G. W. & R. PAULSON.

PNEUMATIC PLAYER.

APPLICATION FILED NOV. 6, 1909.

1,100,611. **Patented June 16, 1914.**

6 SHEETS—SHEET 1.

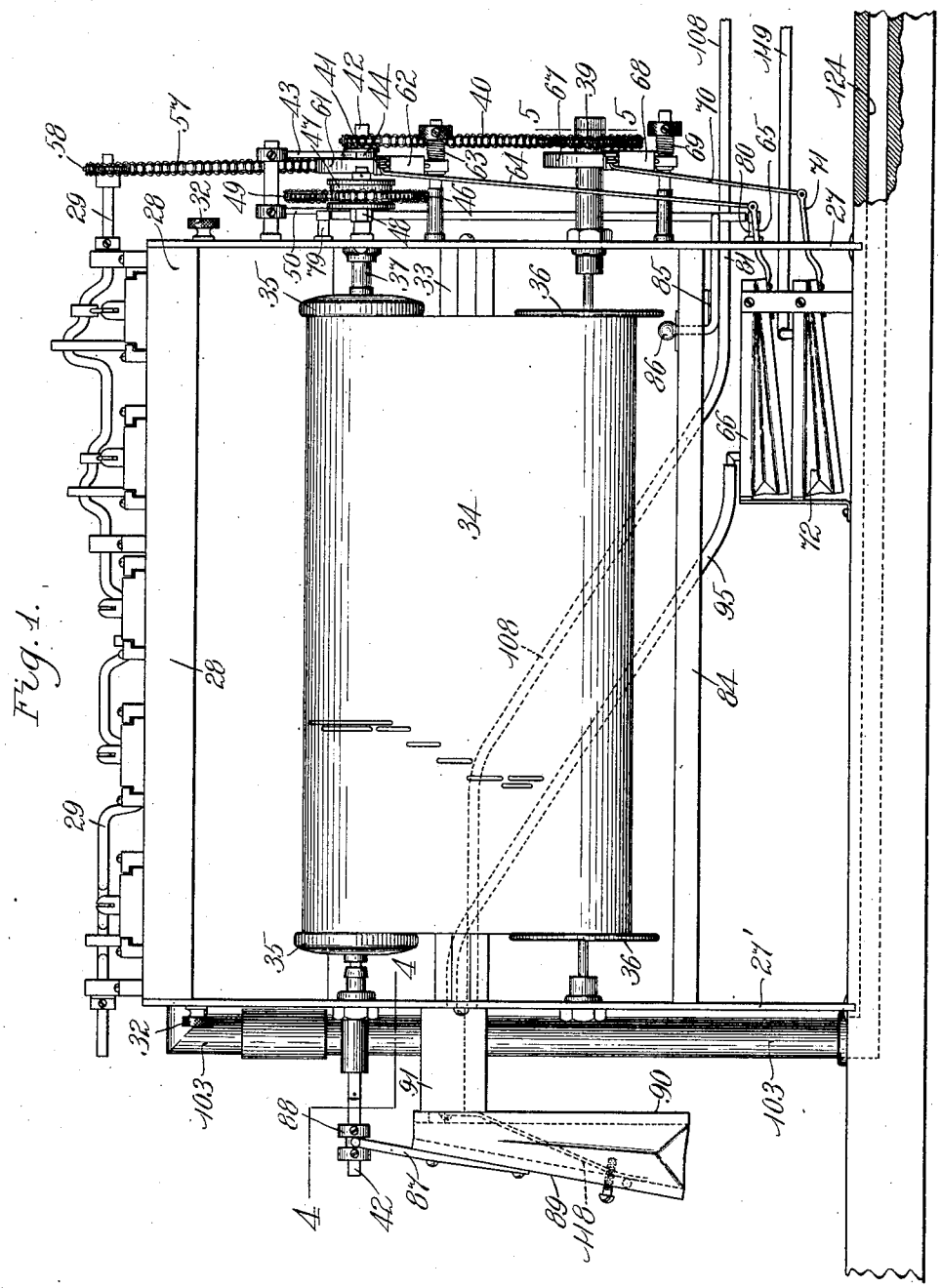

Fig. 1.

Witnesses.
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and Rudolf Paulson,
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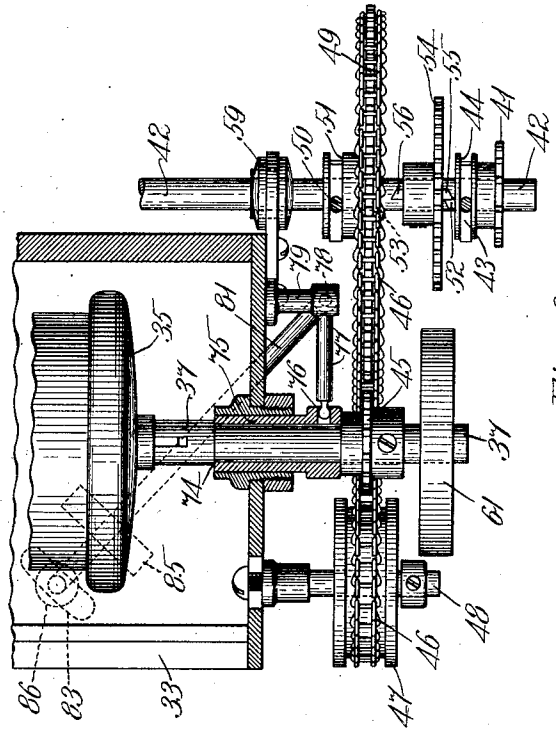

Fig. 3.

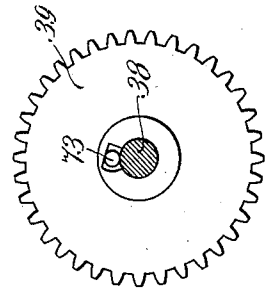

Fig. 5.

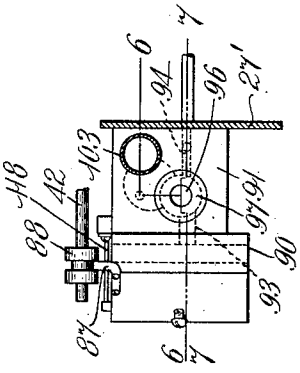

Fig. 4.

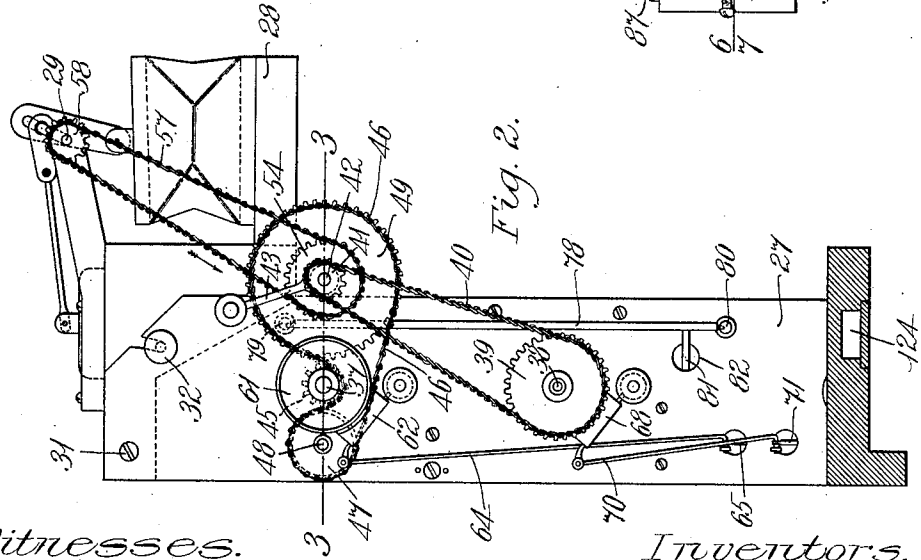

Fig. 2.

Witnesses.

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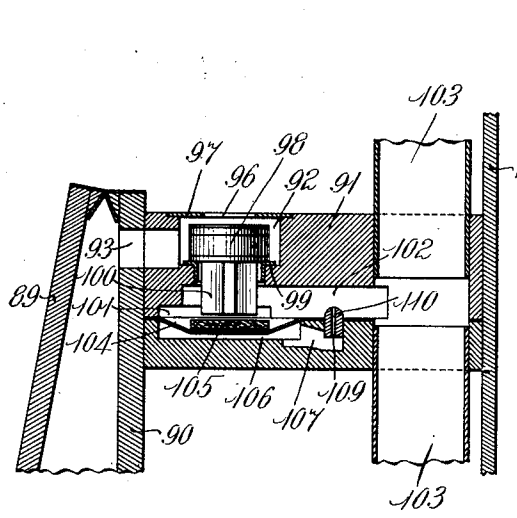


Fig. 6.

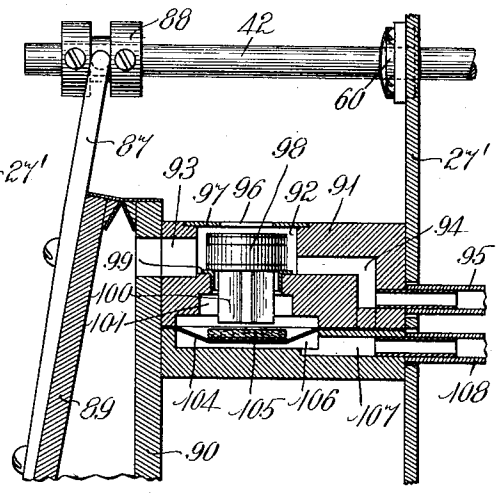
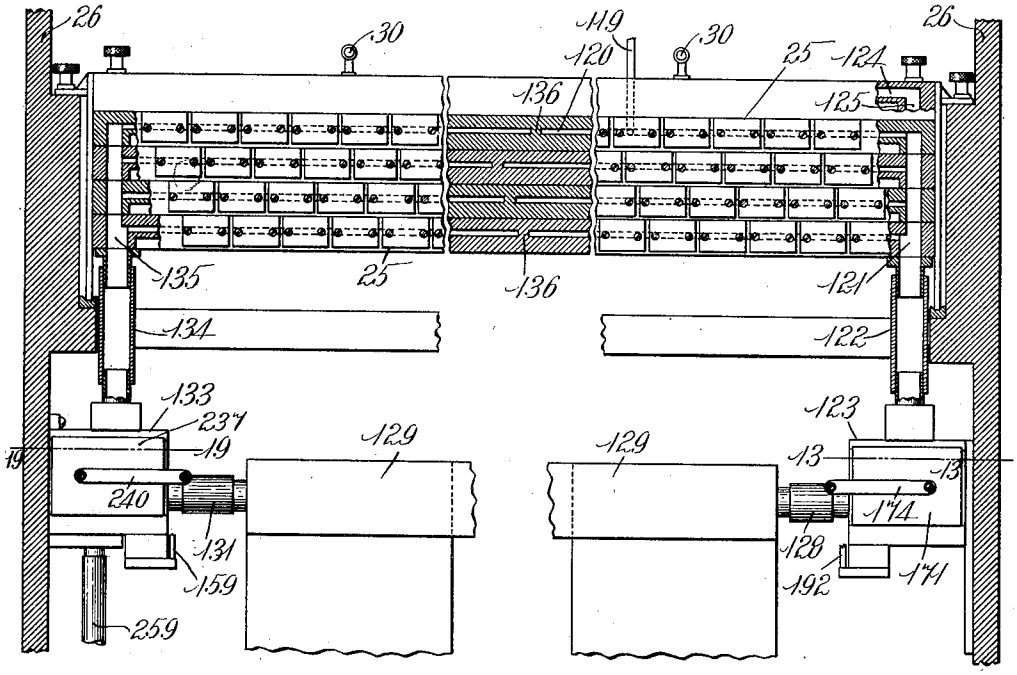


Fig. 7.



Witnesses.
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Fig. 8.

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6 SHEETS—SHEET 4.

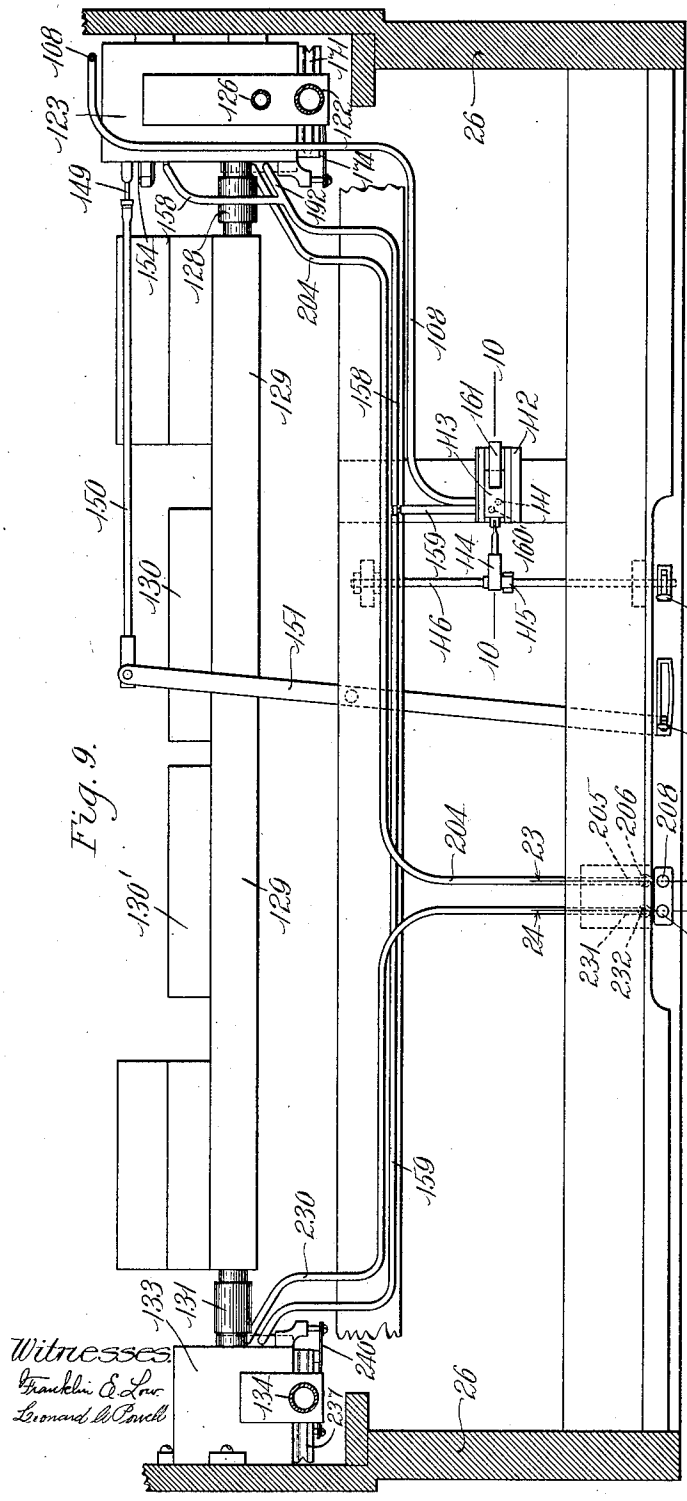

Fig. 9.

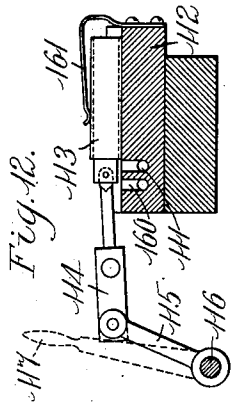

Fig. 12.

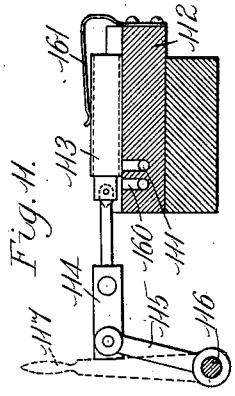

Fig. 11.

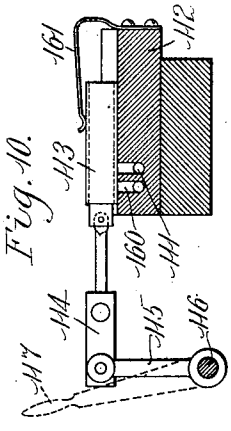

Fig. 10.

Witnesses.
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6 SHEETS—SHEET 5.

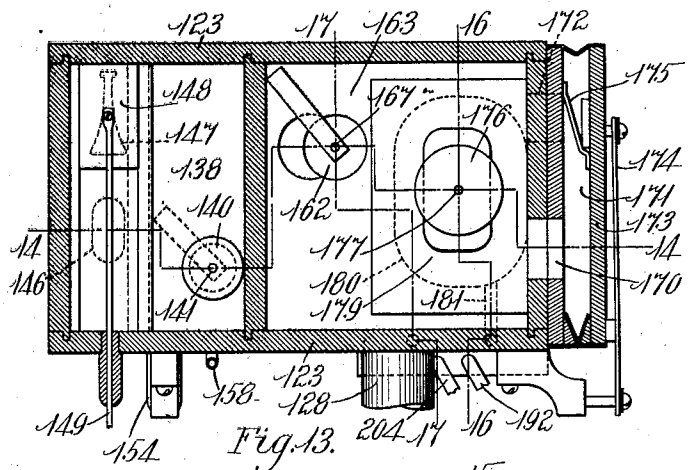

Fig. 13.

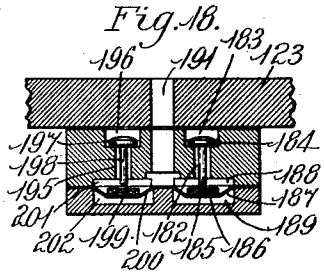

Fig. 18.

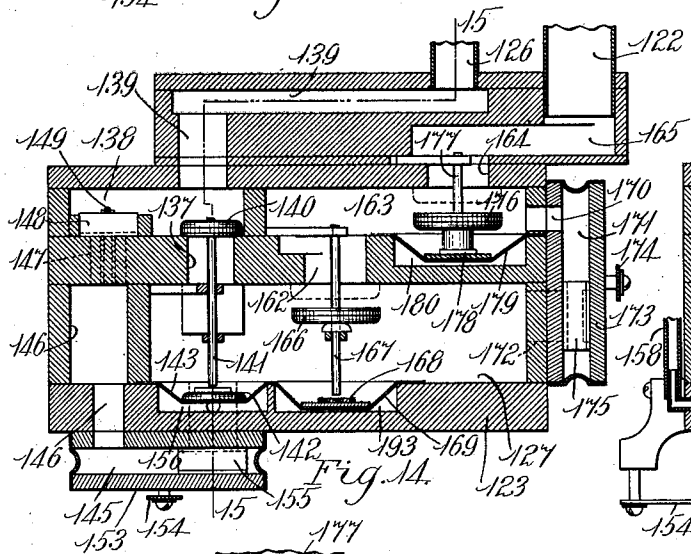

Fig. 14.

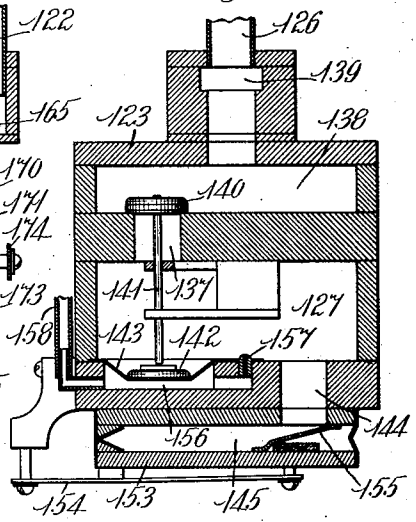

Fig. 15.

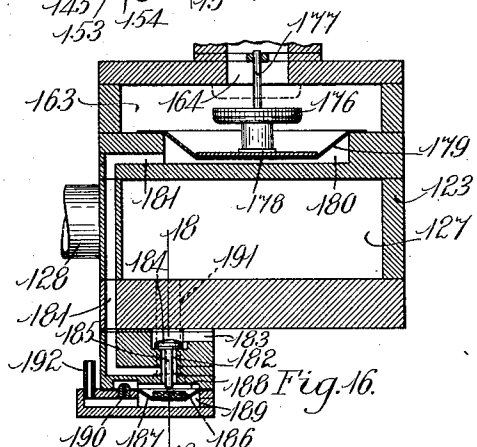

Fig. 16.

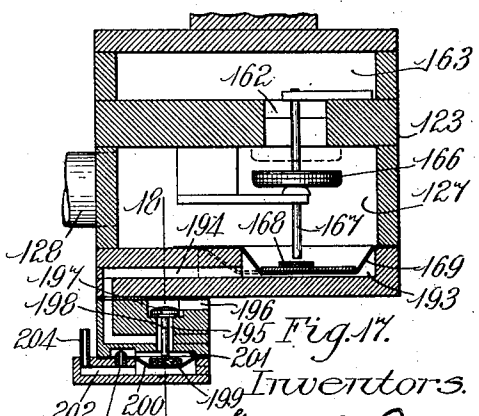

Fig. 17.

Witnesses.

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G. W. & R. PAULSON.

PNEUMATIC PLAYER.

APPLICATION FILED NOV. 6, 1909.

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6 SHEETS—SHEET 6.

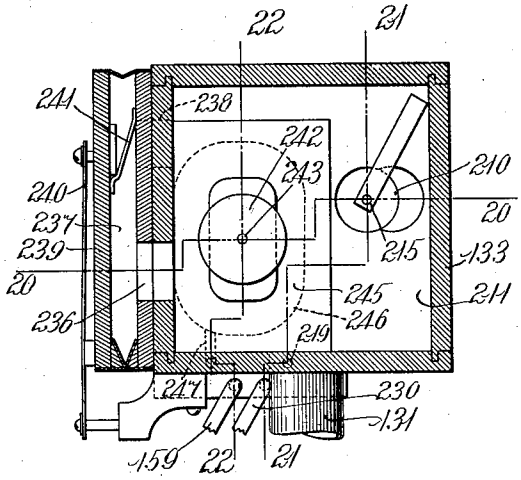

Fig. 19.

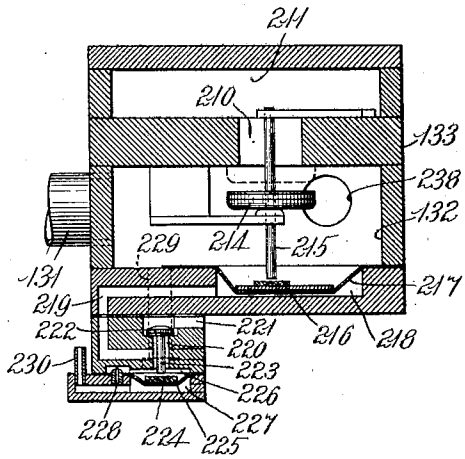

Fig. 21.

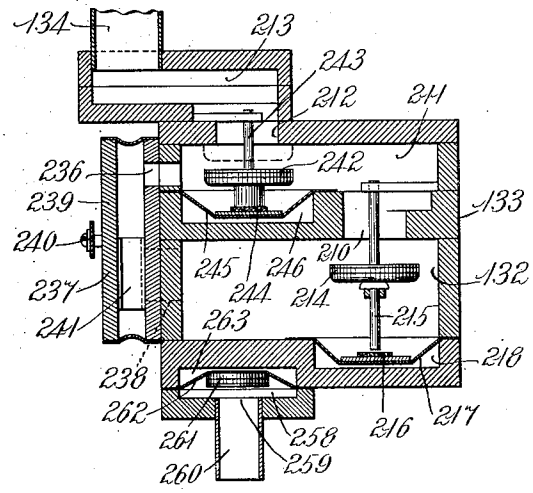

Fig. 20.

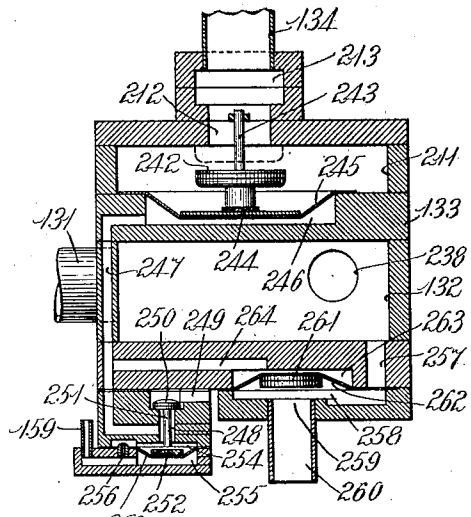

Fig. 22.

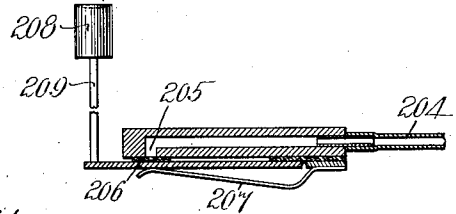

Fig. 23.

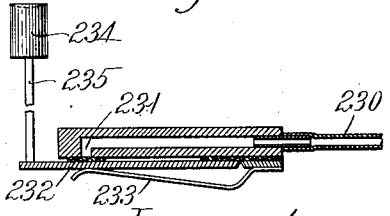

Fig. 24.

Witnesses.

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by their attorney, Charles S. Goding.

UNITED STATES PATENT OFFICE.

GUSTAF W. PAULSON, OF BELMONT, AND RUDOLF PAULSON, OF BOSTON, MASSACHUSETTS, ASSIGNORS TO HENRY F. MILLER & SONS PIANO COMPANY, A CORPORATION OF MASSACHUSETTS.

PNEUMATIC PLAYER.

1,100,611. Specification of Letters Patent. Patented June 16, 1914.

Application filed November 6, 1909. Serial No. 526,514.

To all whom it may concern:

Be it known that we, GUSTAF W. PAULSON, a citizen of the United States, residing at Belmont, in the county of Middlesex, and RUDOLF PAULSON, a citizen of the United States, residing at Boston, in the county of Suffolk, both in the State of Massachusetts, have invented new and useful Improvements in Pneumatic Players, of which the following is a specification.

This invention relates to improvements in pneumatic player mechanisms, and has for its general object to provide simple and conveniently arranged means for controlling the operation of the various parts and for controlling their coöperative action whereby the mechanism shall be easily controlled and instantly responsive to the will of the operator.

The object is further to reduce the number of parts and also to reduce the number of distinct units of the mechanism so as to simplify the construction, render easy and convenient the assembling and dismounting of the parts, and provide more direct communication and connection between coöperating parts so that the entire mechanism is rendered neater and more compact than player mechanisms heretofore and the parts operate with more sensitiveness and responsiveness.

The object is still further to provide improved means for controlling the bass and treble sides of the player action so as to make it possible to accent the melody or accompaniment at will.

Still other objects and advantages will appear hereinafter.

The invention consists in the novel features of construction and in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims.

Referring to the drawings: Figure 1 is a front elevation of the upper portion of a pneumatic player mechanism embodying our invention. Fig. 2 is an elevation, partly in section, viewed from the right of Fig. 1. Fig. 3 is an enlarged detail plan section taken on line 3—3 of Fig. 2. Fig. 4 is a detail plan section taken on line 4—4 of Fig. 1. Fig. 5 is an enlarged detail sectional view taken on line 5—5 of Fig. 1, looking toward the left. Fig. 6 is an enlarged detail developed section taken on line 6—6 of Fig. 4. Fig. 7 is an enlarged detail sectional view taken on line 7—7 of Fig. 4. Fig. 8 is a front elevation of the lower portion of the player mechanism, partly in section and partly broken away to save space. Fig. 9 is a plan, partly in section, showing the controlling devices and their connection with the air tension regulators. Fig. 10 is an enlarged detail sectional view taken on line 10—10 of Fig. 9 showing the controller valve in "playing" position. Fig. 11 is a sectional view also taken on line 10—10 of Fig. 9 showing the controller valve in position for accelerated forward speed of music sheet not playing. Fig. 12 is a sectional view taken on line 10—10 of Fig. 9 showing the controller valve positioned for accelerated speed of music sheet with reverse motion for rewinding. Fig. 13 is an enlarged detail plan section taken on line 13—13 of Fig. 8. Fig. 14 is a sectional view taken approximately on the irregular line 14—14 of Fig. 13. Fig. 15 is a sectional view taken approximately on the irregular line 15—15 of Fig. 14. Fig. 16 is a sectional view taken approximately on the irregular line 16—16 of Fig. 13, looking toward the left. Fig. 17 is a sectional view taken approximately on the irregular line 17—17 of Fig. 13, looking toward the left. Fig. 18 is a detail sectional view taken on line 18—18 of Fig. 16, looking toward the right. Fig. 19 is an enlarged detail plan section taken on line 19—19 of Fig. 8. Fig. 20 is a sectional view taken approximately on the irregular line 20—20 of Fig. 19. Fig. 21 is a sectional view taken approximately on the irregular line 21—21 of Fig. 19, looking toward the right. Fig. 22 is a sectional view taken approximately on the irregular line 22—22 of Fig. 19. Fig. 23 is a section on line 23—23 of Fig. 9. Fig 24 is a section on line 24—24 of Fig. 9.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, referring to Fig. 8, 25 is a player action of any usual or desired construction, suitably supported in a casing 26 which in this instance is the piano casing. On the player action 25 two uprights or cheeks 27 and 27′ are supported, as shown in Fig. 1, and these cheeks support a pneumatic motor 28 of any usual or desired con-

struction having a power shaft 29. By thus supporting the motor on the uprights 27 and 27′, the motor and player action constitute a unit which may be lifted entire from the piano casing by grasping handles 30 secured to the player action, (see Fig. 8). This placing of the motor has the further advantage of making it possible to provide simple, direct connections from the motor to the music roll and spool and between the motor and the wind-chest as will be fully described hereinafter. Preferably the motor 28 is pivoted at 31 on the uprights 27 so that the same may be swung forwardly as viewed in Fig. 1, or counterclockwise as viewed in Fig. 2 in order that the piano strings may be gotten at for the purpose of tuning. The motor is secured in its normal position, as shown in Figs. 1 and 2, by means of thumb screws 32 on each side thereof, see Figs. 1 and 2.

Mounted between the uprights 27 and 27′ is a tracker bar or board 33 of any usual or desired construction across which extends a music sheet 34 having its ends wound on a music roll 35 and a take-up spool 36 driven by spindles 37 and 38, respectively, mounted in any usual or desired manner on the upright 27. Mounted on the spindle 38 is a sprocket wheel 39 connected by a chain 40 to a sprocket wheel 41 loosely mounted on a shaft 42 and held against longitudinal displacement thereon by a fixed fork 43 located in an annular groove 44 provided in the hub of said sprocket wheel.

Secured to the spindle 37 is a sprocket wheel 45 driven by a chain 46 passing part way around an idler drum 47 journaled on a stud 48, said chain extending part way around and being driven by a sprocket wheel 49 loosely mounted on the shaft 42 and held against longitudinal displacement thereon by a fixed fork 50 located in an annular groove 51 provided in the hub of said sprocket wheel. The sprocket wheel 41 is provided with a clutch tooth 52 and the sprocket wheel 49 is provided with a clutch tooth 53, (see Fig. 3).

Secured to the shaft 42 is a sprocket wheel 54 having on one side a clutch tooth 55 adapted to be moved into engagement with the clutch tooth 52, while said sprocket wheel is provided on its other side with a clutch tooth 56 adapted to be moved into engagement with the clutch tooth 53. The sprocket wheel 54 is connected by a chain 57 to a sprocket wheel 58 secured to the power shaft 29. The shaft 42 is rotatably and slidably mounted in suitable bearings 59 and 60, (see Figs. 3 and 7) on the uprights 27 and 27′, respectively, so that movement of said shaft in one direction causes the clutch tooth 55 to coöperate with the clutch tooth 52, and movement of said shaft in the opposite direction causes the clutch tooth 56 to coöperate with the clutch tooth 53 so that either the sprocket wheel 41 or the sprocket wheel 49 is driven by the sprocket wheel 54 according to which pair of clutch teeth are engaged. Assuming that the power shaft 29 rotates counterclockwise, it will be evident that when the sprocket wheel 49 is connected to and driven by the sprocket wheel 54, the sprocket wheel 45 and music roll 35 will be rotated clockwise and that when the sprocket wheel 41 is connected to and driven by the sprocket wheel 54, the sprocket wheel 39 and take-up spool 36 will be rotated counterclockwise.

Secured to the spindle 37 is a brake drum 61, see Figs. 1, 2 and 3, and against this drum a pivoted brake shoe 62 is forced by a suitable spring 63. The brake shoe 62 is connected by a link 64 to a lever 65 secured to the movable part of a brake-releasing bellows 66. Secured to the spindle 38 is a brake drum 67 against which a brake shoe 68 is adapted to be pressed by a suitable spring 69. The brake shoe 68 is connected by a link 70 to a lever 71 secured to the movable part of a brake-releasing bellows 72. Preferably the sprocket wheel 39 normally drives the shaft 38 through a suitable roller clutch 73 (see Fig. 5) so that the music sheet may be adjusted by manually rotating the take-up spool 36 independently of the spindle 38 in an obvious manner.

Loosely mounted on the shaft 37 between the shoulder 74 thereon and the sprocket wheel 45 is a sleeve 75 having therein a recess 76 in which is located a spherical projection formed on an arm 77 secured to a vertical rock shaft 78 mounted in suitable bearings 79 and 80 on the upright 27, (see Figs. 1, 2 and 3). Secured to the rock shaft 78 adjacent to its lower end is an arm 81 projecting horizontally through a hole 82 provided in the upright 27 and vertically through a slot 83 provided in a cross member 84 connecting the uprights 27 and 27′. The horizontal portion of the arm 82 is engaged by a suitable frictional brake 85 acting thereon at all times and tending to hold the same in fixed position. By grasping a knob 86 provided on the arm 82 the same may be rocked one way or the other, thereby imparting a rocking motion to the arm 77 and a horizontal reciprocatory motion to the sleeve 75, spindle 37 and music roll 35 so that the music sheet 34 may be shifted at will to cause the usual slots therein to aline with the usual holes in the tracker bar.

The shaft 42 is shifted by a lever 87 engaging a collar 88 secured to said shaft, said lever being secured to a movable wall 89 of a clutch shifting bellows 90, (see Figs. 1 and 7). The bellows 90 is secured to a valve casing 91 having therein a recess 92 communicating with said bellows through a passage 93 and communicating with the bel-

lows 66 through a passage 94 and a suitable conduit 95. The recess 92 normally communicates with the outer atmosphere through an aperture 96 provided in a washer 97 which forms an upper seat for a vertically reciprocatory valve 98, (see Figs. 6 and 7). The valve 98 normally rests upon a lower valve seat 99 and is provided with a fluted shank 100 extending downwardly through a passage 101 forming a communication between the recess 92 and a passage 102 communicating with a motor conduit 103. The valve 98 is actuated by a diaphragm 104 having thereon a suitable pad 105 which engages the lower end of the shank 100, said diaphragm separating the passage 102 from a chamber 106 located therebeneath, said chamber being connected by a passage 107 to a conduit 108. The passage 107 communicates with the passage 102 through a pin hole 109 which for convenience of manufacture is formed in a plug 110. Assuming that an air tension exists in the motor conduit 103, it will be evident that an air tension will normally exist on the upper and lower sides of the diaphragm 104 so that said diaphragm will be normally balanced. The conduit 108 leads to a port 111 formed in a valve chest 112, (see Figs. 9 to 12, inclusive) and the communication between this port and the outer atmosphere is controlled by a slide valve 113 connected by a link 114, rocker arm 115 and rock shaft 116 to a manually operable lever 117.

A spring 118 located within the bellows 90 constantly tends to open the same and thus tends to hold the clutch tooth 55 in position to coöperate with the clutch tooth 52. When the port 111 is opened to the atmosphere, atmospheric air rushes through the conduit 108 into the chamber 106 and lifts the diaphragm 104, said diaphragm thereby actuating the valve 98 to close communication between the bellows 90 and the outer atmosphere and open communication between said bellows and the motor conduit 103, the consequence being that air is drawn from said bellows and the same is closed, thereby shifting the shaft 42 and moving the clutch tooth 56 into position to coöperate with the clutch tooth 53. Furthermore, when the valve 98 lifts, as just described, air is drawn from the bellows 66 through the conduit 95, passages 94, 101 and 102 to the motor conduit 103 thereby collapsing the bellows 66 and thus actuating the brake shoe 62 to release the brake drum 61 simultaneous with the engaging of the clutch tooth 56 with the clutch tooth 53. The bellows 72 is connected by a conduit 119, (see Figs. 1 and 8) with a passage 120 formed in the player action 25, the latter passage communicating through a passage 121 and conduit 122 with a controller casing 123, (see Figs. 8, 9 and 14). Therefore, since an air tension is created within the passages 120 and 121 of the player action, air is drawn through the conduit 119 from the bellows 72 thereby collapsing the same and actuating the brake shoe 68 to release the brake drum 67. It will be understood that this releasing of the brake drum 67 takes place as soon as the operation of the usual feeders or exhausters begins, as will be hereinafter more fully explained. The motor conduit 103 which is connected to the motor 28 leads to a passage 124 communicating with a passage 125 in the player action 25, the latter passage being connected by a conduit 126 to the controller casing 123, (see Figs. 1, 8 and 14). Here then is another advantage resulting from placing the motor upon the uprights 27 and 27′ since the passage to the motor extends for the most part through conduits built into the player action instead of having a long flexible conduit extending from the motor to the controller casing, as is customary.

The controller casing 123 is provided with a chamber 127 which is, at all times, in communication through a conduit 128 with a wind-chest 129, (see Figs. 16 and 17) from which air is exhausted by two usual pedal operated feeders 130 and 130′, (see Fig. 9). The wind-chest 129 also communicates through a conduit 131 with a chamber 132 formed in a second controller casing 133, (see Figs. 21 and 22). The controller casing 133 is connected by a conduit 134 to a passage 135 within the player action 25.

The internal air tension passages of the player action are divided into right and left parts by a partition or partitions 136 in a well known manner and thus by varying the amount of air drawn from opposite sides of this partition the bass notes or treble notes of the piano are accented by suitable devices which will be hereinafter described. The chamber 127 communicates through a passage 137 with a chamber 138 and a passage 139 with the conduit 126 which is in communication with the motor 28. The passage 137, however, is normally closed by a valve 140 having a stem 141 mounted to slide vertically in suitable guides, the lower extremity of said stem resting upon a pad 142 upon a valve-actuating diaphragm 143. The chamber 127 also communicates with the chamber 138 through a passage 144, a bellows 145, passage 146 and a port 147, said port being controlled by a slide throttle valve 148. The throttle valve 148 is connected by a valve stem 149 and link 150 to a tempo lever 151 having a handle 152 for manual control, (see Fig. 9). It will be evident that when the valves 140 and 148 are both closed, the motor will remain inactive since no air can be drawn therefrom by the feeders. The bellows 145 has a movable wall 153 to which is connected a spring 154

constantly tending to distend said bellows and said movable wall actuates a suitable valve 155 controlling the communication between the passage 144 and said bellows.

It will be evident that when the operation of the feeders begins, air will be drawn from the chamber 127 and bellows 145 thereby collapsing said bellows. If then, the throttle valve 148 be opened, air will be drawn from the motor and the same will be started into operation, the function of the bellows 153 being to act as a governor on the motor to maintain the speed thereof substantially constant when the throttle valve 148 is set at a certain point. The amount of air being drawn from the motor being thus restricted by the valve 155, said motor will operate at a comparatively slow speed, or in other words, at the proper speed to feed the music sheet across the tracker bar when the music is being played. If, however, the valve 140 be opened there will be an unrestricted flow of air from the motor to the chamber 127 and the motor will, therefore, operate at an accelerated speed, this high rate of speed being used when rerolling the music sheet or when it is desired to feed the music sheet forward at an accelerated speed with the player action out of operation.

Beneath the valve actuating diaphragm 143 there is provided a chamber 156 which communicates with the chamber 127 through a pin hole 157 (see Fig. 15) so that said diaphragm is normally balanced by air tension upon opposite sides thereof. The chamber 156 communicates through conduits 158 and 159 (see Figs. 15 and 9) with a port 160 formed in the valve chest 112, (see Figs. 9 to 12, inclusive) and the communication between this port and the atmosphere is controlled by the slide valve 113. This valve is held against the valve chest 112 by a suitable spring 161. When the port 160 is open to the atmosphere, atmospheric air rushes through the conduits 159 and 158 into the chamber 156, thus lifting the diaphragm 143, thereby lifting the valve 140 whereby an unrestricted flow of air from the motor to the wind-chest is permitted. The chamber 127 communicates through a port 162 with a chamber 163 and the latter chamber communicates through a port 164 and passage 165 with the conduit 122 leading to the treble side of the pneumatic action 25. The port 162 is controlled by a valve 166 having a stem 167 mounted to slide vertically in suitable guides, the lower extremity of said stem being engaged by a pad 168 on a valve actuating diaphragm 169. The chamber 163 also communicates with the chamber 127 through a passage 170, a governing bellows 171 and a port 172, said bellows having a movable wall 173 to which is connected a spring 174 tending at all times to distend said bellows. The movable wall 173 actuates a suitable valve 175 which controls the passage of air through the port 172, the consequence being that when the valve 166 is seated and the port 164 is opened the governing bellows 171 acts to maintain in the treble side of the pneumatic action a substantially constant air tension.

The port 164 is controlled by a valve 176 having a stem 177 mounted to slide vertically in suitable guides, the lower extremity of said stem being engaged by a pad 178 upon a valve-actuating diaphragm 179. Located beneath the diaphragm 179 is a chamber 180 which communicates with the outer atmosphere through a passage 181, a port 182, and a passage 183, the port 182 being normally closed by a primary valve 184 having a stem 185. The lower extremity of the stem 185 is adapted to be engaged by a pad 186 on a primary diaphragm 187. Above the diaphragm 187 is a chamber 188 and below said diaphragm is a chamber 189, these two chambers communicating with each other through a pin hole 190. The chamber 188 is always in communication with the chamber 127 through a passage 191 (see Fig. 18) so that the primary diaphragm 187 is normally balanced by air tension on both sides thereof. The chamber 189 communicates through a conduit 192 with the conduit 158 so that when the port 160 communicating with the conduit 158 is opened, atmospheric air rushes into the chamber 189 and lifts the primary diaphragm 187 thereby actuating the primary valve 184 to admit atmospheric air through the passages 183, 182 and 181 to the chamber 180 beneath the secondary diaphragm 179, whereby said secondary diaphragm is lifted and seats the secondary valve 176 thus closing the port 164.

Located beneath the diaphragm 169 is a chamber 193 which communicates through a passage 194, a port 195 and a passage 196 with the outer atmosphere, said port being normally closed by a primary valve 197. The valve 197 is provided with a stem 198 extending downwardly and adapted to be engaged by a pad 199 upon a primary diaphragm 200. Located above the primary diaphragm 200 is a chamber 201 and located below said diaphragm is a chamber 202, these chambers being in communication with each other through a pin hole 203. The chamber 201 communicates with the chamber 127 through the passage 191. The chamber 202 communicates through a conduit 204 with a port 205, (see Fig. 23) normally closed by a hinged valve 206 held in its closed position by a spring 207. A push button 208 is provided with a downwardly extending pin 209 by which the valve 206 is opened. The opening of the port 205 admits atmospheric pressure through the conduit 204 to the chamber 202, thereby actuating the primary diaphragm 200 to lift the

primary valve 197. The lifting of the primary valve admits atmospheric air through the passages 196, 195 and 194 to the chamber 193, thereby lifting the secondary diaphragm 169 and actuating the secondary valve 166 to close the port 162. As a consequence, the only communication between the treble side of the player action and the wind-chest is through the port 172 controlled by the valve 175 and the flow of air being thus restricted the treble notes are played very softly, the effect being to accent the bass.

Referring now to Figs. 19 to 22, inclusive, illustrating the controller casing 133 and the mechanism contained therein, it will be understood that this casing with its mechanism is similar to a part of the controller casing 123 and part of the mechanism contained therein except that in the controller casing 133 there are no means for controlling the operation of the motor. The chamber 132 communicates through a port 210 with a chamber 211 located thereabove, the latter chamber communicating through a port 212 and passage 213 with the conduit 134 to the base side of the player action 25. The port 210 may be closed by a valve 214 having a stem 215 mounted to slide vertically in suitable guides, the lower extremity of said stem being adapted to be engaged by a pad 216 on a secondary diaphragm 217. Located beneath the diaphragm 217 is a chamber 218 communicating through a passage 219, a port 220 and a passage 221 with the outer atmosphere, said port being normally closed by a primary valve 222. The valve 222 is provided with a stem 223 adapted to be engaged by a pad 224 on a primary valve actuating diaphragm 225. Located above the diaphragm 225 is a chamber 226 and located below said diaphragm is a chamber 227, these chambers communicating with each other through a pin hole 228. The chamber 226 communicates through a passage 229 with the chamber 132, the consequence being that air is normally drawn from the chamber 227 through the pin hole 228, chamber 226 and passage 229 into the chamber 132 and the primary diaphragm 225 is balanced by an air tension on both sides thereof. The chamber 227 communicates through a conduit 230 with a port 231, (see Fig. 24) controlled by a hinged valve 232 seated by a spring 233. A push button 234 is provided with a downwardly extending pin 235 which is adapted to depress the valve 232, thereby admitting atmospheric air at the port 231. The air rushing through the conduit 230 into the chamber 227 lifts the primary diaphragm thereby lifting the primary valve 222. The lifting of the primary valve admits atmospheric air through the passage 221, port 220 and passage 219 to the chamber 218, thereby causing the secondary diaphragm 217 to actuate the valve 214 to close the port 210. As a consequence, the only communication then between the conduit 134 and the chamber 132 is through a passage 236, a bellows 237 and a port 238. The bellows 237 is provided with a movable wall 239 to which is connected a spring 240 constantly tending to distend said bellows. The movable wall 239 is connected to and operates a controller valve 241 which controls the passage of air through the port 238. Therefore, if the valve 214 be seated all of the air which is drawn from the bass side of the player action 25 through the conduit 134 will pass through the bellows 237 and the air tension will collapse said bellows, the consequence being that there is a restricted and governed supply of air drawn out of the bass side of the player action. As a result, the bass notes of the piano are sounded with a lessened force and the effect is to accent the treble. The port 212 may be closed by a valve 242 having a stem 243 mounted to slide vertically in suitable guides, the lower extremity of said stem being engaged by a pad 244 on a secondary diaphragm 245. Located beneath the secondary diaphragm 245 is a chamber 246 communicating through a passage 247, a port 248 and a passage 249 with the outer atmosphere, said port being normally closed by a primary valve 250. The primary valve 250 is provided with a stem 251, the lower end of which is engaged by a pad 252 on a primary diaphragm 253. Located above the diaphragm 253 is a chamber 254 and located below said diaphragm is a chamber 255, said chambers communicating with each other through a pin hole 256. The chamber 254 communicates through the passage 229 with the chamber 132, the consequence being that the primary diaphragm 253 is normally balanced by an air tension on both sides thereof. The chamber 255 communicates through the conduit 159 with the port 160 so that when said port is opened to the atmosphere air rushes into the chamber 255 and lifts the primary diaphragm 253, thereby actuating the primary valve 250 to uncover the port 248. Atmospheric air then rushes through the passage 249, port 248 and passage 247 to the chamber 246 thereby lifting the secondary diaphragm 245 and actuating the valve 242 to close the port 212. When the port 212 is closed the communication between the bass side of the player action and the wind-chest is entirely cut off.

It will be evident that since the control of the valve 242 and the valve 176 is exercised simultaneously by admitting atmospheric air at the port 160, both sides of the player will be rendered inoperative at one and the same time and this takes place during the rerolling of the music sheet and also during forward movement of the music sheet at the

accelerated speed. The chamber 132 communicates through a passage 257, chamber 258, port 259 and conduit 260 with the usual sustaining bellows, not shown, controlling through the pedal mechanism of the piano the dampers thereof. The port 259 is controlled by a valve 261 supported by a diaphragm 262 located above the chamber 258. Located above the diaphragm 262 is a chamber 263 connected by a passage 264 to the passage 247. When the rerolling of the music sheet takes place, as hereinbefore described, atmospheric pressure exists in the passage 247, the consequence being that it acts through the passage 264 and chamber 263 to depress the diaphragm 262, thereby seating the valve 261 over the port 259. This is for the purpose of preventing movements of the damper bellows and connected parts as the slots in the music sheet pass over the tracker board during the rewinding of the music sheet. When the rewinding of the music sheet is completed and the valve 113 is moved by the operator from the position shown in Fig. 12 to the position shown in Fig. 10, the port 160 will be closed and the atmospheric air will then be exhausted from the passages 247 and 264, so that the valve 261 will assume the position illustrated in Fig. 22 and the port 259 and conduit 260 will then be open, through the passage 257, to the chamber 132, so that the sustaining bellows which control the dampers through the pedal mechanism of the piano will be operated as the slots in the music sheet provided therefor pass over the tracker board.

The general operation of the player mechanism hereinbefore specifically described is as follows: Assuming that the music sheet is in position on the music roll and take-up spool, as shown, and it is desired to play the music, the user commences to operate the feeders in the usual manner thus exhausting the air from the wind-chest 129. He then operates the lever 117 to move the valve 113 into the position shown in Fig. 10. The exhausting of the air from the wind-chest has the immediate effect of collapsing the bellows 72, thereby actuating the brake shoe 68 to release the brake drum 67 and allow the take-up spool 36 to be rotated by the motor in the proper direction for playing. Owing to the fact that the valve 140 is normally closed, the speed of the motor will be under the manual control of the operator through the valve 148 and the speed will be automatically governed by the action of the bellows 145, changes of tempo being accomplished by varying the position of the valve 148 by means of the lever 151. If it be desired to accent the treble, the push button 234 is depressed, thus causing the valve 214 to be closed, whereupon the amount of air exhausted from the bass side of the player action is restricted by the valve 241. On the other hand, if it be desired to accent the bass, the operator depresses the push button 208, thereby causing the valve 166 to close, the consequence being that the amount of air drawn from the treble side of the player action is restricted by the valve 175 and the treble notes are, therefore, struck with less force. If now the operator reaches some part of the music which he does not care to play, he operates the lever 117 to move the valve 113 into the position shown in Fig. 11 and atmospheric air being admitted to the port 160 and conduit 159 causes the valves 176 and 242 to close, thereby entirely cutting off the communication between the entire player action and the wind chest. At the same time the valve 140 is unseated and an unrestricted supply of air is drawn from the motor, thereby operating the same at an accelerated speed. This condition of affairs exists until the operator returns the valve 113 to the position shown in Fig. 10 when the playing of the music will be resumed. When it is desired to reroll the music sheet, the operator grasps the lever 117 and actuates the same to move the valve 113 into the position shown in Fig. 12, the consequence being that the valves 176 and 242 close, the valve 140 opens, thereby shutting off the player action and giving the motor an accelerated speed. The bellows 72 immediately distends, thus causing the brake shoe 68 to be applied to the brake drum 67 and atmospheric air being admitted through the conduit 108 to the under side of the diaphragm 104 causes the valve 98 to be lifted. The air is then exhausted from the bellows 90 and the bellows 66, thereby causing both to collapse. The collapsing of the bellows 90 acts, as hereinbefore described, to shift the sprocket wheel from the position shown in Fig. 3 so that the clutch tooth 56 will engage with the clutch tooth 53 and the music roll 35 is then rotated counterclockwise, Fig. 2, it being understood that at this time the brake shoe 62 is released by the collapsing of the bellows 66.

The advantage resulting from the particular arrangement of the ports actuated by the lever 117 is to make its different functions follow each other in the most natural and convenient order thus eliminating unnecessary operations.

Having thus described our invention, what we claim and desire by Letters Patent to secure is:

1. In a player mechanism, the combination of a wind motor, a bellows connected therewith, a pneumatic action, sound-producing devices operated by said pneumatic action, a reversible driving train for music sheets connected to said motor, a valve between the bellows and the pneumatic action, a pneumatic controller between the bellows and the motor, a valve for throttling said

controller, a valve for short-circuiting said controller, and an operating member for the action valve, the short-circuiting valve and the reversible driving train, and intermediate connections between said operating member and said parts whereby the action valve may be opened and closed and the short-circuiting valve closed and opened with or without shifting the reversible driving train.

2. In a player mechanism, the combination of a wind motor, a bellows connected therewith, a pneumatic action, sound-producing devices operated by said pneumatic action, a reversible driving train for music sheets connected to said motor, a valve between the bellows and the pneumatic action, and an operating member for said valve and reversible driving train for closing the valve, materially before reversal of the driving train, whereby the driving train may be continued in forward movement with the said valve closed.

3. In a player mechanism, the combination of pneumatic action mechanism, reversible pneumatic sheet-driving mechanism, bellows, a pneumatic connection between the bellows and the sheet-driving mechanism, a valve controlling said connection, a pneumatic connection between the bellows and the pneumatic action, a valve controlling said connection, an operating member, and connections between the operating member, the reversing mechanism of the sheet-driving motor, the valve between the pneumatic action and bellows, and the valve between the motor and bellows whereby the valves may be opened and closed by partial movement of the operating member and without operating the reversing mechanism, and complete movement of the operating member will operate the reversing mechanism, as well as the valves.

4. In a player mechanism, the combination of sheet supporting mechanism, means for driving said sheet supporting mechanism in either direction, a controlling member for determining the direction of movement of the sheet supporting mechanism, a pneumatic action, bellows, a connection between said bellows and pneumatic action, a valve controlling said connection, an operating member, and connections between said operating member and valve and controlling member for the driving mechanism, whereby the valve may be opened and closed by partial movement of said operating member without operating the controlling member of the driving mechanism, and complete actuation of said operating member will serve to operate both said valve and controlling member.

5. In a player mechanism, the combination of a bellows, a pneumatic motor, a connection between said pneumatic motor and bellows, a pneumatic controller in said connection, a tempo valve in said connection, an operating member for said tempo valve, a short-circuiting connection between said bellows and motor for short-circuiting the pneumatic controller, a short circuiting valve for controlling said short-circuiting connection, a pneumatic action connected with the bellows, a valve controlling the action between the bellows and pneumatic action, sheet-supporting mechanism, driving connections between said sheet-supporting mechanism and motor, a reversing member for reversing the connections between the motor and the sheet-supporting mechanism, an operating member, and intermediate connections between said operating member, reversing member, short-circuiting valve and pneumatic action valve, whereby the short-circuiting valve and pneumatic action valve may be operated by said operating member independently of or in conjunction with the reversing member.

6. In an apparatus for the purpose described, the combination of a tracker board, a record sheet arranged in operative relation thereto, a motor for feeding and rewinding the record sheet, air exhausting means connected with the motor for operating the same, a governor through which the air is exhausted, a shunt passage for the air around the governor, means for closing said passage, and means for rendering the rewinding mechanism active when said passage is open, the last said means embodying mechanism whereby the said passage may be opened without rendering the rewinding mechanism active.

7. In an apparatus for the purpose described, the combination of a tracker board, a record sheet arranged in operative relation thereto, a motor for feeding and rewinding the record sheet, air exhausting means connected with the motor for operating the same, a governor through which the air is exhausted, a shunt passage for the air around the governor, means for closing said passage, a chest for the note-sounding instrumentalities, air exhausting means therefor, means for opening the said passage, means whereby the chest will be closed by the operation of the last recited means, and means whereby the operation of the passage opening means will render the rewinding mechanism active, the last said means embodying means whereby the passage opening means may be actuated without rendering the rewinding mechanism active.

8. In an apparatus for the purpose described, the combination of a tracker board, a record sheet arranged in operative relation thereto, a motor for feeding and rewinding the record sheet, air exhausting means connected with the motor for operating the same, a governor through which the air is

exhausted, a shunt passage for the air around the governor, means for closing said passage, a chest for the note-sounding instrumentalities, air exhausting means therefor, means for opening the said passage, means whereby the chest will be closed by the operation of the last recited means, means whereby the operation of the passage opening means will render the rewinding mechanism active, the last said means embodying means whereby the passage opening means may be actuated without rendering the rewinding mechanism active, and means for controlling the action of such parts at will.

9. In an apparatus for the purpose described, the combination of a tracker board, a record sheet arranged in operative relation thereto, a motor for feeding and rewinding the record sheet, a governor through which the air is exhausted from the motor, a shunt passage for the air around the governor, means for closing said passage, a chest for the note-sounding instrumentalities, air exhausting means for the motor and the chest, means for opening the said passage, means whereby the chest will be closed by the operation of the last recited means, and means whereby the operation of the passage opening means will render the rewinding mechanism active, the last said means embodying means whereby the passage opening means may be actuated without rendering the rewinding mechanism active.

10. In an apparatus for the purpose described, the combination of a tracker board, a record sheet arranged in operative relation thereto, a motor for feeding and rewinding the record sheet, a governor through which the air is exhausted from the motor, a shunt passage for the air around the governor, means for closing said passage, a chest for the note-sounding instrumentalities, air exhausting means for the motor and the chest, means for opening the said passage, means whereby the chest will be closed by the operation of the last recited means, means whereby the operation of the passage opening means will render the rewinding mechanism active, the last said means embodying means whereby the passage opening means may be actuated without rendering the rewinding mechanism active, and means for controlling the action of such parts at will.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

GUSTAF W. PAULSON.
RUDOLF PAULSON.

Witnesses:
HARRY G. ROBINSON,
LOUIS A. JONES.