R. BUKOWSKY.

MEANS FOR CONTROLLING THE EXPRESSION OF PNEUMATIC MUSIC PLAYERS.

APPLICATION FILED JULY 29, 1911.

**1,047,494.**

Patented Dec. 17, 1912.

5 SHEETS—SHEET 1.

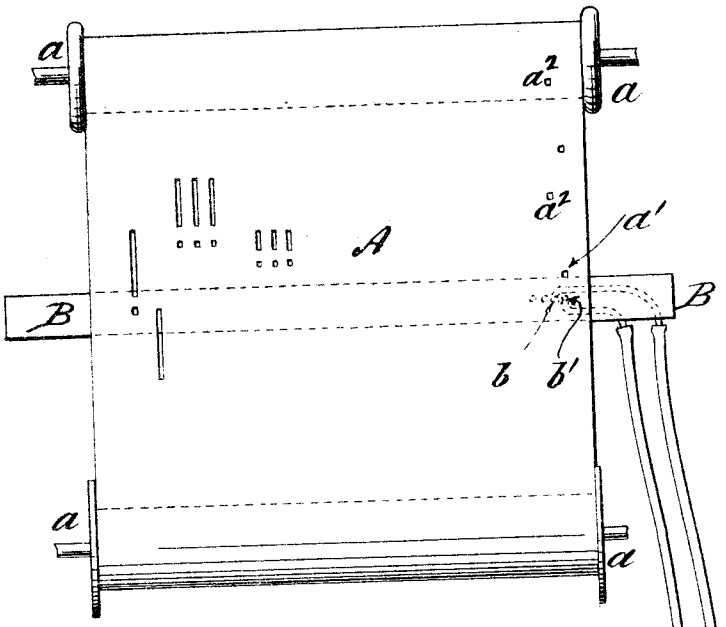
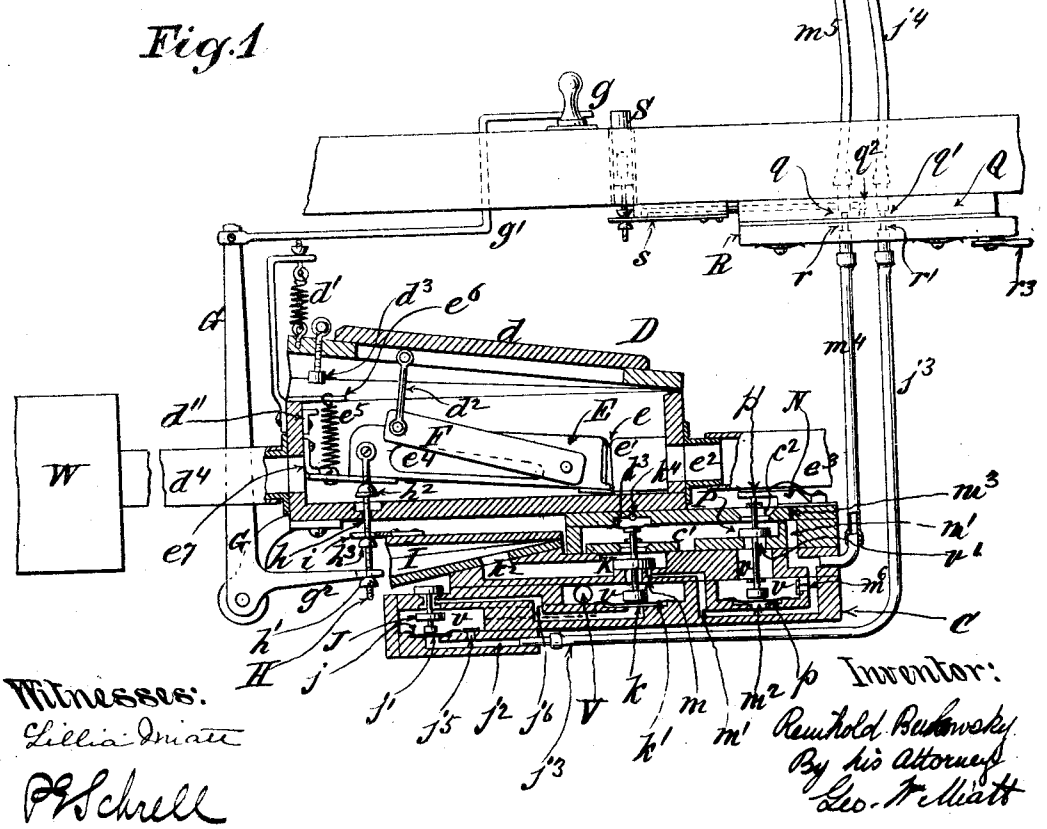



Fig. 1

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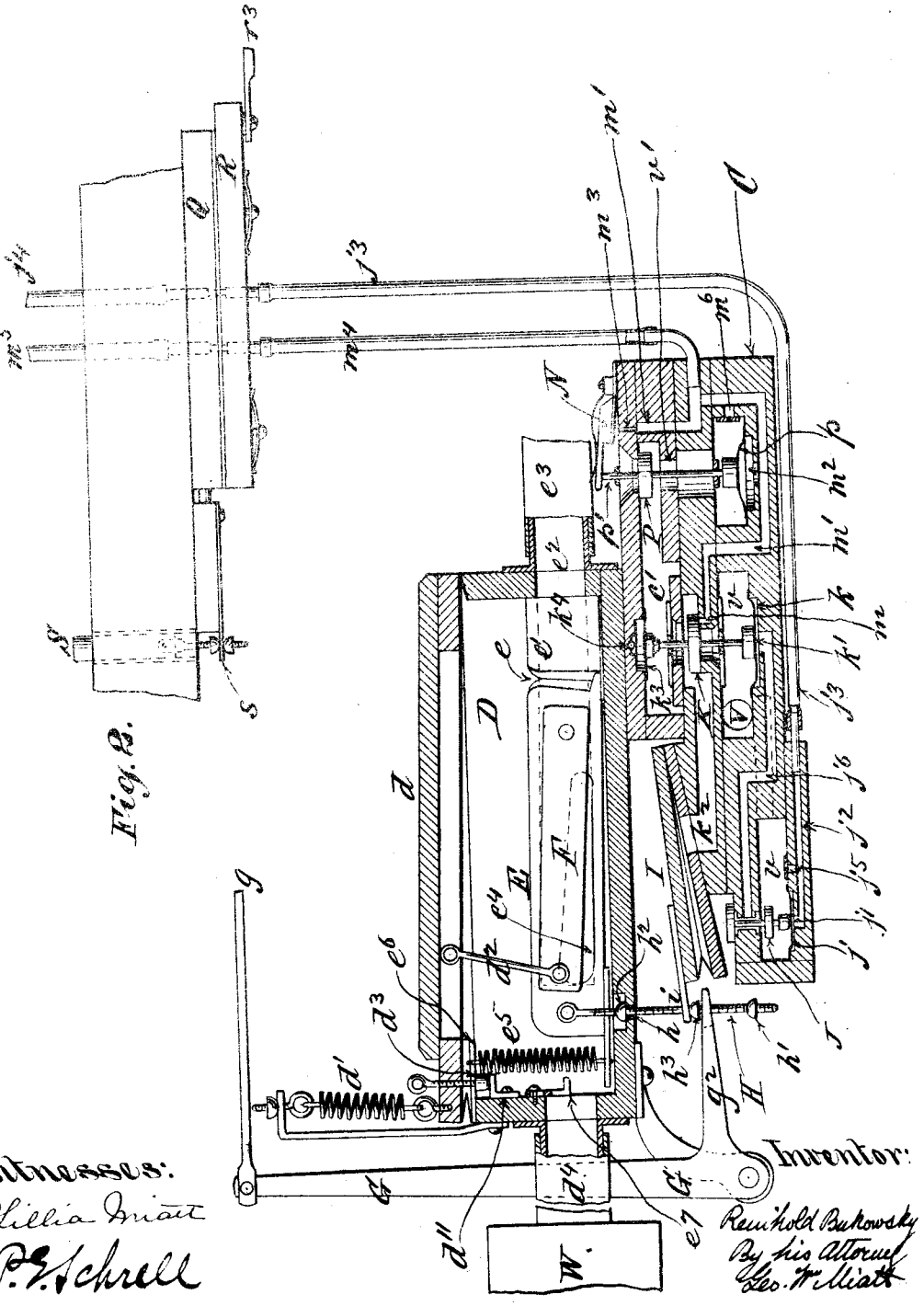

Fig. 2.

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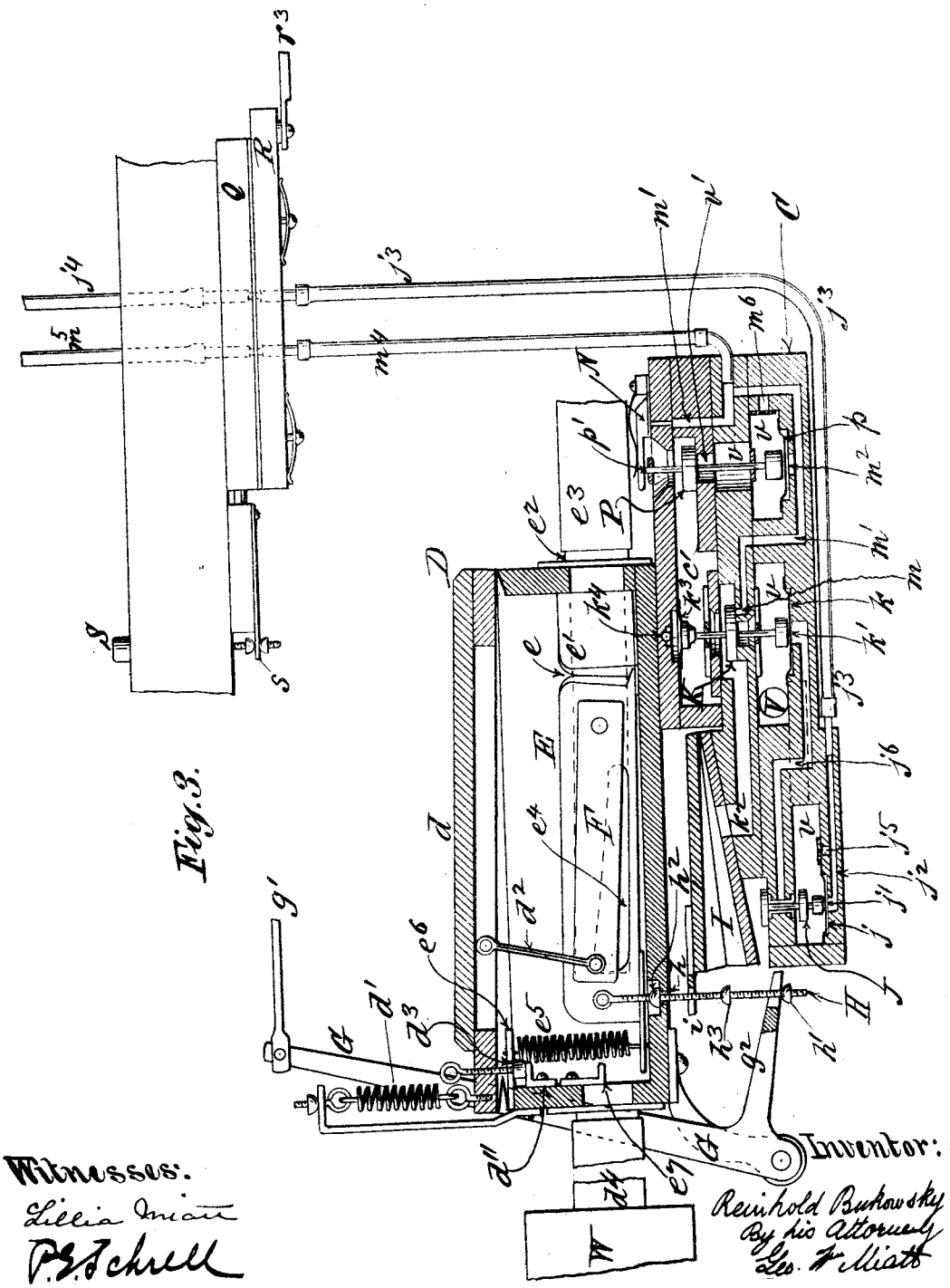

Fig. 3.

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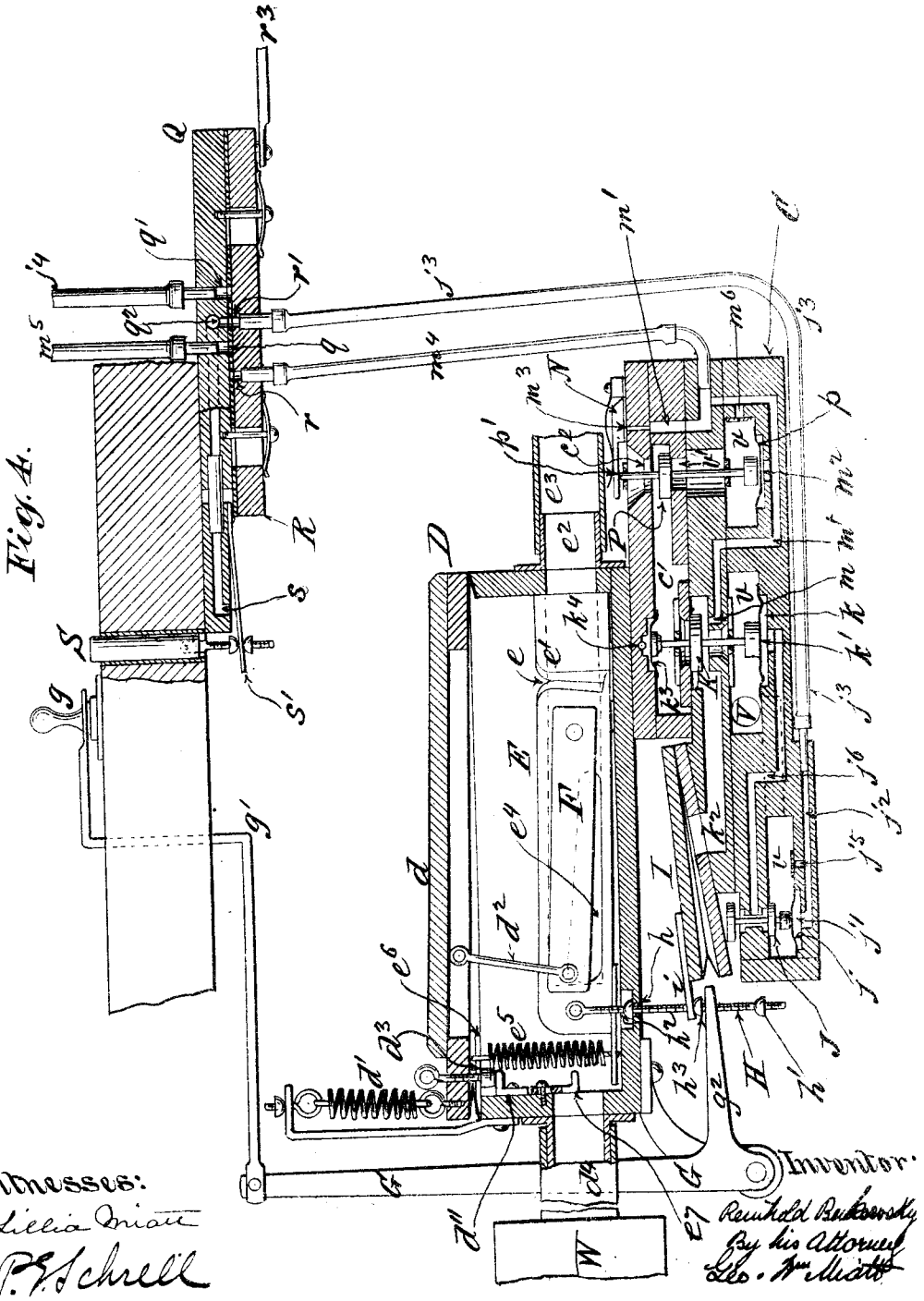
Fig. 4.



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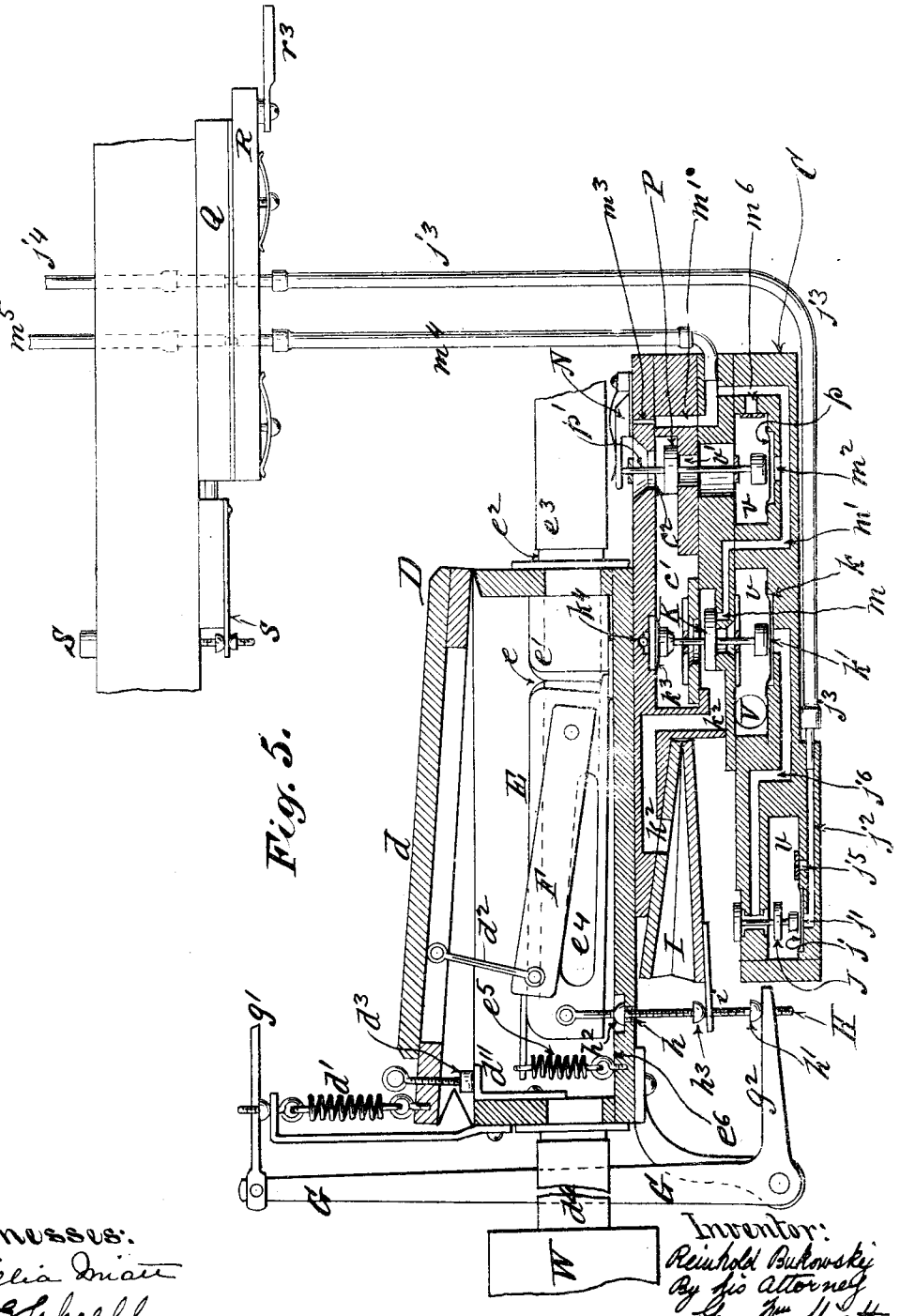

Fig. 5.

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# UNITED STATES PATENT OFFICE.

REINHOLD BUKOWSKY, OF NEW YORK, N. Y.

## MEANS FOR CONTROLLING THE EXPRESSION OF PNEUMATIC MUSIC-PLAYERS.

1,047,494. Specification of Letters Patent. Patented Dec. 17, 1912.

Application filed July 29, 1911. Serial No. 641,276.

*To all whom it may concern:*

Be it known that I, REINHOLD BUKOWSKY, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Means for Controlling the Expression of Pneumatic Music-Players, of which the following is a specification.

My improvements relate to pneumatic apparatus in which a perforated music sheet traveling over a tracker board controls the action of note-pneumatics in the manner well known in the art,—said note-pneumatics being connected individually and collectively with an action tension or work chest, or in series with two or more such action tension work chests, as for instance treble and bass work chests, as may be desired or found most expedient, according to requirements of use and capacity.

My invention relates more particularly to the means provided for effecting and governing the expression or accentuation of the music as rendered by the apparatus, either automatically through the medium of the music sheet, pneumatically through the medium of a push button or equivalent mechanical expedient, or mechanically by means of manually actuated lever mechanism, as hereinafter more fully described and claimed specifically.

In the accompanying drawings, Figure 1, represents a sectional elevation, more or less diagrammatic, of the parts of the apparatus essential to an understanding of the practical embodiment of my improvements in a pneumatic music player of the class designated, the several parts being represented at rest or in their normal positions with relation to each other; Fig. 2, is a similar view upon an enlarged scale, of the accentuating valve chest and tension governor, the parts being shown in the relative positions assumed during long or "continuous" accentuation for the time being,—*i. e.*, while the throttle is governed through the medium of an auxiliary valve controlled by the tracker board and music sheet; Fig. 3, is a similar view showing the parts in the relative positions assumed when the accentuation is effected manually; Fig. 4, is a similar view showing the parts in the relative positions assumed when the accentuation is effected pneumatically by means of a push button. Fig. 5, is a similar view showing a modification in which the action of the movable valve seat pneumatic is reversed to effect a lowering of tension when the governor is used for normally high tension.

In the accompanying drawings A. represents a perforated music sheet supported by and between the usual rollers *a*, *a*, and traveling over a tracker board B, of any known or desired construction, the air ducts in said tracker board communicating as usual with note-pneumatics, except the last two ducts *b*, *b'*, shown in the present case for convenience at the right hand end of the row of said tracker ducts. In this connection attention may be called to the well known fact that the accentuating perforations in the music sheet are customarily arranged at or near the edge thereof beyond the note perforations in a situation where either a long, continuous slot, or a line of closely related successive perforations are both objectionable in that they weaken the edge of the sheet, allowing it to warp or curl, thereby not only impairing the sheet but rendering it ineffective and uncertain in operation in so far as accentuation is concerned at least. Thus, even if the music sheet is not rendered inoperative as a whole by such "accentuation" perforations its life and usefulness are limited and restricted. These objectionable features I overcome by the provision of an auxiliary valve arranged to keep the accentuating pneumatic deflated for a period prescribed by means of a self-sustaining pouch or diaphragm controlled by special ducts in the tracker board as hereinafter described. In order to portray the practical embodiment of this important feature of my invention I have herein indicated essential parts of the apparatus without intending to restrict myself to the identical construction shown, in which C, represents the accentuating valve chest generally, and D, the variable tension governor chamber.

The variable tension chamber D, is formed with a movable member *d*, connected with a spring *d'*, which tends constantly to retract said movable member and maintain the maximum capacity of said tension chamber D, in which is situated the movable valve seat E, communicating by means of a flexible connection *e*, with an exhaust block *e'*,

communicating through suitable conduits $e^2$, $e^3$, with the main bellows or exhaust mechanism of any desired or well known character.

A valve blade F, is pivotally attached near one extremity to the movable valve seat E, to act in conjunction with the exhaust port $e^4$, in said seat,—the other extremity of said valve blade F, being pivotally connected by a pitman $d^2$, with the movable member $d$, of the tension chamber D, so that the tendency of the spring $d'$, acting through said movable member $d$, is to draw and hold the valve blade F, away from the movable valve seat E, and to open the exhaust port $e^4$. This tendency to open the exhaust port $e^4$, is counteracted in part by a spring $e^5$, interposed between the movable valve seat E, and a stationary part $e^6$,—the action of the spring being limited by a stop $e^7$, which is preferably adjustable, and which limits the upward thrust of the said movable valve seat E.

In a similar manner the inward thrust of the movable member $d$, may be limited by an adjustable stop $d^3$, carried by said movable member and arranged to contact with a stationary part (as $d''$,). When this happens, and the movable valve seat is resting against the stop $e^7$, the valve blade F, will very nearly but not quite close the exhaust port $e^4$. Hence it will be seen that the area of the exhaust port $e^4$, may be increased or diminished within certain limits by the movements of either the valve blade F, or the movable valve seat E, (or both) with relation to each other.

The variable tension chamber D, is connected by a suitable conduit $d^4$, with the "action" or work chest W, communicating with the note-pneumatics, which are arranged and operated as heretofore by means well known in the art; and the normal working tension in said action chest W, will be maintained, equalized and compensated for by the movable member $d$, acting as a governor through the medium of the valve blade F, to control the effective area of the exhaust port $e^4$, in accordance with the requirements of the note-pneumatics as actuated by the note-perforations in the music sheet as the latter passes over the tracker board.

The normal tension thus being provided for and maintained automatically, by the movable governor member $d$, and the valve blade F, in conjunction with the valve seat E, in its normal position, I effect accentuation by providing for the movement of the movable valve seat E, with its exhaust port $e^4$, away from said normal position and from the valve blade F, by three different methods, as hereinbefore intimated.

Thus, presuming that the valves &c. are arranged to operate vertically as shown in the drawings, and the parts being in the normal position shown in Fig. 1, the depression of the movable valve seat E, against the resistance of the spring $e^5$, may be effected manually by means of rock lever G, as indicated in Fig. 3, actuated through the medium of a finger lever $g$, and intermediate connecting rod $g'$,—the shorter arm $g^2$, of said rock lever G, being bifurcated and straddling the pendent link H, pivotally attached to the movable valve seat E, and protruding through a packed bearing $h$, in the bottom of the variable tension chamber D. In this case the under side of the short arm $g^2$, of the rock lever G, acts against a contact button $h'$, which is adjustable upon the threaded end of the pendent link H, so that by regulating the position of the contact button $h'$, on said link H, the available thrust of the rock lever G, may be regulated with accuracy. The downward thrust or depression of the movable valve seat E, is regulated however, by an adjustable stop $h^2$, on the pendent link H, which stop $h^2$, contacts with a stationary part (as the floor of the tension chamber D,) when the prescribed degree of motion is attained,—the stop $e^7$, limiting the upward thrust of the movable valve seat E, as before stated.

I thus provide for individual, manual accentuation of the music at the will and inclination of the performer independent of the perforated music roll, accentuating valves &c., by putting him in direct control, mechanically, of the movable valve seat E, by means of which he can instantaneously vary the tension in the work chest W,—the movable valve seat E, being returned automatically to its normal position against the stop $e^7$, as soon as released, by means of the spring $e^5$.

The accentuation may also be effected automatically and pneumatically through the medium of the accentuating valve chest C, by which the action of the movable valve seat pneumatic I, is controlled,—said pneumatic acting on the pendent link H, in a manner similar to the rock lever G, as hereinafter set forth.

All the chambers and passages marked $v$, in the accentuating valve chest C, communicate with the main exhaust mechanism through the port V.

J, is the primary valve operated by the diaphragm $j$, by air admitted through the duct $b$, in the tracker board B,—said duct $b$, communicating with the diaphragm chamber $j'$, on the under side of the diaphragm through the conduits $j^2$, $j^3$, $j^4$.

$j^5$, is a bleed for the passage $j^2$. The primary valve J, controls the conduit $j^3$, communicating with the diaphragm chamber $k$, on the under side of the diaphragm $k'$, by which the secondary valve K, is actuated, said secondary valve K, controlling the passage $k^2$, to the movable valve seat pneu-

matic I. When in said normal position the secondary valve K, covers the duct $m$, communicating with the conduit $m'$, which extends under the diaphragm chamber $m^2$, (which opens into it) and thence upward to the duct $m^3$, closed normally by the clack valve N. The conduit $m'$, communicates through the tubes $m^4$, $m^5$, with the auxiliary duct $b'$, in the tracker board B. A bleed $m^6$, also communicates with said conduit $m'$. The auxiliary or continuous accentuation valve P, is actuated by what may be designated as the "self-holding pouch" or diaphragm $p$, situated in the diaphragm chamber $m^2$. In its normal position the auxiliary valve P, closes the port $v'$, communicating with the tension spaces $v$, of the accentuation valve chest C. When raised it opens said port $v'$, to the passage $c'$, and closes the air port $c^2$, at the same time raising the clack valve N, and thereby opening the duct $m^3$. Under these conditions, the rise of the auxiliary valve P, having shut off communication with the atmosphere through the port $c^2$, there will be a balance tension on either side of the secondary valve K, which balance is overcome by the upper diaphragm $k^3$, communicating with the atmosphere through the duct $k^4$, thereby seating the said secondary valve K, in its lowest position covering the duct $m$.

The conduits $m^5$, and $j^4$, are connected respectively with ports $q$, $q'$, in a stationary port plate Q, to which is fitted a slidable port plate R, containing the ports $r$, $r'$, with which the tubes $m^4$, and $j^3$, communicate respectively. The stationary port plate Q, is also formed with a third port $q^2$, communicating with the port $s$, which is closed normally by a spring valve $s'$, which may be depressed by means of a push button S, (see Fig. 4.)

When the slidable port plate R, is in the position shown in Figs. 1 2 and 3, the ports $r$, $r'$, are in coincidence with the ports $q$, $q'$, and the accentuation valve chest C, is in communication with the tracker board B. When the slidable port plate R, is moved into the position shown in Fig. 4, by means of a hand lever $r^2$, or equivalent mechanical expedient, the port $r$, is cut out, and the port $r'$, brought into coincidence with the intermediate port $q^2$, thereby establishing communication between the press button port $s$, and the diaphragm chamber $j'$, of the primary valve J. Under these last named conditions, the depression of the push button S, admitting air through the port $s$, and connections, causes the diaphragm $j$, to raise the primary valve J, thereby cutting off the conduit $j^6$, from the tension space $v$, and admitting air to said conduit $j^6$, to raise the diaphragm $k'$, under the secondary valve K. As a result the secondary valve K, cuts off communication between the passages $c'$, and $k^2$, and puts the latter in communication with the tension space $v$, thereby deflating the movable valve seat pneumatic I. The collapse of the valve seat pneumatic I, causes its bifurcated arm $i$, to act against the contact button $k^3$, on the pendent link H, and thereby depress the movable valve seat E, against the resistance of the spring $e^5$. This action, by increasing the available area of the exhaust port as related to the blade valve F, immediately creates a relatively high degree of tension in the variable tension chamber D, and the work chest W, and this is maintained until the push button S, is released, when the bleed $j^5$, releases the primary valve J, and the parts named in the operation just described return to their normal positions, with the movable valve seat E, again contacting with the stop $e^7$.

The stop $d^3$, on the movable governor member $d$, of the variable tension chamber D, is so adjusted that when it contacts with the stationary part $d''$, the valve blade F, will very nearly but not quite close the exhaust port $e^4$, when the valve seat is resting against the stationary stop $e^7$, as illustrated in Fig. 1, and from these relative positions the opening of the area of the exhaust port $e^4$, will vary according to the requirements of the work chest W.

Supposing the slidable port plate R, to be returned to its normal position as in Figs. 1, 2, and 3, and the accentuation to be provided for by perforations formed in the usual way heretofore in vogue in music sheets,—*i. e.*, by perforations $a$, in line with the duct $b$, in the tracker board B, air admitted through said duct $b$, will pass through the tube $j^4$, ports $q'$, and $r'$, tube $j^3$, and conduit $j^2$, to the under side of the diaphragm $j$, raising the primary valve J, thereby admitting air to the conduit $j^6$, to raise the secondary valve K, closing the passage $k^2$, to atmospheric pressure and opening it to tension $v$, thus deflating the movable valve seat pneumatic I, pulling down the movable valve seat E, and creating high tension as hereinbefore set forth,—the recovering of the duct $b$, in the tracker board B, by the music sheet allowing the bleed $j^5$, to return the parts to their normal positions.

Hence my apparatus is adapted to effect accentuation by means of the ordinary music roll heretofore known and used without alteration or special adjustment of parts. But in order to effect prolonged accentuation without weakening the edge of the music sheet with a long slot or series of successive close perforations I provide the accentuation valve chest C, with the auxiliary valve P, and the tracker board with the auxiliary duct $b'$, for actuating said valve P,—the music sheet being formed with one or more

supplemental perforations $a'$ (as required by the music) in line with said auxiliary duct $b'$, said supplemental perforations $a'$, being preferably slightly elongated and beginning slightly in advance of the note or notes to be first accentuated, so as to prepare, slightly in advance, the auxiliary valve P, for such long accentuation or solo effect.

Air pressure admitted through the duct $b'$, passes through the tube $m^5$, ports $q$, and $r$, and tube $m^4$, to the conduit $m'$, in the accentuating valve chest C, from which it enters the diaphragm chamber $m^2$, causing the diaphragm $p$, to raise the auxiliary or continuous-accentuation valve P, thereby closing the air pressure port $c^6$, and opening the tension port $v'$. The secondary valve K, being closed, covering the duct $m$, and held so by atmospheric pressure acting on the diaphragm $k^4$, the tension $v$, acting through the port $v'$, and passages $c'$, and $k^2$, deflates the movable valve seat pneumatic I, thereby depressing the movable valve seat E, and creating high tension in the variable tension chamber and action work chest W, as before set forth. When the auxiliary valve P, is raised by the diaphragm $p$, the valve stem $p'$, lifts the clack valve N, admitting atmospheric pressure through the duct $m^3$ in sufficient quantity to maintain the diaphragm $p$, and auxiliary valve P, in their raised positions, and hence continuing the accentuation after the perforation $a'$, in the music sheet has passed beyond the auxiliary duct $b'$, in the tracker board, and until the auxiliary valve P, and clack valve N, are released as hereinafter set forth.

It being understood that the supplemental perforation $a'$, in the music roll, and the auxiliary duct $b'$, in the tracker board B, are provided solely for the purpose of setting the auxiliary accentuation valve P, and clack valve N, for continuous accentuation,—the duct $m^3$, acting in lieu of a continuous perforation, or a line of perforations in the music sheet,—I provide for the release of the parts to normal conditions after a prescribed period, by a perforation $a$, in the music sheet in line with the duct $b$, in the tracker board B,—the space between the supplementary accentuation perforation $a'$, and the releasing perforation $a$, being continuous and unbroken.

The effect of admitting air pressure through the release perforation $a$, and duct $b$, is to raise the primary valve J, as hereinbefore described; thereby admitting atmospheric pressure to the conduit $j^6$, to raise the secondary valve K, through the medium of the diaphragm $k'$, which is of larger superficial area than the diaphragm $k^3$, and therefore predominates. Under these conditions the main result of raising the secondary valve K, is to uncover the duct $m$, (which is of greater area than the air duct $m^3$,) to tension $v$, which, acting through the conduit $m'$, and diaphragm chamber $m^2$, releases the auxiliary valve P, and hence the clack valve N, also. The passage of the perforation $a$, in the music sheet beyond the duct $b$, in the tracker board having released the primary valve J, the conduit $j^6$, is again put in communication with tension $v$, allowing the secondary valve K, to descend and open the passage $k^2$, to atmospheric pressure through the passage $c'$, thereby inflating the pneumatic I, and releasing the movable valve seat E.

This feature of maintaining accentuation continuously for a prescribed period and length of music roll by a setting and a releasing perforation therein without an intervening opening of any kind in so far as they are concerned, is an important practical advantage in that the strength and integrity of the music sheet are insured and maintained where most needed, near the edge of the roll. Furthermore, the continuous accentuation is rendered more positive and effective because maintained independently as long as the music sheet covers and seals the releasing duct $b$, in the tracker board B, a function it is well adapted to perform owing to its smoothness and continuity of surface between the auxiliary or "setting" perforation $a'$, and the said "releasing" perforation $a$.

It will be seen that by my combination and arrangement of parts I adapt the apparatus to all possible requirements of use in so far as accentuation is concerned. That is to say the performer can, by mechanical means, as in Fig. 3, manually and instantaneously change from low to high tension; or, by the slidable port block R, being suitably adjusted, as in Fig. 4, the same result may be attained pneumatically by means of a push button or equivalent, thus in either case adapting the apparatus to individual requirements or fancy in musical expression. On the other hand, prescribed accentuation may be effected automatically by the music sheet, either as prepared heretofore, or as specially prepared as herein set forth to operate and control the auxiliary continuous accentuating valves P, and N,—the presence of the two latter not interfering with the accentuation through a single duct $b$, in the tracker board B, by succeeding perforations $a$, in alinement with each other as heretofore.

In any case a quick response and change from low to high tension, or vice versa, may be attained by reason of the use of the movable valve seat E, in conjunction with the governor member $d$, of the variable tension chamber D, and the pivotally mounted and connected valve blade F.

In this connection it may be noted that the secondary valve in the present case per-

forms a three fold function. In the first place it performs its ordinary function when the accentuation is effected as heretofore by means of a single line of perforations in the music sheet, acting through a single duct in the tracker board; in the second place, in its lowest or normal position it renders the passages $c'$, $k^2$, continuous for the purpose of deflating the movable valve seat pneumatic L through the port $v'$, when the auxiliary accentuating valve P, is raised; and thirdly, it releases said auxiliary accentuating valve P, and thereby closes the clack valve N, when air is admitted through the duct $b$, in the tracker board B, to actuate the primary and secondary valves in the usual way, by uncovering the duct $m$, and creating tension under the diaphragm $p$, the bleed $m^6$, acting to neutralize the pressure on both sides of said diaphragm $p$,—it being understood that the relatively large area of the duct $m$, as compared with that of the air duct $m^3$, is sufficient to overcome the latter and insure the collapse of the diaphragm $p$.

My variable tension chamber accentuation valve chest and connections may be readily applied, assembled, to or embodied in, automatic players as generally constructed.

The auxiliary valve P, may be designated as a "prolonged-accentuation" valve; and obviously any form of air valve controlled thereby may be substituted for the clack valve shown, with like result.

The first four figures of the accompanying drawings show my invention as applied to what is known as a normally low tension governor, the accentuation or variation of expression in playing being effected by a temporary or prolonged increase of tension in the governor D, and work chest C, as may be desired, and as hereinbefore set forth. In Fig. 5, I show the invention as adapted to a normally high tension governor and work chest, the only change being that the movable valve seat pneumatic I, is reversed in position and action so as to push the movable valve seat E, up toward the blade valve F,—the movable member $d$, being held down normally by the exhaust as shown in said Fig. 5, with the stop $d^3$, resting against a stationary part $d''$, thereby insuring an open port $e$, for high tension, and the raising of the movable valve seat E, lowering the tension by contracting the area of the port $e^4$. In this arrangement the contact shoulders $h'$, $h^3$, on the pendent link H, are reversed as related to the bearing arms $i$, and $g^2$, so that the latter push upward in action, instead of pulling down. Likewise the spring $e^5$, is arranged so as to tend constantly to depress the movable valve seat E, with the stop $h^2$ resting against a stationary part as shown in said Fig. 5. Otherwise than in this reversal of action of the movable port block E, the various operations are the same as hereinbefore described in connection with the first four figures of the drawings.

What I claim and desire to secure by Letters Patent, is—

1. In automatic apparatus of the character designated, the combination of a pneumatic adapted to actuate an operative part, a valve chest communicating with said pneumatic, a primary and a secondary valve therein arranged to control said pneumatic, an auxiliary valve in said valve chest arranged to prolong the deflation of said pneumatic, a diaphragm arranged to actuate said auxiliary valve, a clack valve actuated by said auxiliary valve to inflate said diaphragm, a valve arranged to deflate said diaphragm, and means for controlling said valve pneumatically, for the purpose set forth.

2. In automatic apparatus of the character designated, the combination of a pneumatic adapted to actuate an operative part, a valve chest communicating with said pneumatic, a primary and a secondary valve therein arranged to control said pneumatic, an auxiliary valve in said valve chest arranged to prolong the deflation of said pneumatic, a diaphragm arranged to actuate said auxiliary valve, a clack valve actuated by said auxiliary valve to inflate said diaphragm, a valve arranged to deflate said diaphragm, and a tracker board, ducts and connections for controlling said valve by means of a perforated music sheet, for the purpose described.

3. Pneumatic musical apparatus of the character designated, comprising an action chest, a variable tension chamber interposed between said action chest and the exhaust mechanism, a movable valve seat in said variable tension chamber communicating with the exhaust mechanism, a movable governor member forming part of said variable tension chamber, resilient means tending to hold said governor member in its normal position, a valve blade pivotally connected with said governor member and with relation to the exhaust port in said movable valve seat, resilient means tending to hold said movable valve seat in its normal position, a pendent link connected with said movable valve seat and projecting from the variable tension chamber, a contact shoulder on the outer portion of said pendent link, a pneumatic for operating the movable valve seat formed with a bearing for engagement with said contact shoulder on the pendent link, an accentuation valve chest communicating with said pneumatic, an accentuating valve in said valve chest controlling the inflation and deflation of said pneumatic, a diaphragm arranged to actuate said accentuating valve, a valve controlled by said accentuating valve and arranged to admit at-

mospheric pressure to said diaphragm when the accentuating valve is raised, a valve arranged to deflate said diaphragm, and a tracker board, ducts and connections for controlling said valves by means of a perforated music sheet, for the purpose described.

4. In pneumatic musical apparatus of the character designated, the combination of an action chest, a variable tension chamber interposed between said action chest and the exhaust mechanism, a movable valve seat in said variable tension chamber communicating with the exhaust mechanism, a movable governor member forming part of said variable tension chamber, resilient means tending to hold said governor member in its normal position, a valve blade pivotally connected with said governor member and with relation to the exhaust port in said movable valve seat, resilient means tending to hold said movable valve seat in its normal position, a pendent link connected with said movable valve seat and projecting from the variable tension chamber, a contact shoulder on the outer portion of said pendent link, a pneumatic for operating said movable valve seat formed with a bearing for engaging with said contact shoulder on the pendent link, an accentuating valve chest communicating with said pneumatic, primary and secondary valves therein controlled by the tracker board and connections, an auxiliary accentuation valve in said valve chest also controlled by the tracker board and connections and controlling the inflation and deflation of said pneumatic, a diaphragm arranged to actuate said accentuating valve and a valve controlled by said accentuating valve and arranged to admit atmospheric pressure to said diaphragm when the accentuating valve is raised, as and for the purpose set forth.

5. In pneumatic musical apparatus of the character designated, the combination of an action chest, a variable tension chamber interposed between said action chest and the exhaust mechanism, a movable valve seat in said variable tension chamber communicating with the exhaust mechanism, a movable governor member forming part of said variable tension chamber, resilient means tending to hold said governor member in its normal position, a valve blade pivotally connected with said governor member and with relation to the exhaust port in said movable valve seat, resilient means tending to hold said movable valve seat in its normal position, a pendent link connected with said movable valve seat and projecting from the variable tension chamber, a contact shoulder on the outer portion of said pendent link, a pneumatic for operating said movable valve seat formed with a bearing for engaging with said contact shoulder on the pendent link, an accentuating valve chest communicating with said pneumatic, primary and secondary valves therein controlled by the tracker board and connections, an auxiliary accentuating valve and diaphragm in said valve chest also controlled by the tracker board and connections, a valve actuated by said auxiliary accentuating valve to inflate its diaphragm, and a duct controlled by the secondary valve and arranged to deflate the said diaphragm of the auxiliary accentuating valve, substantially in the manner and for the purpose described.

6. In pneumatic musical apparatus of the character designated, the combination of an action chest, a variable tension chamber interposed between said action chest and the exhaust mechanism, a movable valve seat in said variable tension chamber communicating with the exhaust mechanism, a movable governor member forming part of said variable tension chamber, resilient means tending to hold said governor member in its normal position, a valve blade pivotally connected with said governor member and with relation to the exhaust port in said movable valve seat, resilient means tending to hold said movable valve seat in its normal position, a pendent link connected with said movable valve seat and projecting from the variable tension chamber, a contact shoulder on the outer portion of said pendent link, a pneumatic for operating said movable valve seat formed with a bearing for engaging with said contact shoulder on the pendent link, an accentuating valve chest communicating with said pneumatic, primary and secondary valves therein controlled by the tracker board and connections, an auxiliary accentuating valve and diaphragm in said valve chest controlled by the tracker board and connections, a valve actuated by said auxiliary accentuating valve to inflate its diaphragm, a duct controlled by the secondary valve and arranged to deflate the said diaphragm of the auxiliary accentuating valve, and an auxiliary diaphragm communicating with the atmosphere and bearing upon the secondary valve, for the purpose set forth.

7. In pneumatic musical apparatus of the character designated, a governor comprising a variable tension chamber connected with a chamber from which air is to be withdrawn, a movable valve seat in said variable tension chamber connected with exhaust mechanism, a retractile spring connected directly with said movable valve seat and with a stationary part of the said variable tension chamber and tending to hold said movable valve seat in contact with a stop prescribing the normal position of said movable valve seat, said stop, a movable member forming part of said variable tension chamber, an external retractile spring connected with said movable member and with a stationary part and tending constantly to hold said movable

member in its normal position, a valve blade pivotally connected with said movable member and with relation to the exhaust port in said movable valve seat, a pendent link connected with said movable valve seat and projecting from the variable tension chamber, a contact shoulder on the outer portion of said pendent link, a pneumatic for operating said movable valve seat formed with a bearing for engaging with said contact shoulder on the pendent link, an actuating valve chest communicating with said pneumatic, primary and secondary valves therein controlled by a manually operated air inlet valve through the medium of an air duct communicating with the primary valve and said air duct and manually operated air inlet valve, arranged and operating as and for the purpose set forth.

8. In pneumatic musical apparatus of the character designated, a governor comprising a variable tension chamber connected with a chamber from which air is to be withdrawn, a movable valve seat in said variable tension chamber connected with exhaust mechanism, a retractile spring connected directly with said movable valve seat and with a stationary part of the said variable tension chamber and tending to hold said movable valve seat in contact with a stop prescribing the normal position of said movable valve seat, said stop, a movable member forming part of said variable tension chamber, an external retractile spring connected with said movable member and with a stationary part and tending constantly to hold said movable member in its normal position, a valve blade pivotally connected with said movable member and with relation to the exhaust port in said movable valve seat, a pendent link connected with said movable valve seat and projecting from the variable tension chamber, a contact shoulder on the outer portion of said pendent link, a pneumatic for operating said movable valve seat formed with a bearing for engaging with said contact shoulder on the pendent link, an accentuating valve chest communicating with said pneumatic, primary and secondary valves in said valve chest controlled by a manually operated air inlet valve through the medium of an air duct communicating with the primary valve, and also controlled by the tracker board and connections, an auxiliary accentuating valve and diaphragm in said chest also controlled by the tracker board and connections, an air inlet valve actuated by said auxiliary accentuating valve, and a slidable port plate for varying connections between the conduits to the said valve chest, the tracker board and the manually operated inlet valve, as and for the purpose set forth.

9. In pneumatic musical apparatus of the character designated, the combination of an action chest, a variable tension chamber interposed between said action chest and the exhaust mechanism, a movable valve seat in said variable tension chamber communicating with the exhaust mechanism, a movable governor member forming part of said variable tension chamber, resilient means tending to hold said governor member in its normal position, a valve blade pivotally connected with said governor member and with relation to the exhaust port in said movable valve seat, resilient means tending to hold said movable valve seat in its normal position, a pendent link connected with said movable valve seat and projecting from the variable tension chamber, a contact shoulder on the outer portion of said pendent link, a pneumatic for operating said movable valve seat formed with a bearing for engaging with said contact shoulder on the pendent link, an accentuating valve chest communicating with said pneumatic, primary and secondary valves therein controlled by the tracker board and connections, an auxiliary accentuating valve and diaphragm in said valve chest also controlled by the tracker board and connections, and a manually operated air inlet valve and connections and controlling the inflation and deflation of said pneumatic communicating with said primary valve, for the purpose described.

10. In pneumatic musical apparatus of the character designated, the combination of an action chest, a variable tension chamber interposed between said action chest and the exhaust mechanism, a movable valve seat in said variable tension chamber communicating with the exhaust mechanism, a movable governor member forming part of said variable tension chamber, resilient means tending to hold said governor member in its normal position, a valve blade pivotally connected with said governor member and with relation to the exhaust port in said movable valve seat, resilient means tending to hold said movable valve seat in its normal position, a pendent link connected with said movable valve seat and projecting from the variable tension chamber, a contact shoulder on the outer portion of said pendent link, a pneumatic for operating said movable valve seat formed with a bearing for engaging with said contact shoulder on the pendent link, an accentuating valve chest communicating with said pneumatic, primary and secondary valves therein controlled by the tracker board and connections, an auxiliary accentuating valve and diaphragm in said valve chest also controlled by the tracker board and connections and controlling the inflation and deflation of said pneumatic, and a slidable port plate for varying the connection between the primary valve conduit, the manually operated air valve conduit, and the tracker board conduits, for the purpose set forth.

11. In pneumatic musical apparatus of the character designated, the combination of an action chest, a variable tension chamber interposed between said action chest and the exhaust mechanism, a movable valve seat in said variable tension chamber communicating with the exhaust mechanism, a movable governor member forming part of said variable tension chamber, resilient means tending to hold said governor member in its normal position, a valve blade pivotally connected with said governor member and with relation to the exhaust port in said movable valve seat, resilient means tending to hold said movable valve seat in its normal position, a pendent link connected with the movable valve seat and projecting from the variable tension chamber, a contact shoulder on the outer portion of said pendent link, a rock lever arranged to engage with the contact shoulder on said pendent link, means for actuating said lever manually, a second contact shoulder on the outer portion of said pendent link, a pneumatic formed with a bearing for engaging with said second shoulder on the pendent link, an accentuating valve chest communicating with said pneumatic, a primary and a secondary valve in said chest actuated by the tracker board and connections and controlling said pneumatic, for the purpose described.

12. In pneumatic musical apparatus of the character designated, the combination of an action chest, a variable tension chamber interposed between said action chest and the exhaust mechanism, a movable valve seat in said variable tension chamber communicating with the exhaust mechanism, a movable governor member forming part of said variable tension chamber, resilient means tending to hold said governor member in its normal position, a valve blade pivotally connected with said governor member and with relation to the exhaust port in said movable valve seat, resilient means tending to hold said movable valve seat in its normal position, a pendent link connected with the movable valve seat and projecting from the variable tension chamber, a contact shoulder on the outer portion of said pendent link, a rock lever arranged to engage with the contact shoulder on said pendent link, means for actuating said lever manually, a second contact shoulder on the outer portion of said pendent link, a pneumatic formed with a bearing for engaging with said second shoulder on the pendent link, an accentuating valve chest communicating with said pneumatic, a primary and a secondary valve in said chest actuated by the tracker board and connections and controlling said pneumatic, and an auxiliary prolonged-accentuation valve in said valve chest also actuated by the tracker board and connections, for the purpose described.

13. In pneumatic musical apparatus of the character designated, the combination of an action chest, a variable tension chamber interposed between said action chest and the exhaust mechanism, a movable valve seat in said variable tension chamber communicating with the exhaust mechanism, a movable governor member forming part of said variable tension chamber, resilient means tending to hold said governor member in its normal position, a valve blade pivotally connected with said governor member and with relation to the exhaust port in said movable valve seat, resilient means tending to hold said movable valve seat in its normal position, a pendent link connected with the movable valve seat and projecting from the variable tension chamber, a contact shoulder on the outer portion of said pendent link, a rock lever arranged to engage with the contact shoulder on said pendent link, means for actuating said lever manually, a second contact shoulder on the outer portion of said pendent link, a pneumatic formed with a bearing for engaging with said second shoulder on the pendent link, an accentuating valve chest communicating with said pneumatic, a primary and a secondary valve in said chest actuated by the tracker board and connections and controlling said pneumatic, an auxiliary prolonged-accentuation valve in said valve chest also actuated by the tracker board and connections, and a manually-actuated air valve and connections communicating with the primary valve, for the purpose described.

14. In pneumatic musical apparatus of the character designated, the combination of an action chest, a variable tension chamber interposed between said action chest and the exhaust mechanism, a movable valve seat in said variable tension chamber communicating with the exhaust mechanism, a movable governor member forming part of said variable tension chamber, resilient means tending to hold said governor member in its normal position, a valve blade pivotally connected with said governor member and with relation to the exhaust port in said movable valve seat, resilient means tending to hold said movable valve seat in its normal position, a pendent link connected with the movable valve seat and projecting from the variable tension chamber, a contact shoulder on the outer portion of said pendent link, a rock lever arranged to engage with the contact shoulder on said pendent link, means for actuating said lever manually, a second contact shoulder on the outer portion of said pendent link, a pneumatic formed with a bearing for engaging with said second shoulder on the pendent link, an accentuating valve chest communicating with said pneumatic, a primary and a secondary valve in said chest actuated by the

tracker board and connections and controlling said pneumatic, an auxiliary prolonged-accentuation valve in said valve chest also actuated by the tracker board and connections, a manually actuated air valve and connections communicating with the primary valve, and a slidable port plate for varying the connections between the primary valve conduit, the manually actuated air valve conduit, and the tracker board conduits, for the purpose set forth.

15. In pneumatic musical apparatus of the character designated, the combination of an action chest, a variable tension chamber interposed between said action chest and the exhaust mechanism, a throttle device in said variable tension chamber, a pendent link connecting with said throttle device and protruding from the variable tension chamber, a pneumatic engaging with said pendent link, an accentuating valve chest communicating with said pneumatic, primary and secondary valves in said valve chest operated through the medium of the tracker board and connections and controlling the inflating and deflating of said pneumatic, and an auxiliary prolonged-accentuation valve in said valve chest also actuated through the medium of the tracker board and connections, for the purpose set forth.

16. In pneumatic musical apparatus of the character designated, the combination of an action chest, a variable tension chamber interposed between said action chest and the exhaust mechanism, a throttle device in said variable tension chamber, a pendent link connecting with said throttle device and protruding from the variable tension chamber, a pneumatic engaging with said pendent link, an accentuating valve chest communicating with said pneumatic, primary and secondary valves in said valve chest operated through the medium of the tracker board and connections and controlling the inflating and deflating of said pneumatic, an auxiliary prolonged-accentuation valve and its actuating diaphragm in said valve chest also operated through the tracker board and connections, and an air inlet valve actuated by the said auxiliary accentuating valve to inflate its diaphragm, for the purpose described.

17. In pneumatic musical apparatus of the character designated, the combination of an action chest, a variable tension chamber interposed between said action chest and the exhaust mechanism, a throttle device in said variable tension chamber, a pendent link connecting with said throttle device and protruding from the variable tension chamber, a pneumatic engaging with said pendent link, an accentuating valve chest communicating with said pneumatic, primary and secondary valves in said valve chest operated through the medium of the tracker board and connections and controlling the inflating and deflating of said pneumatic, an auxiliary prolonged-accentuation valve and its actuating diaphragm in said valve chest also operated through the tracker board and connections, an air inlet valve actuated by the said auxiliary accentuating valve to inflate its diaphragm, and a tension duct in said valve chest controlled by the secondary valve and arranged to deflate the diaphragm of said auxiliary accentuating valve, for the purpose described.

REINHOLD BUKOWSKY.

Witnesses:
M. B. MENDELL,
LILLIA MIATT.

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