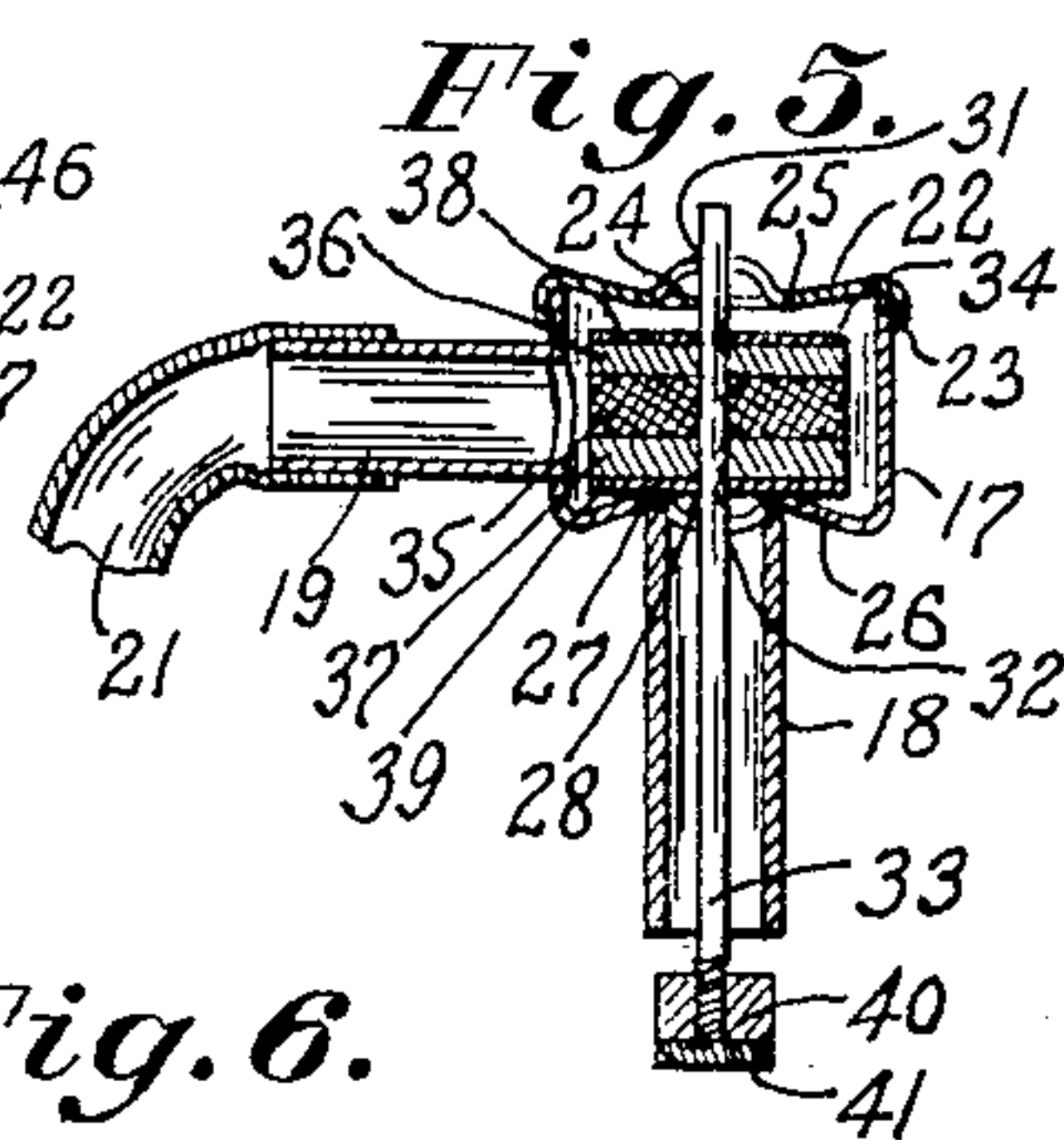
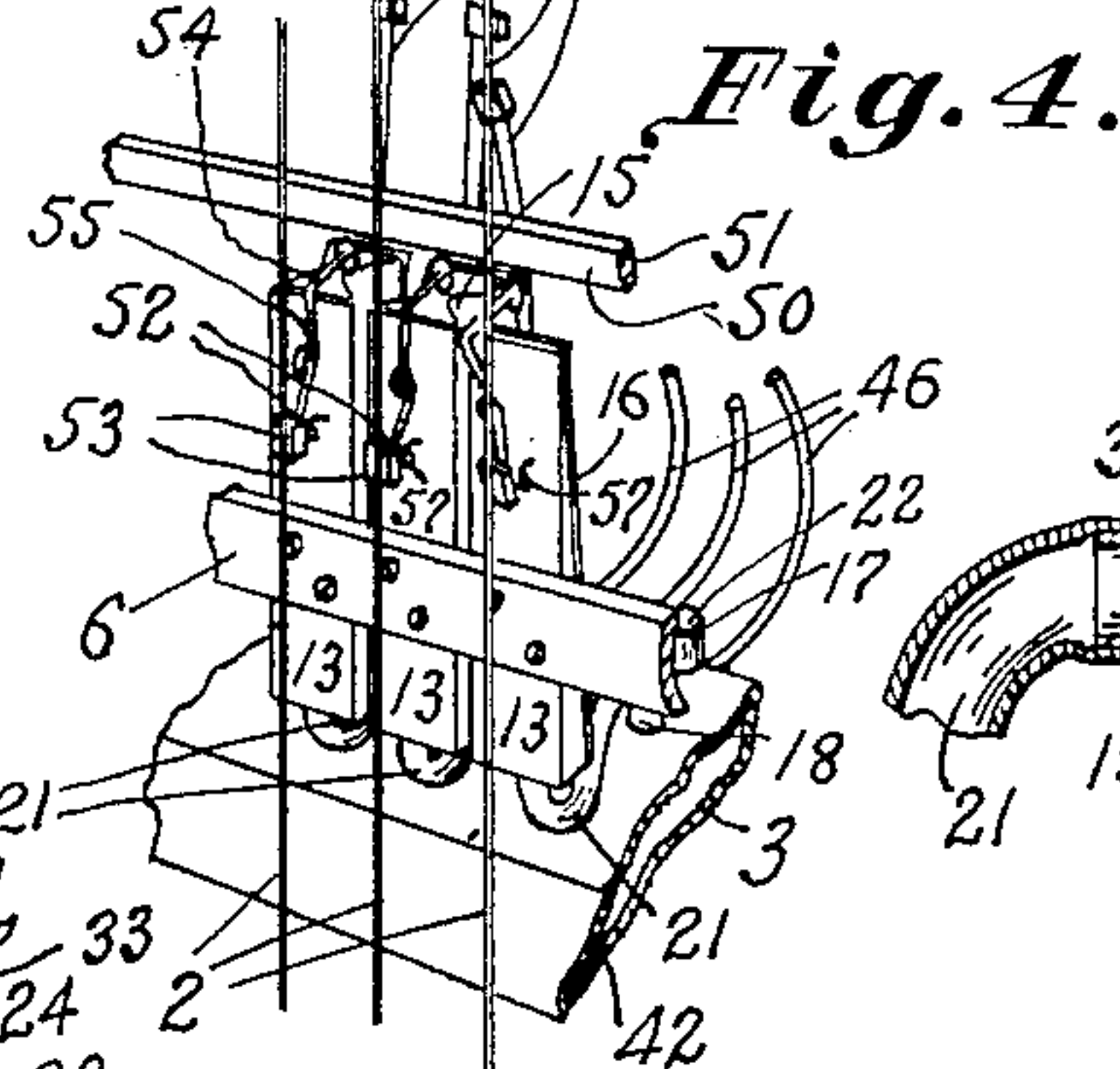
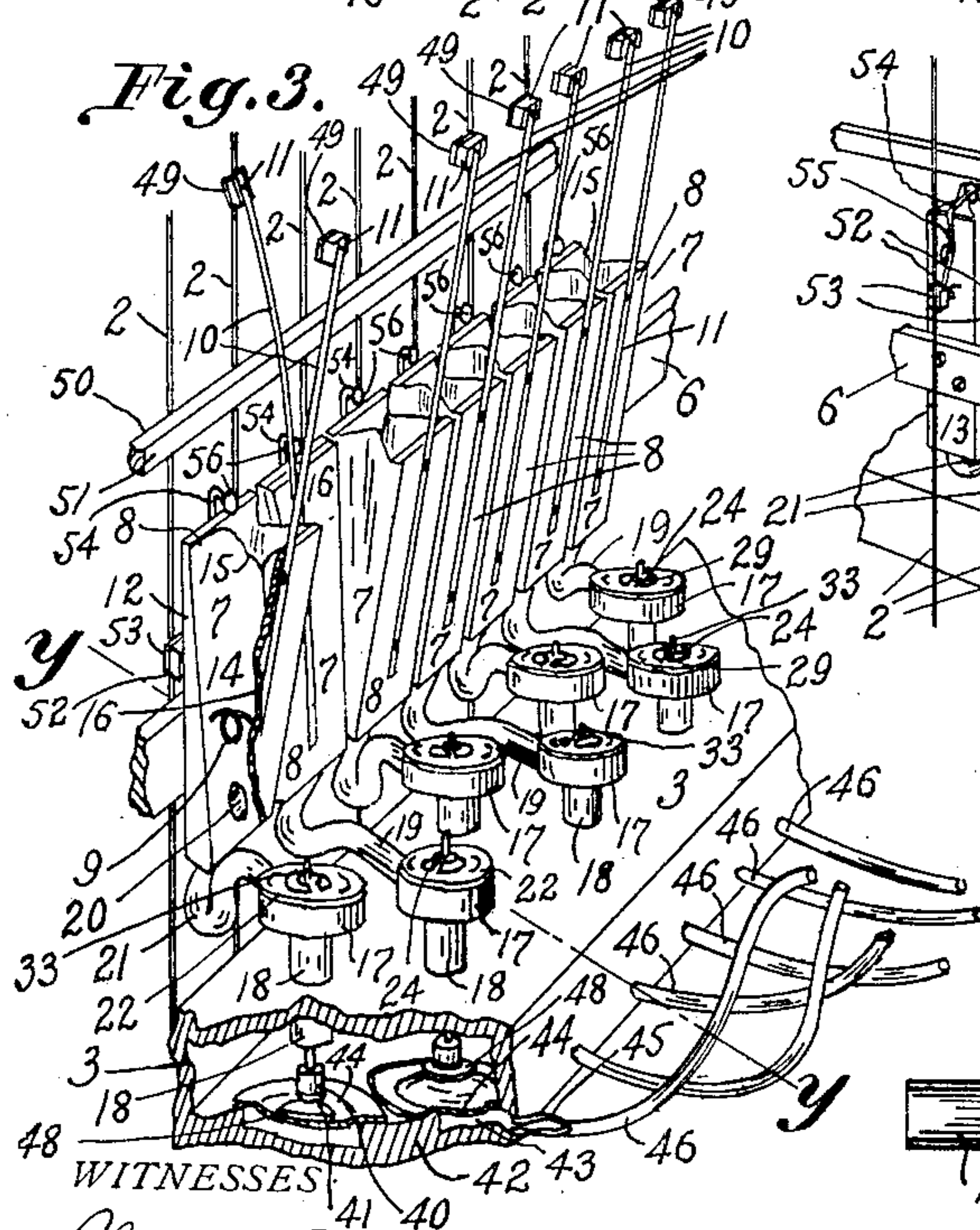
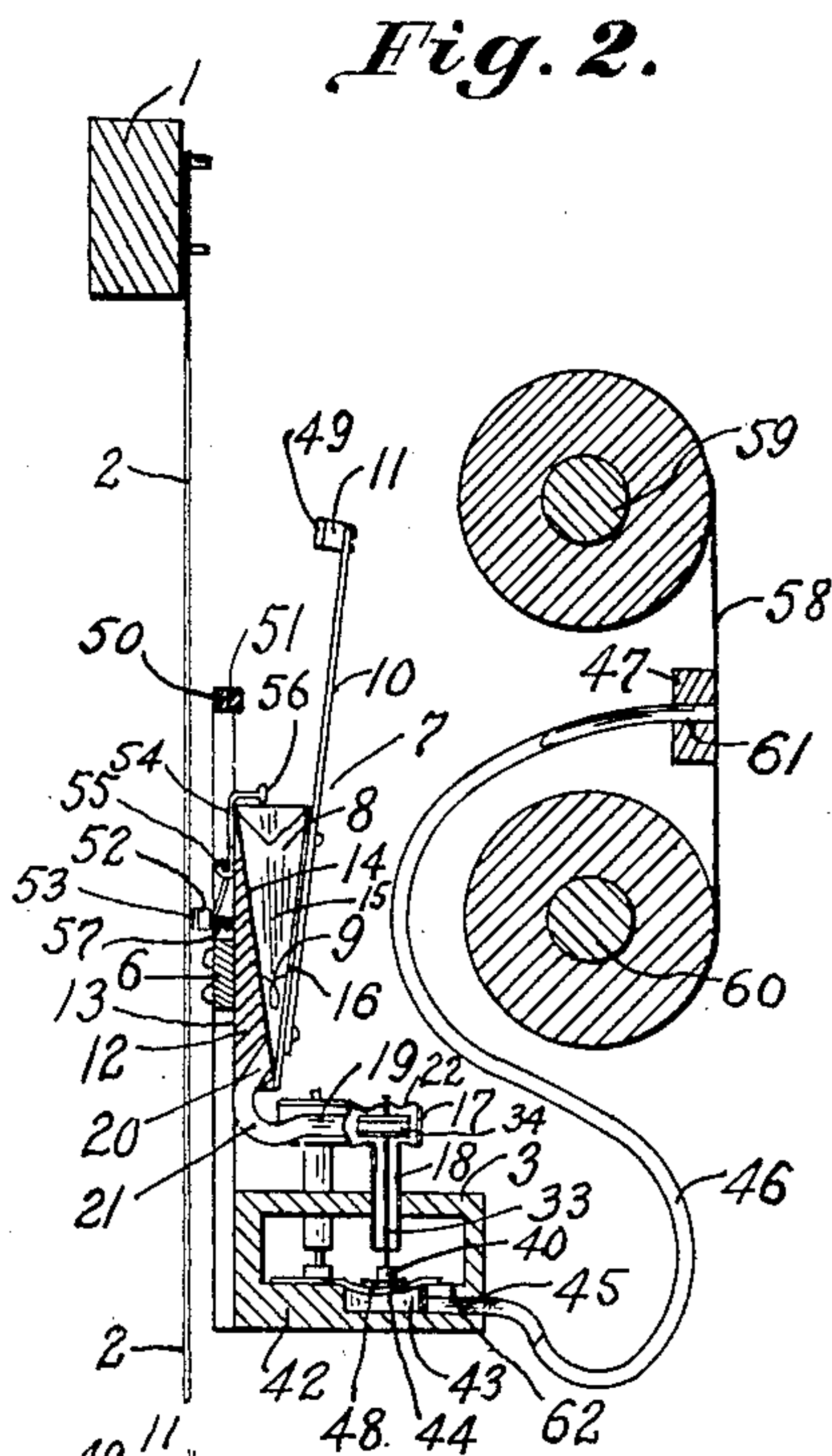
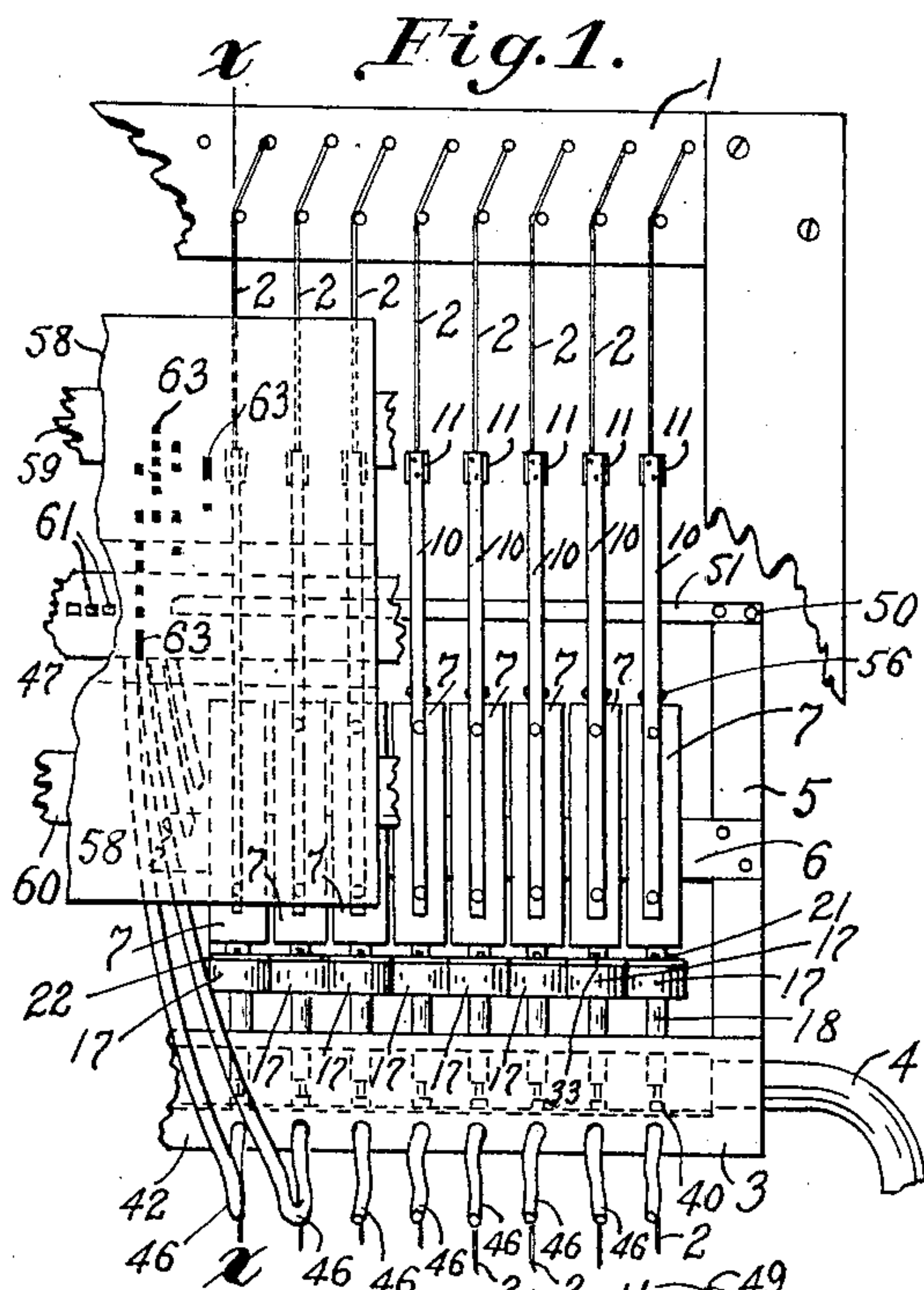


No. 877,125.

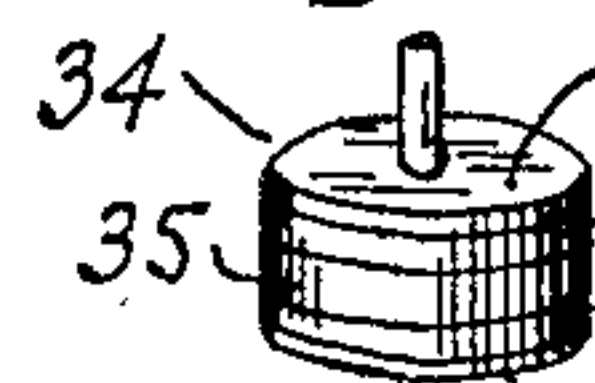
PATENTED JAN. 21, 1908.

A. A. ROSE.  
AUTOMATIC MUSICAL INSTRUMENT.

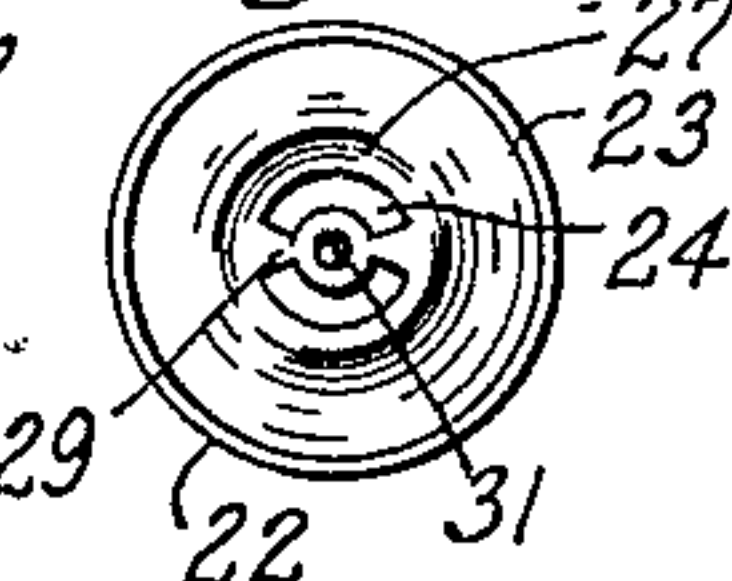
APPLICATION FILED FEB. 11, 1907.



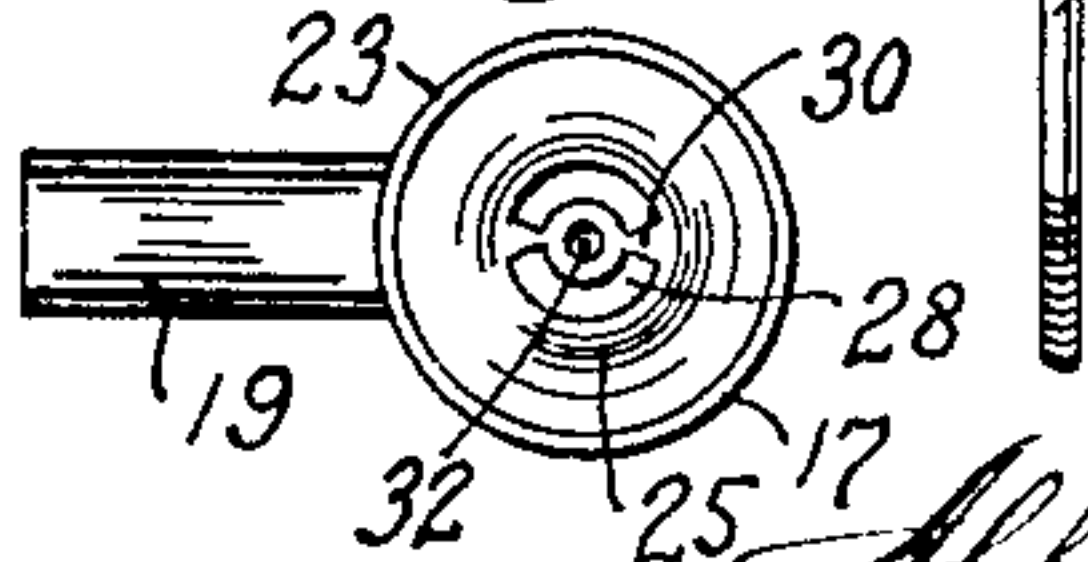
*Fig. 6.*



*Fig. 7.*



*Fig. 8.*



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# UNITED STATES PATENT OFFICE.

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## AUTOMATIC MUSICAL INSTRUMENT.

No. 877,125.

Specification of Letters Patent.

Patented Jan. 21, 1908.

Application filed February 11, 1907. Serial No. 356,754.

*To all whom it may concern:*

Be it known that I, ALFRED A. ROSE, a citizen of the United States, and resident of Bellevue, in the county of Campbell and State of Kentucky, have invented certain new and useful Improvements in Automatic Musical Instruments, of which the following is a specification.

My invention relates to automatic musical instruments, the object being to provide a self-contained valve chamber in combination with the parts of a mechanism whereby music may be procured automatically, as nearly as possible similar to the music produced by playing an instrument manually.

My invention consists in the combination with a musical instrument having a vacuum reservoir and means for producing a vacuum in said reservoir, a pneumatic beater adapted to act upon said instrument and a connection between said pneumatic beater and said vacuum reservoir, a valve interposed in said connection, so constructed and supported as to be easily removed and replaced, as will hereinafter be more fully described.

In the drawing: Figure 1 is a partial front elevation of my invention. Fig. 2 is a section of same on the line  $x-x$  of Fig. 1, representing the valve in the act of opening. Fig. 3 is a partial perspective view of my invention from the front in which one of the pneumatic beaters is represented as striking one of the wires. Fig. 4 is a partial perspective view of my invention from the rear. Fig. 5 is an enlarged sectional view of my invention on a line corresponding to  $y-y$  of Fig. 3, the valve being shown in closed or normal position. Fig. 6 is a detail perspective view of the valve and its stem. Fig. 7 is a detail lower plan view of the valve chamber cap. Fig. 8 is a detail plan view of the valve chamber with the cap removed.

As I illustrate the application of my invention the frame 1 has the strings 2 suitably stretched thereon, and in front of said strings 2 extending horizontally is a vacuum chamber 3. The vacuum chamber 3 is provided with the suction hose 4 whereby it may be connected to a pump or bellows adapted to exhaust the air from said vacuum chamber 3 and to maintain a continuous vacuum therein. Extending upward from the rear of said vacuum chamber 3 is the frame 5, upon the transverse portion 6 of which are mounted the pneumatic beaters 7. Each pneumatic beater 7 consists of a bellows 8

normally held open by a spiral spring 9 in the lower portion thereof and a flexible stem 10 upon the upper end of which is mounted the head 11. The bellows 8 is preferably constructed with the wedge-shaped back 12 which when it is attached to the transverse portion 6 of the frame 5 has its rearward side 13 vertical while the forward or inner side 14 is inclined. The sides 15 of the bellows 8 are so proportioned that when the bellows 8 is caused to assume its open position by means of the spring 9, as well, as by the pressure of the atmosphere, the front 16 of said bellows 8 will incline in the opposite direction at an equal angle to that of the inclination of the side 14. The flexible stem 10, being connected to the front 16 parallel thereto will thus be adapted to normally assume a position whereby the head 11 is maintained at a proper distance from the wire 2 to attain the desired momentum when the bellows 8 is collapsed.

Forward of the bellows 8 is the valve chamber 17 having the vertical tube 18 extending downward and opening into the interior of the vacuum chamber 3, this vertical tube 18 forming the support for said valve chamber 17. The valve chamber 17 also has the horizontal tube 19 extending rearwardly and the lower part of the back 12 of the bellows 8 is provided with the opening 20. Leading from the opening 20 to the horizontal tube 19 is the flexible tube 21. An opening is thus formed leading from the interior of the bellows to the interior of the valve chamber 17 and from there to the interior of the vacuum chamber 3. The cap 22 of the valve chamber 17 is screwed onto said valve chamber as at 23 and has the centrally located opening 24. The cap 22 is so formed that it has the downwardly facing annular valve seat 25 surrounding the opening 24 and the bottom 26 of the valve chamber 17 is similarly formed so that it has the upwardly facing annular valve seat 27 surrounding the opening 28 which leads into the vertical tube 18. Both the openings 24 and 28 have extending diametrically across them the valve stem guides 29 and 30, respectively, and extending vertically through the openings 31 and 32, respectively, in said guides is the valve stem 33. The valve stem 33 has mounted upon the valve chamber 17 the cylindrical valve 34. Preferably said valve 34 is formed with the central portion 35 of lead or other heavy substance which central



portion has above and below it the pads 36 and 37, respectively, and which pads 36 and 37 are faced with the gaskets 38 and 39, respectively. Screwed onto the lower end of the valve stem 33 is the circular foot 40 provided with the cushion 41.

The bottom 42 of the valve chamber 3 has the circular recess 43 closed at the top to the interior of the vacuum reservoir 3 by the diaphragm 44 and having the horizontally extending opening 45 from which leads the flexible tube 46 to the tracker-board 47, the tube 46 there opening to the atmosphere. The diaphragm 44 preferably is provided with the centrally located shield 48 and the valve chamber 17 is mounted over and in alignment with said diaphragm 44 and the shield 48. The foot 40 of the valve stem 33 is thus adapted to normally occupy a position near to the diaphragm 44 for engagement thereby, the contact coming between the shield 48 on the diaphragm 44 and the cushion 41 on the foot 40.

The head 11 of the pneumatic beater 8 is preferably provided with the cushion 49 and mounted on the frame 5 is an additional transverse portion or fender 50 which is preferably provided with the cushion 51. This fender 50 is supported in a position with reference to the head 11 such that when the bellows 8 is collapsed, bringing the head 11 toward the string 2, the flexible stem 10 will come in contact with the cushion 51 on the fender 50 before the head 11 has reached the string 2. However, the flexibility of the stem 10 is such that the head 11, by its momentum and by the momentum of the upper portion of the stem 10 which is bent over the fender 50, is carried onward so that the head 11 strikes the string 2 with the cushion 49. Immediately upon the head 11 thus striking the string 2 the elasticity of the stem 10 will cause the head 11 to recede from the string and having lost its momentum the head 11 will be prevented from further coming in contact with the string 2 to interfere with the sound produced by the vibration of said string. The damper 52 provided with the cushion 53 is mounted on the lower end of the lever 54 pivoted at 55 on the rearward side 13 of the back 12. The lever 54 extends upward and forward over the top of the back 12 and has a face 56 adapted to be engaged by the stem 10 before said stem 10 has come in contact with the cushion 51 on the fender 50. The damper 52 has its cushion 53 normally held in contact with the string 2 by being held backward by the spiral spring 57 compressed between it and the back 12.

The pump or bellows connected to the vacuum chamber 3 by means of the suction hose 4 must be of sufficient capacity to at all times maintain a thorough vacuum within the vacuum chamber 3 as well as to quickly

at any time produce additional vacuum in any one or more of the bellows 8 of the pneumatic beaters 7. This suction also causes the diaphragm 44 to rise when the opening of the tube 46 permits the pressure of the atmosphere to act on the under-side of said diaphragm within the circular opening 43. The opening and closing of the tube 46 is controlled by means of the music web 58 carried over it on the rolls 59 and 60.

A complete set of parts, as above described and as best illustrated in Fig. 2 of the drawing, is provided for each string on the instrument to be played. The tracker-board 47 is made of a convenient length, the openings 61 therein are brought conveniently near together and the tubes 46 lead to the openings 61. The music web 58 passing over the tracker-board 47 has openings arranged in positions corresponding to the apertures 61 in the tracker-board 47 whereby the music web 58 is adapted to open and close said tubes 46 to the pressure of the atmosphere. Then when the tube 46 is opened to the atmosphere the diaphragm 44 will rise, raising the valve 34 by means of its valve stem 33. This forces said valve away from the lower annular valve seat 27 against the upper annular valve seat 25, closing the valve chamber 17 to the atmosphere, to which it is normally open by means of the opening 24. At the same time it opens valve chamber 17 to the interior of the vacuum chamber 3, the suction through the suction hose 4 being of ample capacity, a vacuum will immediately be produced within the bellows 8 of the pneumatic beater 7 which communicates with the valve chamber 17, thus causing the bellows 8 to collapse. The stem 10 bearing on its upper end the head 11 is brought forcibly toward the string 2 and strikes the face 56 of the lever 54 causing the damper 52 to recede from the string 2 so that the string 2 is free to vibrate. Immediately afterward the stem 10 strikes the cushion 51 on the fender 50 and being flexible permits the head 11 to strike the string 2 with its cushion 49 causing said string 2 to vibrate. It then, immediately, owing to its elasticity causes the head 11 with its cushion 49 to recede from the string 2. The parts then remain in the positions thus assumed until the tube 46 is again closed. In these positions the head 11 and its cushion 49 and the damper 52 with its cushion 53 will be away from the string 2 so that the full vibration and the consequent tone is produced. As soon as the tube 46 is again closed to the atmosphere the suction in the vacuum chamber 3 will exhaust the air from the tube 46 through the breathe hole 62 sufficiently to allow the diaphragm 44 to fall and permit the valve 34 to regain its lower seat 27, thus closing the valve chamber 17 to the vacuum chamber 3 and preventing the suction from acting further upon the pneu-



matic beater 7. The spiral spring 9 will act to open the bellows 8 and the head 11 will regain its former position away from the string 2. As the bellows 8 expands the stem 10 will leave the face 56 of the lever 54, allowing the spring 57 to force the damper 52 backward with its cushion 53 against the string 2 preventing further vibration of said string 2.

The above operations take place every time a note is to be struck in the playing of the musical instrument which notes are represented on the music web 58 by the holes 63.

The central portion 35 of the valve 34 is made of heavy material in order to insure its seating quickly without depending entirely upon the suction while the pads 36 and 37 are provided to prevent noise when the valve is operated and the gaskets 38 and 39 are provided to insure air-tight joints with the valve seats 25 and 29, respectively. The cushions 41 and 50 are provided to insure noiseless operation while the cushions 49 and 53 are provided to take up the vibration of the wire 2 when the head 11 and the damper 52, respectively, are acting. In order that the diaphragms 44 may be given sufficient diameter I prefer to "stagger" them as well as the valve chamber 17, which would be in alinement with them, in order that the wires 2 may be brought conveniently near together.

The valve chambers 17 are mounted in the vacuum chamber 3 by merely inserting the vertical tube 18 through the opening in the top of said vacuum chamber and their connections with the pneumatic beaters 7 consisting merely of the elastic tube 21, which may be conveniently removed from the horizontal tube 19, thorough ease of adjustment of the valve 34 and the parts related thereto is secured. Any one of the valve chambers 17 may be removed without disturbing any other part of the mechanism and the distance between the diaphragm 44 and the foot 40 of the valve stem 33 may be regulated by adjusting said valve stem 33 upward or downward in the valve 34 in which it is centrally and frictionally mounted. This may be conveniently done, as it is only necessary to unscrew the cap 22 from the valve chamber 17 and the foot 40 from the valve stem 33 when the valve and stem may be lifted out. The convenience of access for either adjustment or repairs thus attained is particularly desirable in the construction herein set forth, dispensing as it does, with the necessity of removing any parts other than those requiring attention, and decreasing the cost of construction as well as the difficulties of maintaining the musical instrument in which it is embodied, in perfect working order. It will be seen

that the adjustment of the valves in the valve chamber, individually is facilitated not only by the frictional mounting of the valve upon the valve stem, but by the means of supporting the valve chamber itself, which allows it to be removed from the vacuum chamber bodily and with its operating parts contained therein. This self contained construction of the valve chamber is particularly desirable where the individual valve chambers are necessarily numerous, as in an instrument of the character described herein. The cylindrical and otherwise symmetrical formation of the parts constituting the valve and chamber also permit it to be economically and accurately produced, securing the advantages above enumerated, due to the individual and independent valve chambers, without entailing the increased cost of production and difficulty of maintenance attendant upon the use of a large number of inter-dependent parts that would make it necessary to remove all, separately, to allow access to one of them. The joints between the various parts when properly adjusted may be held firmly by means of shellac or similar material, thus insuring rigidity and tightness of said joints.

While in illustrating and describing the application of my invention a peculiar construction of parts is shown, I do not wish to be understood as limiting myself to it but

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

1. In an automatic musical instrument, the combination with a vacuum chamber and a pneumatic beater, of a cylindrical valve chamber, a connection on said valve chamber leading vertically downward to said vacuum chamber and forming the only support for said valve chamber, a connection leading horizontally from said valve chamber, a double seated valve in said valve chamber, and a valve stem centrally and frictionally mounted therein, as and for the purposes specified.

2. In an automatic musical instrument, the combination with a vacuum chamber and a pneumatic beater, of a valve chamber, a connection on said valve chamber leading vertically downward therefrom and forming the only support therefor, and a double seated, vertically reciprocable valve movably and adjustably supported in said valve chamber.

ALFRED A. ROSE.

Witnesses:

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