

No. 896,905.

PATENTED AUG. 25, 1908.

R. B. FOWLER.
AUTOMATIC MUSICAL INSTRUMENT.

APPLICATION FILED SEPT. 24, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

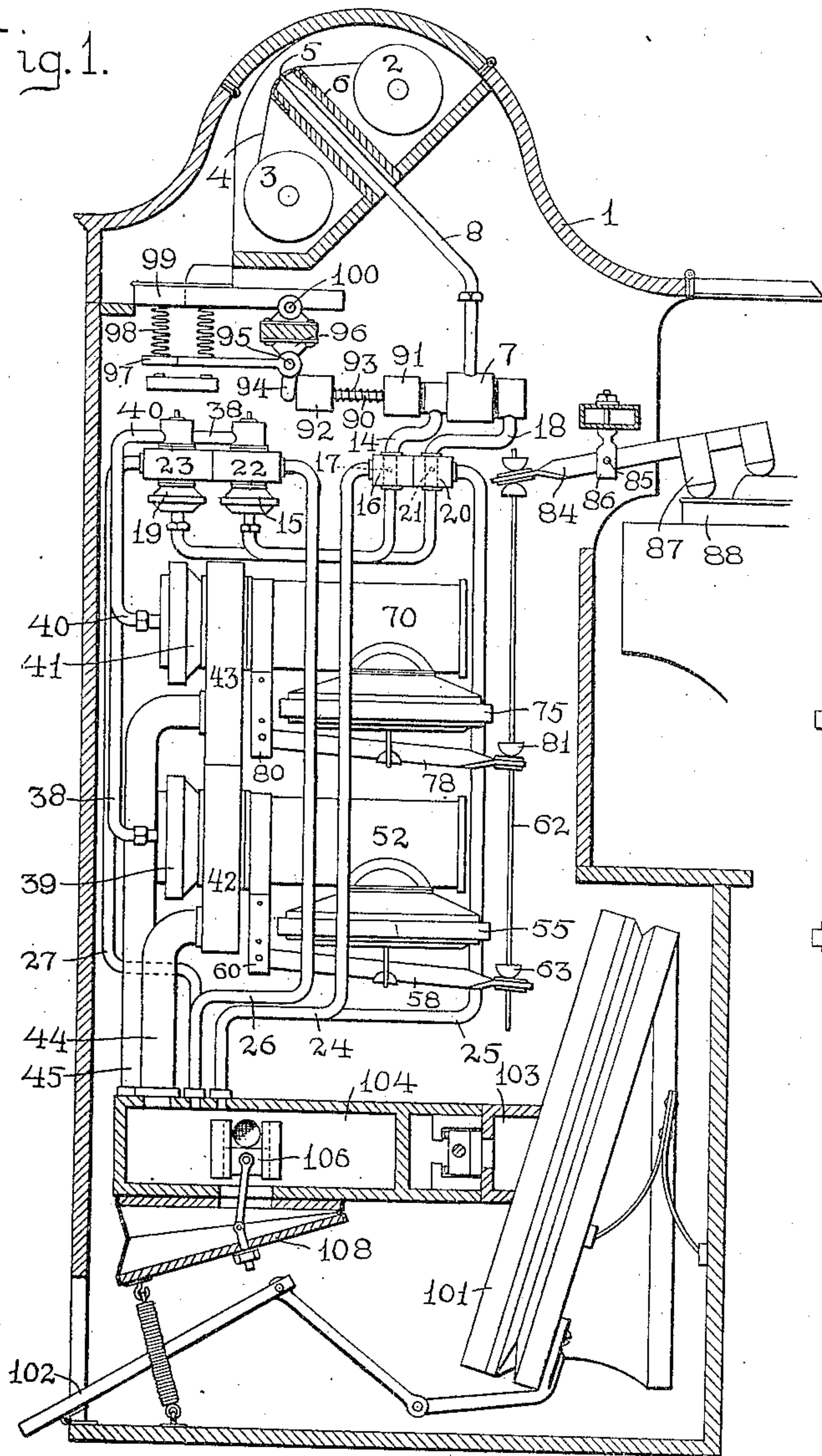


Fig. 2.

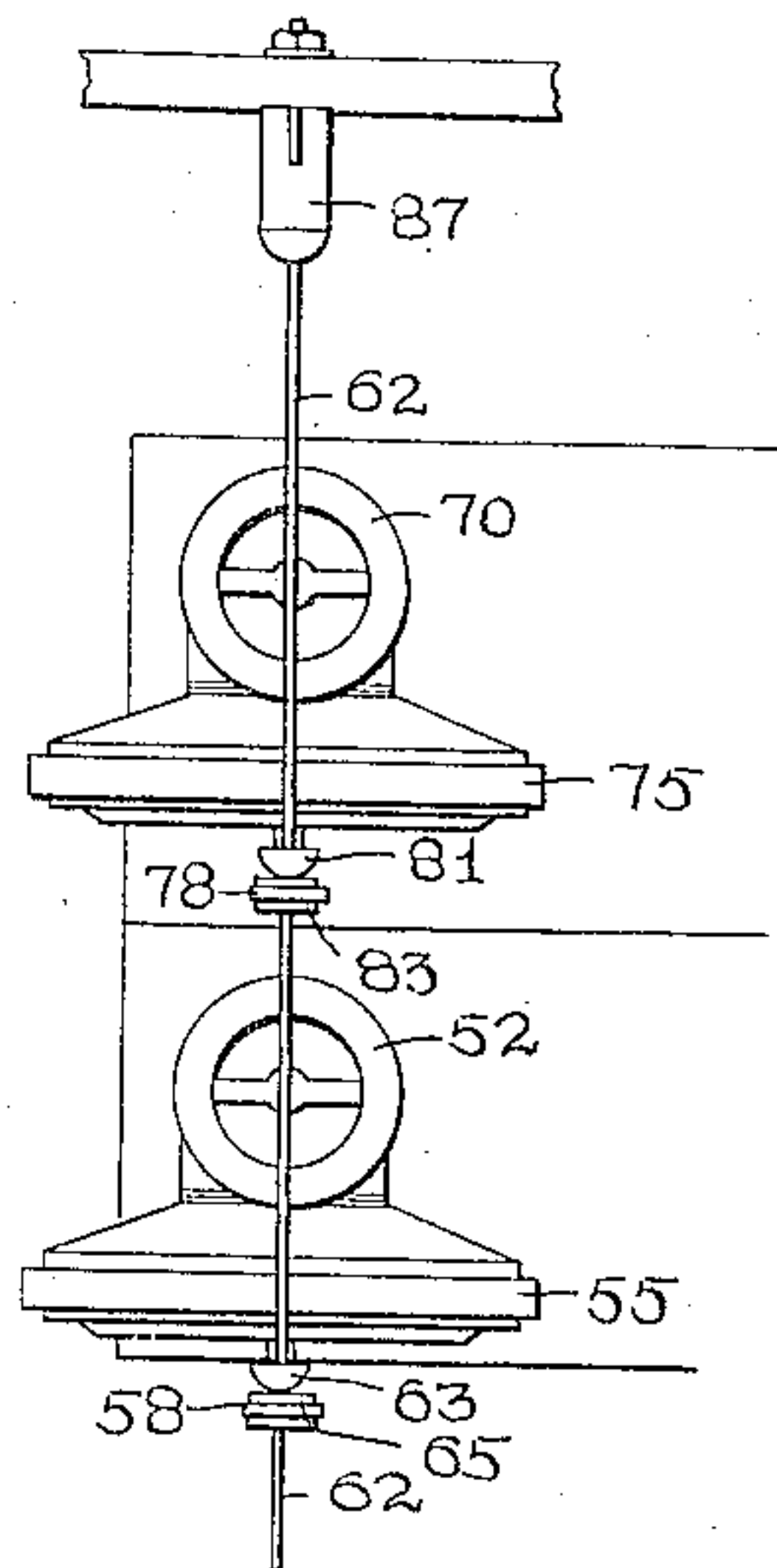
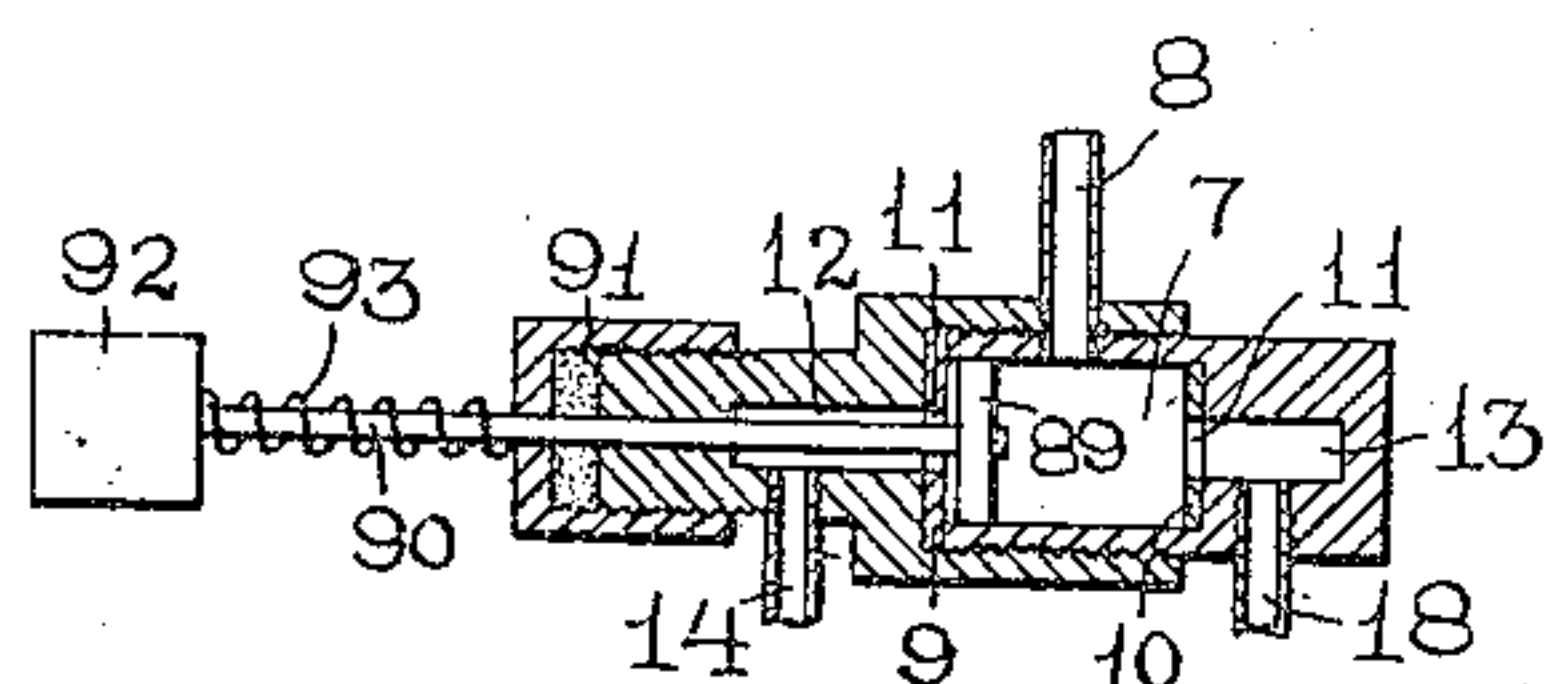
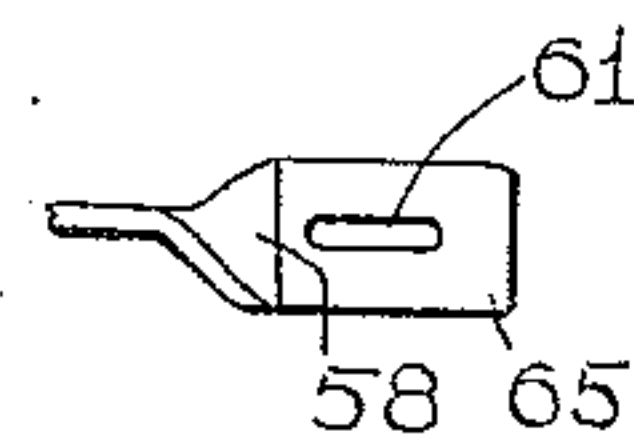


Fig. 7.



Witnesses

Roy D. Tolman.
Penelope Combertach.

Fig. 3.

Inventor.

Rupert B. Fowler

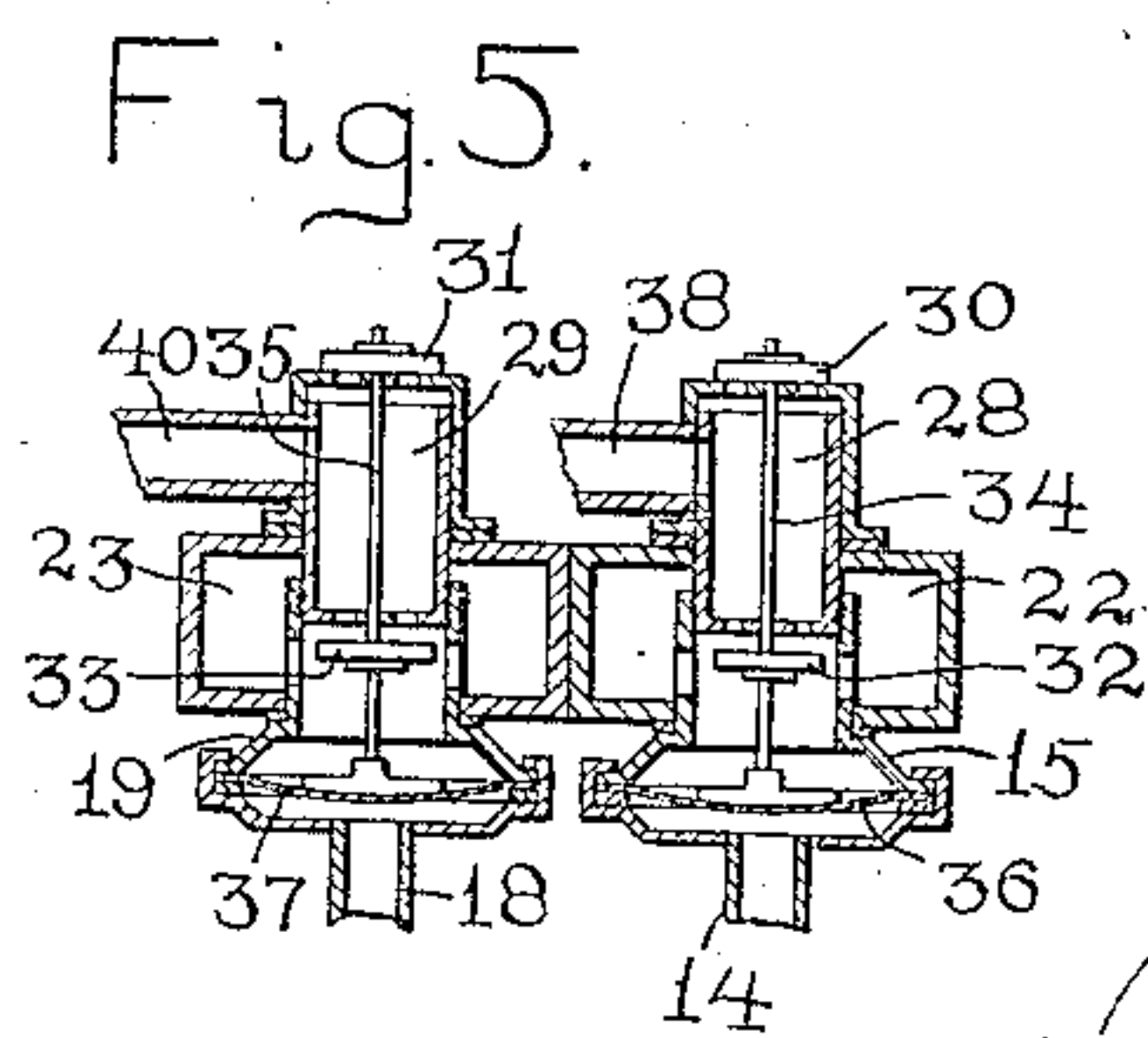
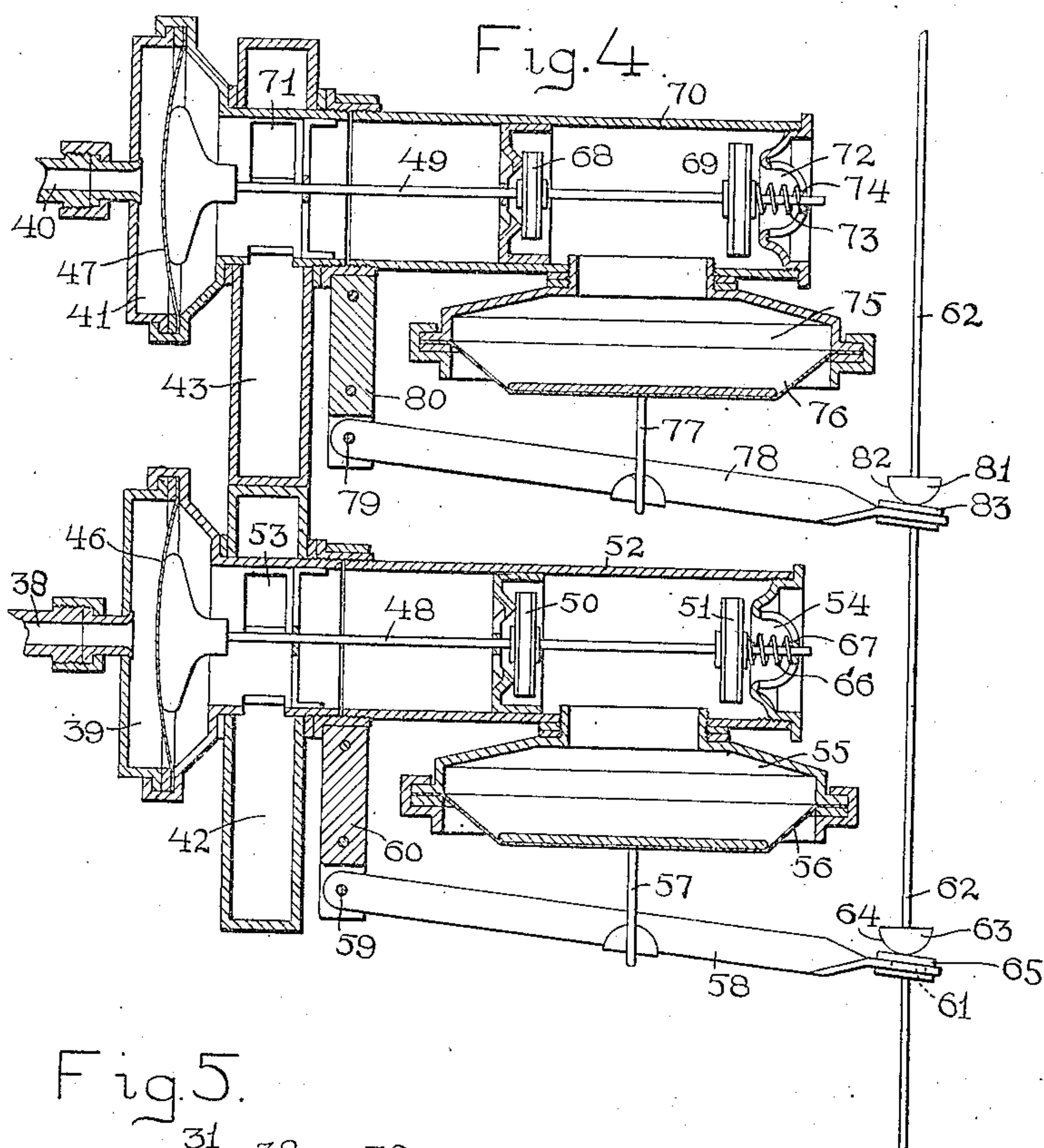
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2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

RUFUS B. FOWLER, OF WORCESTER, MASSACHUSETTS.

AUTOMATIC MUSICAL INSTRUMENT.

No. 896,905.

Specification of Letters Patent.

Patented Aug. 25, 1908.

Application filed September 24, 1904. Serial No. 225,750.

To all whom it may concern:

Be it known that I, RUFUS B. FOWLER, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in Automatic Musical Instruments, of which the following is a specification, accompanied by drawings, forming a part of the same, in which—

Figure 1 represents a side view of so much of the operative mechanism of an automatic musical instrument as is necessary to illustrate the nature of my present invention. Fig. 2 is a rear view of one of the key strikers with its actuated motor pneumatics. Fig. 3 is a sectional view of one of the switch valves. Fig. 4 is a vertical sectional view on a larger scale of a pair of motor pneumatics with their actuated valves and valve or secondary pneumatics. Fig. 5 is a sectional view of a pair of primary pneumatics. Fig. 6 is a top view of the individual exhaust chambers 104, 105, shown in section and connected with the common air chamber 103, also partly shown in section, and Fig. 7 is a plan and end view of one of the levers actuated by the motor pneumatics and showing the elongated opening to receive the key striker rod.

Similar reference letters and figures refer to similar parts in the different views.

My present invention relates to a mechanism for playing pianos, comprising means for automatically actuating the note producing mechanism of the piano, consisting in the present instance of a key striker for depressing the piano key, a motor pneumatic for actuating the key striker, a valve mechanism for controlling the action of the motor pneumatic, and valve pneumatics controlled by the passage of a perforated music sheet over the ducts of a tracker board for actuating the valve mechanism, the arrangement and operation of these several parts being similar to the comparable parts in instruments of this class now in common use.

The objects of my invention are to provide means for varying the force applied to any individual note producing mechanism of the piano without regard to its position in the musical scale, whereby any individual note may be accented, and to enable the note producing mechanism of the piano to be actuated at will without the employment of a perforated music sheet, and I accomplish these objects by means of instrumentalities

as hereinafter described, comprising a pair of motor pneumatics for actuating each note producing mechanism, a common striker rod for each pair of motor pneumatics, means for varying the air exhaustion in each of the motor pneumatics in said pair, and means for bringing either one of said pair of motor pneumatics into action at will.

Referring to the accompanying drawings, 1 denotes the inclosing case containing the operating mechanism, 2 and 3 denote the music rolls for carrying the perforated music sheet 4 and for passing the same over the ducts 5 of a tracker board 6 by means of any suitable motor, such as those now in common use for this purpose.

7 is a valve chamber connected by a pipe 8 with the duct 5. The valve chamber 7 with which the pipe 8 communicates is provided at opposite ends with valve seats 9 and 10 consisting preferably of annular disks of leather or similar compressible material provided with central holes 11, 11, which afford communication between the valve chamber 7 and the air chambers 12 and 13. A pipe 14 connects the air chamber 12 with a primary pneumatic 15 and between the air chamber 12 and the primary pneumatic 15 the pipe 14 passes through a vacuum chamber 16 and is provided within the chamber 16 with a vent hole 17. Similarly a pipe 18 connects the air chamber 13 with a primary pneumatic 19, and between the air chamber 13 and the primary pneumatic 19 the pipe 18 passes through a vacuum chamber 20 and is provided within the vacuum chamber 20 with a vent hole 21.

The primary pneumatics 15 and 19 are duplicates of each other but they communicate with independent vacuum chambers 22 and 23. The vacuum chambers 16 and 20 are connected with means for exhausting the air therefrom by pipes 24 and 25 and the vacuum chambers 22 and 23 are similarly connected with means for exhausting the air therefrom by pipes 26 and 27. The primary pneumatics 15 and 19 contain air chambers 28 and 29 which communicate at their upper ends with the open air by means of air passages which are controlled by valves 30 and 31 and at their lower ends with the vacuum chambers 22 and 23 by means of air passages which are controlled by valves 32 and 33, said valves 30, 31, 32 and 33 being carried upon valve stems 34 and 35 which are actuated by the primary pneumatic diaphragms

36 and 37. The air chamber 28 is connected by a pipe 38 with a secondary pneumatic 39 and the air chamber 29 is connected by a pipe 40 with a similar secondary pneumatic 41. The secondary pneumatics 39 and 41 are duplicates of each other but they communicate with independent vacuum chambers 42 and 43 which are connected by pipes 44 and 45 with means for exhausting the air therefrom.

The secondary pneumatics 39 and 41 contain the secondary pneumatic diaphragms 46 and 47 which actuate the valve stems 48 and 49 respectively. The valve stem 48 carries a pair of valves 50 and 51 inclosed within a tube 52 which communicates with the vacuum chamber 42 by openings 53 and also with the outer air by an opening 54. Supported by the tube 52 between the valves 50 and 51 is a motor pneumatic 55 communicating with the interior of the tube 52 and containing a pneumatic diaphragm 56 which is connected by a link 57 with a lever 58 pivoted at one end at 59 upon a fixed stud 60. The opposite or free end of the lever 58 is provided with a slightly elongated opening 61 which incloses a striker rod 62. Attached to the striker rod 62 is a button 63 having its lower surface rounded at 64 and resting upon a leather or felt washer 65 attached to the free end of the lever 58. The valve stem 48 is normally held against the pneumatic diaphragm 46 by means of a spiral spring 66 which is inserted between the valve disk 51 and a fixed brace 67 at the open end of the tube 52. The valve stem 49 carries the valves 68 and 69 inclosed in a tube 70 which communicates with the vacuum chamber 43 by means of openings 71, and also with the outer air by means of an opening 72, and the valve stem is normally held in contact with the pneumatic diaphragm 47 by means of a spiral spring 73 inserted between the valve disk 69 and a fixed brace 74 at the open end of the tube 70. Supported by the tube 70 between the valves 68 and 69 is a motor pneumatic 75 communicating with the tube 70 and provided with a diaphragm 76 which is connected by a link 77 with a lever 78 pivoted at one end at 79 to a fixed stud 80 and having its free end provided with an elongated opening similar to the opening 61 in the lever 58, and inclosing the striker rod 62.

Attached to the striker rod 62, immediately above the free end of the lever 78 is a button 81 having its under side rounded at 82 and resting upon a leather or felt washer 83 supported upon the free end of the lever 78. The striker rod 62 is common to both motor pneumatics 55 and 75 and is connected at its upper end with a key striker, consisting of a lever 84 pivoted at 85 upon a fixed stud 86 and provided with a head 87 resting upon a piano key 88, thereby enabling the key striker to be actuated by either one of the

motor pneumatics 55 or 75 independently of the other.

The valve chamber 7 contains a sliding piston valve 89 carried upon the end of a valve stem 90 preferably passing through a stuffing box 91. At the outer end of the valve stem 90 is attached a collar 92 and between the collar 92 and the stuffing box 91 is an open wound spiral spring 93 which normally holds the valve 89 against the valve seat 9, closing the communication between the pipes 8 and 14, but leaving an open passage between the pipes 8 and 18, as shown in sectional view in Fig. 3. Bearing against the outer end of the collar 92 is a short arm 94 of a bell crank lever, pivoted at 95 upon a fixed stud 96, the long arm 97 of the lever extending horizontally and supporting thereon a spiral spring 98 which is considerably stiffer than the spring 93. Bearing upon the upper end of the spring 98 is the free end of a key or manual 99, pivoted at 100 and arranged to be depressed by the performer in order to push the valve 89 against the valve seat 10 and close the passage between the pipes 8 and 18, and open the passage between the pipes 8 and 14. The valve 89 therefore forms a switch valve by which a current of air admitted through one of the ducts of the tracker board and through the pipe 8 to the valve chamber 7 may be directed at will through either of the pipes 14 or 18. The pipe 14 is normally closed by the switch valve and air entering through a perforation in the music sheet 4 into a duct of the tracker board will pass through the pipe 8 into the valve chamber 7, and thence through the pipe 18 to the primary pneumatic 19, thereby actuating the diaphragm 37 to raise the valve stem 35, thereby closing the valve 33 and opening the valve 31. This action of the primary pneumatic closes the communication between the vacuum chamber 23 and the air chamber 29, and establishes communication between the air chamber 29 and the outside air which passing through the pipe 40 to the secondary pneumatic 41 will actuate the diaphragm 47 to slide the valve stem 49 against the tension of the spiral spring 73, thereby closing the valve 69 and opening the valve 68. This movement of the valves 68 and 69 closes the motor pneumatic 75 to the outside air and connects it with the vacuum chamber 43. The vacuum thus set up in the motor pneumatic 75 causes the pressure of the outside air to suddenly lift the diaphragm 76 and rock the lever 78 to carry its free end upward against the button 81. The rocking movement of the lever 78 serves to rock the lever 84 of the key striker and depress the piano key 88.

If the key 99 be depressed it will depress the long arm 97 of the bell crank lever, carrying its short arm 94 against the collar 92, thereby sliding the valve 89 in the valve

chamber 7 against the tension of the spring 93 until the valve 89 is brought against the valve seat 10. This movement of the valve 89 closes the communication between the pipes 8 and 18 and establishes a communication between the pipes 8 and 14, causing the next impact of air admitted through a perforation of the music sheet 4 to pass through the pipes 8 and 14 to the primary pneumatic 15, the valves 30 and 32 of which will then become actuated in the same manner as already described with reference to the valves 31 and 33 of the primary pneumatic 19, and air will be admitted through the pipe 38 to the secondary pneumatic 39 to actuate the pneumatic diaphragm 46 and slide the valve stem 48 against the tension of the spiral spring 66, thereby closing the valve 51 and opening the valve 50. The motor pneumatic 55 now becomes connected with the vacuum chamber 42 through the openings 53 and closed to the outside air, causing the motor pneumatic diaphragm 56 to be suddenly lifted and the lever 58 to be rocked, carrying its free end upward against the button 63 and thereby lifting the striker rod 62 to rock the key striker against the key 88 of the piano, thereby sounding the same note that had previously been sounded by the action of the motor pneumatic 75. When the lever 78 is rocked by the motor pneumatic 75, the lower button 63 on the striker rod 62 will be drawn away from the lever 58, the rod 62 sliding through the elongated hole 61 and similarly when the lever 58 is rocked by the motor pneumatic 55 the button 81 will be carried upward out of contact with the lever 78. The key striker applied to the key 88 of the piano is therefore coupled by means of a single connecting striker rod 62 to two independently acting motor pneumatics 55 and 75. The motor pneumatic 75 is normally brought into action by the movement of the perforated music sheet over the ducts of the tracker board, the motor pneumatic 55 remaining normally at rest, but in case the key 99 is depressed thereby changing the position of the switch valve 89, the movement of the perforated music sheet over the ducts of the tracker board will then cause the motor pneumatic 55 to be actuated, allowing the motor pneumatic 75 to remain at rest. Whether the motor pneumatic 55 or 75 is brought into action, the same key striker is actuated and the piano key 88 is depressed. By applying to the vacuum chambers 42 and 43 means for exhausting the air therefrom, comprising independent regulating bellows, such as are now in common use in instruments of this class, whereby a greater exhaustion is maintained in the vacuum chamber 42 than in the vacuum chamber 43, the depression of the key striker will be made with greater force when actuated by the motor pneumatic 55 than when actuated by the motor

pneumatic 75, causing the note to be accented.

I do not confine myself to any special means for exhausting the air from the vacuum chambers 42 and 43, the primary vacuum chambers 22 and 23, and the vent chambers 16 and 20, as any of the means now used in instruments of this class may be employed, such for example as an exhaust bellows 101 arranged to be operated by a foot pedal 102, by which air is exhausted from a chamber 103, which communicates with the independent exhaust chambers 104 and 105, the passages between the common exhaust chamber 103 and the independent exhaust chambers 104 and 105 are controlled by valves 106 and 107 which are actuated by regulating bellows, one of which is shown at 108, Fig. 1, by which different degrees of air exhaustion is maintained in the two chambers 104 and 105.

I have not deemed it necessary to show or describe the detailed construction and operation of the regulating bellows and valves as they are now in common use and will be well understood by those conversant with this class of instruments.

The secondary and primary vacuum chambers 43 and 23 and the vent chamber 20 are connected to the independent exhaust chamber 105 and the secondary vacuum chamber 42, primary vacuum chamber 22 and vent chamber 16, are connected with the independent exhaust chamber 104, in which a greater degree of air exhaustion is maintained than in the chamber 105, so that when the key striker is actuated by the motor pneumatic connected with the vacuum chamber 42, the striker will be moved with greater force and the note accented. Between the common exhaust chamber 103 and the independent exhaust chamber 105, I interpose a valve 109 by which the chamber 105 may be entirely cut off from the chamber 103 and consequently from the air exhausting bellows 101, so that no vacuum will be produced in either the secondary vacuum chamber 43, primary vacuum chamber 23 or vent chamber 20. If the valve 109 be closed therefore, and the perforated music sheet be removed, no air will enter through the ducts of the tracker board, as there is no vacuum in chamber 104, and the ducts will be cut off from the several vacuum chambers 42, 22 and 16, which communicate with chamber 105, by means of the switch valve 89, and the key strikers will remain at rest. If, however, a key 99 be depressed and a switch valve 89 be shifted against the valve seat 10, the corresponding duct in the tracker board will admit air to the primary pneumatic 15 and the corresponding key striker will be actuated by its motor pneumatic 55. The key strikers therefore can be brought into action individually at will by the performer and the piano played

by the keys 99 without the use of a perforated music sheet, and without removing the instrument from the piano.

I have described my present invention in connection with a series of key strikers adapted to depress the keys of the piano and thereby actuate the hammers of the piano action to throw them against the piano strings; but I do not wish to confine myself to the employment of key strikers as the striker rods of each pair of motor pneumatics may be made to operate directly upon the piano action in any of the known methods now practiced in the so called playing pianos.

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

1. In a musical instrument of the class described, the combination with a pair of motor pneumatics and a common striker rod, of means for causing the operation of either of said pneumatics, and means for actuating said striker rod by either of said pneumatics independently.

2. In a musical instrument, the combination with a note producing mechanism and a pair of motor pneumatics, a single connecting rod between said pair of motor pneumatics and said note producing mechanism, means for causing the operation of either of said motor pneumatics, and means for actuating said connecting rod by either of said pneumatics independently.

3. In a musical instrument of the class described, the combination of a pair of motor pneumatics, a common striker rod for said pneumatics, a pair of vacuum chambers independently connected by valve controlled passages with said pneumatics, means for maintaining different degrees of air exhaustion in said chambers, whereby said pneumatics are actuated with different degrees of force, two sets of valves for said valve passages, and means for operating either set of valves independently of the other, whereby either pneumatic of said pair is brought into action at will.

4. In a musical instrument of the class described, the combination with a key striker, of a pair of motor pneumatics, means for operatively connecting said key striker with each of said motor pneumatics, whereby said key striker may be actuated by each motor pneumatic in said pair independently of the other, two sets of valves for controlling the action of said pair of motor pneumatics, two sets of valve pneumatics for actuating said valves, a tracker board, pipes leading from said tracker board to each set of valve pneumatics, a switch valve for directing the air from said tracker board to either set of valve pneumatics, and means for controlling the position of said switch valve at will.

5. In a musical instrument of the class described, the combination with a key striker, of a pair of motor pneumatics, means for

operatively connecting said key striker with both pneumatics in said pair, a pair of vacuum chambers having independent communication with said motor pneumatics by means of valve controlled air passages, whereby said pneumatics are independently actuated, valves for said air passages, two sets of valve pneumatics for actuating said valves, a switch valve chamber, pipes leading from said switch valve chamber to said valve pneumatics, a tracker board, a pipe leading from said tracker board to said switch valve chamber, a switch valve by which air from said tracker board is directed at will to either of said sets of valve pneumatics.

6. In a musical instrument of the class described, the combination with a pair of motor pneumatics, a vacuum chamber for each motor pneumatic in said pair, and communicating therewith by valve controlled passages, means for producing different degrees of air exhaustion in each of said chambers, whereby the motor pneumatics in said pair may be actuated with different degrees of force corresponding with the degree of air exhaustion in said vacuum chambers, means for operatively connecting both motor pneumatics in said pair to a common striker rod, and means for bringing each motor pneumatic into communication with its vacuum chamber at will.

7. In a musical instrument of the class described, the combination with a striker rod of means for actuating said striker rod with different degrees of force at will, and comprising the following instrumentalities, two motor pneumatics, each operatively connected with said striker rod to move it in one direction independently of the other motor pneumatic, a vacuum chamber for each motor pneumatic in said pair, means for maintaining different degrees of air exhaustion in each of said chambers, valve controlled passages between said motor pneumatics and said vacuum chambers, valve actuating pneumatics for said valves, a tracker board, air passages connecting said tracker board with said valve actuating pneumatics, and means for controlling said air passages, whereby either set of valve pneumatics is brought into communication with the tracker board.

8. In a musical instrument of the class described, the combination with a striker rod, of two motor pneumatics, each operatively connected with said striker rod to move it in one direction independently of the other motor pneumatic in said pair, and means for actuating each of said motor pneumatics with different degrees of force.

9. In a musical instrument of the class described, the combination with a key striker, of a pair of motor pneumatics operatively connected with said key striker, means for independently actuating said motor pneu-

5 matics and comprising a switch valve, a spring for holding said switch valve in its normal position and a key or manual for shifting said switch valve.

10 10. In a musical instrument for playing pianos, the combination with a series of key strikers corresponding with the keys of the piano, of a tracker board for a perforated music sheet, duplicate mechanisms for actu-
15 ating said key strikers arranged to be controlled by the movement of the perforated sheet over the tracker board, and means for bringing each of said actuating mechanisms into action at will, comprising a set of keys
20 or manuals corresponding with the keys of the piano.

11. In a musical instrument of the class described, the combination with a series of key strikers, of a duplicate set of actuating
25 mechanisms for each of said key strikers arranged to be controlled by the movement of a perforated sheet over a tracker board, and comprising independent vacuum chambers for each set of actuating mechanisms, a
30 tracker board, air passages connecting said tracker board with each set of actuating mechanisms, switch valves normally closing the air passages to one set of actuating mechanisms and leaving the air passages from the
35 tracker board to the other set of actuating mechanisms normally open, means for open-

ing said normally closed air passages at will, means for exhausting the air from said vacuum chambers and means for cutting off the
40 air exhausting mechanism from the actuating mechanism in normal communication with the tracker board.

12. In a musical instrument for playing pianos, the combination with the note producing mechanisms of the piano, of a pair of
45 pneumatic mechanisms connected with each note producing mechanism, means for causing the operation of either of said pneumatic mechanisms, and means for actuating each note producing mechanism from either of
50 said pneumatic mechanisms independently.

13. In a musical instrument for playing pianos, the combination with the note producing mechanisms of the piano, of a pair of
55 pneumatic mechanisms connected with each note producing mechanism, means for causing the operation of either of said pneumatic mechanisms, means for actuating each note producing mechanism from either of said pneumatic mechanisms independently, and
60 means for selecting the one of said pneumatic mechanisms to be operated.

Dated this 22d day of Sept. 1904.

RUFUS B. FOWLER.

Witnesses:

PENELOPE COMBERBACH,
DAVID FOSTER.