W. G. BETZ.

PNEUMATIC PIANO.

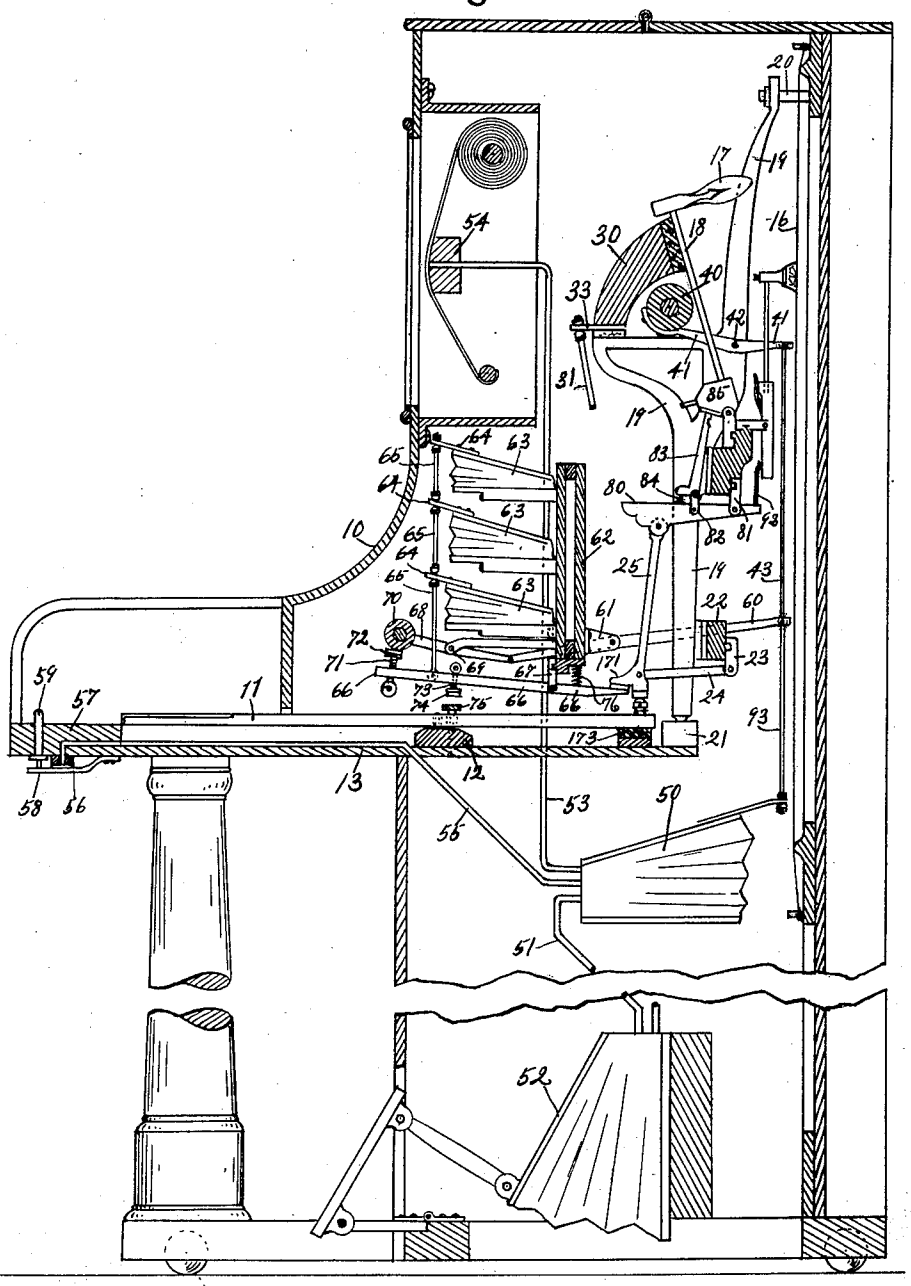
APPLICATION FILED JAN. 7, 1911.

1,021,502.

Patented Mar. 26, 1912.

3 SHEETS—SHEET 1.

Fig - 1 -



WITNESSES:

W. M. Gentle

O. W. McLaughlin

INVENTOR.

William G. Betz.

BY

W. H. Lockwood

ATTORNEY.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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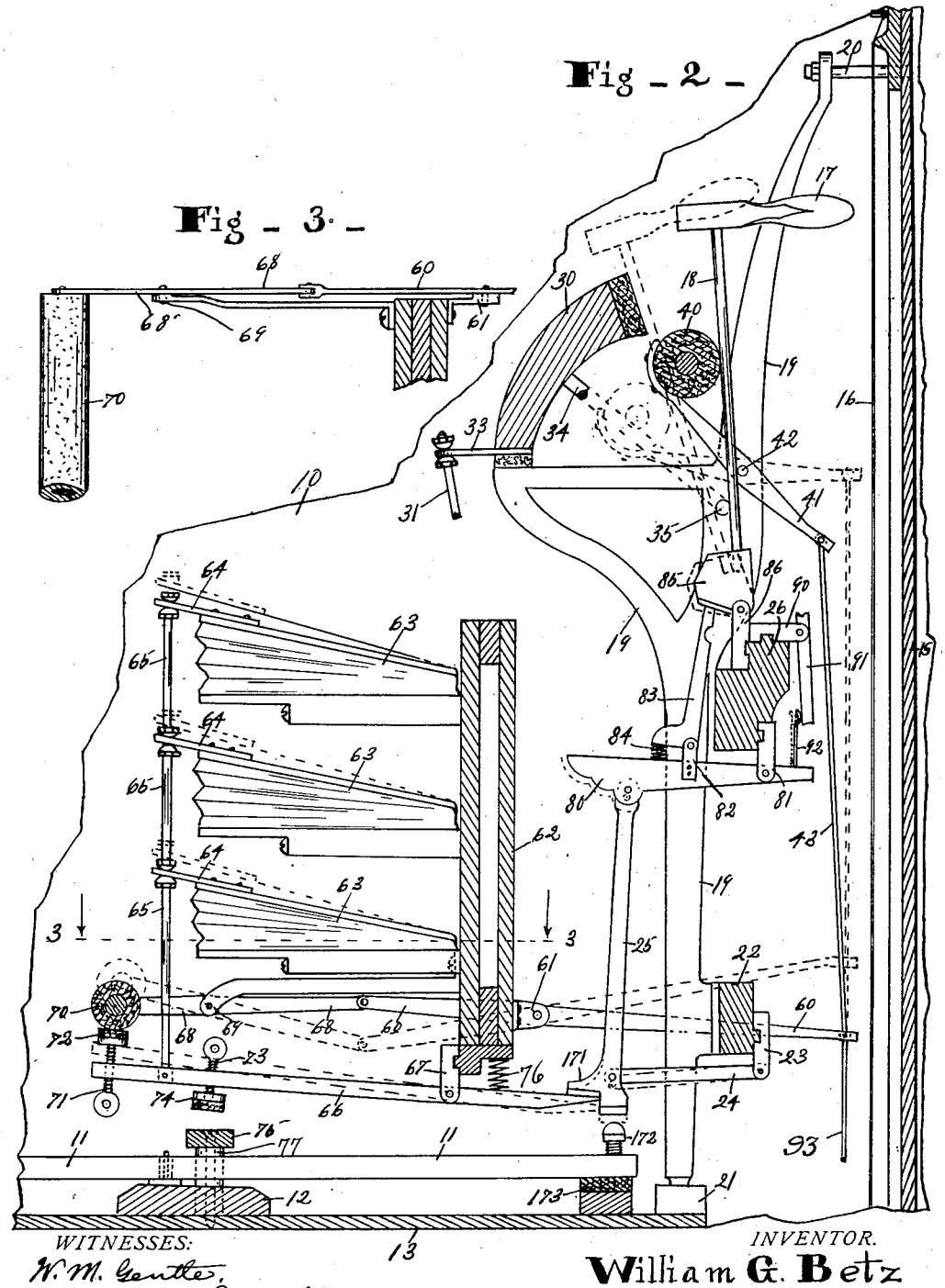
3 SHEETS—SHEET 2.

Fig - 2 -

Fig - 3 -



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3 SHEETS—SHEET 3.

Fig. 4.

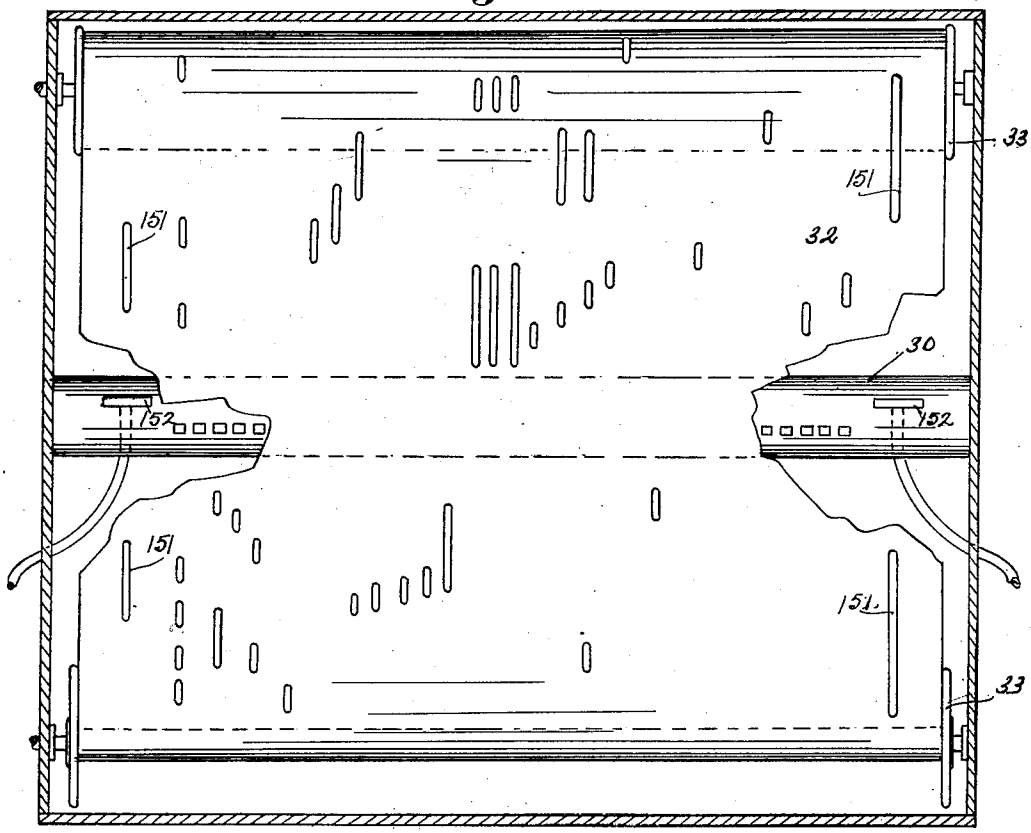
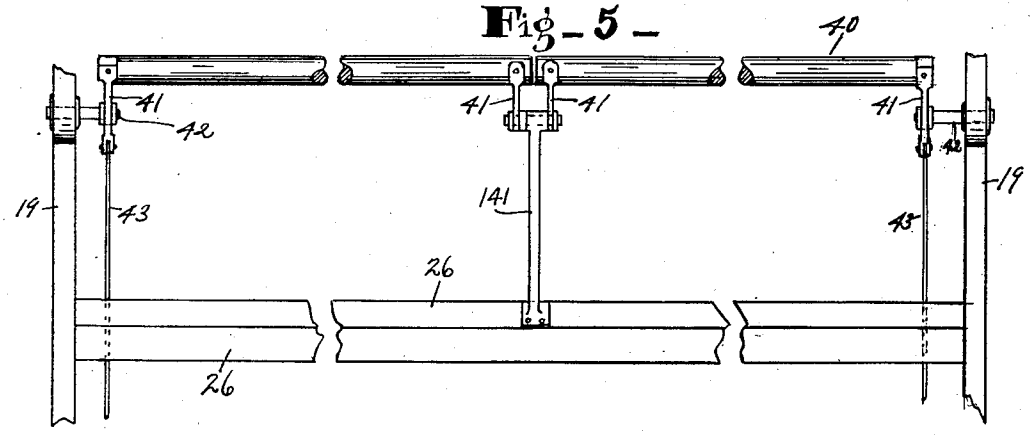


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM G. BETZ, OF CHICAGO HEIGHTS, ILLINOIS, ASSIGNOR TO STEGER & SONS PIANO MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION.

PNEUMATIC PIANO.

1,021,502. Specification of Letters Patent. Patented Mar. 26, 1912.

Application filed January 7, 1911. Serial No. 601,450.

To all whom it may concern:

Be it known that I, WILLIAM G. BETZ, of Chicago Heights, county of Cook, and State of Illinois, have invented a certain useful Pneumatic Piano; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings.

The object of this invention is to improve the pianissimo mechanism in pneumatic pianos.

It provides satisfactory means, whereby the lost motion of the parts will be overcome automatically.

Lost motion levers and the like have been provided in connection with a pianissimo device operated by pedals, but the object of this invention is to provide means for accomplishing the same general result when there is a pianissimo device operated by the pneumatic elements in a pneumatic piano. Both sorts of pianissimo devices may and are preferably used in the same piano, but heretofore there has been no means for overcoming the lost motion of parts when the pneumatic pianissimo device is operated. There are also improvements in the hammer rest rails and the means for mounting and operating the same.

The nature of the invention will be understood from the accompanying drawings and the following description and claims.

In the drawings Figure 1 is a central cross section through a piano, parts being broken away. Fig. 2 is the upper right hand portion of Fig. 1, dotted lines showing the parts as they are in Fig. 1, and full lines showing the parts in altered position. Fig. 3 is a horizontal section on the line 3—3 of Fig. 2. Fig. 4 is a front elevation of a sheet of music, tracker bar and the casing in which they are mounted, portions of the sheet of music being broken away. Fig. 5 is a detail showing two pneumatic hammer rest rails.

In the drawings there is shown a portion of the usual piano casing 10, finger operated keys 11, balance rail 12 therefor, secured on a key bed 13. There is also shown a sounding board 15 and string 16 and a felt hammer 17, the latter being mounted on the shank 18 pivoted to an action bracket 19, the upper end of which is secured by the screw 20 to the sounding board and the lower end mounted in a support 21. Each hammer 17 is in position to engage the spring 16. There is a transverse flange rail 22 from which a flange 23 extends downwardly and a bar 24 pivoted thereto projects forwardly and its front is pivoted to the lower portion of a sticker 25. 26 is an action rail which is secured to the brackets 19. There is also shown the usual hammer rest rail 30 which extends transversely of the piano in position to engage the shanks 18 of the hammers 17 and limit their movement. This hammer rest rail is operated by a rod 31 which extends down to the soft pedal (not shown) of the piano or other usual well known means for mechanically operating the hammer rest rail to produce the pianissimo effect. The plate 33 connects the upper end of the rod 31 to the under side of the hammer rest rail 30. Said hammer rest rail is segmental in vertical section and is mounted on rods 34 which are fulcrumed at 35 from the brackets 19 so as to cause the hammer rest rail to move in an arc. While at rest the shanks 18 of the hammer 17 lie against the hammer rest rail.

The foregoing parts and their arrangement with reference to each other are old and are shown in the particular manner herein for the purpose of illustrating the invention, but not for the purpose of limiting it.

Pneumatic hammer rest rails 40 are mounted on levers 41 fulcrumed between their ends to the brackets 19 by pins 42, others on levers 41 on post 141 on the action rail 26. These hammer rest rails are round and formed of a metal rod surrounded by felt or a yielding cover to engage the hammer shanks 18. Thus the metal rod maintains the rail always straight and in true position. Cords 43 are connected with the rear ends of the levers 41 and extend downwardly and at their lower ends are connected with the rear ends of levers 60 which are fulcrumed between their ends to brackets 61 secured to a pneumatic frame 62 on which the pneumatic elements 63 are secured. The movable portion of each pneumatic element has an arm 64 projecting therefrom which is pivoted to a rod 65 which extends down to a lever 66 fulcrumed between its ends to a bracket 67 which is secured to the lower end of the pneumatic frame 62. The pneumatic elements are arranged on different elevations and they have

separate rods 65 of varied lengths extending down to the levers 66, which are arranged in the same horizontal plane, only one of which, however, appears in Fig. 1. There is one lever 68 at each end of the machine, or at least at each end of the pneumatic hammer rest rail 40, and the outer ends of the levers 60 are pivotally connected with the levers 68 which are fulcrumed between their ends to the brackets 69 secured on a fixed part of the pneumatic elements or any other fixed part of the piano. A felt covered rod 70 extending entirely across the piano is carried by the outer ends of the levers 68 and engages heads 72 on screws 71 adjustably mounted on the outer ends of the levers 66 in such manner that said rod 70 tends to bear down on the outer ends of the levers 66 and hold their inner ends against the stickers 25 and hold said stickers and other parts of the action in close association with each other to prevent lost motion. A spring 76 between the frame 62 and the inner end of the lever 66 returns said lever to its normal position when the hammer rest rail actuating means is not operated. The actuation of the lever 66 by the pneumatic element through the rod 65 is limited by the adjustable screw 73 in said lever 66 which carries a felt covered head 74 that engages the stop bar 75 which extends entirely across the key board and is supported at each end on posts 77 in the balance rail 12.

The rear end of each lever 66 lies under a shoulder 171 projecting forwardly from the sticker 25 and each sticker is mounted on a capstan screw 172 at the rear end of the finger key 11 and a cushion 173 lies under the rear end of the finger keys. The upper end of the sticker is pivotally connected with a rocker 80 which is fulcrumed between its ends to a bracket 81 extending forwardly from the action rail 26. A jack flange 82 extends forwardly from the rocker 80 and has mounted in it a jack 83 which is spring pressed by a jack spring 84. Said jack engages and actuates a hammer butt 85 which is fulcrumed in a hammer flange 86 that is secured to the action rail 26. A damper flange 90 extends horizontally from the upper part of the action rail 26 and on it a damper sticker 91, partly shown, is pivoted between its ends in a vertical position so that its lower end will be engaged and actuated by a damper spoon 92. There is no particular novelty in this latter part of the construction and since the remaining features thereof are of quite common knowledge, the further details are not shown or described.

A cord 93 extends from the rear end of the lever 60 to the bellows 50 which are connected by a tube 51 to the foot bellows 52. A tube 53 runs from the bellows 50 to a tracker board 54, also a tube 55 runs from the bellows 50 to and through a valve seat 56 on the under side of a front rail 57 of the piano. A spring valve 58 is secured to the under side of the front rail of the piano in position to close the tube 55, and said valve is opened by a push rod 59. It operates through the front rail of the piano.

When the push rod 59 is actuated to open the valve 58, air escapes through the tube 55 and the bellows 50 collapses and through the cords 43 and 93 the levers 60 and 68 are operated from the normal or dotted line position shown in Fig. 2, to the full line position. This moves the hammer rest rail 40 from the dotted line to the full line position shown in Fig. 2, and produces the pianissimo effect. Since the hammer rest rail 40 prevents the hammer shanks 18 from moving entirely back to the left, as shown in Fig. 2, there will be lost motion in the action and that is taken up by the outer end of the lever 66 being adjustably engaged by the rod 70 and levers 68 and 60 which are actuated by the connection 93 running to the pneumatic element which operates the hammer rest rail. Thus the parts 60 and 68 and 70 hold the outer end of the lever 66 down and, therefore, the inner end up and also the inner end of the lever 66 holds the sticker 25 and the other parts of the action up in engaging position with the associated parts and this is accomplished in spite of the tendency of the bellows 63 to expand. In other words, while the hammer rest rail is being maintained in the pianissimo position, the lever 66 is held so that the bellows cannot entirely expand, although this is no important result. With the adjustment 71, the relation between the rod 70 and lever 66 could be accurately adjusted.

A tracker bar or board 130 is provided and over it the perforated sheet of music 132 travels from one roll 133 to the other. There are a plurality of pneumatic hammer rest rails 40 extending throughout the width of the piano, at least one for the treble and one for the base, see Fig. 5. They are in alinement with each other. The pneumatic hammer rest rails are held normally just out of touch with the shanks of the hammers and immediately under and to the rear of the pedal actuated hammer rest rail 30.

There is one pneumatic element for each hammer rest rail and these pneumatic elements are in communication with the bellows 50 through the tubes 55, whereby air is exhausted from the pneumatic elements. The action of each pneumatic element is controlled by the sheet of music 32 which is at desired intervals, provided with slots 151 adapted to register at times with slots 152 in the tracker bar 130, which latter slots are in communication with the respective pneumatic elements through the tubes 53. With

this arrangement, whenever any slot 151 registers with a slot 152, air will be admitted to the pneumatic elements with the corresponding pneumatic elements and thus enable the bellows to cause the operation of the pneumatic which actuates the particular hammer rest rail desired.

I claim as my invention:

1. A pneumatic piano including hammers, pneumatic elements, a lever operated by each pneumatic element for operating its corresponding hammer, a hammer rest rail, pneumatically controlled means for actuating the hammer rest rail, levers operated by the means for actuating the hammer rest rail and a rod arranged transversely of the piano and actuated by said levers for adjusting all of the levers which are actuated by the pneumatic elements for taking up the lost motion of the parts of the action when the hammer rest rail is actuated.

2. A pneumatic piano including hammers, a pneumatic frame, pneumatic elements secured thereto, a lever for each pneumatic element, a connection between each pneumatic element and its corresponding lever for operating the latter, means actuated by each of said levers for operating the corresponding hammers, a hammer rest rail, pneumatically controlled means for actuating the hammer rest rail, levers pivoted between their ends to the pneumatic frame in position to be actuated by said means for actuating the hammer rest rail, levers fulcrumed between their ends to the lower pneumatic elements and pivoted at one end to said last mentioned levers, and a rod carried by the outer end of the levers pivoted in the pneumatic elements in position to engage the levers actuated by the pneumatic elements so that when the hammer rest rail is actuated the levers actuated by the pneumatic elements will be moved so as to overcome the lost motion of parts of the action.

3. A pneumatic piano including hammers, levers fulcrumed between their ends, intermediate means actuated by the levers for actuating the hammers, pneumatic means for actuating said hammer actuating levers, a hammer rest rail, means for actuating the hammer rest rail, means in adjustable engagement with the free ends of said levers for preventing lost motion of said levers and the parts of the action, and means actuated by the hammer rest rail actuating means for holding said lost motion preventing means in an engaging position.

4. A pneumatic piano including hammers, levers fulcrumed between their ends, intermediate means actuated by the levers for actuating the hammers, pneumatic means for actuating said hammer actuating levers, a hammer rest rail, pneumatic means for actuating the hammer rest rail, a rod extending transversely of the piano, adjustable means in the free ends of said levers upon which said rod rests, and a system of levers fulcrumed in connection with the pneumatic means for actuating said first-mentioned levers and actuated by the hammer rest rail actuating means for moving and holding said rod in its downward position.

In witness whereof, I have hereunto affixed my signature in the presence of the witnesses herein named.

WILLIAM G. BETZ.

Witnesses:
O. M. McLAUGHLIN,
H. J. WELLS.