2 is a section on the line 2—2 of Fig. 1, showing the hammer-action at rest. Fig. 3 is a similar view, showing the action in operation. Fig. 4 is a plan view being a section on the line 4—4 of Fig. 2, and, Fig. 5 is a vertical section, on the line 5—5 of Fig. 2.

In said figures the reference letter *a* indicates the upright roll box of a piano-player, which board may be of usual character shown as having a tracker-board and rolls and music sheet moving laterally over the tracker-board and rolls. Penetrating said tracker-board is a series of perforations, *a'*, so disposed as to aline, separately, with corresponding rows of the serried apertures

in the music sheet *b*; and said perforations *a'* each communicating with a tube *c* of a series of such tubes, each tube *c* representing service for a separate piano key.

The key board frame *d* or piano bed is provided with an air chest *e* which extends throughout its length, lying beneath the keys. Said chest receives air from the bellows *f* through pipe *g*; or it may be supplied by any other suitable pressure means. Superimposed upon the air chest is a row of valve chambers, as *h*, each separated from the interior of the air chest by a flexible diaphragm *h'*, each said diaphragm carrying a double headed valve *h*². The valve chambers *h* are located intermediate the length of the finger keys, serving as fulcras for the latter; and the key pivots, as *i*, which are made hollow, are mounted in the valve chambers, and connect at their upper ends with the tubes *c*.

Located beneath the rear end of the finger keys are a series of pressure boxes *j*, each with an upper covering flexible diaphragm *j'*, adapted, upon distention, to tilt said key, which latter, in turn, elevates the extension or abstract *k* of the hammer action, operating said action in the same manner as though the key had been struck by the finger of a pianist.

Passages *l* connect the boxes *j* with air chests *e*, the openings of said passages in the air chest being controlled by the valves *h*², in the following manner: Assuming the perforated music sheet to be traveling across the tracker-board, and the air chest *e* carrying a pressure; the air columns, at atmospheric pressure, in the tubes *c*, plus the resistance afforded by the flexible diaphragms *h'*, will prevent the outward flexing of said diaphragms and the consequent unseating of valves *h*² from the passages *l*, when the solid material of the music sheet lies across the orifices *a'*. This condition is represented in Fig. 2. But when, as in Fig. 3, a perforation in the music sheet registers with orifice *a'*, the pressure in tube *c* is relieved, the diaphragm *h'* is distended under the pressure in air chest *e*, the valve *h*² is thereby lifted from the orifice of passage *l*, and the pressure from the air chest passes through said passage *l* into valve chamber *j*, there distending the diaphragm *j'*, and operating the hammer action through the finger key and the extension or abstract *k*. A relief valve, as *m*, is provided in the air

chest, to prevent the pressure therein from becoming excessive. Upon covering the orifice a' , by an imperforate portion of the music sheet, the diaphragm h' , just actuated, resumes its normal condition, while the diaphragm j' is similarly depressed under the influence of the weight of the hammer action. The retroactive power of both diaphragms also plays some part in their return movements. Obviously, regulation of the pressure in the air chest governs the force with which the hammer action is actuated, so that, by a skilful control of the bellows or other source of pressure, the tones produced may be modulated and intensified at will. By-passes e' are provided between the air chest e and valve chamber h , to equalize the pressure on both sides of diaphragm h' , and permit the return of the parts to normal position at times when the orifices a' are closed by the music sheet. Also when it is necessary we may provide suitable exhausts, as j^2 , for the pressure chambers j .

We claim:

1. A player-piano, an air chest therefor and a pressure supply for said air chest, together with a valve chamber, a flexible diaphragm separating said air chest and valve chamber, a by-pass connecting said air chest and valve chamber, a pressure duct between said valve chamber and the tracker-board, a valve chamber having a flexible diaphragm to operate the hammer extension or abstract, a pressure duct between said last named valve chamber and said air chest, and a double acting valve carried by said first named flexible diaphragm operating to open one of said pressure ducts while closing the other.

2. In a player-piano, having keys, a tracker-board, an air chest located beneath the keys, a system of pneumatic tubing between said air chest and tracker-board, and hollow pivots for the keys, said hollow pivots being included in the system of pneumatic tubing.

3. In a player-piano, a piano action, a series of flexible diaphragms disposed beneath and acting upon the rear end of the keys, pneumatic pressure means disposed to distend said diaphragms and move the action extensions or abstracts, an air chest, a tracker-board, separate pneumatic pressure means between said air chest and tracker-board, and valves operated by said last named pressure means, said valves controlling the pressure to said flexible diaphragms.

4. In a player-piano, a key-bed, a tracker-board, a music sheet, an air chest disposed within the piano bed, a source of pressure supply, a series of tubes between said air chest and tracker-board, flexible diaphragms responding to the change of pressure in said tubes in the operation of the music sheet, air chambers with flexible diaphragms directly operating to move the hammer extension or abstract, and passages, governed by said valves, connecting said air chambers and air chest.

5. In a player-piano, an air chest, located within the bed of a piano, beneath the keys, hollow pivots for said keys, a source of pressure supply, a tracker-board, means of pneumatic pressure between said air chest and tracker-board, the pressure path including the hollow pivots, valves operated by said pneumatic pressure means, and separate pneumatic pressure means controlled by said valves for actuating the hammer actions.

6. In a player-piano, having keys, and hollow pivots for said keys, a piano action, a series of flexible diaphragms disposed beneath the rear end of the keys, pneumatic pressure means disposed to distend said diaphragms and move the action extensions or abstracts; an air chest, a tracker-board, separate pneumatic pressure means, including the hollow pivots in their paths, between said air chest and tracker-board, and valves operated by said last named pressure means, said valves controlling the pressure to said flexible diaphragms.

7. In a player-piano, having keys, hollow pivots for said keys, a tracker-board, a music sheet, an air chest disposed within the piano bed, a source of pressure supply, a series of tubes, including said hollow pivots, between said air chest and tracker-board, flexible diaphragms responding to the change of pressure in said tubes in the operation of the music sheet; air chambers with flexible diaphragms to move the hammer extensions or abstracts, and passages governed by said valves, connecting said air chambers and air chest.

Signed at the borough of Manhattan in the city county and State of New York this 22nd day of November A. D. 1910.

LEWIS CASS SMITH.

MARC A. BLUMENBERG.

Witnesses:

F. W. BARKER,

SPENCER T. DRIGGS.