

No. 702,030.

Patented June 10, 1902.

S. K. REYNOLDS.
PNEUMATIC PIANO.

(Application filed Nov. 15, 1900.)

(No Model.)

Fig. 1.

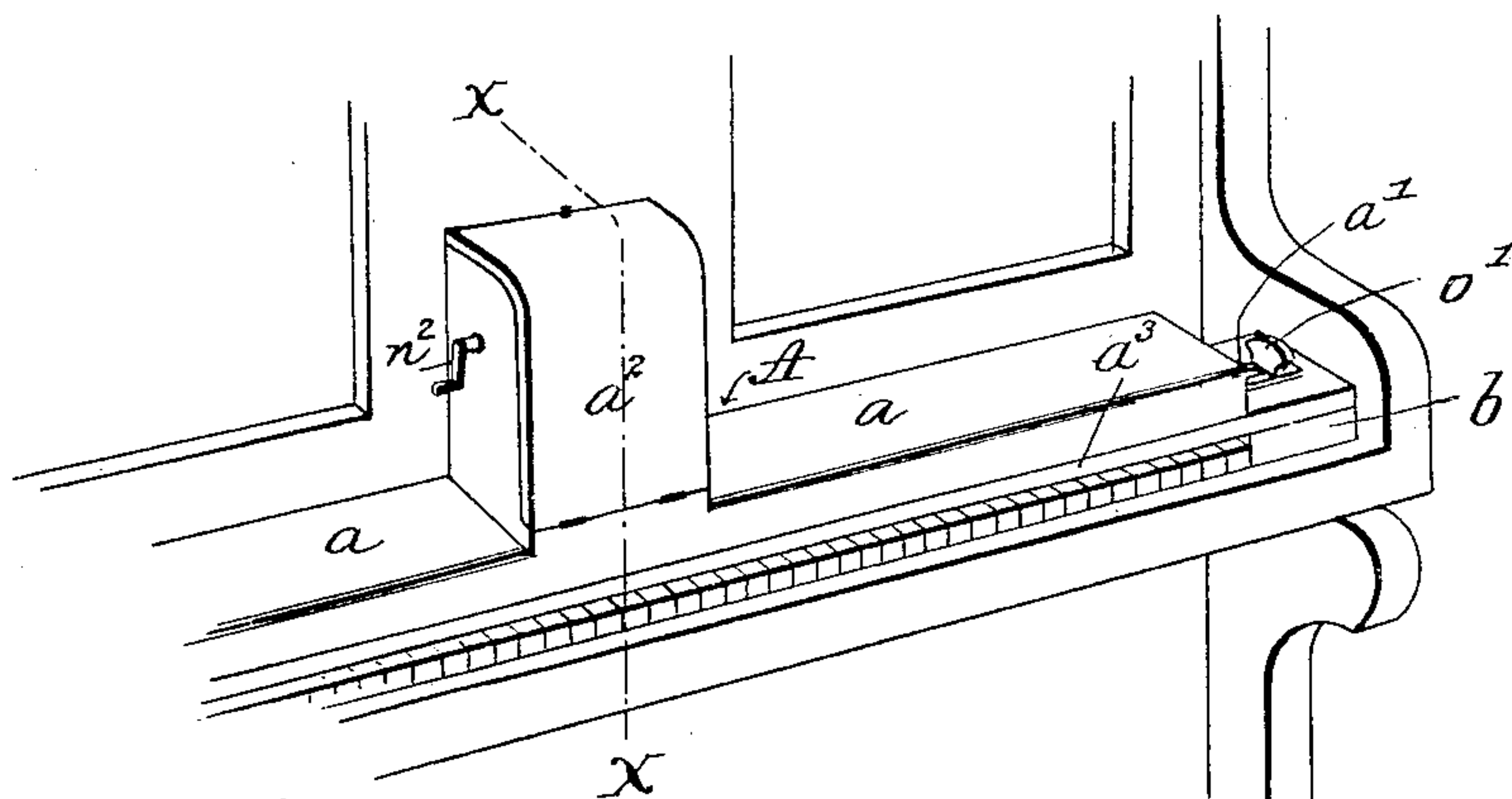
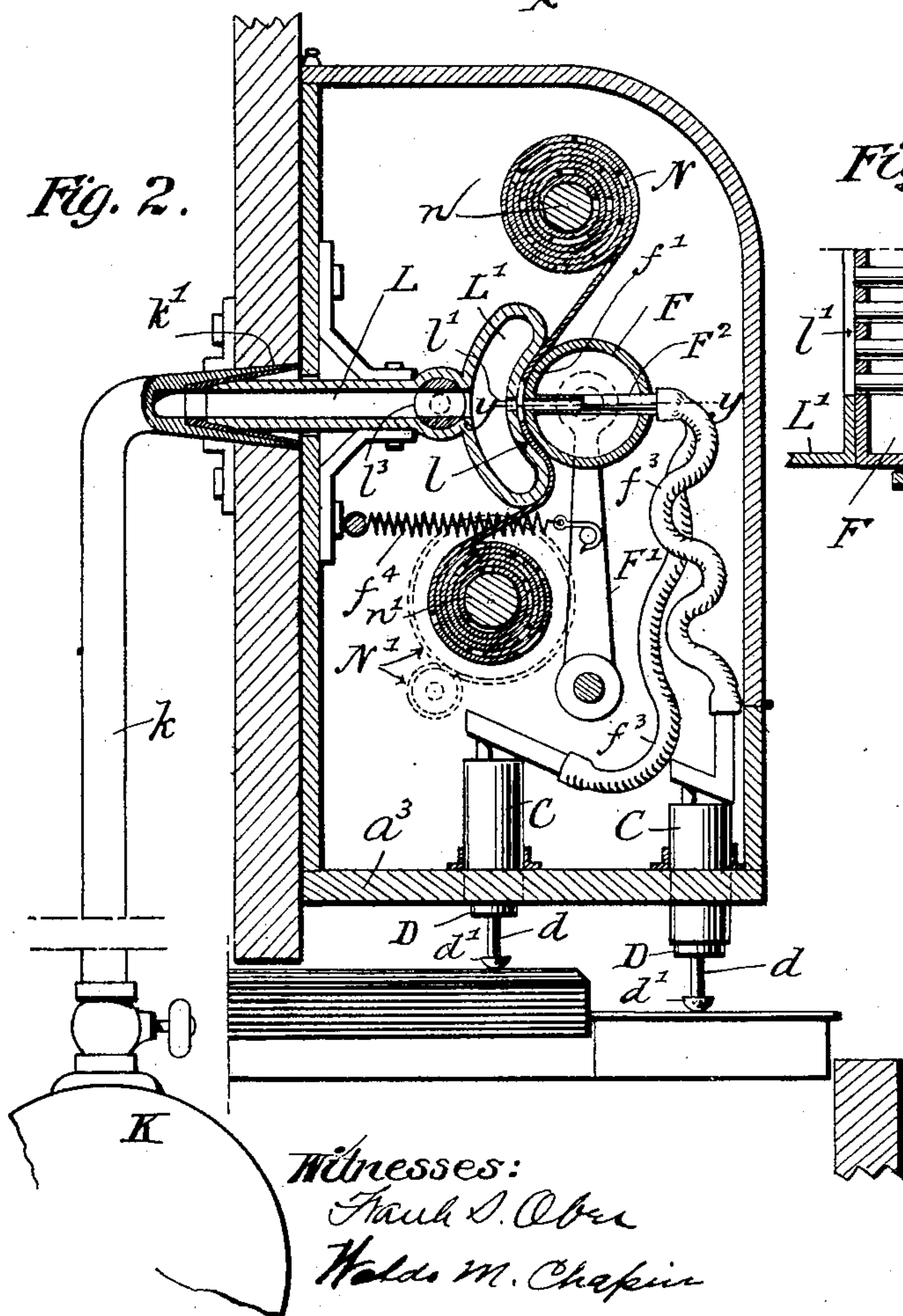
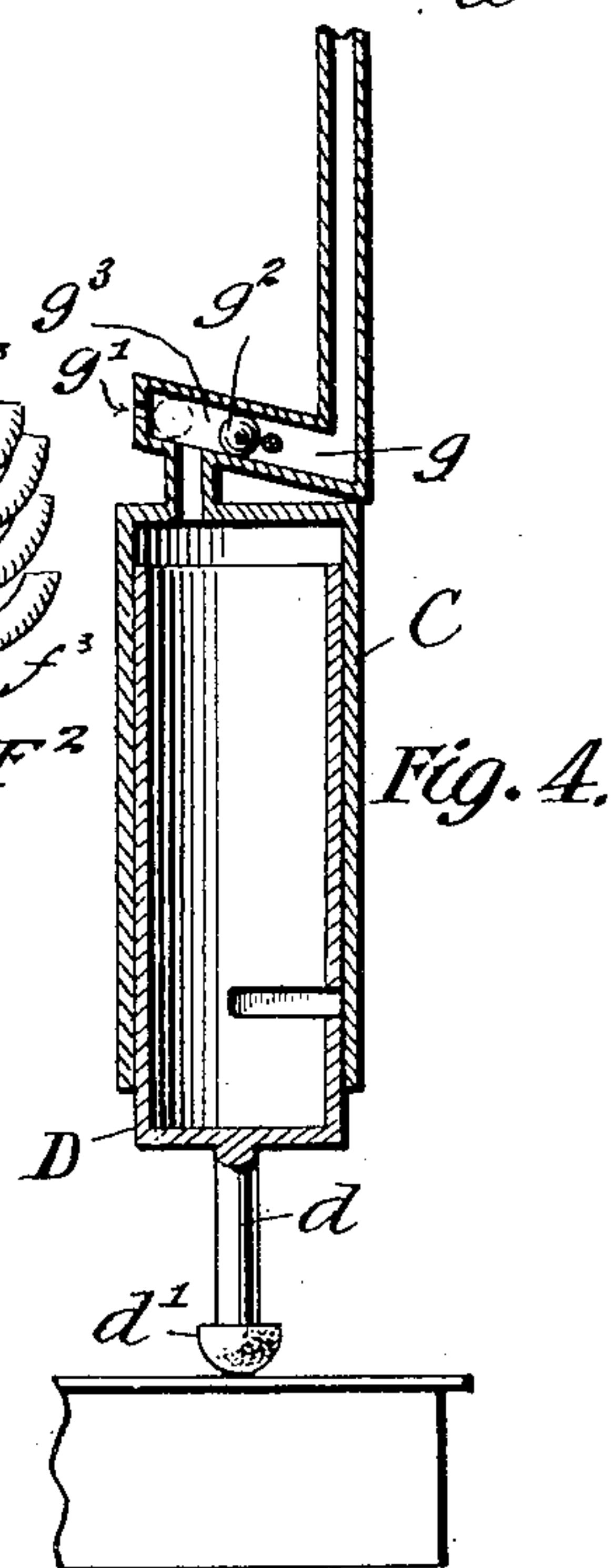
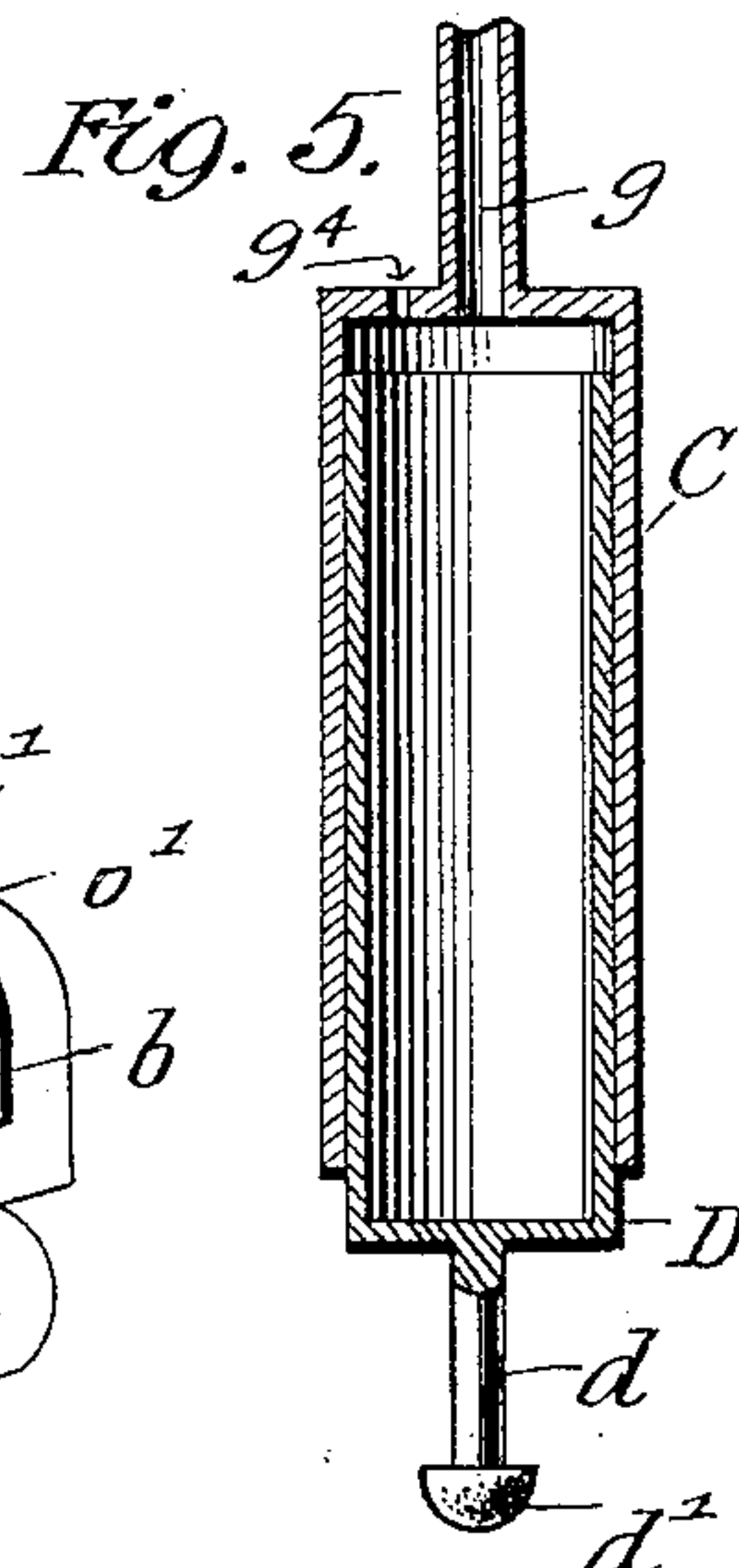
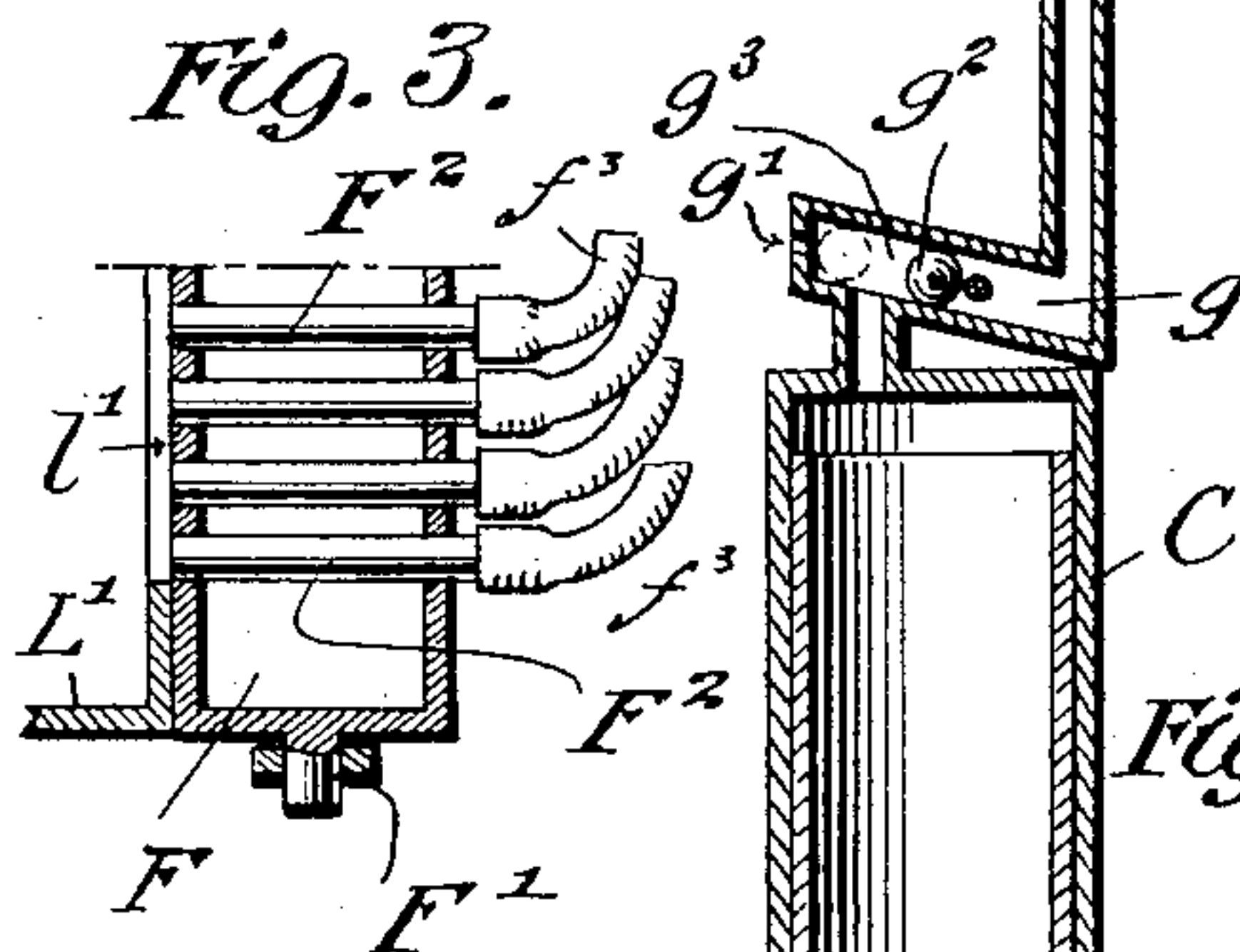


Fig. 2.



Witnesses:
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Fig. 3.



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PNEUMATIC PIANO.

SPECIFICATION forming part of Letters Patent No. 702,030, dated June 10, 1902.

Application filed November 15, 1900. Serial No. 36,555. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN K. REYNOLDS, a citizen of the United States, residing at the city of New York, in the borough of Manhattan and State of New York, have invented certain new and useful Improvements in Pneumatic Pianos, of which the following is a full, clear, and exact description.

This invention relates to automatic musical instruments with special reference to pianos, the object being to produce simple pneumatically-operable apparatus which may be contained within small compass and adapted to be readily attached to and detached from the keyboard of a piano and which shall not necessitate important changes, if any, in the piano itself or impair its effectiveness as a manually-operative instrument.

A further object is to imitate the action of the human finger in operating the keys, which I accomplish by locating the key-depressing devices directly over the keys, near the ends thereof, and causing the same to move in a vertical direction.

The key-depressing mechanism consists of a series of cylinders supported above the keyboard in two rows, one for the white keys and one for the black, there being a cylinder for each key and each cylinder containing an air-operative plunger, having a downwardly-projecting stem, which rests directly upon the upper surface of its respective key. The plungers are depressed by a pressure of air admitted to the cylinders, and since said pressure is directly transmitted to the piano-keys instead of passing through various links and levers the slightest variations in the volume of air admitted to the cylinder will produce corresponding modulations of the sound produced. I am therefore able to obtain by a simple valve arrangement a delicate control of "expression," which is a still further object of my invention. The plungers, it should be understood, are not mechanically connected with the keys, but simply rest upon the same, being light enough to be supported thereby in their normal elevated position. After being depressed by the air they will be returned to normal position by the same force which returns the key.

A complete understanding of the invention

may be had by reference to the accompanying drawings, in which—

Figure 1 is a perspective view of one end of a piano, showing my invention applied thereto. Fig. 2 is a sectional view, enlarged, taken along line *xx* of Fig. 1. Fig. 3 is a detail sectional view of a portion of Fig. 2, taken along line *yy*. Fig. 4 is a sectional detail of a key-actuating device, and Fig. 5 is a modified form of a key-actuating device.

Referring to the drawings by letter, A represents a frame consisting of a flat elongated casing *a* and the comparatively narrow superstructure *a*², preferably located in the middle of the frame. The bottom board *a*³ of the frame is somewhat longer than the keyboard and rests upon the usual spacing-blocks *b* at each end of the row of keys. To hold the frame steadily in place, the blocks *b* may be provided with buttons *b*¹, adapted to pass through slots *a*¹ in the projecting ends of the bottom board of the frame and then given a quarter-turn. Upon or in the bottom board of the frame are mounted two rows of cylinders C, one for the white keys and one for the black, one cylinder being placed centrally above each key and with its axis at right angles to the key. The cylinders are closed at their upper ends and are each fitted with a plunger D, which is also preferably a cylinder closed at its lower end. These plungers carry downwardly-projecting stems *d*, provided with heads *d*¹, of felt or soft rubber, which rest directly upon the keys. Each cylinder C is further provided with an air-inlet *g* and an air-outlet *g*¹ and preferably with an automatic valve of suitable construction. A simple form of such valve is shown in Fig. 4 and consists of a loose ball *g*², located in the transverse passage *g*³ and normally occupying the position shown in full lines, the floor of said passage being slightly inclined, as shown. Passage *g*³ connects with or is a part of the air-inlet *g*, so that a flow of air through said passage toward the cylinder will force the ball *g*² from its normal position to the position shown in dotted lines, where, as indicated, it will close the outlet *g*¹, located at the end of the passage. When the supply of air is checked, the ball will return to normal position by gravity, opening the outlet *g*¹ for

the free escape of the air in the cylinder and allowing the plunger to be raised by the key without resistance. In some instances a valve may be found unnecessary, a simple outlet-valve, as indicated at g^2 in Fig. 5, taking its place.

The mechanism which controls the admission of air to the cylinders is inclosed within the superstructure a^2 , before referred to.

10 K represents the source of air-supply, and k the pipe leading therefrom to the front panel of the piano, where it will be provided with a flaring mouth k' , having a lining of soft rubber or other suitable packing material. Preferably pipe k will be concealed within the frame of the piano, the flaring mouth k' only being visible.

L is a pipe projecting through the back board of the superstructure a^2 and having a conical end, which when frame A is in operative position will fit snugly within the mouth k' . The inner end of pipe L connects with a chamber L' , which is provided with an outer concave surface l , having a slit or air-outlet l' . This pipe is also provided with a valve l^3 , controllable from the outside of the superstructure a' by a handle n^2 .

F is a frame carried by the pivoted arms F' and having a convex surface f' , corresponding to and adapted to stand in parallel relation with the concave surface l . The frame is also provided with a series of separate air-tubes F^2 , there being as many such tubes as there are cylinders C and each tube being connected by a flexible tube f^3 with its corresponding cylinder. The ends of the tube F^2 open to the slit l' . A spring f^4 tends to hold frame F in contact with or in a position closely adjacent to the chamber L, but is adapted to be readily disengaged when desired and the frame F swung outwardly clear of said chamber.

N represents the usual perforated music-sheet commonly employed in instruments of this character, and N' a suitable motor for driving the same. The sheet will be drawn from roller n to roller n' , passing between

and in contact with the curved surfaces l and f aforesaid, opening and closing communication between the chamber L' and the air-passages F^2 , according to the arrangement of the perforations in said sheet. The unperforated portions of the music-sheet bar the entrance of air from chamber L' to the tubes F^2 , while the perforations in the sheet permit the air to flow to the respective cylinders while they are passing the open-ended tubes F^2 . The pressure of air passing into a cylinder forces its piston downward, and the key is depressed. If the pressure is prolonged, the tone is sustained correspondingly, and the instant the source of pressure is cut off the air escapes and permits the key to return to its normal position. By the aid of the valve l^3 the pressure admitted to the chamber can be controlled, with the result that the stroke on the keys is varied and expression in the music obtained.

Having described my invention, I claim—

1. In a pneumatically-operated keyboard instrument, the combination of an air-chamber having a perforated wall, a series of tubes opening against said perforated wall, a series of air-cylinders connected with the respective tubes and a perforated sheet adapted to pass between the ends of the tubes and the perforated wall, substantially as described.

2. In a pneumatically-operated keyboard instrument, the combination of an air-chamber having a perforated wall, a series of tubes opening against said perforated wall, a series of air-cylinders connected with the respective tubes, a pivoted frame supporting the ends of said tubes, means for forcing said frame toward said wall and a perforated sheet adapted to pass between the ends of the tubes and the wall, substantially as described.

In witness whereof I subscribe my signature in presence of two witnesses.

STEPHEN K. REYNOLDS.

Witnesses:

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