

No. 840,302.

PATENTED JAN. 1, 1907.

F. V. CROFUT.
MECHANICALLY OPERATED PIANO.

APPLICATION FILED AUG. 14, 1905.

4 SHEETS—SHEET 4.

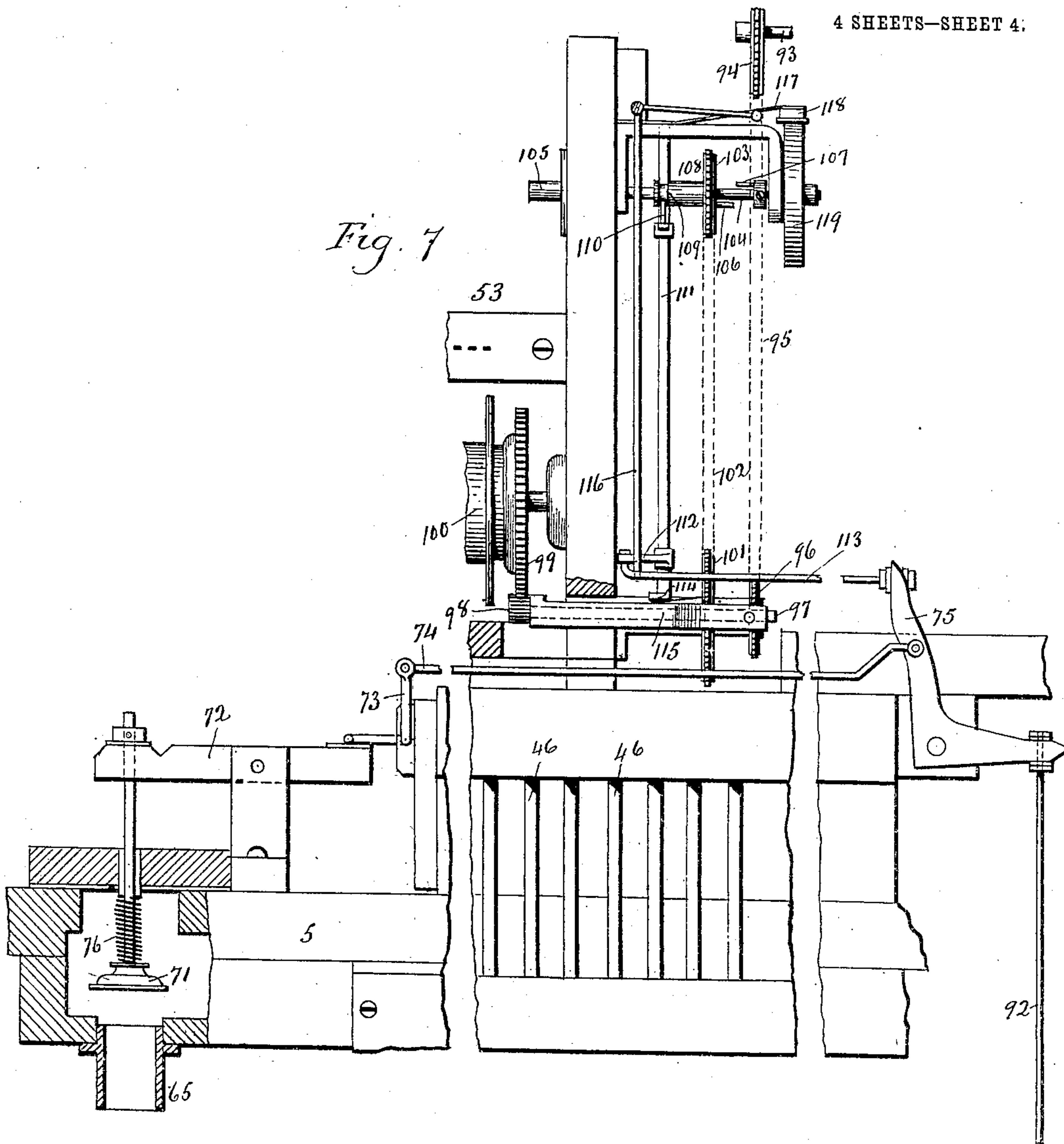
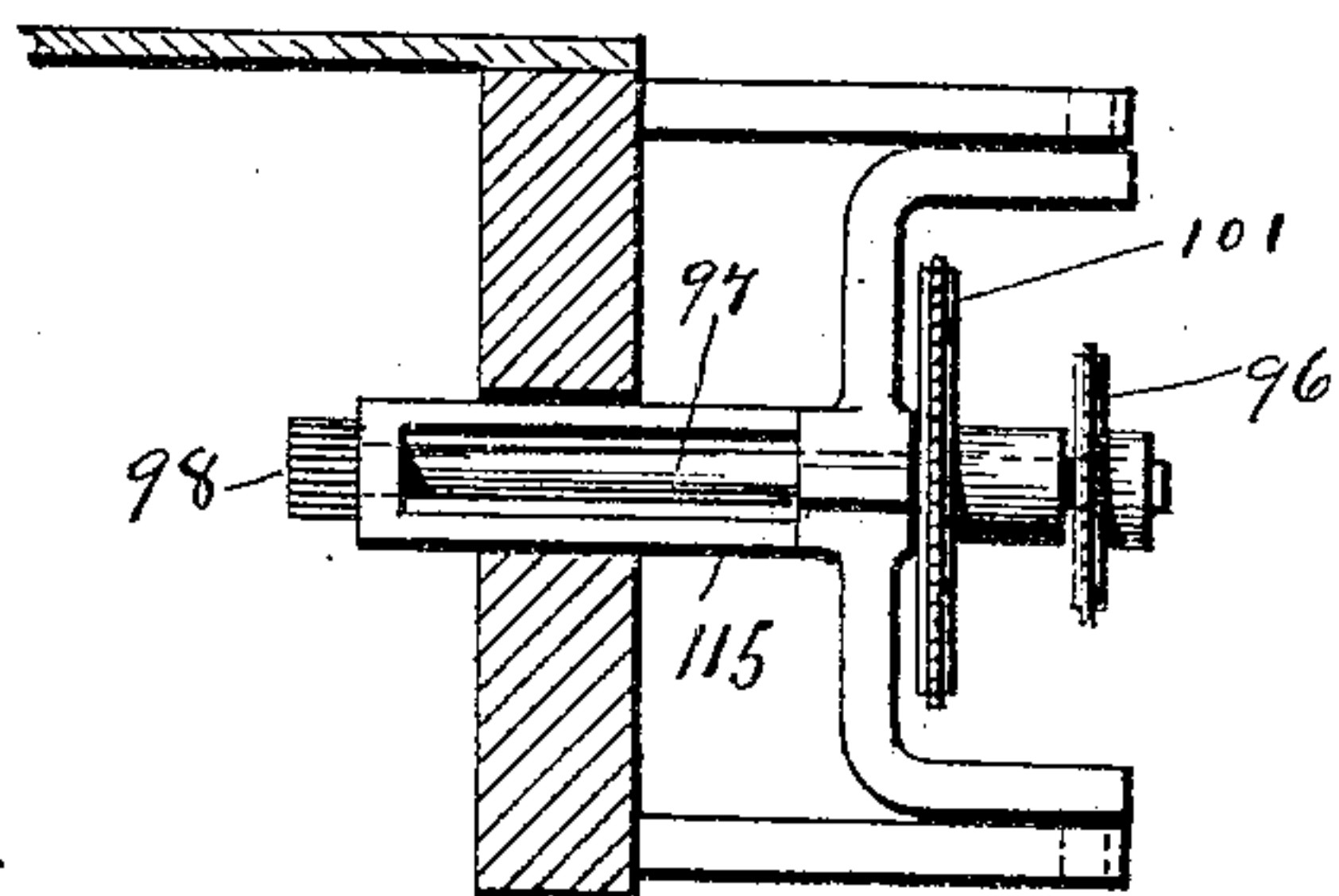


Fig. 8



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UNITED STATES PATENT OFFICE.

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MECHANICALLY-OPERATED PIANO.

No. 840,302.

Specification of Letters Patent

Patented Jan. 1, 1907.

Application filed August 14, 1905. Serial No. 274,175.

To all whom it may concern:

Be it known that I, FRANK V. CROFUT, a citizen of the United States, residing at Derby, in the county of New Haven and State of Connecticut, have invented a new and useful Improvement in Manually or Mechanically Operated Pianos; and I do hereby declare the following, when taken in connection with the accompanying drawings and the characters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a face view of a piano containing a pneumatic player constructed in accordance with my invention with the front of the case removed; Fig. 2, a sectional view through the piano-case, showing an end view of the pneumatic action; Fig. 3, a vertical sectional view showing the power-pneumatics and operating-valves therefor on an enlarged scale; Fig. 4, a front view, partially in section, showing the bellows and connections from them to the exhaust-chamber and from the exhaust-chamber to the valve-boxes; Fig. 5, a section view on the line *a b* of Fig. 4; Fig. 6, a top or plan view of a section of the valve-board; Fig. 7, a broken front view showing the winding and rewinding mechanism and also showing the cut-off valve between the exhaust-chamber and the secondary-pneumatic chamber; Fig. 8, a broken top or plan view showing the pinion-shaft of the winding and rewinding mechanism with the yoke in which it is mounted.

This invention relates to an improvement in manually or mechanically operated pianos, and particularly to the arrangement and construction of a pneumatically-operated device arranged within the piano-case for playing the instrument through the medium of a perforated roll.

The object of the invention is a simple and convenient arrangement of parts which may be readily inserted into or removed from the piano-case without disturbing the mechanism of the piano proper and which is readily accessible for repair; and the invention consists in the construction as hereinafter described, and particularly recited in the claims.

In the usual construction of pneumatic piano-players a tracker is employed, over which the perforated paper is drawn onto

a driven roller, the tracker communicating with pneumatics which operate upon the hammer mechanism, the pneumatics being controlled through an exhaust-chamber, from which the air is exhausted by bellows controlled by feeders operated by the feet.

In carrying out my invention I employ certain features like those shown and described in my prior patent, No. 773,851, granted November 1, 1904. The piano-case 2, which is of the usual form of an upright-piano case, has its interior side walls formed with brackets or shelves 3, arranged above the keys 4, the brackets being formed by the checks of the piano-case, and on these brackets rests the secondary-pneumatic-board 5, on which is supported, or to which is connected the main portion of the pneumatic device, as will be hereinafter described. Arranged below the secondary-pneumatic board 5 are three horizontally-arranged pneumatic boards 6, 7, and 8, which support three rows of power-pneumatics 9, 10, and 11, each of which is connected with a separate lever 12, which extends rearward, and which are furnished at their rear ends with capstan-screws 13, which engage with lugs 14, secured to the forward faces of abstracts 15 of the piano mechanism, which will not be further described, as it may be of any preferred construction. The secondary pneumatic board 5 contains a secondary-pneumatic chamber 16, formed with three rows of ports 17, 18, and 19, which communicate with holes 20, 21, and 22, arranged in rows in a valve-board 23. In each hole are double valves 24, 25, and 26, normally closing the ports 17, 18, and 19, but adapted to be raised to close the holes 20, 21, and 22, which are provided with metal valve-seats 27, 28, and 29. the valves 24, 25, and 26 being operated by secondary pneumatics 30, 31, and 32, arranged within the secondary-pneumatic chamber and on which rest the valve-stems 33, 34, and 35 of the valves 24, 25, and 26. The holes 20, 21, and 22 are arranged in the valve-board in rows, and from the holes 21 and 22 passages 36 extend rearward and open downward through the bottom of the valve-board 23, which projects beyond the rear of the secondary-pneumatic board 5, and these passages 36 and 37 connect by tubes 38 with passages 40 and 41, which enter the power-

pneumatics 10 and 11, while from the holes 20 passages 42 extend forward and open through the top of the valve-board 23 and are connected with tubes 43, which extend rearward over the valve-board 23 into connection with passages 44, which extend down through the valve-board 23 between the passages 36 and 37, through the secondary-pneumatic board 5, into connection with the power-pneumatics 9, and this arrangement of the holes 20, 21, and 22 is made necessary in order to get the required number of holes and make the connections from them to the power-pneumatics within the limited space allowed. Each of the secondary pneumatics 30, 31, and 32 is connected by a passage 45 and tube 46 with a channel 47, leading to the primary-pneumatic chamber 48 and through ports 49 to the atmosphere, the primary-pneumatic chamber being arranged parallel with the secondary-pneumatic chamber. In the chamber 48 are a series of primary pneumatics 51, operating valves 50 to close the passage to the channel 47 and open the ports 49. Opening to the under side of the primary pneumatics 50 are passages 52, leading to the tracker 53 through pipes 54. The exhaust-chamber 55 is arranged below the keyboard 56 and is preferably cut away at the center to give clearance for pedals 57, which operate feeders 58, by which air is exhausted from the chamber 55. At the center of the exhaust-chamber and above the pedals 57 is a high-pressure bellows 59, and at the left is a low-pressure bellows 60, while at the right is a motor-bellows 61. The low-pressure bellows 60 is connected by a passage 62 and tube 63 with the valve-box 64, which is connected, through a tube 65, with the secondary-pneumatic chamber 16, while the exhaust-chamber 55 connects directly with the valve-box 64 through a port 66 and tube 67, the valve-box being provided with a valve 68, which is adapted to close the tube 67 and which is operated through a rod 69, having a handle 70 extending up in front of the keys 4. The upper end of the tube 65 is adapted to be closed by a valve 71, arranged above it and extending upward through the secondary-pneumatic board 5 and suspended at the outer end of a lever 72, which is depressed by a lever 73, arranged at the right-hand end of a tracker 74, which extends across the instrument into engagement with a bell-crank lever 75, which will be hereinafter described. The valve 71 is normally held open against the action of a spring 76. If, therefore, the valve 68 is closed, the power of the exhaust will be that exerted by the low-pressure bellows 60, whereas if the valve 68 be opened the pressure will be that exerted by the high-pressure bellows 59, as that bellows will act directly through the exhaust-chamber 55 with the secondary-pneumatic chamber, whereas if the valve 71 be closed all connec-

tion between the exhaust-chamber 55 and the secondary-pneumatic chamber will be cut off.

At the right-hand side the motor-bellows 61 connects with the chamber 77 of the motor-valve box 78 through a passage 79 and tube 80, and this chamber 77 communicates with motors 81 through a passage 82 and tube 20, which are controlled by a slide-valve 83, which may be opened or closed by a valve-rod 84, operated by a handle 85 in front of the keyboard. Connection is also made with the motors 81 through the valve-box 78 by tubes 86 and 120, which communicate through a port 87 with the exhaust-chamber 55, and this tube 86 is adapted to be closed by a valve 88, operated by a rod 121 through a crank-lever 89, the upper arm of which is connected through a rod 90 with a handle-lever 91, while the other end is connected by a rod 92 with the lower arm of the bell-crank lever 75 before specified. The motors 81 turn a crank-shaft 93, on which is mounted a sprocket-wheel 94, connected by a chain 95 with a sprocket-wheel 96 on the outer end of a shaft 97, which at its inner end carries a pinion 98, meshing with a pinion 99 on the end of a winding-roll 100. The shaft 97 also carries a sprocket-wheel 101, connected by a chain 102 with a sprocket-wheel 103, loosely mounted upon a shaft 104, which carries one of the supports 105 for the music-roll, the other end of the roll entering a support 105^a in the usual manner. The sprocket 103 carries an outwardly-extended point 106, adapted to engage with a similar point 107, fixed to the shaft 104, and the sprocket-wheel 103 is adapted to be moved back and forth on the shaft 104, so that the points 106 may engage or disengage with each other by forming its hub 108 with a groove 109 to receive a pin 110, mounted upon a vertically-arranged rock-shaft 111, which is provided near its lower end with an arm 112, the outer end of which is connected by a rod 113 with the upper end of the bell-crank lever 75. The lower end of the rock-shaft 111 is formed with a foot 114, which bears upon a frame 115, carrying the shaft 97, and so that as the rock-shaft is turned the foot 114 will depress the pinion 98 and throw it out of engagement with the pinion 99. The outer end of the arm 112 also engages the lower end of a rod 116, which extends upward above the shaft 104 and forward beneath a spring-arm 117 of a brake 118, which bears upon the periphery of the wheel 119, mounted on the outer end of the shaft 104.

A roll being mounted in the supports 105 and 105^a and passed over the tracker 53 is engaged with a winding-roll 100 in the usual manner. The feeders 58 being actuated by pedals 57 exhaust the air from the chamber 55, and the motor-valve 83 being open allows the motor-pneumatics 81 to operate, turning

the crank-shaft 93 and through the sprockets and chains driving the winding-roll 100. At the same time if the valve 68 in the valve-box 64 be open the power of the exhaust-chamber 55 will be exerted in the secondary-pneumatic chamber 16. As the perforation in the music-roll passes over the corresponding opening in the tracker air will be admitted, communicating through the tubes 54 and passage 52 with one of the primary pneumatics 50, causing it to operate and raise the valve 51, which opens a port 49 to the atmosphere, allowing air to enter through the channel 47, tube 46, and passage 45 to one of the secondary pneumatics 30, 31, or 32. If one of the pneumatics 30 be operated, it will raise the stem 33 of the valve 24 and open the port 17 in the hole 20 in the valve-board 23, and this will communicate through the passage 42 forward and upward through the tube 43, thence downward through the passage 44 to one of the upper series of power-pneumatics 9, which will operate a corresponding lever 12, raising its rear end to lift its corresponding pilot-rod and strike a note. If either of the secondary pneumatics 31 or 32 is operated, the corresponding port 18 or 19 will be opened into a corresponding hole 21 or 22 in the valve-board, which communicates rearward through passages 36 or 37 with tubes 38, extending downward into connection with the corresponding power-pneumatics 10 or 11 and operate levers, as before described.

By having the valve 68 open the power of the high-pressure bellows is exerted, while fortissimo effects are obtained by moving the regular dampers of a piano, which may be done through the instrumentality of a handle 120, arranged in front of the keyboard. To obtain soft effects, the valve 68 will be closed, cutting off direct communication between the valve-box 64 and the exhaust-chamber and limiting the pressure to that derived by the low-pressure bellows 60 through the passage 62 and tube 63, this valve 68 being operated by the handle 10. To increase or diminish the tempo, the handle 85 will be turned to move the valve 83 to open or close the passage 82 from the motor-bellows 61 to the motor, the motor being thus operated entirely through the motor-bellows 61, so that the regular pressure is obtained. When, however, it is desired to rewind the roll, greater speed is desired, and this is obtained by moving the handle 91, which moves the rod 90, turning the bell-crank lever 89, raising the valve 88, which opens direct communication between the chamber 55 and the motor. At the same time turning the bell-crank lever 89 turns the bell-crank lever 75, which rocks the shaft 111, first depressing the shaft 97 and throwing the pinion 98 out of engagement with the pinion 99, leaving the winding-roll free to revolve. At the same time the shaft 111 shifts the wheel 103, so that the pins 106

and 107 engage with each other, so that the roll-holder 105 will be turned by the movement of the shaft 104, which is thereby turned. At the same time that the shaft 111 is turned by the arm 112 that arm engages the lower end of the rod 116, which lifts the brake 118 over the wheel 109, leaving the shaft 104 free to turn. When the rewinding is taking place, it is desirable to cut off all communication with the secondary-pneumatic chamber so as to prevent the sounding of notes as the perforations pass over the tracker, and this is done by closing the valve 71, by releasing the lever 72, by raising the lever 73, which is done by means of a rod 74, which is also engaged with the bell-crank lever 75, so that the turning of the rewinding-handle 91 not only operates the valve to drive the motor faster, but throws the winding mechanism out of action and the rewinding mechanism into action and cuts off communication between the exhaust-chamber and the power-pneumatics.

The arrangement of parts as herein shown and described is such that the upper part of the mechanism, including the power-pneumatics, valve-board, winding mechanism, &c., may be readily inserted into the case above the keyboard and secured therein by one or two screws at each side entering the brackets 3, while the bellows and feeding mechanism is as readily inserted below the keyboard without interfering with the piano mechanism. By cutting away the central portion of the bellows the pedals may be readily folded into the case when not required, so that the regular pedals of a piano are accessible, the connections between the valve-box and the secondary-pneumatic chamber and the motor-valve box and the motor being the only parts that extend up through the keyboard, aside from the levers which control the mechanism. Thus either the upper or lower part of the mechanical playing device may be readily removed without disturbing the other, and, as before stated, either part may be removed without interfering with the regular piano mechanism. A further advantage of this construction is that ready access may be had to the valve-board without removing the entire pneumatic device from the piano-case. If foreign substances enter the action, they are most likely to lodge in the valves above the secondary pneumatic, and this construction permits the removal of the top portion, so that these valves are exposed for inspection.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a piano-case and piano mechanism, of pneumatic instrumentalities comprising a transversely-arranged secondary-pneumatic chamber, a valve-board above the same and parallel therewith, power-pneumatics arranged horizontally in two or more series below said secondary pneu-

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 matics, valves in said valve-board for controlling said power-pneumatics, said valves arranged in two or more rows, passages from the foremost row of valves forward and upward through the valve-board, thence over the valve-board and down through the same to the uppermost power-pneumatics, and passages from the other valves rearward through the valve-board and opening downward through the same into connection with the lower pneumatics, and connections between the forward ends of the pneumatics downward to levers which extend rearward into engagement with the piano-action.

15 2. The combination with the piano-action including a keyboard and means for operating the hammers, of a pneumatic action arranged above the keyboard and having levers extending rearward into engagement with
 20 said action, said pneumatic action including a secondary-pneumatic chamber, a motor and means for shifting the power therefrom to

wind and rewind a roll, an exhaust-chamber, passages therefrom to the secondary-pneumatic chamber and to the motor, a valve in the secondary-pneumatic chamber for closing the passage thereto, a valve below the keyboard for opening direct connection between the exhaust-chamber and the motor, a lever above the secondary-pneumatic chamber for operating the first-mentioned valve, a bell-crank lever for operating the motor-shifting mechanism and for operating the valve for operating and closing connection between the exhaust-chamber and the motor, said levers being coupled together for simultaneous action, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

FRANK V. CROFUT.

Witnesses:

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 RAYMOND CHRISTENSEN.