

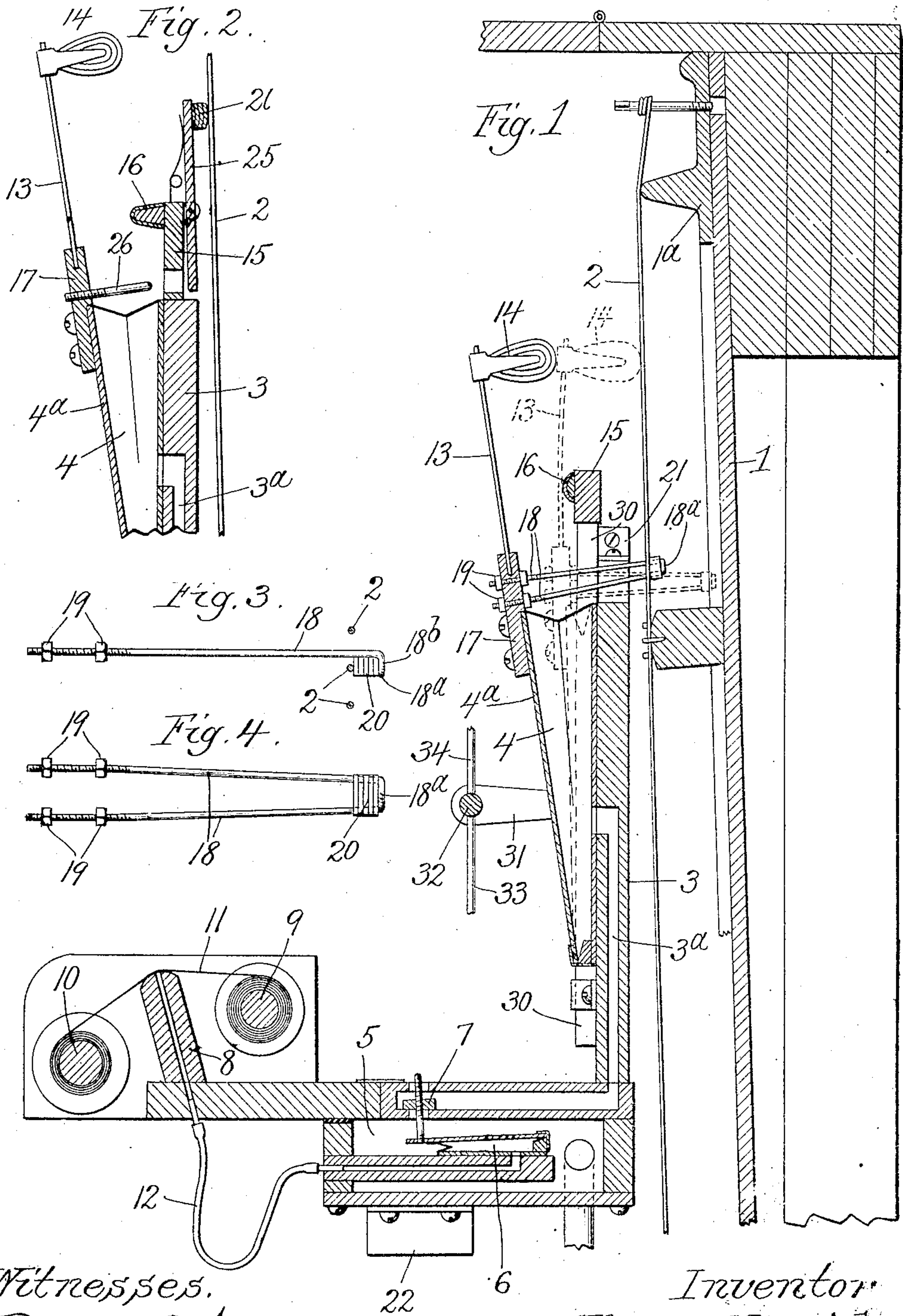
No. 865,524.

PATENTED SEPT. 10, 1907.

T. M. PLETCHER.
AUTOMATIC PIANO.

APPLIOATION FILED OCT.4, 1906.

2 SHEETS—SHEET 1.



Witnesses.
Edward T. Wray.
M. Gertrude Ady

Inventor
Thomas M. Pletcher
by Clinton D. Dunton
his Attys.

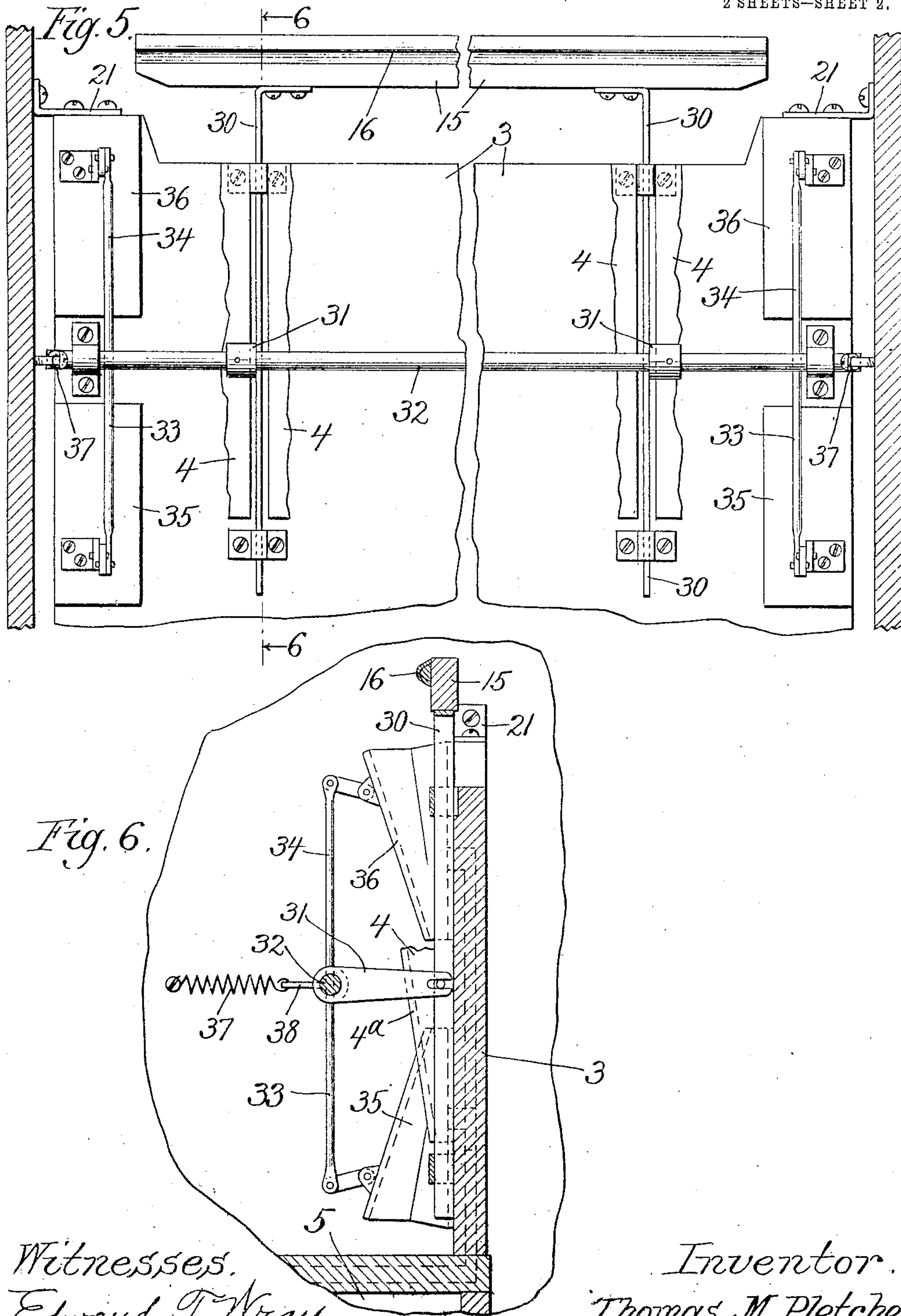
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Thomas M. Pletcher.
by *Denton Durbin*
his Attys.

UNITED STATES PATENT OFFICE.

THOMAS M. PLETCHER, OF CHICAGO, ILLINOIS.

AUTOMATIC PIANO.

No. 865,524.

Specification of Letters Patent.

Patented Sept. 10, 1907.

Application filed October 4, 1906. Serial No. 337,382.

To all whom it may concern:

Be it known that I, THOMAS M. PLETCHER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and
5 useful Improvements in Automatic Pianos, of which the following is a specification; reference being had to the accompanying drawings, forming a part thereof.

This invention relates to automatic playing devices for and embodied in and constituting a part of a musical
10 instrument which is played by them, and it is particularly designed to afford automatic devices for playing a stringed instrument, as a piano.

It consists, in general, in the automatically controlled striking devices substituted for the ordinary
15 action of a piano in the same relation to the strings as that usually occupied by such action, dispensing with the latter; and in particular it consists of the mechanical elements and combinations shown and described in the claims.

20 In the drawings:—Figure 1 is a vertical fore-and-aft section of a portion of a musical instrument having this invention applied to it and embodied in it. Fig. 2 is a detail section of one striking element showing a modification of the damper and operating devices. Fig. 3
25 is a plan and Fig. 4 is a detail elevation of the damper finger of the form shown in Fig. 1. Fig. 5 is a detail front elevation showing the devices for modifying the expression. Fig. 6 is a section at the line 6—6 on Fig. 5.

30 In the structure shown in the drawings, 1 represents the sounding board and 1^a the string frame of such an instrument as a piano, 2 being one of the strings or wires thereon. In front of the strings there is mounted a duct-board, 3, which in an upright piano such as may
35 be understood to be represented in the drawings, stands vertically quite close to the strings. On this duct-board there are mounted motor pneumatics, 4, one only appearing in the view. The duct-board has the customary ducts, 3^a, connecting the motor pneu-
40 matics with the outer air and with the primary pneumatic exhaust chamber, 5, in which the primary pneumatics, 6, one being shown, operate each a valve, 7, to control communication of the motor pneumatic
45 either with the exhaust chamber or with the outer air. 8 is a tracker-board, and 9 and 10 are the take-up and rewind rolls respectively for carrying the perforated
controlling sheet, 11, over the tracker-board to control, by means of a connecting duct, 12, the action of the
primary pneumatics in a manner well understood.

50 The motor pneumatics, 4, are mounted for vibration at the upper end of their vibrating member, 4^a, and to the upper end of said vibrating member there is rigidly secured the spring-arm, 13, of the hammer, 14,
which projects toward the string, 2, and is carried to-
55 ward it for striking it by the collapse of the pneumatic, 4.

On the duct board, 3, there is adjustably mounted a stop-bar, 15, from which a felt-covered rib, 16, projects forward in position for collision therewith of the spring
arm, 13, which strikes the stop-rib, 16, at a point on
60 the arm determined by the adjustment of the stop bar, said stop-rib being positioned so that the collision of the arm therewith occurs a little before the hammer touches the string, the stroke of the hammer upon the
string being obtained by the spring of the arm, 13, oc-
65 casioned by the momentum derived from its movement previous to collision with the stop-rib, so that the reaction of the spring-arm causes it to immediately retract the hammer from the string, leaving the latter
free to sound without any damping effect from the
70 hammer. The spring-arm, 13, is connected to the vibrating member of the pneumatic, preferably by means of a block, 17, made fast to said vibrating member and projecting therefrom for securement of the
spring finger therein. 75

In the portion of the block projecting beyond the pneumatic there is secured the damper finger, 18, which is preferably, as illustrated in Figs. 1, 3 and 4, made of a piece of wire folded at 18^a upon itself, the
two arms diverging from the fold and having their ends
80 threaded and inserted through the block, 17, both arms being in the same vertical plane and secured in the block by the nuts, 19, on the threaded ends, as seen clearly in Figs. 1, 3 and 4. The arms divergently folded
and secured as described at their ends, render the de-
85 vice stiff in a vertical plane. The folded end is bent laterally at right angles to the plane in which the two diverging limbs stand, forming a lip or offset finger, 18^b, on the forward side of which there is mounted and suitably secured a felt pad, 20. 90

The entire action comprising the duct-board, 3, and all parts connected with it is mounted in position in front of the strings the damper fingers being first in-
serted between the strings and then moved laterally
95 with the entire action to bring the pad, 20, on each finger behind its appropriate string, the damper fingers being adjusted by means of the nuts, 19, so that the pad, 20, upon each damper finger touches the string when the pneumatic is inflated and at normal position.

It will be seen that as soon as the pneumatic is col-
100 lapsed for causing the hammer to strike the string, the damper pad is carried back away from the string, leaving it free to sound, and that it will so remain until the pneumatic is again allowed to become inflated. This will occur of course at the conclusion of the time during
105 which the notes should be sounded, and thus the vibration of the string will be arrested precisely as in the ordinary piano action when the performer lifts the key, unless the instrument has devices for sustaining the tone and they are operated for that purpose. 110

It will be understood that such devices may be employed in this instrument as in any other, but the draw-

ings are not made to indicate either their presence or their absence. The entire action comprising the duct-board, 3, and the primary pneumatic air chamber and all parts mounted on or connected with both of them, is
 5 designed to be removable bodily from the operative position shown in front of the piano strings; and for that purpose it may be supported, when in operative position, by being secured to blocks, 21 and 22, on the end cheeks of the piano case, which are not shown, but may
 10 be understood to be in the ordinary position and relation to the other parts.

The construction of the damper fingers described, adapting them to be disengaged from behind their respective strings, permits the mounting and removal of
 15 the entire structure as described. For some purposes, as, for example, in any instance in which the strings or some of them may be too close together to admit of the easy insertion between them of such damper fingers as shown in Figs. 3 and 4, damper devices of a different
 20 sort may be employed, such as represented in Fig. 2, consisting of a damper lever, 25, fulcrumed between its ends on the stop-bar, 15, the upper end carrying the damper pad, 20, the lower end being exposed in the path of a stud or finger, 26, projecting rigidly from the
 25 block, 17, so as to encounter said lower end of the lever, 25, when the hammer is operated for giving its stroke, and by such encounter retracting the upper end of the lever and taking the damper pad off the string, a spring, 27, being provided to return the damper into contact
 30 with the string as soon as the pneumatic is inflated to retract the hammer.

It will be observed that any means of controlling the motor pneumatics may be employed, and that, so far as the action for striking and damping the strings is concerned, it is immaterial whether the controlling of the
 35 motor pneumatics is effected by automatic devices or otherwise, and I do not limit myself to construction in which the entire action, including the selection of tones to be sounded, is automatic, and I use the term
 40 "automatic" to denote the striking action performed by the motor pneumatic when it is vented for collapse by whatever means the venting is accomplished.

For varying the expression or loudness or softness of tone produced by the stroke of the hammers on the
 45 strings, I provide for varying the portion of the length of the spring arms, 13, of the hammers which project beyond the stop bar, 15, and which is thereby left available for springing to carry the hammer to the string after the stop bars are encountered. The shorter the por-
 50 tion of this arm which projects beyond the stop bar, the less the range of vibration of the hammer after the stop bar is encountered and the lighter the stroke received by the string. This variation is effected by adjusting the stop bar, 15, along the spring arm, and in order to be
 55 thus adjusted the stop bar is carried on the ends of transverse arms, 30, 30, which are mounted for sliding parallel with the position occupied by the spring arms, 13, at their encounter with the stop bar, so that the adjustment of the latter will not change the position of the
 60 hammer at the instant of its encounter with the stop bar, but will only change the length of its projecting portion as indicated. For sliding the arms, 30, 30, they are connected with lever arms, 31, 31, of a rock shaft, 32, suitably mounted in fixed supports carried in
 65 any convenient way, as by being mounted upon the

forward side of the duct board, 3. This rock shaft has two additional lever arms, 33 and 34, projecting in opposite directions and connected respectively to the moving walls of motor pneumatics, 35 and 36.

It will be noticed that the collapse of the pneumatic, 70 35, which is attached to the downwardly projecting arm, 33, of the rock shaft, will rock the shaft in direction for causing its lever arms, 31, to push upward the slide arms, 30, 30, and move the stop bar upward to shorten the springing length of the hammer arms, 13; and that 75 the collapse of the pneumatic, 36, rocks the shaft from the opposite direction and moves the stop bar downward, increasing the springing length of the hammer arm. A spring, 37, connected with the lever arm, 38, tends to hold the rock shaft yieldingly at the interme- 80 diate position locating the stop bar, 15, at intermediate position along the hammer arms.

The motor pneumatics, 35 and 36, are controlled in the familiar manner by primary pneumatics connected with the tracker board and governed by perforations in 85 the controlling sheet in precisely the same manner as the hammer-operating motor pneumatics are controlled and governed, and requiring no specific illustration. The perforation in the controlling sheet located so as to bring into action the motor pneumatic, 35, will soften 90 the tone by causing the stop bar, 15, to move upward toward the hammer, and a like perforation in position to bring into operation the motor pneumatic, 36, will cause the production of a louder tone by moving the stop bar, 15, downward and permitting the hammer to 95 make a heavier stroke upon the string.

I claim:—

1. In a stringed instrument, in combination with each string, a motor pneumatic; a hammer having a spring arm by which it is connected to the moving wall of the 100 pneumatic; a fixed stop for arresting the movement of said moving wall which carries the hammer toward the string, mounted in position to cause the impact of the hammer on the string to occur by momentum of the hammer; a finger projecting rigidly from the moving wall 105 hooked at its end to engage behind the string and having a damping pad on the forward side of the hook.

2. In a piano, in combination with the strings and their supports, a pneumatic action for striking the strings consisting of a structure adapted to be as a whole attached 110 to and removed from the fixed structure which supports the strings and consisting of a motor pneumatic for each string; a hammer for striking the string having a spring arm carried by the moving wall of the pneumatic; a duct board on which the motor pneumatics are mounted; a 115 stop bar mounted on the duct board in position to arrest the spring arms to cause the impact of the hammers to occur by momentum; a damper for each string and a finger carried by the moving wall of the pneumatics for taking the damper off the string in the collapsing movement of the pneumatic; 120

3. In a piano, in combination with the strings and their supports, a pneumatic action for striking the strings consisting of a structure adapted to be as a whole attached 125 to and removed from the fixed structure which supports the strings and consisting of a motor pneumatic for each string; a hammer for striking it having a spring arm carried by the moving wall of the pneumatic; a duct board on which the motor pneumatics are mounted; a stop bar 130 mounted on the duct board in position to arrest the spring arms to cause the impact of the hammers to occur by momentum, and a damper finger rigid with the moving wall of each pneumatic having a hooked and padded end adapted to be entered between the strings and engaged behind them respectively. 135

4. In a piano, in combination with the strings and their supports, a pneumatic action for striking the strings comprising a motor pneumatic for each string and means

for controlling such pneumatics; means operated by the motor pneumatics respectively for making the stroke on the strings to cause them to sound, and a damper carried by the moving wall of each pneumatic consisting of a wire 5 reflexed upon itself and having the members diverging from the bend and set with said diverging members in a vertical plane, such fingers being bent at an angle to said plane at a little distance back from the bend of the wire from which the members diverge to form a laterally projecting offset, and a damper pad carried on such offset. 10

5. In a musical instrument, in combination with sounding devices adapted to be sounded by a stroke; a motor pneumatic for each sounding device; a hammer for making the stroke provided with a spring arm and attached 15 thereby to the moving wall of the pneumatic; a rigid stop for arresting the spring arm to cause it to complete its stroke to the string by momentum of the hammer, such stop being mounted for movement along the length of the arm to vary the portion of the latter which projects beyond the stop for such spring action, and means 20 for so adjusting the stop.

6. In a musical instrument, in combination with sounding devices adapted to be sounded by a stroke; a motor pneumatic for each sounding device; a hammer for making the stroke provided with a spring arm and attached 25 thereby to the moving wall of the pneumatic; a stop mounted in position to arrest the spring arm at a point remote from the hammer a little before the latter touches the sounding device, such stop being movable to vary the distance from the hammer of the point of its encounter with the spring arm; a motor pneumatic and means for 30 controlling the same, and connections from the motor pneumatic for so moving the stop bar.

7. In a musical instrument, in combination with sounding devices adapted to be sounded by a stroke; a motor pneumatic for each sounding device; a hammer for making the stroke provided with a spring arm and attached 35 thereby to the moving wall of the pneumatic; a stop bar mounted in position to arrest the spring arm to cause it to reach the string by springing, such stop bar being 40 movable along the spring arm to vary the point on the spring arm at which it is encountered thereby; means for holding the stop bar yieldingly at an intermediate point within the range of its movability; a rock shaft and connections therefrom for moving the stop bar; two motor 45 pneumatics having connections from them respectively to the stop bar for rocking the latter in opposite directions upon the operating movement of the pneumatics respectively, and means for controlling the pneumatics.

8. In a piano, in combination with the strings and 50 their supports, a pneumatic action consisting of a motor pneumatic for each string; a hammer for striking the string having a spring arm rigidly attached to the moving wall of the pneumatic; a stop to arrest the spring arm to cause the impact of the hammer to occur by momentum; a damper for each string and a finger carried 55 by the moving wall of the pneumatic for taking the damper off the string in the collapsing movement of the pneumatic.

In testimony whereof I have hereunto set my hand at 60 Chicago, Illinois, this 28 day of Sept., 1906.

THOMAS M. FLETCHER.

Witnesses:

EDWARD T. WRAY,
CHAS. S. BURTON.