A. NORDEEN.

PNEUMATIC PIANO.

APPLICATION FILED JAN. 20, 1908.

916,765. Patented Mar. 30, 1909.

3 SHEETS—SHEET 1.

Fig-1-

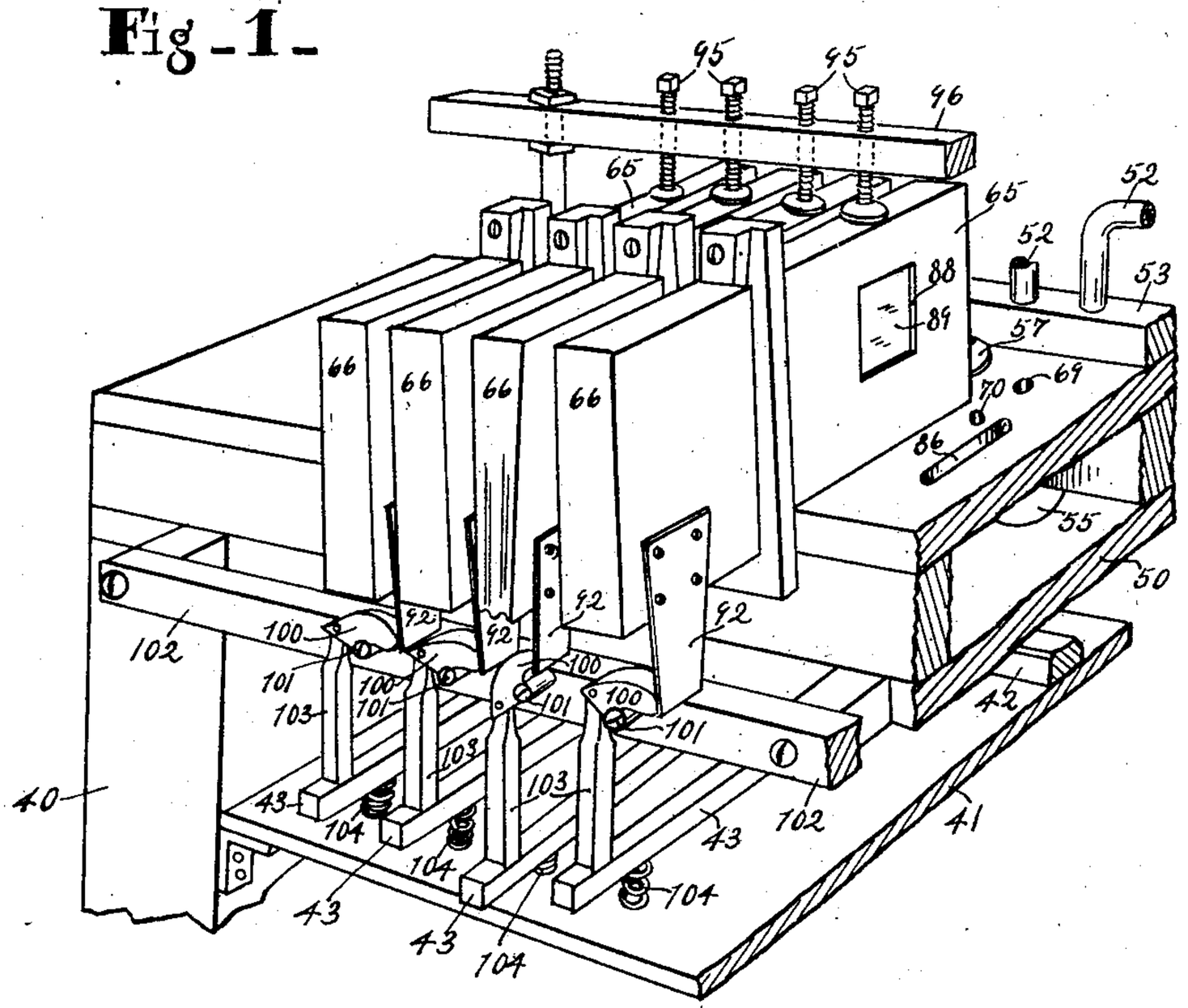
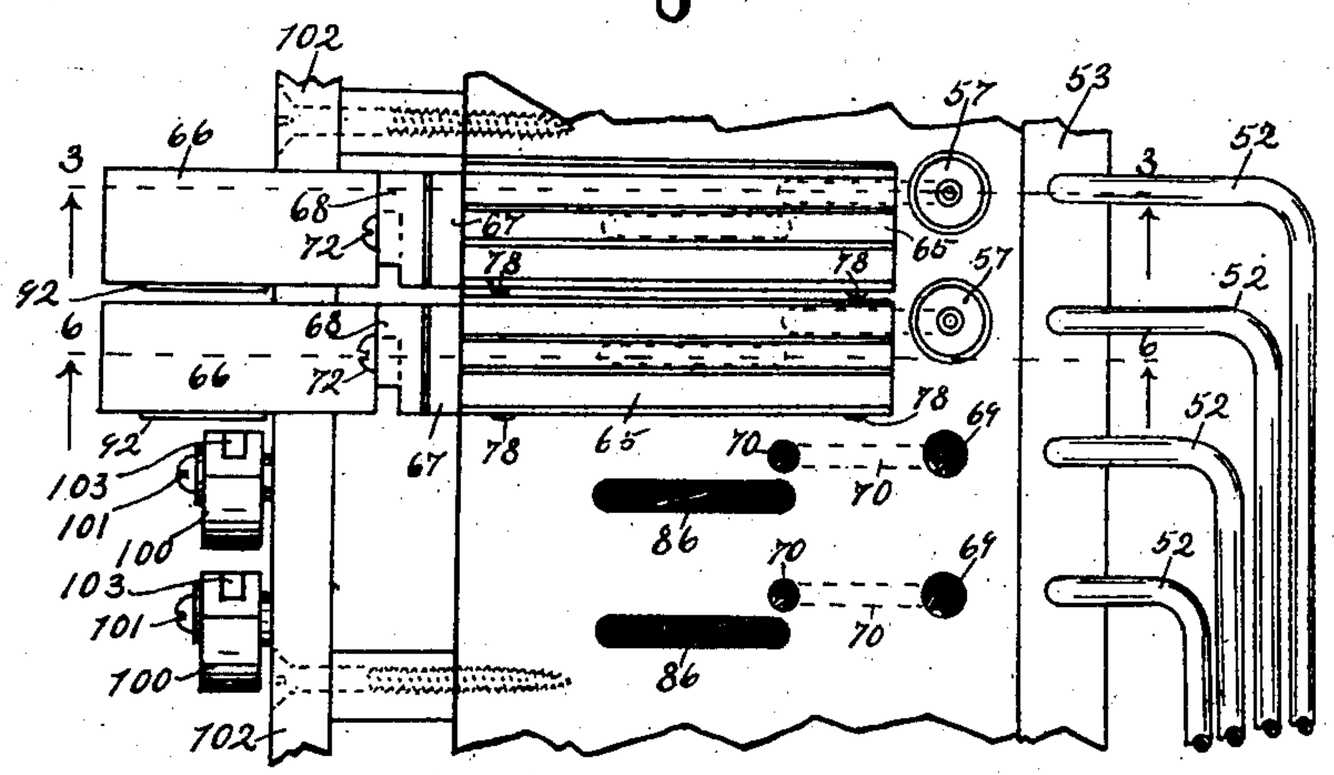


Fig-2-



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3 SHEETS—SHEET 2.

Fig - 3 -

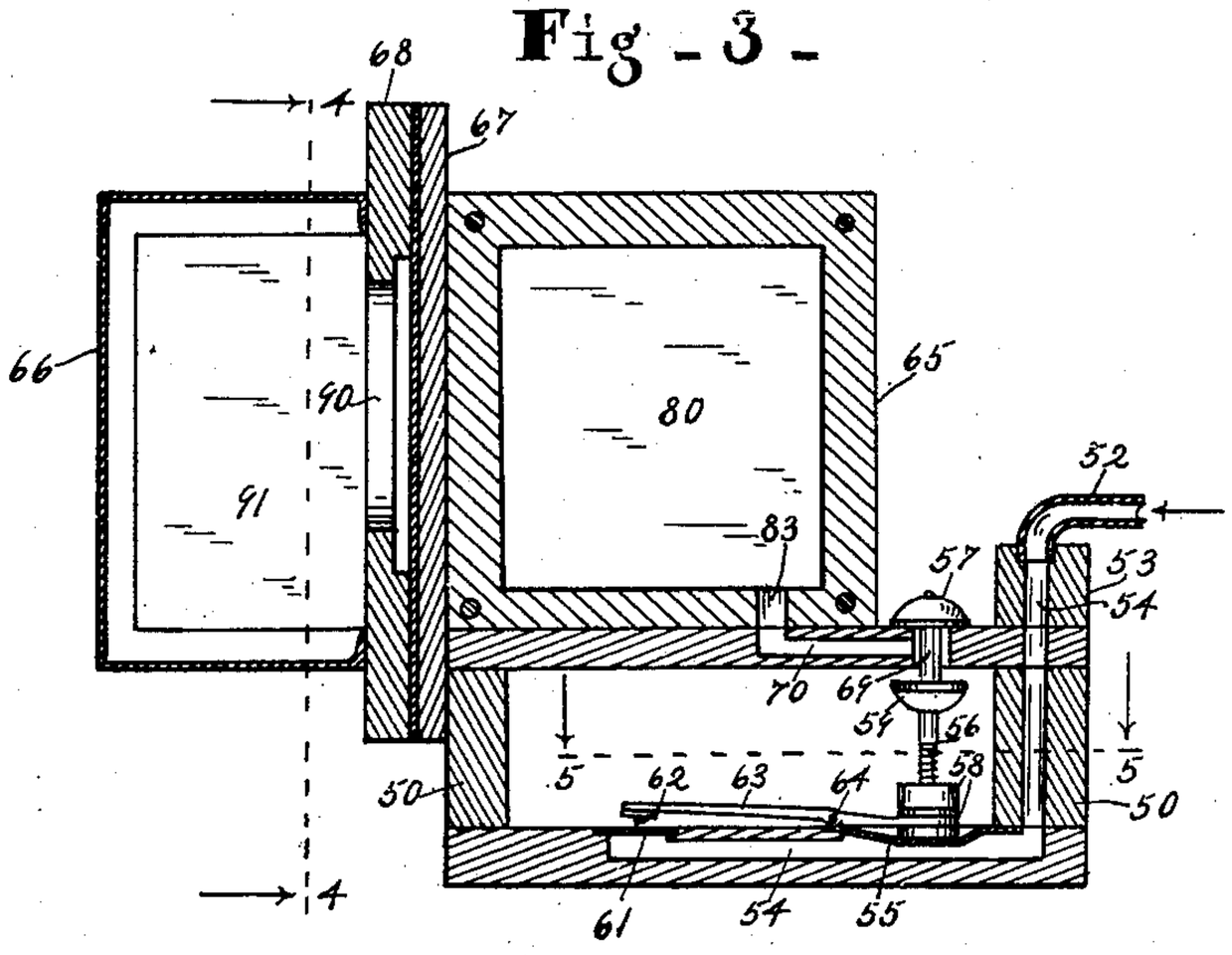


Fig - 4 -

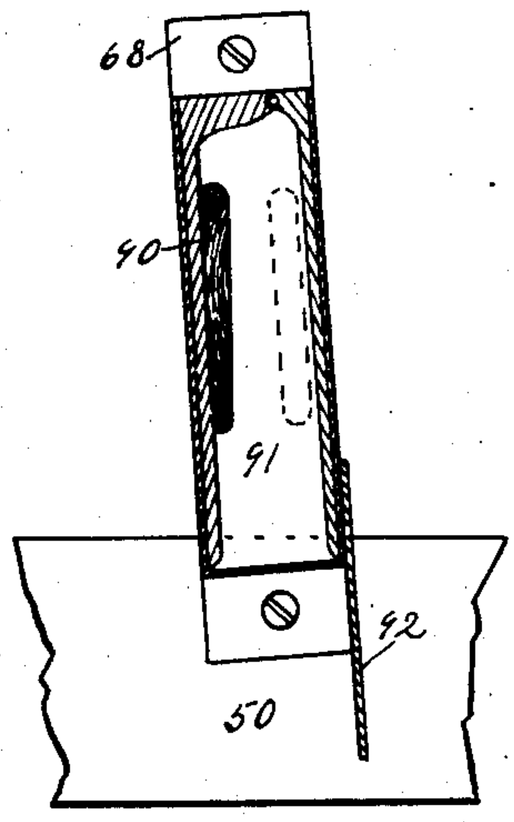
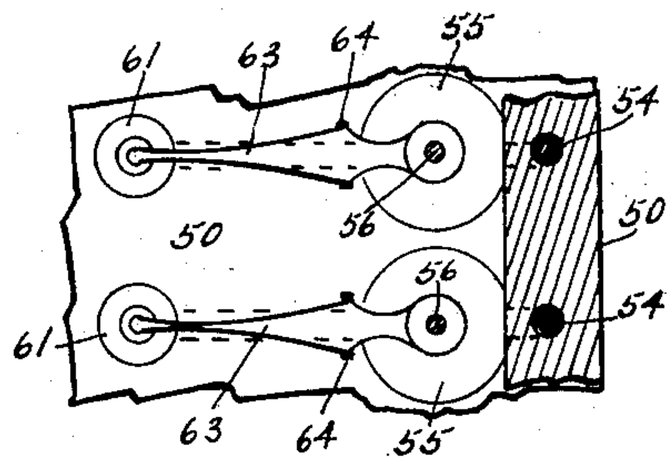


Fig - 5 -



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3 SHEETS—SHEET 3.

Fig-6-

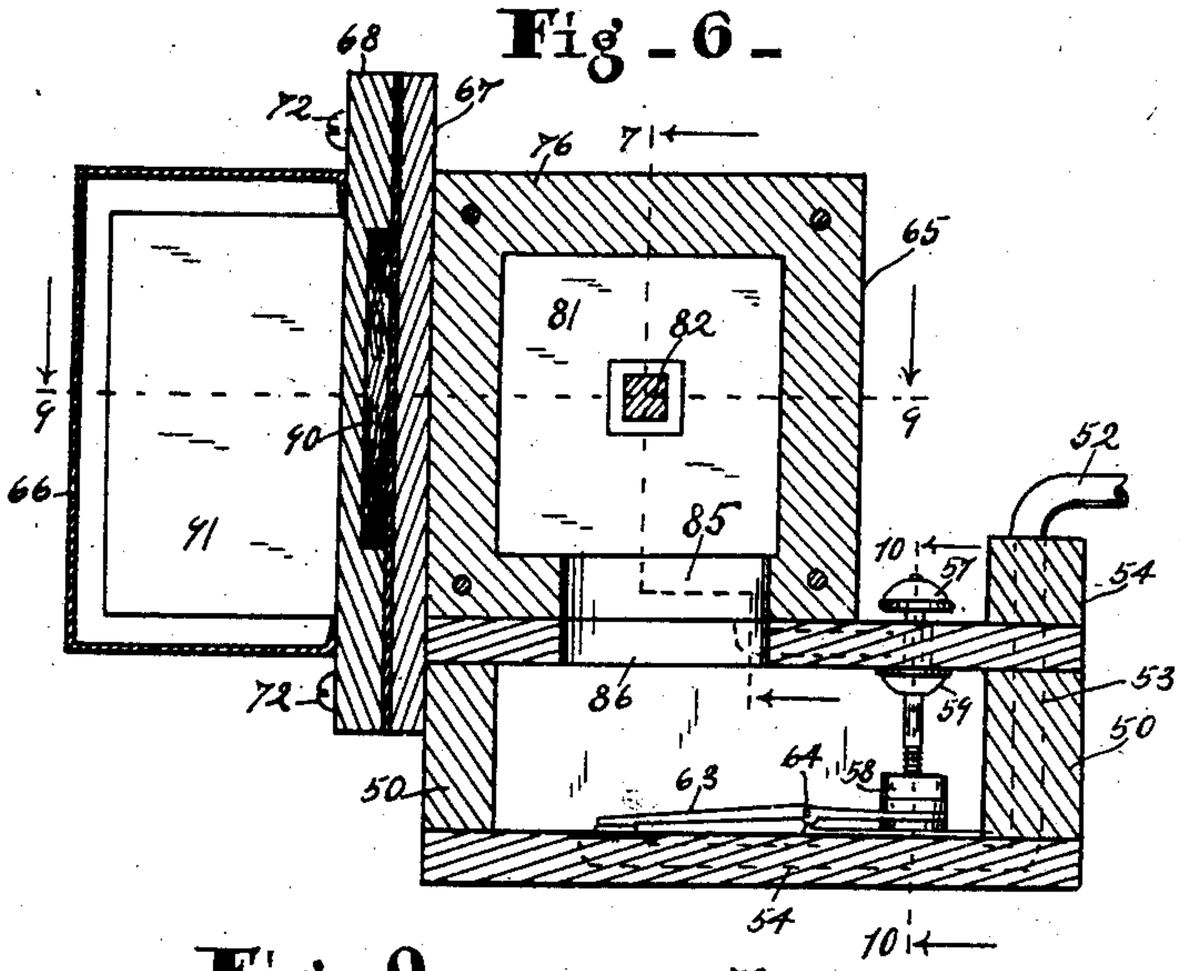


Fig-7-

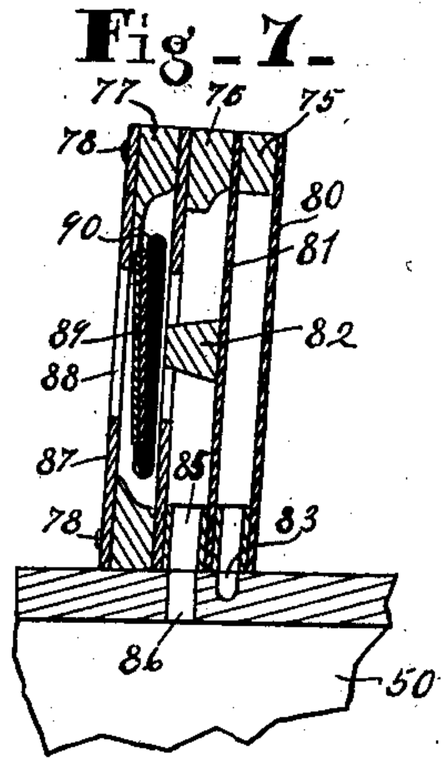


Fig-8-

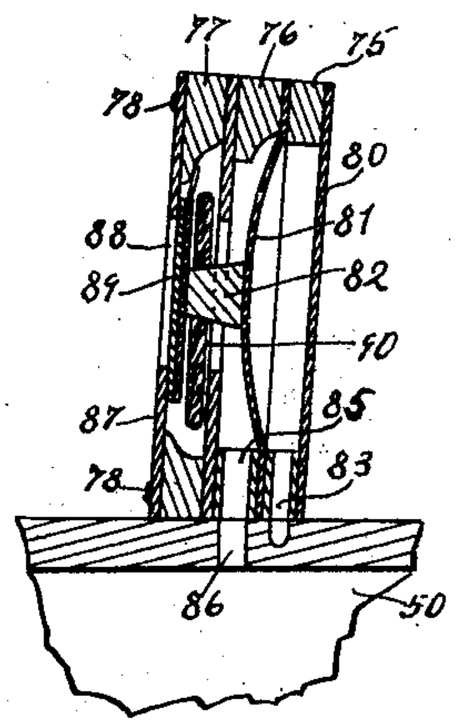


Fig-9-

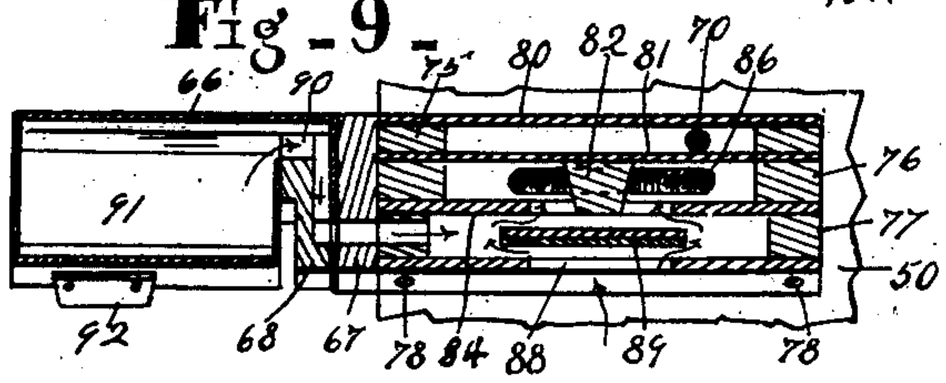
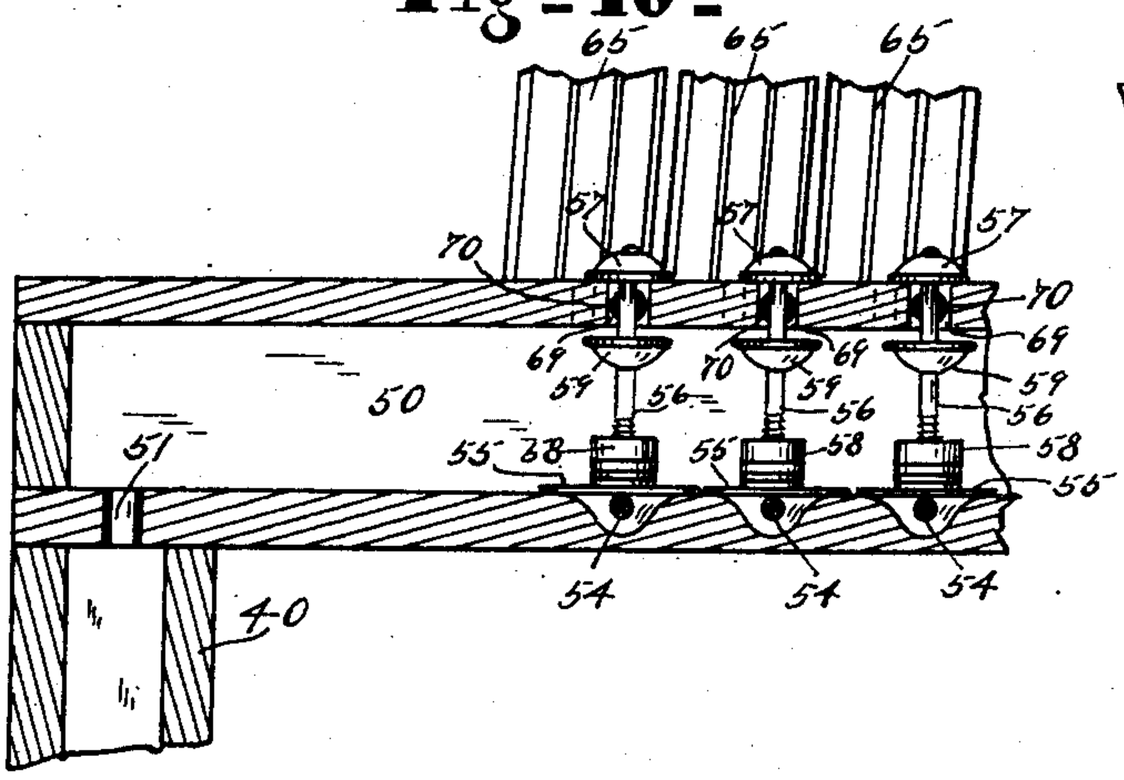


Fig-10-



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UNITED STATES PATENT OFFICE.

AUGUST NORDEEN, OF NEWCASTLE, INDIANA, ASSIGNOR TO RAY PIANO COMPANY, OF NEWCASTLE, INDIANA, A COPARTNERSHIP.

PNEUMATIC PIANO.

No. 916,765. Specification of Letters Patent. Patented March 30, 1909.

Original application filed October 31, 1907, Serial No. 400,074. Divided and this application filed January 20, 1908. Serial No. 411,684.

To all whom it may concern:

Be it known that I, AUGUST NORDEEN, of Newcastle, county of Henry, and State of Indiana, have invented a certain new and useful Pneumatic Piano; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like numerals refer to like parts.

This is a division from an application for "pneumatic piano", filed by me October 31, 1907, Serial No. 400,074.

The object of this invention is to improve the construction and arrangement of the individual pneumatic elements in a pneumatic piano, whereby all of the pneumatic elements in the piano can be placed in a single row, if desired, and the pneumatic element will have other novel advantages and features of operation. To this end the pneumatic element is upended and made very narrow, no thicker than the corresponding piano key and the movable member of the power pneumatic or bellows is arranged at a slight inclination from the vertical so that the lower end will operate laterally and through suitable intermediate means operate the pneumatic key the secondary valve being moved by gravity.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

In the drawings Figure 1 is a perspective view of a portion of a pneumatic mechanism in a piano including my present invention, some parts being broken away and other parts omitted. Fig. 2 is a plan view of a portion of the air chamber and tracker board tubes with two of the pneumatic elements in place, parts being broken away. Fig. 3 is a vertical transverse section through the air chamber and a pneumatic element on the line 3—3 of Fig. 2. Fig. 4 is a vertical section on the line 4—4 of Fig. 3, extending entirely through a power pneumatic. Fig. 5 is a horizontal section on the line 5—5 of Fig. 3. Fig. 6 is a section through the parts shown in Fig. 3 along the line 6—6 of Fig. 2. Fig. 7 is a vertical section through a main pneumatic in the upper part of the air chamber on the line 7—7 of Fig. 6, showing the secondary diaphragm in open position. Fig. 8 is the same with the secondary diaphragm closed or in closing position. Fig. 9 is a horizontal section through a pneumatic element on the line 9—9 of Fig. 6. Fig. 10 is a vertical longitudinal section through the right hand end of the air chamber, showing three valves and the lower part of the three main pneumatics, on the line 10—10 of Fig. 6.

In the particular construction exhibited in the drawings forming a part hereof for the purpose of explaining the general nature of my said invention, the piano is provided with suitable strings and action for operating them when the action is actuated by the ordinary finger keys or by pneumatic levers 43, so arranged in one row or bank, resembling in arrangement and operation the regular finger keys of a piano. The pneumatic levers are fulcrumed between their ends on a rail 42 mounted on the transverse key bed 41. The pneumatic means for operating said pneumatic levers 43 will now be described. There is an exhaust chamber 50 extending transversely of the entire instrument with an exhaust port 51 at the right hand end of the instrument, as shown in Fig. 10, through which air passes from the reservoir 40, as exhausted by any suitable bellows or other mechanism that is located in the lower part of the piano and which is not here shown, as this construction may be the same as in any other instrument of this kind. This air chamber, as shown in Fig. 1, is mounted on the reservoirs 40 over the pneumatic levers 43 and in front of the stickers of the piano action. Air tubes 52 lead through vertical apertures in the cross-strip 53 upon the rear portion of the top of the air chamber 50, as seen in Fig. 3. As in all other pneumatic instruments, there is one air tube 52 for each key of the piano, and through them air passes through the passage way 54 that extends down through the strips 53 and the rear wall of the air chamber 50, and along the bottom of the air chamber 50. The air thus entering elevates or actuates the primary diaphragm or pouch 55 that covers an opening or hole in the bottom of the air chamber 50 and which separates the air passageway 54 from the interior of the air chamber 50. Upon said diaphragm or pouch 55 the stem 56 of the primary valve 57 is supported by the blocks or disks 58, and on said stem there is a second valve 59. The upper part of the valve stem 56 passes through a vertical hole

69 in the top of the air chamber 50, and the valves 57 and 59 are spaced apart so that when they are in their downmost positions, the primary valve 57 will close the hole 69 from the outside air, and when said valve is in its uppermost position, outside air will be admitted, and at that time the second valve below will close the hole or passageway 69 from the air chamber 50 into said hole 69. The hole 69 is connected with the passageway 70, which will hereafter be explained.

As seen in Fig. 3, the air passageway 54 is extended forward in the bottom of the air chamber 50 under a second small pouch or diaphragm 61, which has a bleed hole in it, and that bleed hole is cleaned by the point 62 on lever 63 that is fulcrumed at 64 and is held between the two blocks 58 so that it will be actuated when the diaphragm 55 is actuated to keep the bleed hole clean.

There are in the instrument as many constructions, valves and passageways, such as are described in the preceding paragraph, as there are keys in the piano, and for each set of said valves and passageways, there is a pneumatic element composed of a main pneumatic 65, a power pneumatic 66 and their intermediate connecting plates 67 and 68, which are secured together by the screws 72. These parts, constituting one pneumatic element, are vertically disposed on the top of the air chamber 50 over the corresponding finger key, and are very narrow as compared with pneumatics heretofore employed in similar instruments, the width never exceeding the width of a finger key on the piano, so that all the pneumatic elements can be arranged in one horizontal row or bank, as indicated in Fig. 2, where only a few are shown, corresponding exactly with a single row or bank of finger keys. In order to accomplish this advantage, the movable parts in these pneumatic elements are moved or operated laterally instead of vertically as heretofore. Each pneumatic element is mounted independently of the other on the air chamber 50 and held in place by the downward pressure upon their tops of the screw bolts 95 which are vertically adjustable in a cross-bar 96. This bar 96 extends entirely across the piano, and there is one of the screws 95 for each pneumatic element. Therefore, said pneumatic elements are separately removable for repairing or replacing.

Each main pneumatic consists, as seen in Figs. 7, 8 and 9, of three parts or members 75, 76 and 77 secured together. They are thin wooden frames, the middle one 76 being rigidly secured to the plate 67 and the other two being secured on each side of the middle, all being fastened together by screws 78 that pass through the three parts. The part 75 of the main pneumatic consists essentially of a rectangular frame with a large central opening, as shown in Fig. 7 and on the outside of the frame there is a flexible air-proof covering 80, and on the inside of the frame there is a secondary pouch or diaphragm 81 formed of leather or similar flexible material and carrying on its center the block 82. These parts form a chamber, as shown in Fig. 7, and into it the opening or port 83 through the bottom leads from the air passageway 70, see Figs. 3 and 7. The middle member 76 of the main pneumatic is likewise a rectangular frame with a rigid plate 84 on one side thereof, said plate being centrally perforated to permit the block 82 to extend and operate through it. There is an elongated opening 85 in the lower part of the member 76 that registers with an elongated opening 86 in the top of the air chamber 80. The other member 77 of the main pneumatic is a rectangular frame with a rigid plate 87 on the outside thereof with a central opening 88 that is closed by the secondary valve 89. This secondary valve is a flat valve suspended at the top within the member 77 and hanging on the inside of the opening 88.

The main pneumatic has its lower surface slightly beveled preferably as in Fig. 7, that is not at an exact angle to the sides thereof, so that when mounted, it will lean slightly toward the left when viewed from the front, as in Fig. 7, the purpose of this leaning position being to enable gravity to hold the valve 89 normally open or away from port 88. The purpose of the secondary pouch or diaphragm 81 and block 82 is to hold said stationary valve 89 positively closed, as shown in Fig. 8, when the air enters the chamber in the member 75 of the main pneumatic. There is a passageway 90 at the front end of the member 77 of the main pneumatic, see Fig. 9, that passes on through the members 67 and 68 into the power pneumatic 66. The power pneumatic consists of a stationary portion and a vertically disposed flexible portion 91 hinged at the top with the lower end free for lateral movement, said power pneumatic being practically a bellows with the operating end extending downwardly, and on its lower end there is a projecting plate 92 that, when the bellows is collapsed, engages the rocker 100 pivoted at 101 to a bar 102 carried on the front side of the air chamber 50 and parallel therewith. The movement of the rocker 100 forces the push rod 103 downwardly, and thus the lever 43 is actuated, said lever being held in its normal position by a spring 104.

In operative position the power pneumatic or bellows is expanded by reason of its communication with the passageway 90 and the atmosphere, when the opening 88 is opened by the secondary valve 89, as appears in Fig. 7. When, air passes through the tracker board 200, in the well-known way, operating the primary valve 57, letting air from the passageway 70 into the chamber

in port 75 in the main pneumatic, and moving the secondary pouch or diaphragm 81, as shown in Fig. 8, to forcibly close the secondary 89, as shown therein, so that the suction acts through the slots 86 in the top of the air chamber 50, slot 85 in the middle member 76, and passage 90 in member 77, see Figs. 8 and 9 to exhaust the bellows or power pneumatic 66 and cause the actuation of the pneumatic 43.

When the opening in the tracker board is closed and no air passes through the tube 52, the primary valve 57 closes to the position shown in Fig. 3 and the exhaust acting on both sides of the secondary diaphragm 81 permits it to resume its normal position, as shown in Fig. 7, and release the secondary valve 89, which permits the air on the outside, through the port 88, to again enter the bellows and expand it.

What I claim as my invention and desire to secure by Letters Patent is:

A pneumatic piano including a main pneumatic mounted at a slight inclination from a vertical line, a secondary valve in said pneumatic that is held by gravity in an open position, and a diaphragm therein for closing said valve.

In witness whereof, I have hereunto affixed my signature in the presence of the witnesses herein named.

AUGUST NORDEEN.

Witnesses:
NELS MAGNUSON,
W. G. BETZ.