A. G. GULBRANSEN.

PNEUMATICALLY OPERATED PIANO.

APPLICATION FILED MAR. 20, 1909.

944,033.

Patented Dec. 21, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

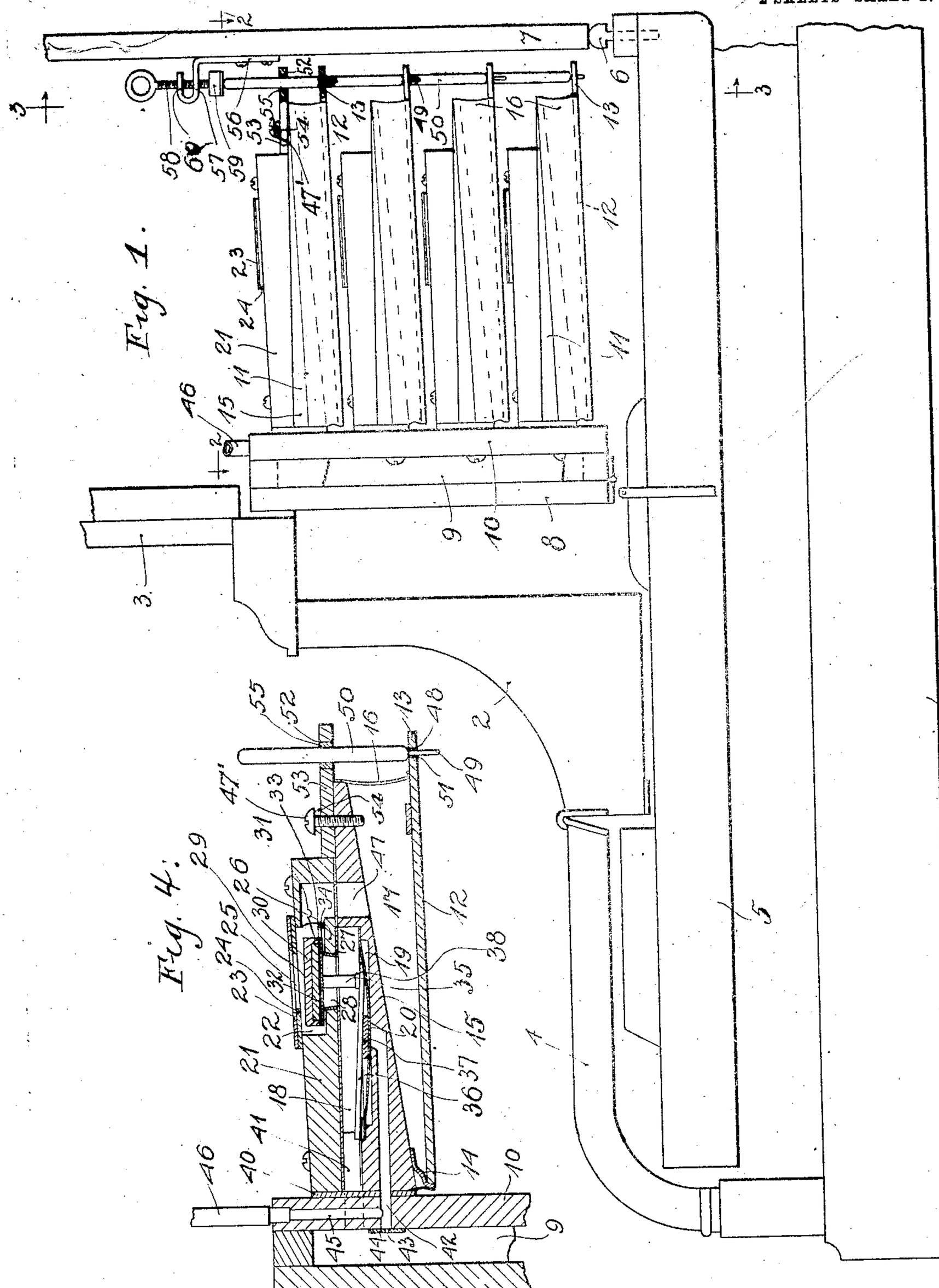

Fig. 4.

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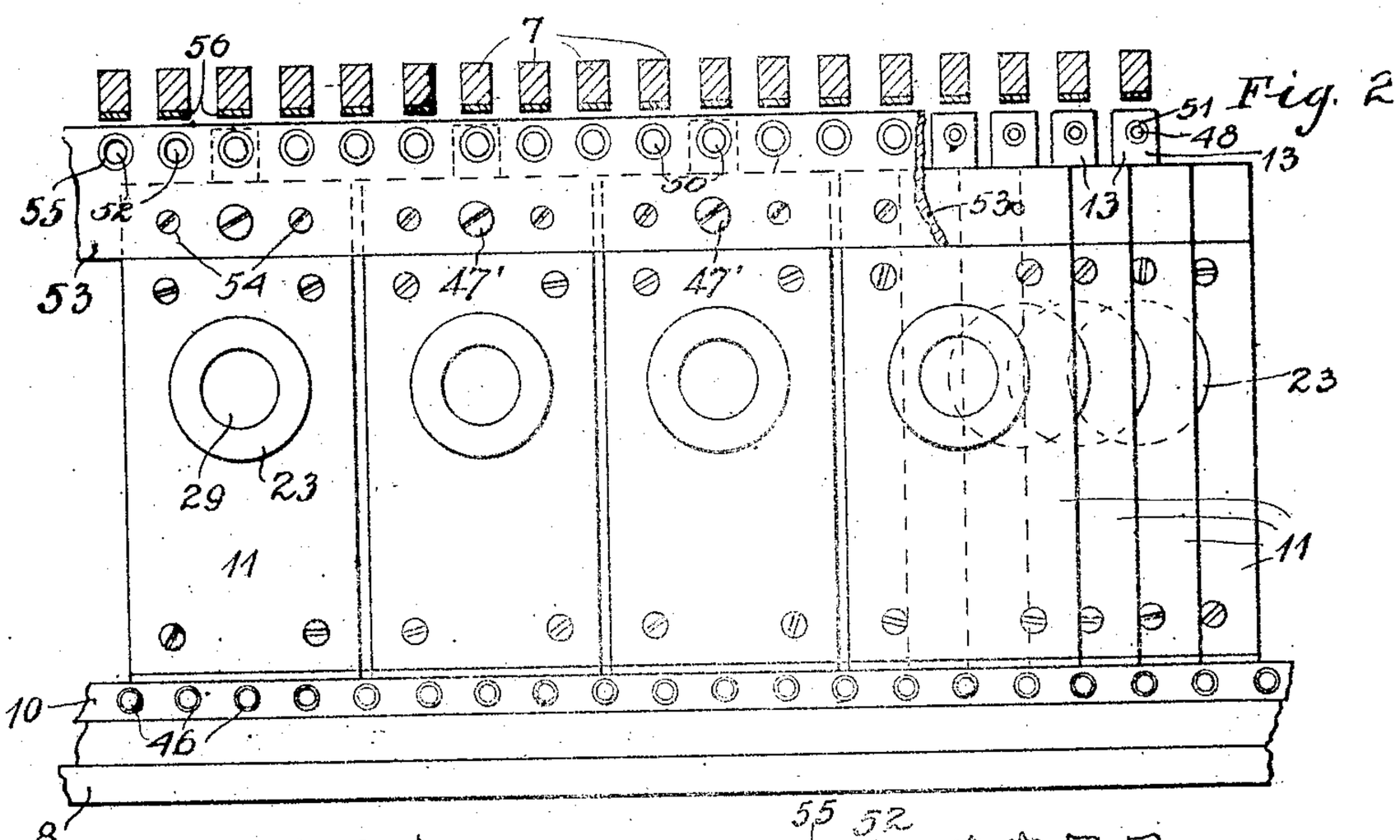
2 SHEETS—SHEET 2.

Fig. 2



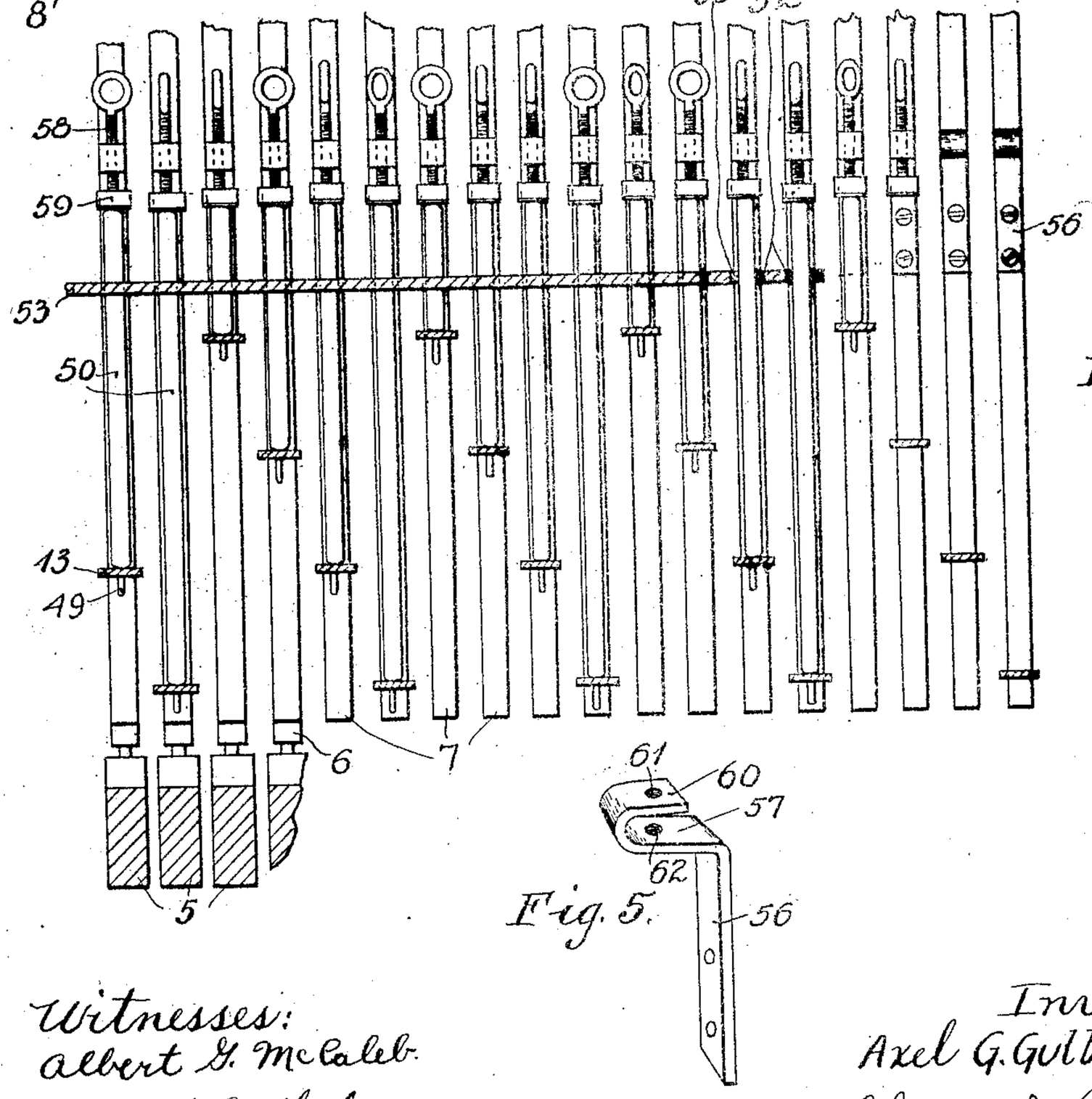


Fig. 3.

Fig. 5.

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UNITED STATES PATENT OFFICE.

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PNEUMATICALLY-OPERATED PIANO.

944,033. Specification of Letters Patent. Patented Dec. 21, 1909.

Application filed March 20, 1909. Serial No. 484,633.

To all whom it may concern:

Be it known that I, AXEL G. GULBRANSEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Pneumatically-Operated Pianos, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to pneumatically operated pianos and its object is to provide improved and more efficient arrangement, particularly in the association of the actuating mechanism with the striking mechanism of the piano.

In the arrangement to which my invention is applied the pneumatic actuating units are disposed in horizontal rows just above the rear ends of the piano keys and directly in front of the lower ends of the piano abstract rods, and my invention resides particularly in the manner of connecting the units with the abstract rods. In my Patent No. 874675 issued Dec. 4, 1907, the movable members of the units engage directly with adjustable abutment pieces secured to the abstract rods, but the units must be more or less disturbed before the abutment pieces can be secured in final adjusted position. In my present invention the arrangement is such that the units can be primarily arranged in position and all adjusting of the abutment and connecting mechanism made without in any way disturbing this primary arrangement, and readjustment can be readily made at any time from the front of the piano without in the least moving or displacing the actuating units. To accomplish the above features, I secure abutment members of improved construction in a horizontal row well above the top row of units, which members are engaged by pitman rods extending upwardly from the movable members of the units and which are entirely supported by the units. These abutment members are readily accessible from the front of the piano by merely removing the front board of the piano. Adjusfment can therefore be made primarily, or thereafter, without disturbing the units which can be placed in their permanent position when primarily installed.

Referring to the accompanying drawings which illustrate my invention Figure 1 shows the end of the keyboard section of a piano, with end wall removed, the pneumatic actuating units being shown in position and the connecting mechanism between them and the abstract rods illustrated, Fig. 2 is a top view taken from plane 2—2 Fig. 1, Fig. 3 is a front view taken from plane 3—3 Fig. 1, Fig. 4 is a section view taken on a vertical plane passing through the middle of a unit and part of the supporting frame, and Fig. 5 is a perspective view of that part of the abutment mechanism which is secured to the abstract rods.

The piano frame section shown comprises the key shelf 1, the front frame 2, the front panel 3, and the cover 4. The piano keys 5 are pivoted on the shelf in the well known manner, their rear ends supporting pins 6 which engage with the lower ends of the piano abstract rods 7, extending upwardly and terminating in string striking mechanism, which it is not necessary to show.

Suitably supported in vertical position from the piano frame and extending horizontally just above the keys and to the rear of the front frame 2 is the frame 8, forming a vacuum chamber 9. Secured to and extending rearwardly from the rear wall 10 of this chamber are the actuating units 11, whose movable members 12 terminate in extensions or shelves 13. The construction of the units is best shown in Fig. 4. The movable member 12 is hinged at 14 to the main block 15 and flexible fabric 16 is secured to the sides and rear ends of the block and member 12 to form a bellows compartment 17. The block is recessed to form the upper and lower diaphragm chambers 18 and 19, separated by the diaphragm 20.

Secured to the top of the block 15 is the valve block 21 which has the valve chamber 22. The top of this chamber is covered by the annular metallic seat 23, cushioned by the leather washer 24, the outlet 25 connecting with the atmosphere. Through the lower wall 26 of the valve chamber is an opening 27 in which is glued, or otherwise held, an annular seat in the form of a metal ring 28. The opening tapers downwardly and the ring tapers correspondingly, the top edge of the ring being finished to form a smooth seat. This taper construction assists in holding the ring securely and rigidly in the opening and prevents it from falling through the opening, should it ever become

loosened. Within the valve chamber is the valve 29 in the form of a disk, and of suitable construction.

The valve shown comprises a wooden supporting disk 30 having the flange 31 extending downwardly from its edge. Within the flange is some cushioning material 32, such as felt, while to the flange end is glued a disk 33 of air proof material, such as rubber, reinforced by a leather disk 34. When the valve is down it engages against the seat ring 28, and when it is up it engages the washer 24 of the upper seat 23. The opening 27 communicates with the right end of the upper diaphragm chamber and glued at its upper end to the center of the leather disk 34 of the valve is the valve stem 35 which extends downwardly through the opening 27 and into the upper diaphragm chamber. Hinged at the left end of the upper diaphragm chamber is a lever 36 which extends diametrically over the diaphragm and which is secured at an intermediary point to the center of the diaphragm by means of a felt disk 37. The end of the lever extends under the valve stem and is flexibly secured thereto by means of a felt disk 38. With this arrangement, when the diaphragm is raised, its force is multiplied and the valve is powerfully lifted to disconnect the valve chamber from the atmosphere and to connect said chamber with the upper diaphragm chamber.

The left end of block 15 is secured to the rear wall 10 of the vacuum chamber, a leather washer 40 being interposed. The upper diaphragm chamber connects with the vacuum chamber through passageway 41, while the lower diaphragm chamber connects with the vacuum chamber through passageway 42, throttled by the small opening 43 in disk 44 applied at the outlet of said passageway. A passageway 45 through wall 10 connects passageway 42 with a hose or other conductor 46 leading to an opening in the tracker board over which the music sheet passes. The valve chamber connects with the bellows chamber through passageway 47.

The operation of the unit is well known. When the tracker board openings are closed, the pressure in both diaphragm chambers is equal to that in the vacuum chamber and the valve is down, the bellows being distended. When a tracker board inlet is opened by the music sheet, air under atmospheric pressure rushes through passageways 45 and 42 to the lower diaphragm chamber and the diaphragm is blown up and the valve raised to close the atmosphere outlet 25 and to expose opening 27 so that the bellows is connected with the vacuum chamber and closed to carry its extension 13 up, the upward movement being limited by an abutment screw 47′ passing through the rear end of the block 15. When the tracker board opening is again closed, the pressure again equalizes in the diaphragm chambers through throttle opening 43 and the parts assume their normal position, the bellows inflating from the atmosphere inlet and the extension 13 dropping to its lower position.

The pneumatic units are arranged in four rows and staggered so that the extensions are equally spaced horizontally, as best shown in Fig. 2. The extensions each have a hole 48 for receiving pins 49 extending from the lower ends of pitman rods 50, a felt bushing 51 lining each opening for cushioning effect and for preventing noise. The pitman rods extend vertically upwardly through guide openings 52 in a horizontal guide plate 53 supported from the rear ends of the blocks 15 of the upper row of units by means of screws 54, each opening being lined by a felt bushing 55. As best shown in Fig. 3 the tops of the rods terminate in a common horizontal plane above the level of the top units and the spacing of the pitman rods is equal to that of the abstract rods, there being a pitman rod in front of each abstract rod. The pitman rods are entirely supported by the units, their lower ends being held in place by the pins and their upper ends being held in alinement and guided by the plate 53. The plate 53 has openings for receiving the abutment screws 47′ of the top row units.

Arranged in a horizontal row above the upper ends of the pitman rods are the abutment supporting members, each comprising an L frame whose vertical limb 56 is secured to an abstract rod and whose horizontal limb 57 carries an eye screw 58, to whose lower end is secured an abutment button 59. The end 60 of the horizontal limb 57 is bent up and back and has the threaded hole 61 registering vertically with the hole 62 in part 57, the eye screw threading through both said holes. The end 60 is primarily at a slight angle with the part 57 and is sprung into parallelism with said part when the eye screw is applied, so that after insertion, the eye screw is clamped by the resulting spring action and securely and rigidly held in any adjusted position.

The abutment members are arranged in a row above the top row of pneumatic units and back of panel 3. They can, therefore, be readily reached from the front of the piano by merely removing the panel 3, it being unnecessary to remove or even disturb any other piano parts or the pneumatic action units. The units with the pitman rods carried thereby can be permanently secured in place upon installation. The eye screws are then adjusted to effect proper engagement of the abutment buttons with the ends of the pitmen, and the buttons after such adjustment will practically be in a horizontal row, as best shown in Fig. 3.

Changes both in construction and arrangement could be made without departing from the spirit of my invention I do not therefore limit myself to the exact construction and arrangement shown. For example, the extensions 13 of the top row of units could engage directly with the corresponding abutment buttons 59, and only the extensions of the lower units provided with pitman rods.

I desire to secure the following claims by Letters Patent:

1. In a pneumatically operated piano, the combination with the abstract rods of the piano, of a plurality of pneumatic actuating units arranged in rows in front of the abstract rods, a plurality of supporting frames secured one to each abstract rod and all arranged in a row above the top row of units, adjustable abutment members carried by the frames, means providing clamping engagement between the frames and abutment members carried thereby, and connecting members extending from the units and engaging the abutment members.

2. In a pneumatically operated piano, the combination with the piano abstract rods, of a plurality of pneumatic actuating units arranged in rows in front of the abstract rods, a supporting frame secured to each abstract rod and having a forwardly extending U part, a screw threading through both limbs of the U part, said limbs being sprung when the screw is first threaded therethrough to thereby exert clamping action on said screw, an abutment carried by each screw, said frames with the abutments being arranged in a row above the top row of units, and a pitman rod extending from each unit and engaging with one of said abutments.

3. In a pneumatically operated piano, the combination with the piano abstract rods, of a plurality of pneumatic actuating units arranged in rows in front of the abstract rods, a supporting frame secured to each abstract rod and having a forwardly extending U part, a screw threading through both limbs of the U part, said limbs being sprung when the screw is first threaded therethrough to thereby exert clamping action on said screw, an abutment carried by each screw, said frames with the abutments being arranged in a row above the top row of units, each abutment connecting with one of said units whereby actuation of the unit will result in actuation of the abstract rod from which the abutment is supported.

4. In a pneumatically operated piano, the combination with an abstract rod of the piano, of a pneumatic actuating unit having a vertically movable actuating member disposed adjacent the abstract rod, a U supporting frame of spring material secured to the abstract rod adjacent the movable member, a screw threading through both limbs of the U frame, said limbs being sprung when the screw is primarily threaded therethrough to thereby exert clamping action on said screw to rigidly hold it in adjusted position, and an abutment carried by the screw and having connection with the vertically movable member of the unit.

5. In a pneumatically operated piano, the combination with an abstract rod of the piano, of a pneumatic actuating unit having an actuating member disposed adjacent said abstract rod, a U frame of spring material having one limb secured to the abstract rod, an adjusting screw threading through both limbs of the U frame and clampingly held by the spring action thereof, and an abutment piece carried by the screw and having connection with the actuating member of the unit.

6. In a pneumatically operated piano, the combination with an abstract rod of the piano, of a pneumatic actuating unit adjacent the abstract rod, an L frame for each abstract rod having its vertical limb secured to the rod and its horizontal limb extending therefrom, an adjusting screw threading through the horizontal limb, an abutment carried by the screw and having connection with the actuating unit, and an extension from said horizontal limb having clamping engagement with said screw to hold said screw firmly in adjusted position.

7. In a pneumatically operated piano, the combination with an abstract rod of the piano, of a pneumatic actuating unit adjacent the abstract rod, an L frame for each abstract rod having its vertical limb secured to the rod and its horizontal limb extending therefrom, an adjusting screw threading through the horizontal limb, an abutment carried by the screw and having connection with the actuating unit, the end of said horizontal limb being bent back and having threaded and clamping engagement with said screw to lock said screw in adjusted position.

8. In a pneumatically operated piano, the combination with the piano abstract rods, of a plurality of pneumatic actuating units arranged in horizontal rows in front of the abstract rods, connecting rods extending upwardly from said units and supported solely thereby, an abutment supporting frame secured to each abstract rod, and an abutment member carried by each frame, said abutment members being engaged by the respective connecting rods to transmit the movements of the units and connecting rods to the abstract rods, and said abutment frames being all arranged in a row above the top row of units to be accessible without necessitating disturbance of the units and connecting rods.

9. In a pneumatically operated piano, the

combination with the piano abstract rods, of a plurality of pneumatic actuating units arranged in horizontal rows adjacent the lower ends of the abstract rods and each having an actuating member, a connecting rod supported from the end of each actuating member and extending upwardly therefrom, said rods all terminating in a horizontal plane above the top row of units, a guide plate carried by the top row of units through which the upper ends of all the connecting rods pass, and abutments secured to the abstract rods in a row above the connecting rods and engaged by the upper ends of said connecting rods.

In witness hereof, I hereunto subscribe my name this 17th day of March A. D. 1909.

AXEL G. GULBRANSEN.

Witnesses:

JULIA C. LOOMIS,

WINIFRED L. FISH.