L. B. DOMAN.

SELF PLAYING PIANO.

APPLICATION FILED JAN. 18, 1912.

1,186,975.

Patented June 13, 1916.

2 SHEETS—SHEET 1.

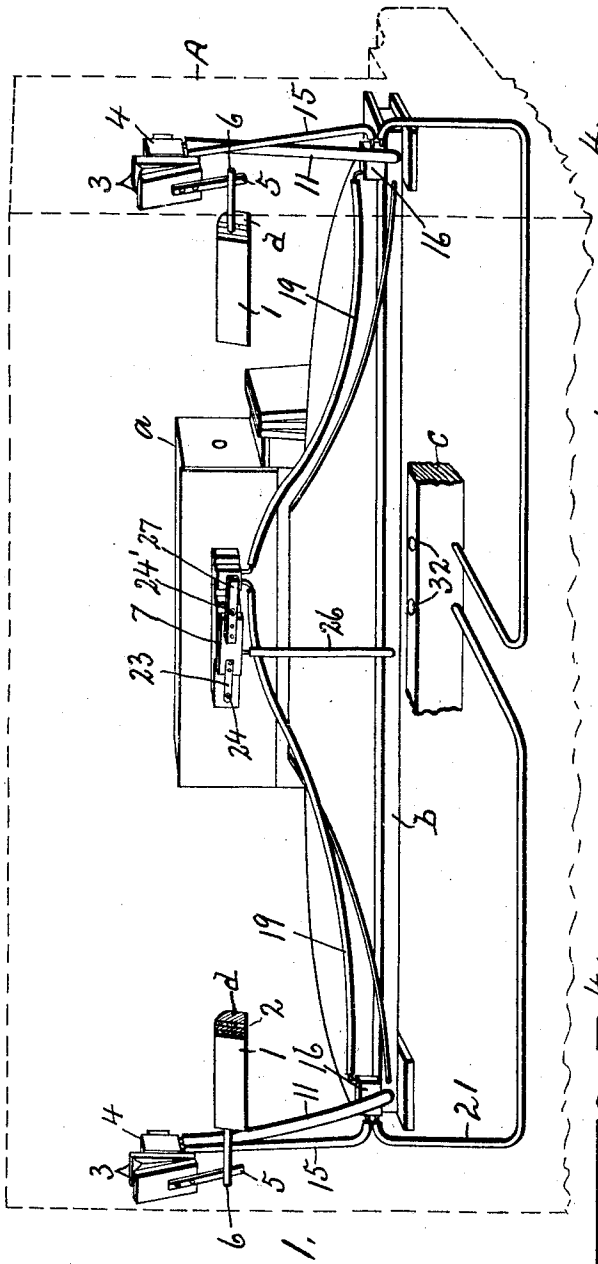


FIG. 1.

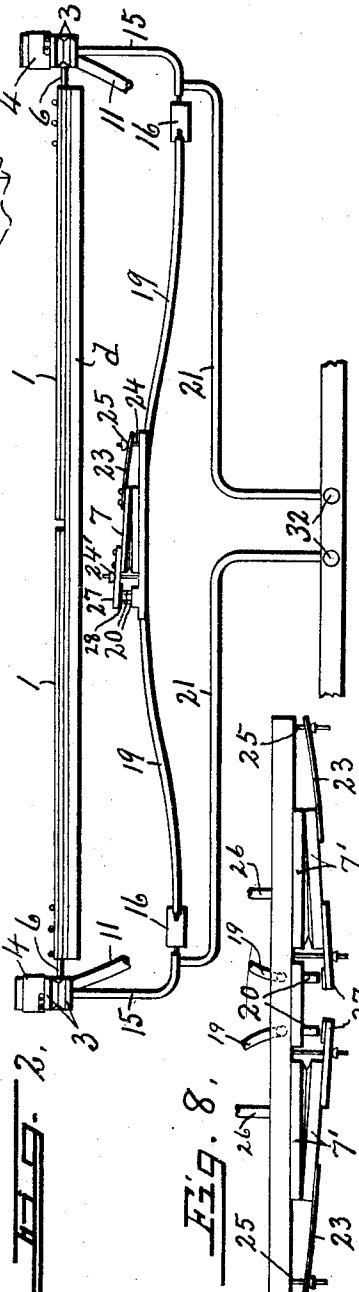


FIG. 2.

FIG. 8.

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2 SHEETS—SHEET 2.

Fig. 3.

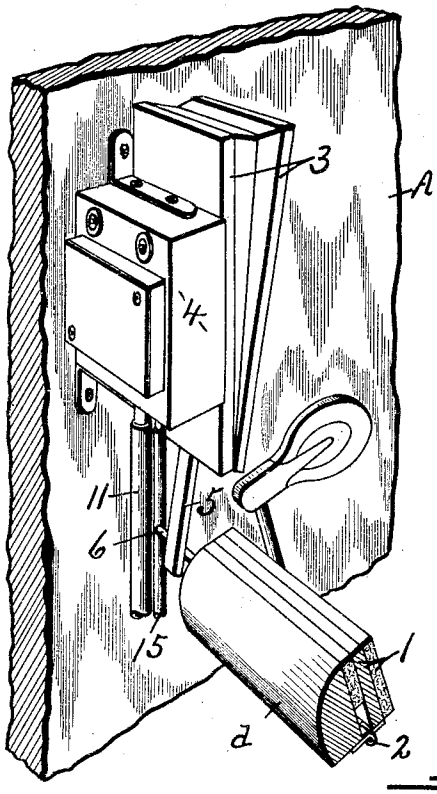


Fig. 4.

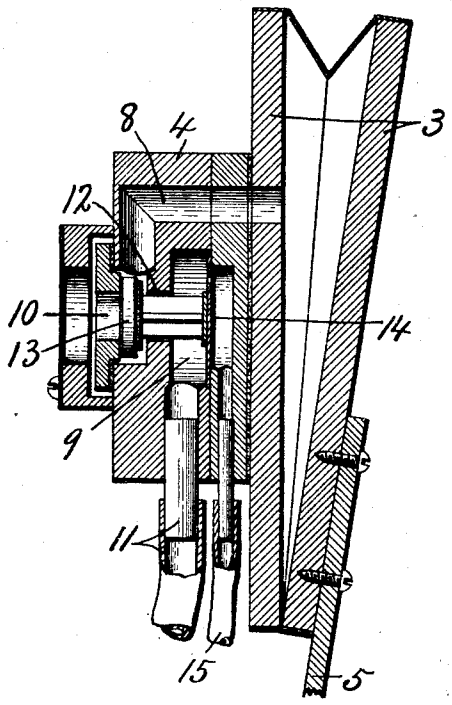


Fig. 5.

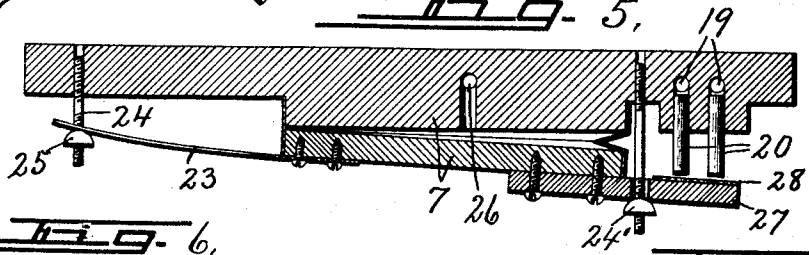


Fig. 6.

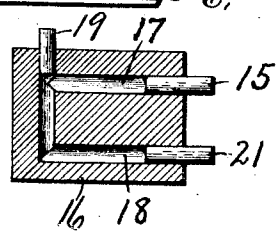
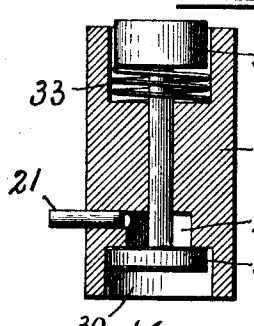


Fig. 7.



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UNITED STATES PATENT OFFICE.

LEWIS B. DOMAN, OF SYRACUSE, NEW YORK, ASSIGNOR TO THE AMPHION PIANO PLAYER COMPANY, OF SYRACUSE, NEW YORK, A CORPORATION OF NEW YORK.

SELF-PLAYING PIANO.

1,186,975. Specification of Letters Patent. Patented June 13, 1916.

Application filed January 18, 1912. Serial No. 671,871.

To all whom it may concern:

Be it known that I, LEWIS B. DOMAN, of Syracuse, in the county of Onondaga in the State of New York, have invented new and useful Improvements in Self-Playing Pianos, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to certain improvements in self-playing pianos and refers more particularly to mechanism for shifting the hammers toward and from the strings for producing soft and loud tone effects as may be desired during the playing of a musical selection.

The main object is to automatically position the hammers nearer to or farther from the strings according to the degree of air tension produced by the wind inducing device in the sound producing action so that when such air tension is relatively low, the hammers will be moved to their soft tone positions nearer the strings and as the air tension increases will be moved to or toward their loud tone positions away from the strings.

In other words I have sought to provide simple means whereby the shifting of the hammers for loud and soft tone effects may be controlled at will by the manipulation of pedals.

Another object is to provide means whereby the operator may voluntarily cause the shifting of one or more sets or groups of hammers corresponding to certain parts such as the melody or accompaniment of a musical selection for subduing such part or parts while the remaining part or parts may be played with varying effects by manipulation of the pedals as may be desired.

Other objects and uses relating to specific parts of the hammer shifting mechanism will be brought out in the following description.

In the drawings—Figure 1 is a perspective view of a portion of a self-playing piano showing one form of my invention, a portion of the piano case being shown by dotted lines and the intermediate portions of the hammer rest rails being broken away. Fig. 2 is a top plan of the hammer shifting mechanism shown in Fig. 1. Fig. 3 is a perspective view of one of the rail shifting pneumatics and valve chest containing the valve and primary pneumatic for controlling the action of the shifting pneumatic showing also a portion of the piano case on which these parts are mounted and adjacent end of the hammer rest rail and one of the hammers. Fig. 4 is an enlarged longitudinal sectional view of the rail shifting pneumatic and valve case shown in Fig. 3. Fig. 5 is an enlarged longitudinal sectional view of the governing pneumatic for controlling the action of the valve for the shifting pneumatic. Fig. 6 is an enlarged sectional view of one of the couplings for the pipe connections between the governing pneumatic and shifting pneumatic. Fig. 7 is an enlarged sectional view of the front rail of the piano and one of the manually operated valves for controlling the admission of atmospheric air to the primary pneumatic independently of the governing pneumatic. Fig. 8 is a top plan of a modified form of governing device showing separate governing pneumatics one for each rail section.

In order that my invention may be clearly understood I have shown by dotted lines a portion of a piano case —A— of a self-playing piano containing the usual music roll box —*a*— and exhaust chamber —*b*— of any suitable form of sound producing action not shown. This exhaust chamber —*b*— may be connected in any suitable manner, not necessary to herein illustrate or describe, to a wind inducing device, not shown, for maintaining the desired air tension, the piano case being provided with the usual front rail or finger bar —*c*—, a portion of which is shown in Figs. 1 and 7.

Suitably mounted within the piano case is a continuous rest-rail —*d*— which is movable in the usual manner for hammer rest rails and serves as a rest for a plurality of, in this instance two, separately movable hammer shifting rail sections or hammer rests —1—. These rail sections run parallel with the main rest rail —*d*— and are hinged thereto along their lower edges at —2—, Fig. 3, so as to permit them to be rocked toward and from the strings for shifting corresponding groups of the hammers independently of the main rest rail, thereby permitting either group of hammers corresponding to the melody or accompaniment of the musical selection to be shifted independently of the other group. These rail sections —1— are adapted to be shifted by separate pneumatics —3—which,

in this instance, are secured to the opposite ends of the piano case —A— and are associated with corresponding valve chests —4— one for each pneumatic. For this purpose the movable side of each of the pneumatics —3— is provided with a pendant —5— in operative engagement with a longitudinal projection or shoulder —6— on the adjacent end of the rail section —1— so as to move said rail and shift the hammers toward the strings when the pneumatic —3— is wholly or partially collapsed by exhausting the air therefrom. The shifting pneumatics —3— are normally in direct communication with the wind inducing device through suitable connections presently described with the exhaust chamber —*b*— and are therefore responsive to the slightest variations of air tension in the wind inducing device as produced by the operation of the pedals not shown.

It therefore follows that the pneumatics —3— will be operated to shift the rail sections and thereby throw the hammers toward the strings under a minimum air tension as, for example, in the initial or slow action of the wind inducing device, thereby reducing the stroke of the hammers and permitting more rapid action thereof when the air tension is relatively low. In addition to this, I have provided means including a governing pneumatic —7— for automatically cutting off communication between the pneumatics —3— and exhaust chamber —*b*— and simultaneously establishing communication between said pneumatic —3— and the atmosphere for distending said pneumatics and thereby permitting the rail sections —1— and hammers to return to normal positions at a maximum distance from the strings when the air tension in the wind inducing device or in the chamber —*b*— increases to a predetermined degree as regulated by the governing pneumatic —7— presently described. For this purpose each valve casing —4— is provided with an air passage —8— connecting to the interior of its corresponding rail shifting pneumatic —3—, said valve case being also provided with an exhaust chamber —9— and an atmosphere port —10—, the exhaust chamber —9— being connected by a conduit —11— to the exhaust chamber —*b*—.

The air passage —8— is connected by a port —12— to the exhaust chamber —9— and is adapted to be alternately placed in communication with said exhaust chamber and with the atmosphere by a suitable valve —13— and primary pneumatic —14— shown more clearly in Fig. 4. Each of the primary pneumatics —14— is connected by a conduit —15— to a three-way coupling —16— having branch passages —17— and —18— one of which as the branch passage —17— is connected by a conduit —19— to one of two atmosphere ports —20— of the governing devices —7—, while the other branch passage —18— is connected by a conduit —21— to a valve chamber —22— in the front rail —*c*— of the piano case where it is conveniently accessible to the operator.

The pneumatic —7—, constituting the automatic governor, controls, in this instance, both of the atmosphere ports —20— and is normally distended to entirely uncover said ports by means of a spring —23— secured to and projecting beyond the hinged end of the movable side of the pneumatic and has its free end attached to a suitable anchorage —24—, the latter consisting of a threaded member having an adjusting nut or bearing —25— by which the tension of the spring may be increased or diminished. This pneumatic —7— is connected by a conduit —26— to the wind chest or exhaust chamber —*b*— and is therefore directly influenced by variations of air tension in the wind inducing device, its opening being limited by an adjustable stop —24'—. The end of the movable side of the pneumatic —7— opposite that to which the spring —23— is attached is provided with an extension —27— carrying a valve —28— of sufficient area to cover both of the atmosphere ports —20— but is prevented from closing said ports under comparatively low air tension in the wind inducing device and consequently in the pneumatic —7— by the tension of the spring —23— which is adjusted to resist the collapse of the pneumatic —7— under relatively low air tension therein but to yield to a relatively high degree of air tension for the purpose of closing said ports.

When the instrument is operated under comparatively low air tension insufficient to cause the action of the pneumatic —7— against the resistance of the spring —23—, the ports —20— will remain open, thereby admitting atmospheric air to their respective primary pneumatics —14—, thus closing the valves —13— against their atmospheric ports —10— and establishing communication between the exhaust chambers —9— and pneumatics —3— to throw the rail sections —1— and corresponding groups of hammers toward the strings to not only shorten the stroke of the hammers for rapid action under the low tension but also for the purpose of subduing the tones.

As the air tension in the pneumatic —7— increases, however, sufficient to overcome the tension of the springs —23— the valve —28— will close the ports —20—, thereby cutting off communication between the primary pneumatics —14— and atmosphere and thus permitting the valves —13— to close the ports —12— for cutting off com-

munication between the rail shifting pneumatics —3— and exhaust chamber —9— and establishing communication between said pneumatic and the atmosphere, whereupon said pneumatics —3— will become inflated or distended to allow the hammer rail sections —1— and hammers to return away from the strings to their normal positions for loud tone effects.

It is now clear that although the shifting mechanism is automatic in that it responds to variations in air tension in its pneumatics, the air tension for said pneumatics is controlled voluntarily by the action of the wind inducing device through the medium of the pedals so that when the instrument is in action with the air tension in the governing pneumatic —7— insufficient to overcome the tension of the spring —23—, the hammers will be shifted toward the strings to their soft tone positions but when the air tension in the governing pneumatic increases sufficiently to overcome the tension of the spring, said pneumatic will be collapsed to close the ports —20— and allow the rail sections —1— and hammers to return to their normal or loud tone positions, and it is therefore evident that the hammers may be shifted at will for loud or soft tone effects by simply varying the action of the operating pedals for the wind inducing device.

In the governor shown in Figs. 1, 2 and 5, both of the hammer rail sections are movable simultaneously by reason of the fact that the valve —28— controls both of the atmosphere ports —20— and therefore all of the hammers will be either in their loud or soft tone positions, but it may be desirable in some instances to enable the operator to shift one group of hammers to their soft tone positions, while another group remains in their loud tone positions, as, for example, in emphasizing a melody or accompaniment and for this purpose I have shown in Fig. 8 two separate governing pneumatics —7— and —7′— similar to the pneumatics —7— each controlling a single one of the atmosphere ports —20— so that the retracting spring —23— of one of the pneumatics may be tensioned to a greater degree than the other spring to cause the pneumatic having the retracting spring of greatest tension to close its port later than that having the spring of least tension and consequently the rail shifting pneumatic —3— corresponding to the earlier closing port —20— will shift the corresponding group of hammers to their loud tone positions before the other rail shifting pneumatic is shifted to a similar position, thus permitting the operator to play one part with greater emphasis than the other part. It is evident, however, that the springs —23— of both pneumatics —7′— may be similarly tensioned to operate at the same time by adjusting the nuts —25—.

When the instrument is in action and the air tension in the pneumatics —7— or —7′— is sufficient to overcome the tension of their springs —23— thereby causing the pneumatics 3— to position the hammers for loud tone effects, it is desirable to provide means whereby one or the other of the groups of hammers may be instantly positioned for soft tone effects and for this purpose I have provided the front rail —c— with atmosphere ports —30— one for each of the pneumatics —3—, said ports being normally closed by self-closing valves —31— having finger pieces —32— by which they may be opened against the action of retracting springs —33—, thereby admitting atmospheric air to the chamber —22— and thence through the conduit —21—, coupling —16— and conduit —15— to the primary pneumatics —14— to cause the valves —13— to close the ports —12—, and open communication between the pneumatics —3— and atmosphere through the ports —10—. In this manner either or both of the groups of hammers may be positioned for soft tones, while the air tension in the governing pneumatics —7— or —7′— is sufficiently high to overcome the tension of their respective springs —23—.

In operation the initial action of the wind inducing device by means of the pedals first causes the pneumatics —3— to shift the rail sections —1— and corresponding groups of hammers toward the springs, in which position they will remain until the air tension in the governing pneumatics —7— is sufficiently high to overcome the tension of the springs —23—, whereupon the ports —20— will be closed and the pneumatics —3— placed in communication with the atmosphere and thereby distended to allow the rail sections —1— and hammers to return to their normal loud tone positions. While in these positions either of the finger valves —31—, as, for example, that corresponding to the accompaniment may be opened to cause the deflation and partial collapse of the corresponding pneumatic —3—, thereby throwing the adjacent rail —1— and corresponding group of hammers to their soft tone positions for relatively emphasizing the melody, or if it is desired to vary the expression alternately from fortissimo to pianissimo and vice versa this may be accomplished by the action of the pedals in varying the air tension above and below that required to overcome the tension of the springs —23— of the governing pneumatic —7.

What I claim is:

1. In a pneumatic piano player, the combination of separate hammer-rests for different groups of strings, separate pneumatic actuators for said hammer-rests, and con-

trolling means therefor including atmosphere ports, one for each actuator, and a single tone-governing pneumatic controlled by the air tension in the player action for controlling the admission of air to said ports.

2. In a pneumatic piano player, the combination of separate hammer-rests for different groups of strings, separate pneumatic actuators for said hammer rests, controlling means therefor including atmosphere ports, one for each actuator, and a single tone-governing pneumatic controlled by the air tension in the player action for opening and closing said ports, and separate devices operable at will for nullifying the effect of the closing of either port upon its corresponding actuator irrespective of the tone-governing pneumatic.

3. In a pneumatic piano player, the combination of separate hammer-rests for different groups of strings, separate pneumatic actuators for said hammer-rests, controlling devices for said actuators including separate primary pneumatics, one for each actuator, separate atmosphere ports communicating with their respective primary pneumatics, a tone-governing pneumatic controlled by the air tension in the player action and controlling the admission of air to said ports.

4. In a pneumatic piano player, the combination of separate hammer-rests for different groups of strings, separate pneumatic actuators for said hammer rest, controlling devices for said actuators including separate primary pneumatics, one for each actuator, separate atmosphere ports communicating with their respective primary pneumatics, a tone-governing pneumatic controlled by the air tension in the player action and controlling the admission of air to said ports, and means operable at will for admitting atmosphere air to either of the primary pneumatics independently of the other when said ports are closed.

In witness whereof I have hereunto set my hand on this 11th day of January 1912.

LEWIS B. DOMAN.

Witnesses:
H. E. CHASE,
E. F. SPEARING.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."