F. G. LYNDE.

CRASH BELLOWS FOR PLAYER PIANOS.

APPLICATION FILED MAY 23, 1914.

1,158,823.

Patented Nov. 2, 1915.

2 SHEETS—SHEET 1.

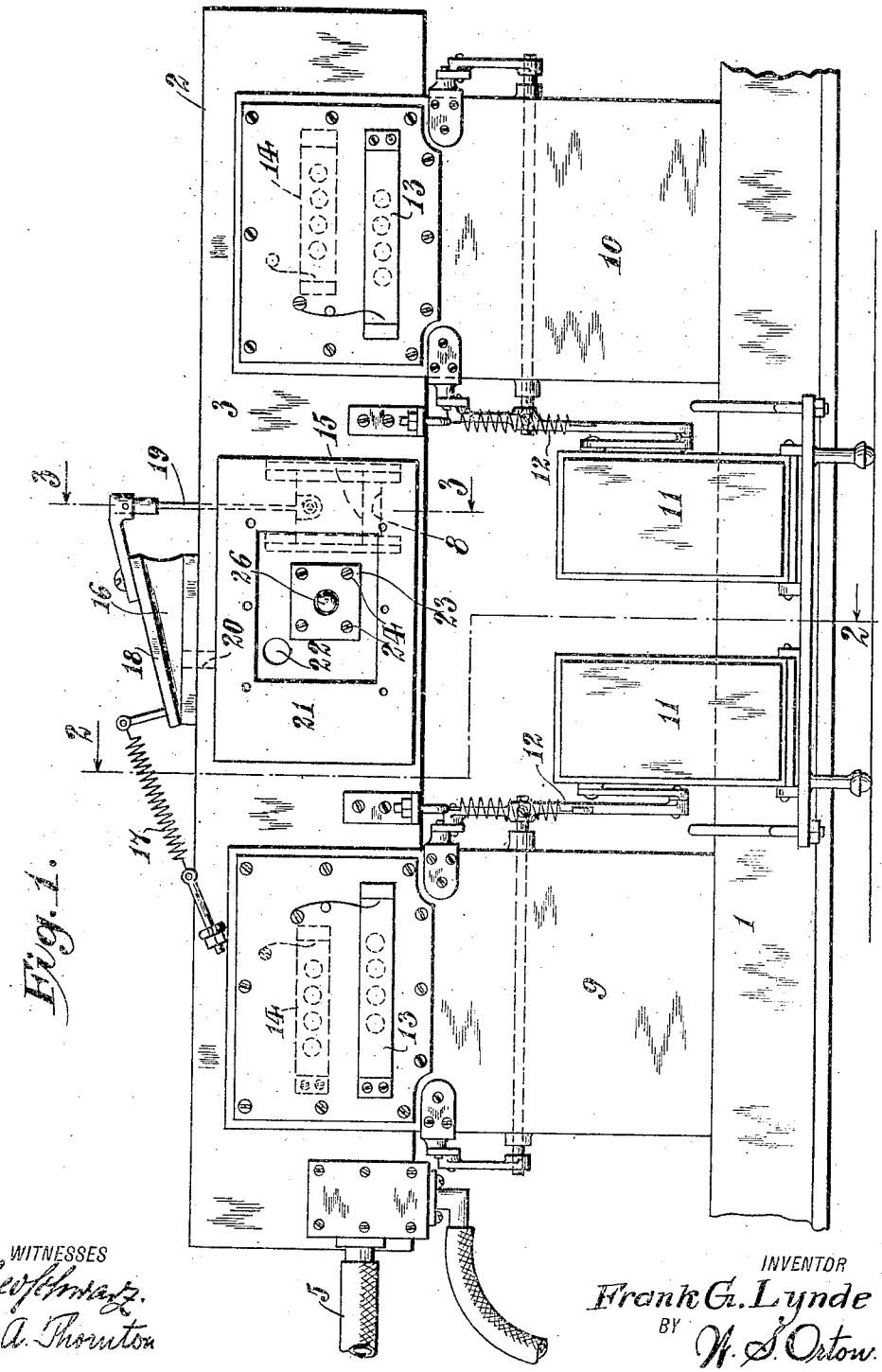

Fig. 1.

WITNESSES

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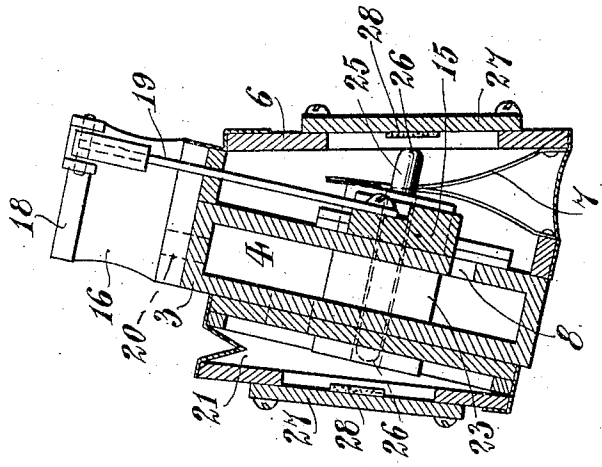

Fig. 3.

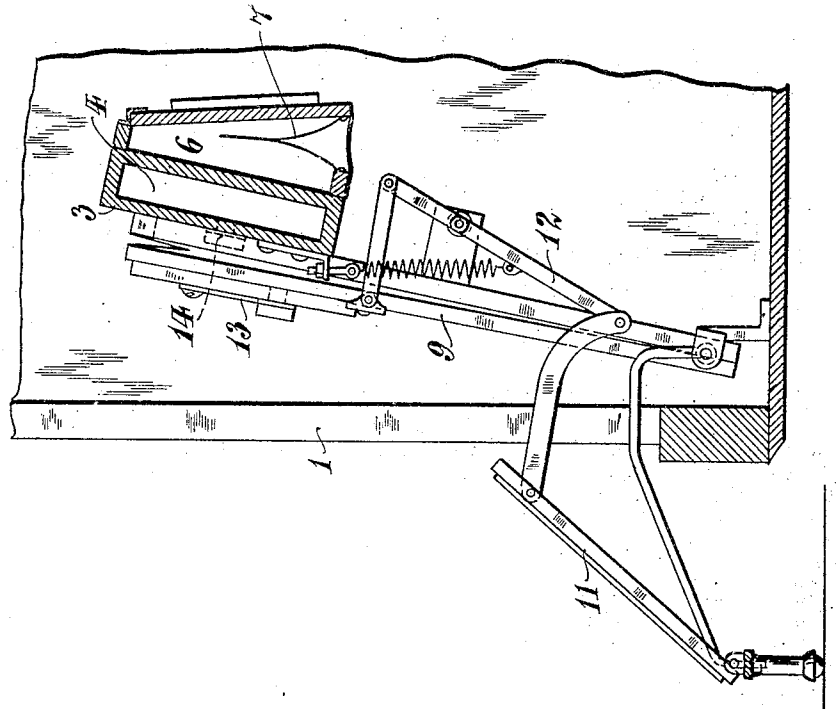

Fig. 2.

WITNESSES

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CRASH-BELLOWS FOR PLAYER-PIANOS.

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To all whom it may concern:

Be it known that I, FRANK G. LYNDE, a citizen of the United States, residing in the city of Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Crash-Bellows for Player-Pianos, of which the following is a specification.

My invention relates in general to player pianos of the pneumatically actuated type and particularly relates to automatically regulated crash bellows of such devices.

In devices of this character the pneumatics energizing the hammer actions are designed to operate with a normal strike or blow when subjected to the action of a predetermined difference in air pressure or vacuum. When it is desired to accent a particular note or combination of notes, or to produce what is known as a crash effect it is the usual practice to pump the actuating pedals quickly to increase the effective working pressure in the instrument but this takes some appreciable time and it is necessary for the operator to anticipate that he is to accent some particular note before the slot representing the note in the music sheet reaches the line of ducts in the tracker-bar.

With player pianos now on the market it is not possible suddenly to accent the note for it requires pumping for at least two seconds before any appreciable difference is noted in the tone of the chord or note and where rapid repeating of accented notes is required or where it is required to accent a note or a succession of notes while playing softly, the present known devices are ineffective.

Accordingly, it is one of the objects of this invention to provide a means for suddenly accenting the note so that a crash effect may be produced even when the note slot in the music sheet is actually over the air duct in the tracker-bar, and when on low pressure or light wind without having to work up extra tension to produce the crash effect.

Another object of the invention is to ease the final collapsing movement of the bellows when the pedals are suddenly pumped by the operator to accent the notes and thus eliminate the thumping or binding effect or jar usually experienced when the crash bellows is forced to the limit of its movement.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one form of mechanism embodying my invention, and the invention further consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawings: Figure 1 is a front elevation of the power mechanism usually positioned in the bottom part of the standard player pianos with a preferred embodiment of my invention installed therein; and Figs. 2 and 3 are transverse sectional views taken respectively on the lines 2—2 and 3—3 of Fig. 1 looking in the direction indicated by the arrows.

In the drawings there is illustrated a fragmentary portion of a piano casing 1 within which is demountably positioned the bellows action 2, which includes the usual long wind chest 3 extending across the piano and having a reservoir vacuum chamber 4. This vacuum chamber communicates with the various hammer action controlling valves and pneumatic (not shown) through the conduit 5. A main bellows 6 of relatively large capacity and constituting an equalizing chamber parallels the wind chest on the rear side thereof and is normally held open by means of the distending springs 7, which tend to cause a steady exhaustion of the air from the chamber 4 through the valve controlled port 8. Exhaust feeders 9 and 10 are fixed to and depend from opposite sides of the front of the chest 3, are actuated from the pedals 11 through suitably connecting mechanism 12 and are provided with exhaust valves 13 opening to the outside atmosphere and with suction valves 14 opening into the chamber 4 as is usual with devices of this character.

The opening through the port 8 is controlled by means of the sliding valve 15 which is normally maintained in open position when the piano is under its normal working vacuum by a pneumatic 16 mounted on the chest 3. A spring 17, preferably adjustable, tends to hold the pneumatic in distended position and the movable side 18 of the pneumatic is suitably connected to the valve 15 by means of a reach rod 19 which extends through the top of the main bellows 6. A port 20 places the pneumatic 16 in communication with the chamber 4.

A supplemental bellows 21 of relatively small capacity compared to the main bellows is mounted on the front of the chest 3 between the feeders 9 and 10 and is continuously in communication with the chamber 4 through the open port 22.

A bushing block 23 extends through the chest 3 centrally of the bellows 21 and is removably affixed to the inner member of the bellows by means of the screws 24. A freely movable plunger 25 is slidably mounted in this block, has a substantially air tight fit therein and has rounded ends 26 adapted to be engaged by the movable elements of the main and supplemental bellows when these elements are in partially collapsed positions. To provide ready access to this plunger the portions of the movable elements engaging the same are formed of removable plates 27 screwed to the outer faces of the elements and provided with cushions 28 to bear on the ends of the plunger.

In the normal operation of the instrument, the easy or usual pumping of the pedals will rock the feeders and draw air from the chamber 4 which in turn will exhaust air from both the main and supplemental bellows. The external air pressure will act slowly on the movable elements of the main bellows tending to collapse the same inward toward the chest 3 against the tension of the distension springs 7 and this air pressure will act quickly on the smaller supplementary bellows to quickly collapse its movable element inward toward the chest 3. When a certain predetermined vacuum has been obtained in the chamber the movable elements will be in engagement with opposite ends of the loose plunger and this is the normal position of these members when the instrument is playing with its normal intensity of sound.

A sudden actuation of the pedal will tend to further exhaust the remaining air in the chamber which reduction in pressure will cause the pneumatic 16 to collapse against the tension of its spring 17 and move the valve 15 to close communication between the chamber 4 and main bellows. This confines the action of the feeders to the chamber 4, its connected conduits, valves and pneumatics and to the small supplementary bellows. As the capacity of these parts are relatively small compared with the capacity of the parts when the main bellows forms an element thereof, a high vacuum is produced in the chamber 4 even by a partial stroke of one of the pedals with the result that the hammer pneumatics are powerfully actuated and the strings given a sharp blow. While this high vacuum is present, the main bellows is closed and is in partially collapsed position due to the partial vacuum therein. This high vacuum causes the movable element of the supplemental bellows to push on the plunger forcing the same against the movable element of the main bellows. The external air pressure against the main bellows acts as a cushion to resist the movement of the plunger and through the plunger to resist the collapsing movement of the supplemental bellows. The effect of this cushioning movement is to gradually ease the final movement of the supplemental bellows against the stationary part fixed to the wind chest. The restoration of normal air pressure in the chamber 4 as is usual with devices of this character permits the spring 17 to distend the bellows 16 and thus open communication between the chamber 4 and the main bellows, and the supplemental bellows tend to assume their normal position.

By means of a device of this character it is possible to make the feeders of relatively high air-exhausting capacity and to make the supplemental bellows and connected parts of relatively low capacity so that any unusual or rapid sudden pedalling will immediately produce a high actuating pressure or vacuum in the instrument. Further a convenient arrangement is attained by means of which the sudden actuation of the pedals will not bring the supplemental bellows into collapsed position with the jar which is noticeable with the present forms of devices of this character.

The device is simple in construction and may be readily installed without modifying present constructions and without the installation of cumbersome mechanisms.

While I have shown and described, and have pointed out in the annexed claims, certain novel features of my invention, it will be understood that various omissions, substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

Having thus described my invention, I claim:

1. In a device of the class described, the combination with a wind chest having a reservoir chamber therein, a main bellows with an opening between said chamber and bellows, a valve for controlling said opening, means operatively connected with said chamber and operatively connected to said valve to close communication between the chamber and bellows when a vacuum higher than a normal vacuum is produced in said chamber, a supplemental bellows continuously in communication with said chamber, said main and supplementary bellows having a collapsing movement toward each other, of a plunger mounted for free movement between the movable elements of said bellows whereby a vacuum higher than the normal vacuum tends to further collapse

said supplemental bellows, said main bellows constituting a cushioning device and acting through said plunger tending to ease the collapsing of said supplementary bellows.

2. In a player piano, a unitary structure adapted to be bodily removed from the piano and comprising a wind chest having a vacuum chamber therein, a main bellows fixed to one side thereof and a supplementary bellows fixed to the opposite side thereof, said bellows being open to the vacuum chamber and having a collapsing movement toward each other, a valve for controlling the communication between the chamber and main bellows, a pneumatic operatively connected with said chamber and governing said valve, pedal actuated feeders open to said chamber, a bushing block carried by said wind chest and a plunger slidably mounted in said block and adapted to be engaged by the bellows in their collapsing movement.

3. In a player piano, the combination with a main bellows and a vacuum chamber exhausting therefrom and a pneumatic operatively controlled by the vacuum in said chamber for closing communication between said bellows and chamber, of a supplemental bellows of smaller capacity than said main bellows continuously in communication with said chamber, means for reducing the pressure in said vacuum chamber, and means associated with said bellows for limiting the collapsing movement of the same relative to each other.

4. In a player piano, the combination with a main bellows of relatively large capacity a vacuum chamber exhausting therefrom and means operatively controlled by the vacuum in said chamber for closing communication between said bellows and chamber, of a supplemental bellows of materially smaller capacity than said main bellows in communication with said chamber and pedal controlled means for quickly reducing the pressure in said vacuum chamber and in said supplemental bellows when the main bellows is shut off from said vacuum chamber.

5. In a device of the class described, the combination with a main bellows and a supplemental bellows having a collapsing movement toward each other of means normally open to both of said bellows for reducing air pressure in said bellows, means for closing one of said bellows when under a partial vacuum whereby said closed bellows acts as a cushioning device and a connection positioned between said cushioning device and the other of said bellows for easing the collapsing movement of said other bellows said bellows capable of a movement free of said correction during the initial part of their collapsing movements.

6. In a player piano, the combination of a main and supplemental bellows and a vacuum chamber having relatively large ports communicating directly with both bellows whereby they may be quickly exhausted, one of said bellows constituting a cushioning means for resisting the collapsing movement of the other bellows and means for maintaining said cushioning means in inoperative position until a definite vacuum is present in said vacuum chamber.

7. In a player piano, the combination of a vacuum chamber of relatively small capacity, an equalizing bellows of relatively large capacity and a supplemental bellows of relatively small capacity, both bellows in communicating with the vacuum chamber, exhaust feeders for exhausting said chamber, pedals for actuating said feeders and means controlled by the sudden actuation of said pedals for automatically closing communication between said main bellows and said chamber whereby said feeders will act exclusively upon said chamber and supplementary bellows of small capacity to quickly reduce the pressure therein.

8. In a player piano, a one-piece unit comprising a long wind chest adapted to extend across the piano and having a reservoir vacuum chamber therein of relatively small capacity, a main bellows of relatively great capacity affixed to and co-extensive with said chest on one side thereof, a plurality of exhaust feeders of relatively large capacity affixed to the opposite side of the chest, said bellows and feeders opening directly into the vacuum chamber whereby a change of pressure in the feeder promptly causes a similar change in the wind chest and main bellows and means for cutting off said main bellows from said chest and feeders of large capacity.

9. In a player piano, the combination of a wind chest having a reservoir vacuum chamber therein, a main bellows, an exhaust feeder and a supplemental bellows, all opening directly into said vacuum chamber by means of passageways of the least possible length and without the use of long connecting conduits whereby the reduction of pressure by the sudden actuation of the feeder will promptly cause a corresponding rapid reduction of pressure in the main and supplementary bellows.

10. In a player piano, the combination of a wind chest having a main bellows mounted at one side thereof and a supplementary bellows mounted on the opposite side thereof, ports opening from both of said bellows to said wind chest, an exhaust feeder for reducing pressure in said wind chest, means independent of the movement of said bellows and operatively controlled by the pneumatic tension in said wind chest for closing communication between the main bellows

and said wind chest whereby the full power of said feeder will be used to reduce the pressure in said wind chest and said supplementary bellows during the presence of a definite low pressure in said wind chest.

11. In a player piano, the combination of a supplemental bellows, and a main bellows adapted to be collapsed towards each other, means normally open to both bellows for reducing the pressure therein, thereby to cause the bellows to collapse, the initial collapsing movement of said supplemental bellows being free of any restraining means and automatically actuated means for causing said main bellows to act as a cushioning means for the final collapsing movement of said supplemental bellows.

12. In a player piano, the combination of a wind chest, and an equalizing bellows normally in open communication therewith, a supplemental bellows continuously in open communication with said wind chest, said bellows and wind chest constituting a vacuum reservoir, means for reducing pressure in said wind chest and in said bellows and pneumatically actuated means operatively controlled by the pressure in said wind chest for automatically reducing the volume of said reservoir affected by the pressure reducing means and for maintaining this reduced volume during the time when the pressure in said wind chest is below a definite pressure.

13. In a player piano, the combination of a wind chest, and an equalizing bellows normally in open communication therewith, a supplemental bellows continuously in open communication with said wind chest, said bellows and wind chest constituting a vacuum reservoir, means for reducing pressure in said wind chest and in said bellows and pneumatically actuated means operatively controlled by the pressure in said wind chest for automatically reducing the volume of said reservoir affected by the pressure reducing means and for maintaining this reduced volume during the time when the pressure in said wind chest is below a definite pressure and means for regulating said pneumatically actuated means so that it will become operable at any desired pressure in the wind chest.

14. In a player piano, the combination with a bellows, means normally open to said bellows for reducing pressure therein, a valve for intercepting communication between said bellows and said means and a pneumatic operatively controlled by the pressure in said bellows for moving said valve into closing position.

15. In a player piano, the combination with a bellows, means normally open to said bellows provided with means for restoring the same to its normal position for reducing pressure therein, a valve for intercepting communication between said bellows and said means, a pneumatic operatively controlled by the pressure in said bellows for moving said valve into closing position and means acting on said pneumatic for restoring said valve to its normal position.

16. In a player piano, the combination with a wind chest, a bellows normally open to said wind chest and a valve for controlling communication between said wind chest and said bellows and a pneumatic open directly to said wind chest and operatively connected to said valve to control said communication.

17. In a player piano, the combination with a wind chest springs for maintaining said bellows in normal position, a bellows normally open to said wind chest and a valve for controlling communication between said wind chest and said bellows, a pneumatic open to said wind chest and operatively connected to said valve to control said communication and a spring engaging said pneumatic tending to hold the same in position to be actuated by the change of pressure in said wind chest and means for adjusting the tension of the spring controlling the pneumatic.

18. In a player piano, a vacuum reservoir having a variable volume, a tension feeder for reducing pressure in said reservoir, and means automatically controlled by the sudden reduction of pressure in said reservoir for reducing the volume of the reservoir which might possibly be affected by the action of said tension feeders whereby a sudden actuation of the tension feeder will cause a sudden reduction in pressure in said reservoir of reduced volume.

19. In a player piano, a vacuum reservoir having a variable volume, a tension feeder for reducing pressure in said reservoir, valves automatically controlled by the reduction of pressure in said reservoir for reducing the volume of the reservoir affected by the action of said tension feeders whereby a sudden actuation of the tension feeder will cause a sudden reduction in pressure in said reservoir of reduced volume and means tending to restore said reservoir to its normal enlarged volume when said tension feeder is working normally.

20. In a player piano, the combination of a wind box having a vacuum chamber therein, a main bellows having an opening therein communicating with the vacuum chamber, a valve for closing said bellows whereby the same is caused to constitute a closed pneumatic cushioning means, a supplemental bellows open to said chamber and having a movement toward said cushioning means and a spacing plunger held resiliently by said cushioning means and adapted to ease the movement of said supplemental bellows toward the said cushioning means.

21. In a player piano, an automatically controlled mechanism for actuating the various pneumatic devices of the piano, a manually actuated means for energizing said mechanism, said mechanism including means controlled by an abnormally forceful actuation of said mechanism whereby a crash effect may be produced by the sudden actuation of the pneumatic.

22. In a player piano, the combination of a support, an equalizing chamber having a movable part on one side of said support, and a supplemental bellows having a movable part on the opposite side of said support, a plunger slidably mounted in said support, opposite ends of said plunger adapted to be engaged by said movable parts to limit the movement of the parts toward each other, means acting on one of said parts tending to move the same and means acting on the other part tending to resist this movement.

23. In a player piano, the combination of a wind chest having a vacuum chamber, an equalizing chamber affixed to one side of said chest and having a side movable relative to said chest, a supplemental bellows affixed to the opposite side of said chest, and having a side thereof movable relative to said chest, ports providing communication between said vacuum chamber and said bellows and equalizing chamber, whereby said sides are moved toward the chest by the reduction of pressure in the vacuum chamber, a plunger slidably mounted in said chest with one end thereof positioned in said bellows and the other end positioned in said equalizing chamber, said movable sides adapted to engage opposite ends of said plunger in their movement toward the chest whereby said plunger limits the collapsing movement of the said sides toward each other and means co-acting with said equalizing chamber for restraining the movement of said plunger.

24. In a player piano, the combination of a wind chest having a vacuum chamber of relatively small capacity, a main bellows of relatively large capacity, a supplemental bellows of relatively small capacity, both bellows normally open to said vacuum chamber, a vacuum producing means of relatively large capacity connected to said vacuum chamber, automatic means for cutting off said main bellows of large capacity from communication with the vacuum chamber whereby the vacuum producing means of large capacity are caused to operate solely upon the vacuum chamber and supplementary bellows or combined small capacity thereby to exhaust the same quickly and to a relatively low vacuum.

25. In a player piano, the combination of a wind chest having a vacuum chamber, an equalizing chamber affixed to one side of said chest and having a side movable relative to said chest, a supplemental bellows affixed to the opposite side of said chest, and having a side thereof movable relative to said chest, ports providing communication between said vacuum chamber and said bellows and equalizing chamber, whereby said sides are moved toward the chest by the reduction of pressure in the vacuum chamber, a plunger slidably mounted in said chest with one end thereof positioned in said bellows and the other end positioned in said equalizing chamber, said movable sides adapted to engage opposite ends of said plunger in their movement toward the chest whereby said plunger limits the collapsing movement of the said sides toward each other and a valve for closing communication between said equalizing chamber and said vacuum chamber whereby the movable side of the equalizing chamber is caused to form a cushioning device to restrain the plunger and thus ease the collapsing movement of the supplemental bellows.

26. In a player piano, the combination with a bellows, means normally open to said bellows for reducing pressure therein, a slidably mounted valve for intercepting communication between said bellows and said means, a pneumatic continuously open to said means, said pneumatic including a movable side and a connection between said side and said valve to actuate the same.

27. In a player piano, the combination with a bellows, means normally open to said bellows for reducing pressure therein, a valve mounted for vertical movement and in its lowered position adapted to intercept communication between said bellows and means, a pneumatic open to said means, a spring acting on said pneumatic to distend the same and raise said valve to open communication between said bellows and means, the reduction of pressure in said pneumatic acting against said spring to permit the lowering of said valve.

Signed at Newark, in the county of Essex and State of New Jersey, this twenty-first day of May, A. D. 1914.

FRANK G. LYNDE.

Witnesses:
S. B. CAIRNS,
H. R. BAUER.