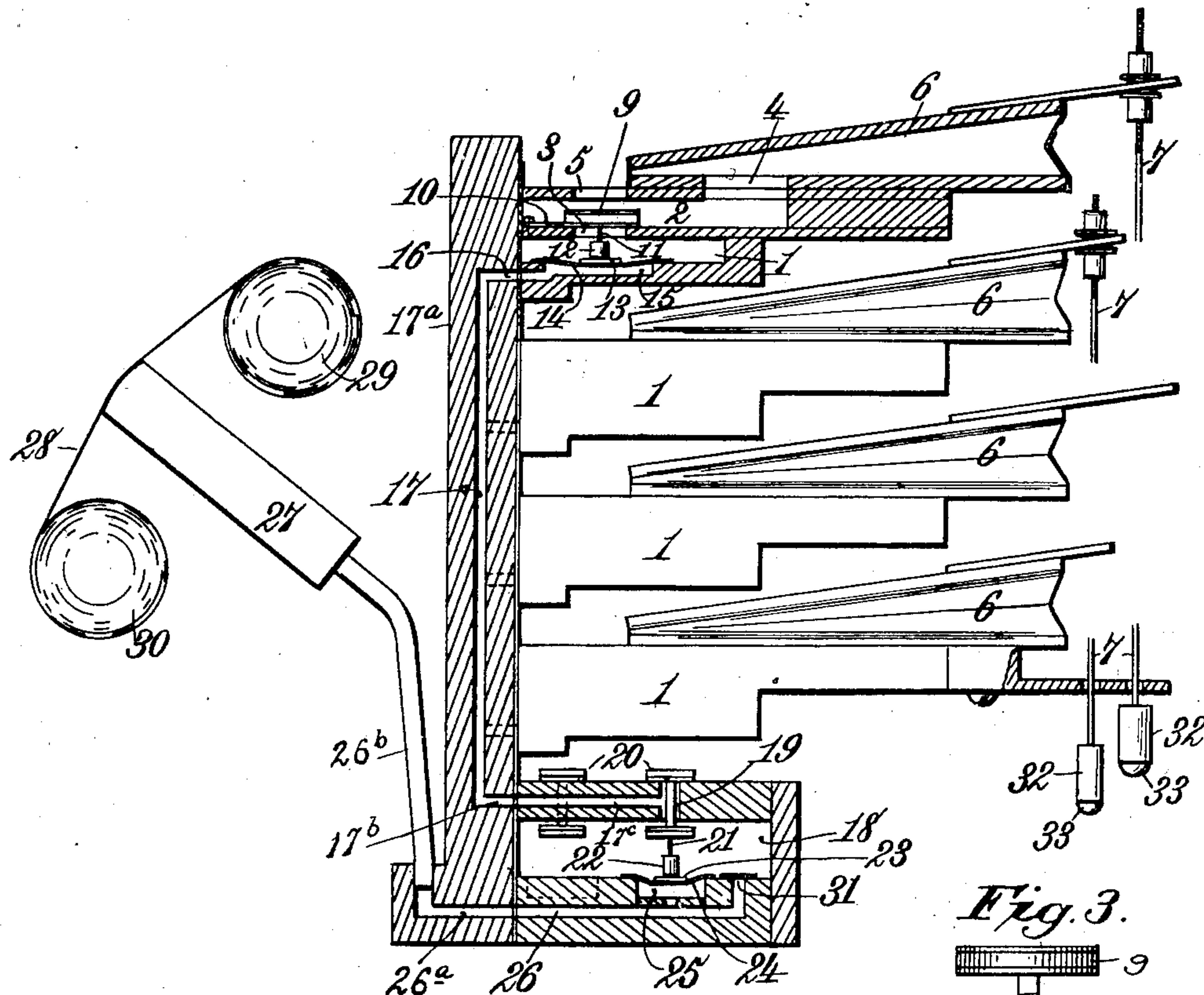
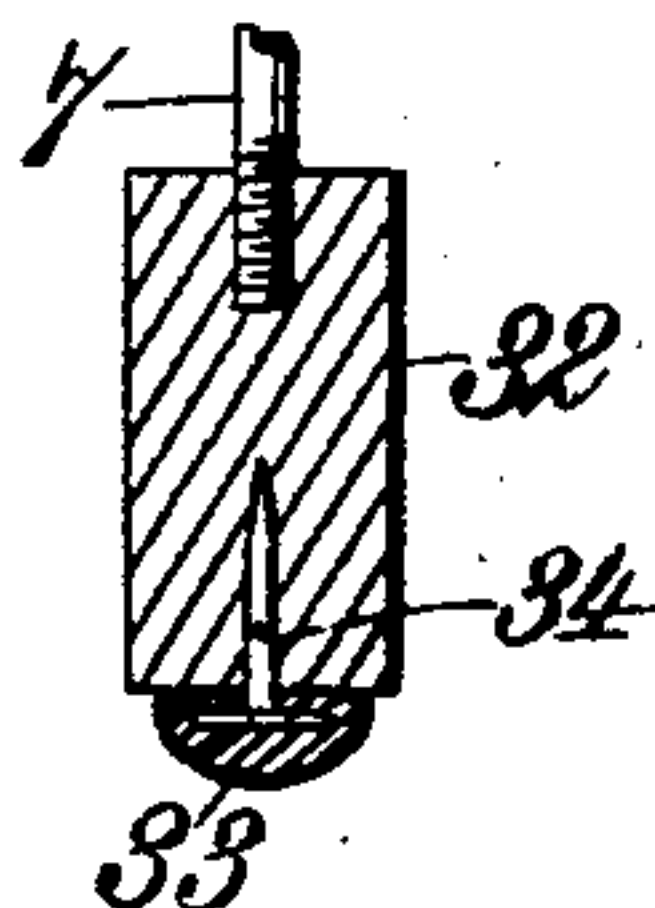
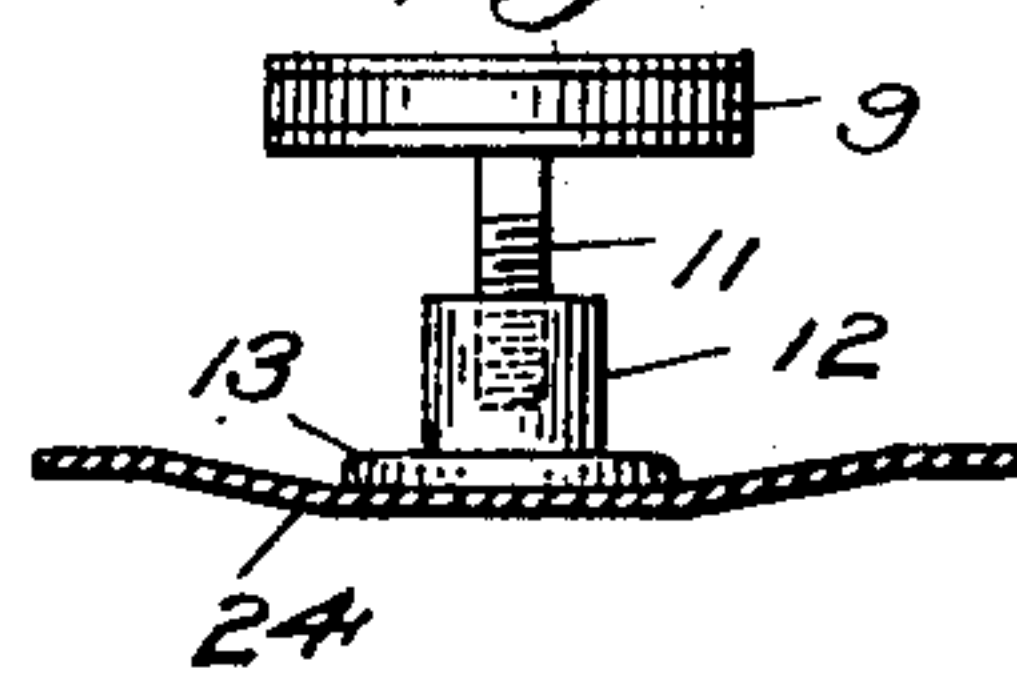


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## PNEUMATIC ACTION FOR SELF-PLAYING MUSICAL INSTRUMENTS.

APPLICATION FILED MAR. 8, 1901.

NO MODEL.

*Fig. 1.**Fig. 2.**Fig. 3.*

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# UNITED STATES PATENT OFFICE.

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PNEUMATIC-ACTION FOR SELF-PLAYING MUSICAL INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 740,391, dated October 6, 1903.

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*To all whom it may concern:*

Be it known that I, THEODORE PARKER BROWN, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Pneumatic-Actions for Self-Playing Musical Instruments; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to attachments for pianos, commonly called "automatic piano-players," in which a series of mechanical fingers or key-strikers is arranged in proximity to the keyboard, which key-strikers through suitable actuating devices are caused to strike the keys of the piano and produce a musical composition, the movements of the key-strikers and their selection being determined by means of a perforated note-sheet or music-web, said sheet controlling the small bellows known as "power-pneumatics," which constitute a part of the actuating mechanism and are the immediate means for imparting movement to the key-strikers, said pneumatics being connected in turn with suitable exhaust apparatus.

It is with the object of improving on the present type of device that I have evolved the present construction, which relates in part to means for insuring a quick strong action of the power-pneumatics without regard to the area of the note-perforation which passes over a duct in the tracker, but will provide for the influx of a sufficient volume of air to the pneumatics, which cause the collapsing of the power-pneumatics to always give a strong sudden movement to the key-lever, it having been found that with the constructions now in use when a note-perforation of somewhat less area than those ordinarily representing a musical composition passes the tracker the action of the power-pneumatic controlling and actuating devices is slow and weak, so that the key-striker will not strike the proper blow, the note is not properly sounded, and the effect of the production is seriously marred. I have also provided a construction of key-striker, or, more properly, the head at the end of the key-striker which strikes the keys, the

construction which I have invented giving a striker which will deliver a blow corresponding more nearly to the "live" or elastic touch of the human finger than those now in use.

In the drawings herewith, which form a part of this specification, I have shown, in Figure 1, a view, partly in section, of so much of a bank of wind-trunks, power-pneumatics, and their controlling devices as will illustrate my invention, a tracker with its connecting-ducts and note-sheet being shown in operative relation to the other parts. Fig. 2 is a detail view in section to illustrate the improved striker or key-striker head. Fig. 3 is an enlarged detail view showing the adjustable connection between the heads and stems of the valves.

Referring to the drawings by numerals, like numerals indicating like parts in the several views, 1 designates a longitudinally-disposed wind-trunk connected in the usual manner with some suitable exhaust apparatus and abuts against or is secured to a duct-board, hereinafter referred to, the duct-board forming one wall of the wind-trunk 1, while 2 denotes a casing forming a valve-chamber mounted on said trunk 1 and communicating therewith through port 3. The casing 2 forms the top wall of the wind-trunk and abuts against or is secured to one side of the duct-board, to be hereinafter referred to, the duct-board forming one wall of the valve-chamber in the casing 2. The valve-chamber in the casing 2 communicates, by means of a port 4, with a power-pneumatic 6, the movable member of which is connected in the usual or any suitable manner with a rod or key-striker 7, which carries at its lower end the head 32, which will be described in detail hereinafter. Said valve-chamber in the casing 2 is in communication with the outer atmosphere by means of a port 5, said port 5 and the port 3 above referred to being controlled by a single puppet-valve 9, which is provided on both sides with suitable seating-faces to insure a tight closure of the port with which it is in contact and being mounted on a flexible flap or hinge 10 will readily seat itself so as to close either the port 3 below or the port 5 above it, in accordance with the condition of the pressure in the wind-trunk 1. Said valve 9 has a depending stem 11, to the lower end



of which is adjustably secured a head 12, said head resting upon a disk 13, placed centrally of a flexible diaphragm 14, which separates the wind-trunk 1 from a chamber 15, which will be referred to hereinafter as the "diaphragm-chamber." The head 12 has a threaded connection with the stem 11, as shown in Fig. 3, which permits of adjustment. Leading from the said diaphragm-chamber 15 is an upper horizontally-extending duct 16, formed in the duct-board 17<sup>a</sup>, the latter preferably arranged to extend in a vertical manner and interposed between the tracker, hereinafter referred to, and the pneumatics. The duct 16 communicates at its inner end with the upper end of a vertically-extending main duct 17; also formed in the duct-board 17<sup>a</sup>. The main duct 17 communicates at its lower end with a horizontally-extending lower duct 17<sup>b</sup>. There are as many upper, lower, and main ducts in the board 17<sup>a</sup> as there are pneumatics. The lower duct 17<sup>b</sup> communicates at its outer end with a horizontally-extending duct 17<sup>c</sup>, formed in the upper wall of a casing 18, which forms a second wind-trunk. The casing 18 abuts against or is secured to one side of the duct-board 17<sup>a</sup>, the latter forming one wall thereof. The duct 17<sup>c</sup> communicates with the wind-trunk formed by the casing 18 by means of a port-passage 19 in the top wall of the casing 18, which passage leads to the outer atmosphere also, the inner and outer mouths of said port-passage 19 being controlled by a double-headed valve 20. Depending from the lower head of said valve 20 is a stem 21, having adjustably secured thereto a head 22, which rests upon a central disk 23, carried by a flexible diaphragm 24, which separates said wind-trunk from a diaphragm-chamber 25, formed in the bottom wall of the casing 18, this arrangement of wind-trunk, diaphragm-chamber, and controlling-valve being quite similar to that described above as forming the immediate actuating means for the power-pneumatic, and this last-described wind-trunk 18, with its cooperating parts, I term the "primary pneumatic," while that which is in direct connection with the power-pneumatic 6, which actuates the key-levers, I term the "secondary pneumatic," the appositeness of these designations being made clear hereinafter in setting forth the operation of the device. The stem 21 has a threaded connection with the head 22, similar to the corresponding parts illustrated in Fig. 3, which permits of an adjustment of the head on the stem. The diaphragm-chamber 25 of the primary pneumatic communicates with a duct 26, formed in the bottom wall of the casing 18, the duct 26 communicating at one end with a duct 26<sup>a</sup>, formed in the lower part of the duct-board 17<sup>a</sup>. The duct 26<sup>a</sup> is termed the "tracker-communicating duct." There are as many tracker-ducts as occasion requires. The duct 26<sup>a</sup> is substantially L-shaped and has connected to its outer end duct-pipe 26<sup>b</sup>, depend-

ing from the tracker 27 of the ordinary construction, a note-sheet 28, mounted on suitable delivery and take-up rollers 29 30, being arranged to travel over the tracker 27 in the usual manner and open or close the tracker-mouths in the customary way.

The operation of the mechanism described is as follows: Air being exhausted from the wind-trunks 1 and 18 of the apparatus and the tracker-mouths being closed, it is clear that the valves 20 and 9 of the primary and secondary pneumatics, respectively, will be held by atmospheric pressure to their seats in their lowermost positions, this action of the valves resulting in closing the upper end of the port-passage 19 in the primary pneumatic and in closing the port 3 in the secondary pneumatic, and thus in this last instance preventing the exhaust from affecting the power-pneumatic 6. It will be apparent that the exhausting of the wind-trunk 18 will cause an exhaustion of the main duct 17, the diaphragm-chamber 15 of the several secondary pneumatics, and the diaphragm-chamber 25 and tracker-duct 26, provision for this last being made by means of a small port 31, connecting wind-trunk 18 and tracker-duct 26, which latter is in direct communication with the diaphragm-chamber 25. Assuming that this state of exhaustion exists, it will be understood that when a note-perforation passes a tracker-mouth there will be an influx of air through the duct 26, which will break the vacuum in chamber 25, and the flexible diaphragm 24 under the action of atmospheric pressure, as against the exhaust in wind-trunk 18, will bulge upwardly, raising the valve 20, closing its upper end. The opening of the upper end or passage-port 19, which is of considerable area, will allow a large volume of air to flow in, which will rush very quickly through the main duct 17 and break the vacuum existing in the diaphragm-chamber 15 of the secondary pneumatic, the action of the body of air entering said port-passage 19 insuring a quick action of the valve 9, which as soon as the vacuum is broken in chamber 15 will be lifted by the upwardly-bulging diaphragm 14, closing port 5, opening port 3, and placing the exhaust-chamber or wind-trunk 1 in communication with the valve-chamber 2 and through the port 4 with the power-pneumatic 6. The said power-pneumatic 6 will, it has been found, collapse much quicker and with a greater force when the construction above described is used, thus insuring a rapid, powerful, and uniform blow of the key-striker without regard to the size or area of the note-perforation which controls the primary pneumatic and indirectly controls the power-pneumatic, this result being attained, as stated, by interposing the primary-pneumatic device between the tracker and the secondary-pneumatic device, which directly controls the power-pneumatic.

The key-striker which I prefer to employ



is illustrated in Fig. 2 and consists in providing a head 32, which is preferably a short cylindrical block of wood, said head being screw-threaded or otherwise adjustably secured to the lower end of the key-striker or striker-rod 7, so as to allow for a delicate adjustment of the said head. Secured to the lower end of said head 32 is an elastic striking-surface, which, as shown, consists of a rubber button 33, having a convex contact-face and being held to the said head by means of a tack or screw 34, the head of which is embedded in the rubber button 33. This construction, which is simple and durable, gives a very elastic touch to the key-strikers, resulting in an improvement in the quality of the music produced, for the reason that it approaches more closely the touch of the finger, and at the same time such elastic button, because of its inherent tendency to spring away after the blow has been delivered, is of material assistance in overcoming the inertia of the key-striker or striker-rod, so that it will make a quick light touch for staccato effect with great accuracy.

Having thus described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In an automatic player for musical instruments, the combination with a tracker, of a duct-board having upper, main, lower and tracker ducts, the latter independent of the upper, main, and lower ducts and communicating with the tracker, said upper, main and lower ducts communicating with each other, a primary wind-trunk arranged against said duct-board and provided with a diaphragm-chamber communicating with the tracker-duct, said wind-trunk communicating with said lower duct, a secondary wind-trunk arranged against said duct-board and provided with a diaphragm-chamber communicating with said upper duct, a valve mechanism suitably arranged in each of said wind-trunks, a power-pneumatic communicating with said secondary wind-trunk, and key-levers operatively connected to the power-pneumatic.

2. An automatic player for musical instruments comprising a duct-board provided with

main, upper and lower ducts communicating with each other, said duct-board further provided with a tracker-communicating duct independent of the main, upper and lower ducts, a primary wind-trunk provided with a diaphragm-chamber and communicating with said lower duct and said tracker-duct, a double valve suitably connected to said wind-trunk and provided with a depending stem carrying an adjustable head, a secondary wind-trunk arranged against said duct-board and provided with a diaphragm-chamber communicating with said upper duct, a double-acting valve arranged in said secondary wind-trunk and provided with a depending stem carrying an adjustable head, a diaphragm arranged in each of the said chambers and adapted to engage the said heads for suitably moving the said valves, and a power-pneumatic device communicating with said secondary-pneumatic device.

3. An automatic player for musical instruments comprising a primary-pneumatic device embodying a double valve having a head depending therefrom and a diaphragm-chamber having a diaphragm mounted therein adapted to engage the said head to move said valve, a tracker communicating with said diaphragm-chamber for controlling said primary-pneumatic device, a secondary-pneumatic device communicating with and controlled by said primary-pneumatic device and communicating through a channel with the atmosphere and embodying a double-acting valve having a head depending therefrom and a diaphragm-chamber having a diaphragm mounted therein adapted to engage the said head of the double-acting valve to move the latter, said double-acting valve adapted to open and close said channel to the atmosphere, and a power-pneumatic communicating with and operated by said secondary-pneumatic device.

In testimony whereof I affix my signature in presence of two witnesses.

THEODORE PARKER BROWN.

Witnesses:

RUFUS B. DODGE, Jr.,  
HOBERT E. SMITH.