

1,175,993.

Patented Mar. 21, 1916.

4 SHEETS—SHEET 1.

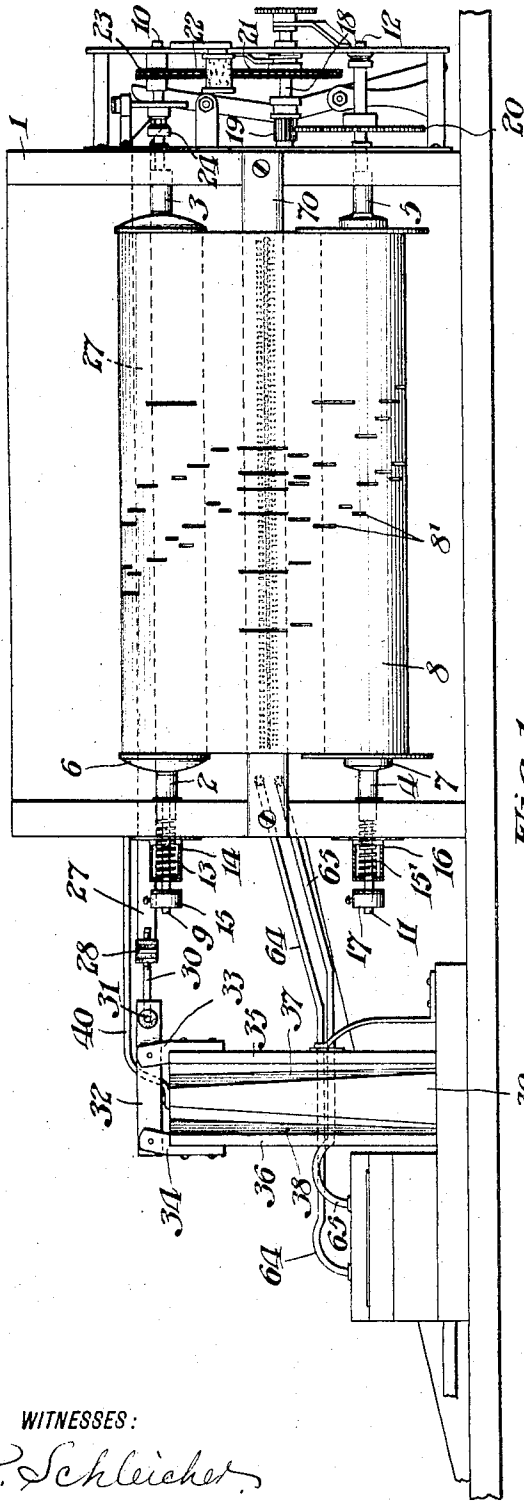
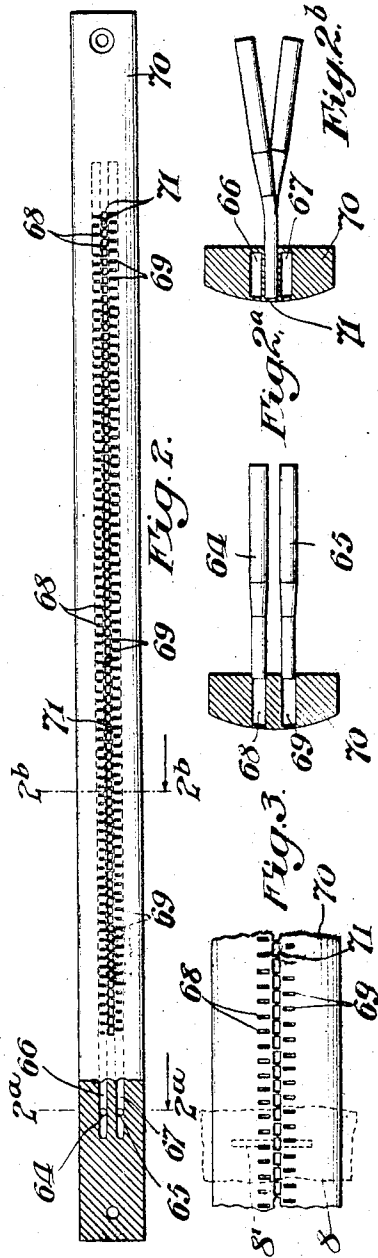


Fig. 1.



WITNESSES:

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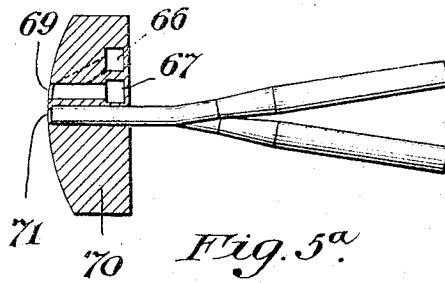
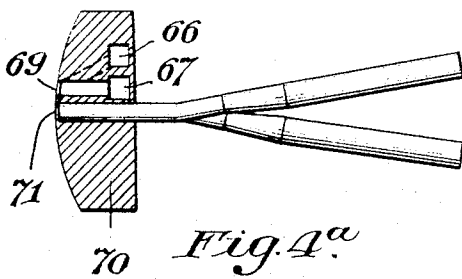
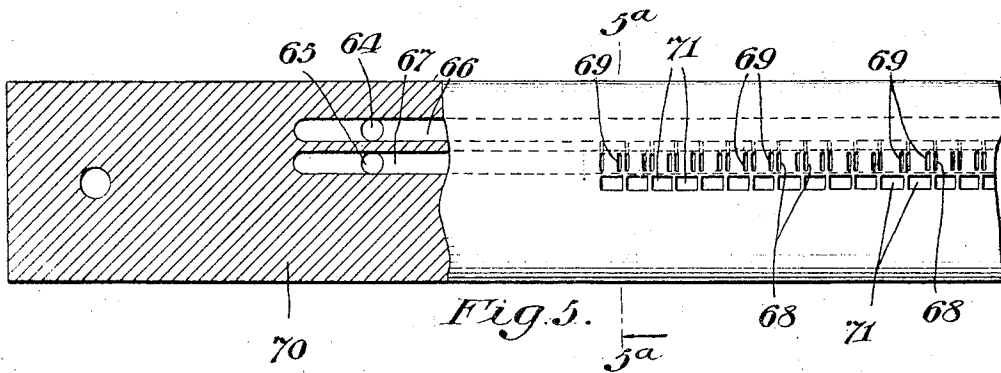
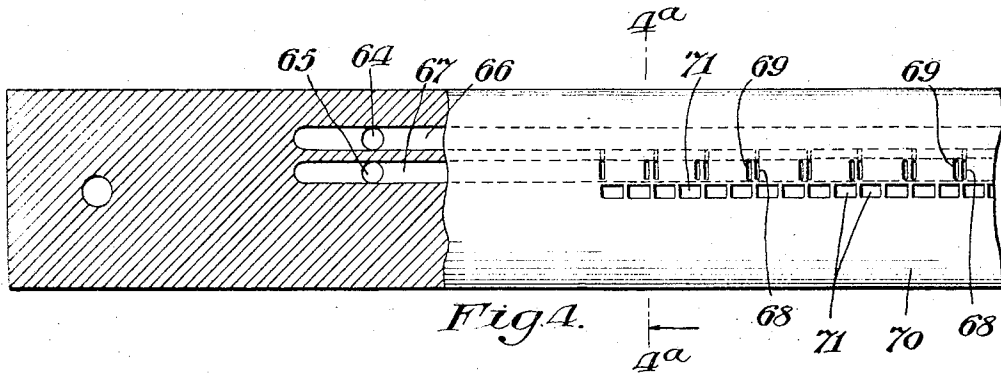
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 AUTOMATIC PIANO.
 APPLICATION FILED APR. 16, 1914.

1,175,993.

Patented Mar. 21, 1916:
 4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

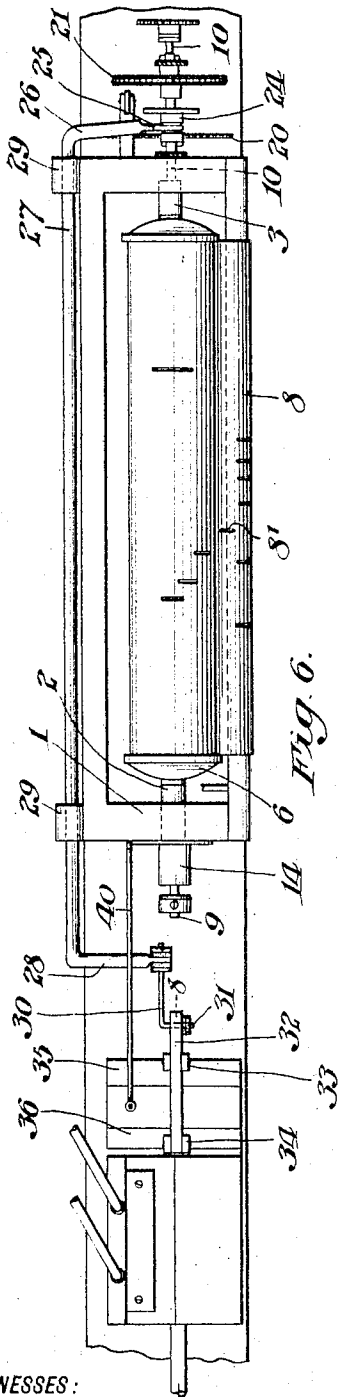


Fig. 6.

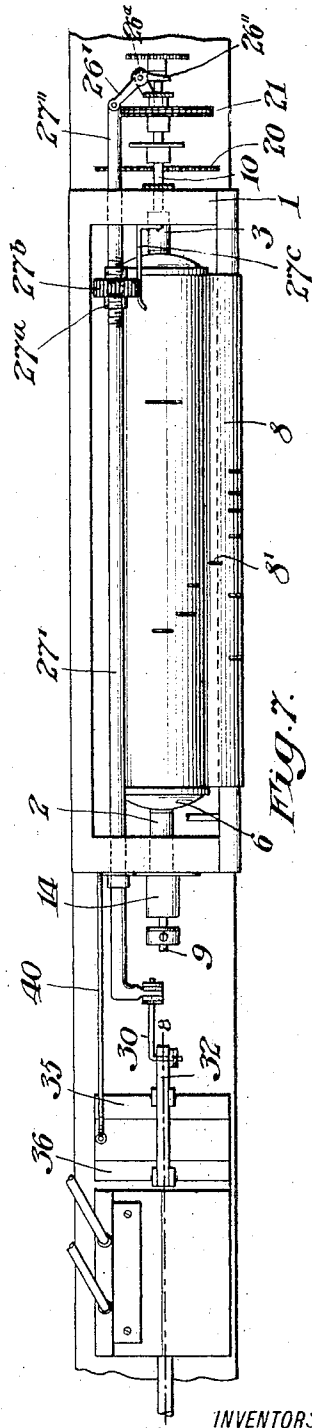


Fig. 7.

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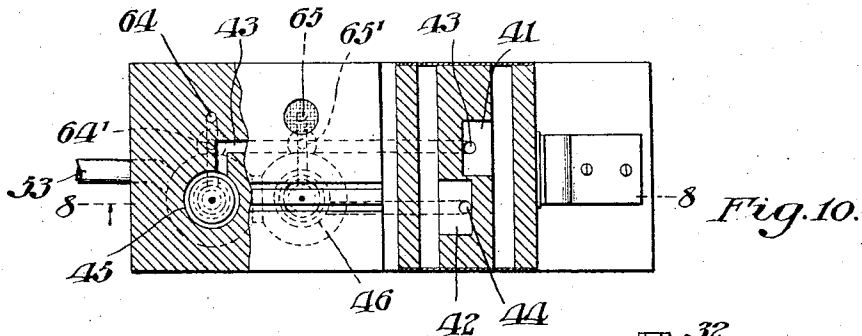


Fig. 10.

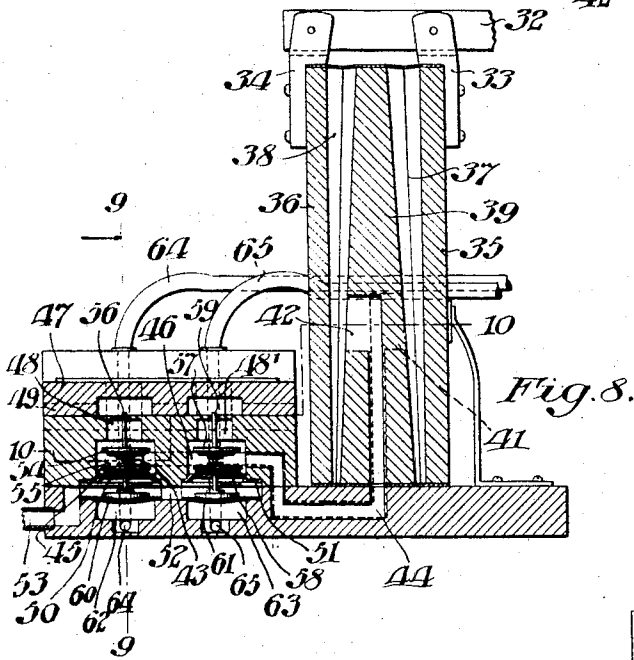


Fig. 8.

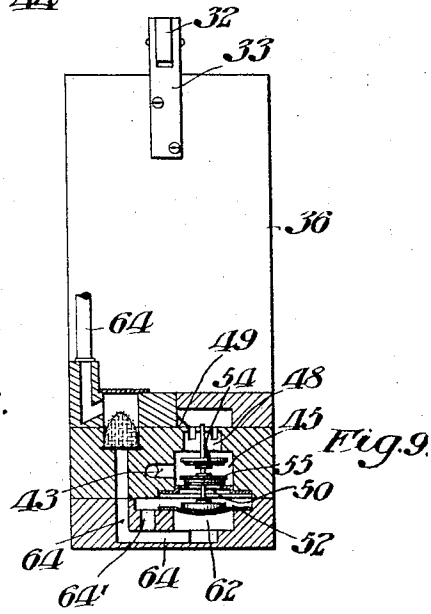


Fig. 9.

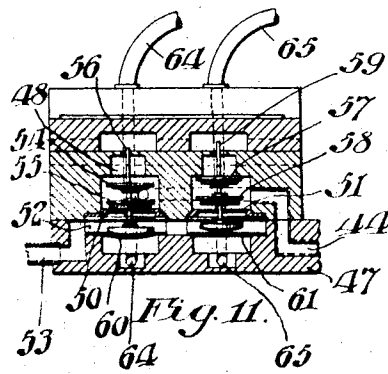


Fig. 11.

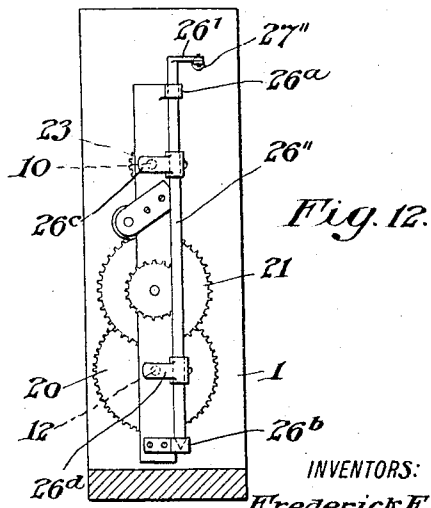


Fig. 12.

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UNITED STATES PATENT OFFICE.

FREDERICK E. REIN, OF RIVERSIDE, NEW JERSEY, AND GEORGE E. MARTIN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO CHARLES N. BUTLER, OF PHILADELPHIA, PENNSYLVANIA.

AUTOMATIC PIANO.

1,175,993.

Specification of Letters Patent.

Patented Mar. 21, 1916.

Application filed April 16, 1914. Serial No. 832,161.

To all whom it may concern:

Be it known that we, FREDERICK E. REIN and GEORGE E. MARTIN, citizens of the United States, and residents, respectively, of Riverside, New Jersey, and Philadelphia, Pennsylvania, have jointly invented certain new and useful Improvements in Automatic Pianos, of which the following is a specification.

This invention relates more particularly to the tracker mechanism of automatic pianos and its primary object is to provide a simple construction which will maintain a more accurate registration than has heretofore obtained and which will permit a ready variation of pitch, as for accompanying another instrument.

In the accompanying drawings, Figure 1 is a front elevation of a tracker mechanism embodying our invention; Fig. 2 is a part sectional front elevation of a detached tracker bar shown on an enlarged scale; Fig. 2^a is an enlarged sectional view taken on the line 2^a—2^a of Fig. 2; Fig. 2^b is an enlarged sectional view taken on the line 2^b—2^b of Fig. 2; Fig. 3 is an enlarged front elevation of a section of the tracker bar shown in Fig. 2 with a section of a music sheet indicated thereon in the normal relation thereto; Fig. 4 is a part sectional front elevation of an end of a detached tracker bar of modified form; Fig. 4^a is a sectional view taken on the line 4^a—4^a of Fig. 4; Fig. 5 is a part sectional front elevation of an end of a detached tracker bar of further modified form; Fig. 5^a is a sectional view taken on the line 5^a—5^a of Fig. 5; Fig. 6 is a top plan view of the construction shown in Fig. 1; Fig. 7 is a top plan view showing a further form of the construction; Fig. 8 is an enlarged sectional view taken on the line 8—8 of Figs. 7 and 10; Fig. 9 is a sectional elevation taken on the line 9—9 of Fig. 8; Fig. 10 is a part sectional plan view taken on the line 10—10 of Fig. 8; Fig. 11 is a sectional view of the valve mechanism, with the pneumatics omitted, taken on the line 8—8 of Figs. 7 and 10 showing a second position of the mechanism; and Fig. 12 is a part sectional end elevation of the construction shown in Fig. 7.

The apparatus, as illustrated in the drawings, comprises the frame 1 provided with

the bearings 2, 3, 4, and 5 which carry the spools 6 and 7 for the perforated music sheet 8, the bearings being carried by the respective shafts 9, 10, 11 and 12, which are supported by the frame and adapted to move longitudinally therein. The bearing 2 and the shaft 9 are movable longitudinally subject to the influence of a coiled spring 13 which acts against the bearing and the end of a box 14 through which plays the shaft, the latter having an adjustable stop 15 thereon to engage the box and limit the inward movement of the bearing. The bearing 4 and shaft 11 are similarly connected with and controlled by the spring 15', box 16 and block 17. The bearings 3 and 5, together with their shafts 10 and 12, which are positively engaged to the respective spools 6 and 7, are revolved by means of a driving shaft 18 journaled in the frame, a lantern pinion 19 movable longitudinally on the driving shaft and revoluble thereby, a spur wheel 20 fixed on the shaft 12, and a sprocket wheel 21 on the shaft 18 which acts through a chain 22 on a sprocket wheel 23 fixed on the shaft 10.

The foregoing parts of known construction are, according to our invention as illustrated in Figs. 1 and 6, provided with a channeled collar 24 which is fixed on the shaft 10 and engaged by a yoke 25 on an arm 26 of a connecting rod 27. In the form of our invention illustrated in Figs. 7 and 12, the connecting rod is composed of sections 27' and 27'' joined in adjustable relation by a sleeve 27^a screwed on oppositely turned threads thereof. The sleeve is provided with a milled ring 27^b by which it can be turned to separate and draw together the sections 27' and 27'' and the desired relation is maintained by the action of a spring 27^c on the milled periphery of the ring. The rod section 27'' is pivoted to the crank arm 26' fixed on a shaft 26'' which is journaled in the bearings 26^a and 26^b on the frame, the shaft having arms 26^c and 26^d fixed thereon and contacting with the shafts 10 and 12. At the opposite end of the connecting rod is an arm 28 connected with a rod 30 having a crank 31 journaled in a link 32. The link is movably connected to lugs 33 and 34 fixed to the respective plates 35 and 36 of pneumatics 37 and 38, the latter having

the common vertical base 39 fixed to the frame by the rod 40 for stability.

As shown in Fig. 8, ports 41 and 42, formed in the base 39 so as to communicate
 5 with the respective pneumatics, are connected by the respective ducts 43 and 44 with the respective valve chambers 45 and 46 in the valve box 47. These valve chambers 45 and 46 are respectively connected
 10 through respective ports 48 and 48' with a passage 49 communicating with the atmosphere, and through the respective ports 50 and 51 with a chamber 52 connected with an exhaust pipe or passage 53. Valves 54 and
 15 55, fixed on a stem 56, control the respective ports 48 and 50, and valves 57 and 58 fixed on a stem 59 control the respective ports 48' and 51, the valve stems being carried on diaphragms 60 and 61 which separate the chamber
 20 52 from the chambers 62 and 63. Ducts 64 and 65 connect the chamber 52 (through the contracted or "bleed" passages 64' and 65') and the chambers 62 and 63 with passages 66 and 67 and therethrough with the
 25 respective sets of narrow apertures 68 and 69 in the tracker bar 70, which is fixed to the frame 1 between the spools 6 and 7.

As shown in Figs. 1 to 3, inclusive, the sets of apertures 68 and 69 may be separated
 30 by the usual tracker bar apertures 71 which cooperate with the apertures 8' of the music sheet, so that each aperture 71 shall lie between two apertures 68 and 69, the latter apertures being staggered relatively to the
 35 former apertures and disposed near the respective ends thereof so that when the apertures in the music sheet properly register with the apertures 71 of the tracker bar they will uncover the respective apertures 68 and
 40 69 to the same extent.

As shown in Figs. 4 and 4^a, the apertures 68 and 69 are disposed on the same side of the apertures 71 and alternate therewith so that an aperture 71 is correlated with a
 45 single aperture 68 disposed adjacent to an end thereof and the next aperture 71 is correlated with a single aperture 69 adjacent to an end thereof, so that a perforation 8' in the music sheet in proper registration will
 50 simultaneously open to a greater or less extent an aperture 71 and an aperture 68 or 69.

As shown in Figs. 5 and 5^a, the apertures 68 and 69 are on the same side of the apertures 71 and each of the latter apertures has
 55 coordinated therewith adjacent to the respective ends thereof apertures 68 and 69 so disposed that they are uncovered to a greater or less degree by the music sheet perforation 8' when in proper tracking relation to the apertures 71.
 60

In operation, with the apertures 8' of the music sheet in proper registration with the apertures 71, the suction pipe 53 exhausts air from the chambers 52, 62 and 63, air
 65 flowing to the chambers 52 and 62 through

the passages 64', 64, 66, 68 and 8', and to the chambers 52 and 63 through the passages 65', 65, 67, 69 and 8'. In this condition of the apparatus, the respective valves and diaphragms are down so that the ducts
 70 43 and 44 connect the pneumatics 37 and 38 with the atmosphere through the ports 48 and 48' and the duct 49, the ports 50 and 51 being closed. When the sheet 8 moves to the right, the passages through the aper-
 75 tures 68 are reduced so that the flow of air therethrough is throttled or cut off, and the passages through the apertures 69 are increased so that the supply of air there-
 80 through and to the chamber 63 is increased. The suction through the pipe 53 thereupon lifts the diaphragm 61 and the valves 57 and 58 to close the port 48' and open the
 85 port 51, the contracted passage 55' throttling the exhaust from the chamber 63 to the pipe 53 so that an unbalanced condition results. Communication is now estab-
 90 lished between the pipe 53 and passage 44, whereby (in the form of apparatus shown in Figs. 7, 8, and 12) air is exhausted from the pneumatic 38, which collapses, while
 95 the pneumatic 37 expands. The parts 32, 30, 27', 27'' and 26' are thereby shifted to the right so as to turn the shaft 26'' which moves to the left the arms 26^c and 26^d, the
 100 shafts 10 and 12 and the music sheet 8, whereby normal conditions are restored. Normal air now being admitted to the chambers 62, 63 and 52, the diaphragm 61, with the valves 57 and 58, falls, thereby effecting
 105 the opening of the duct 44 to the atmosphere through the passages 48' and 49 and cutting off communication with the suction pipe 53. When the sheet 8 moves to the left, the passages through the apertures 69
 110 are reduced so that the flow of air therethrough is throttled or cut off, and the passages through the apertures 68 are increased so that the flow of air therethrough and to the chamber 62 is increased, upon which
 115 the suction in the duct 53 lifts the diaphragm 60 and the valves 54 and 55, the contracted passage 64' throttling the exhaust from the chamber 62. The ducts 43 and 53 now being in communication, air is
 120 (in the form of apparatus shown in Figs. 7, 8 and 12) exhausted from the pneumatic 37, which collapses to a greater or less extent while the pneumatic 38 correspond-
 125 ingly expands. The parts 32, 30, 27', 27'' and 26' are now shifted to the left to turn the shaft 26'' and move to the right the arms 26^c and 26^d, thereby permitting the springs 13 and 15' to move the shafts 10 and 12, together with the sheet 8, to the
 130 right and restore normal conditions. Normal air now being admitted to the chambers 62, 63 and 52, the diaphragm 60, with the valves 54 and 55, falls, thereby effecting the opening of the duct 43 to the atmos-

phere through the passages 48 and 49 and cutting off its communication with the suction pipe 53.

In the form of the apparatus illustrated in Figs. 1 and 6, wherein the rod 27 operates the sheet shifting mechanism directly instead of through fulcrumed lever mechanism, the duct 44 is connected with the pneumatic 37 and the duct 43 with the pneumatic 38, so that movements of the music sheet will cause movements of the rod 27 opposite to those described in the foregoing operations.

By the foregoing improvements, the action can be made of such sensitive character that proper registration will be constantly maintained, for corrections may be effected upon the slightest shifting of the sheet, with avoidance of the usual defects of prior constructions, such, for example, as the imperfections in the action of such constructions as depend upon control by music sheet edges which are or become irregular in character and operation, and the defects in the usual actions where one or two readily clogged edge apertures are used for effecting adjustment. the use of our extended number of controlling apertures within the

edges of the sheet and adapted for operating in conjunction with the sheet apertures effecting important corrections. An independent manual adjustment of the relation of the apertures 8' to the apertures 68, 69 and 71 may be effected by the adjustment of the rod sections 27' and 27'' through the sleeve 27^a.

Having described our invention, we claim:

The combination of a music sheet containing perforations and a spool for carrying said sheet, with tracker mechanism containing a set of apertures coacting with said perforations to effect the production of musical sounds, and mechanism comprising a rod having sections and means for adjusting them relatively to shift said sheet and spool relatively to said tracker so as to change the relation between said perforations and apertures.

In testimony whereof, we have hereunto set our names this 9th day of April, 1914, in the presence of the subscribing witnesses.

FRED'K. E. REIN.

GEORGE E. MARTIN.

Witnesses:

C. N. BUTLER,
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