No. 791,542. PATENTED JUNE 6, 1905.

T. DANQUARD.

AUTOMATIC EXPRESSION DEVICE FOR MECHANICAL MUSICAL INSTRUMENTS.

APPLICATION FILED OCT. 8, 1904.

2 SHEETS—SHEET 1.

FIG. 1.

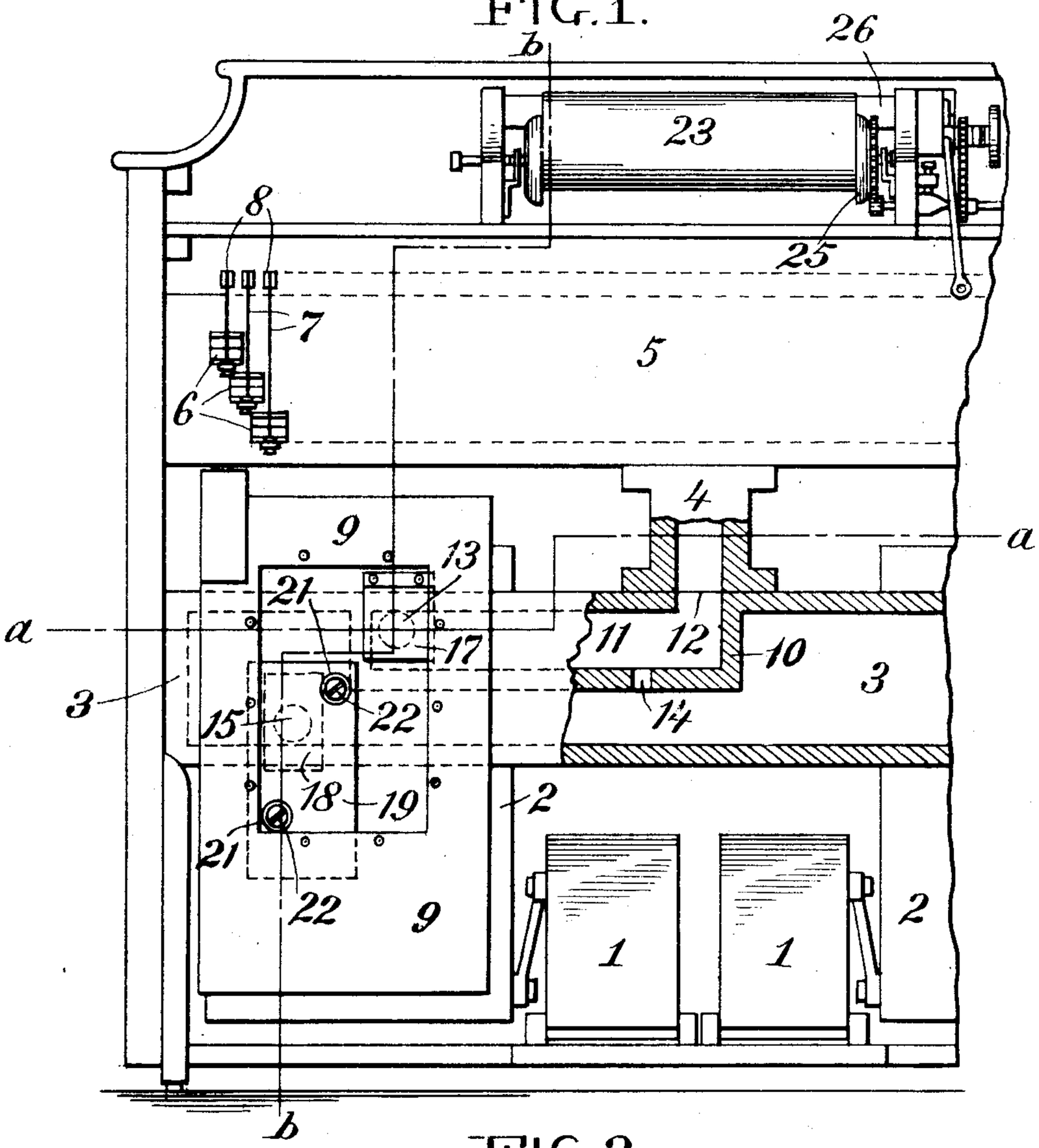
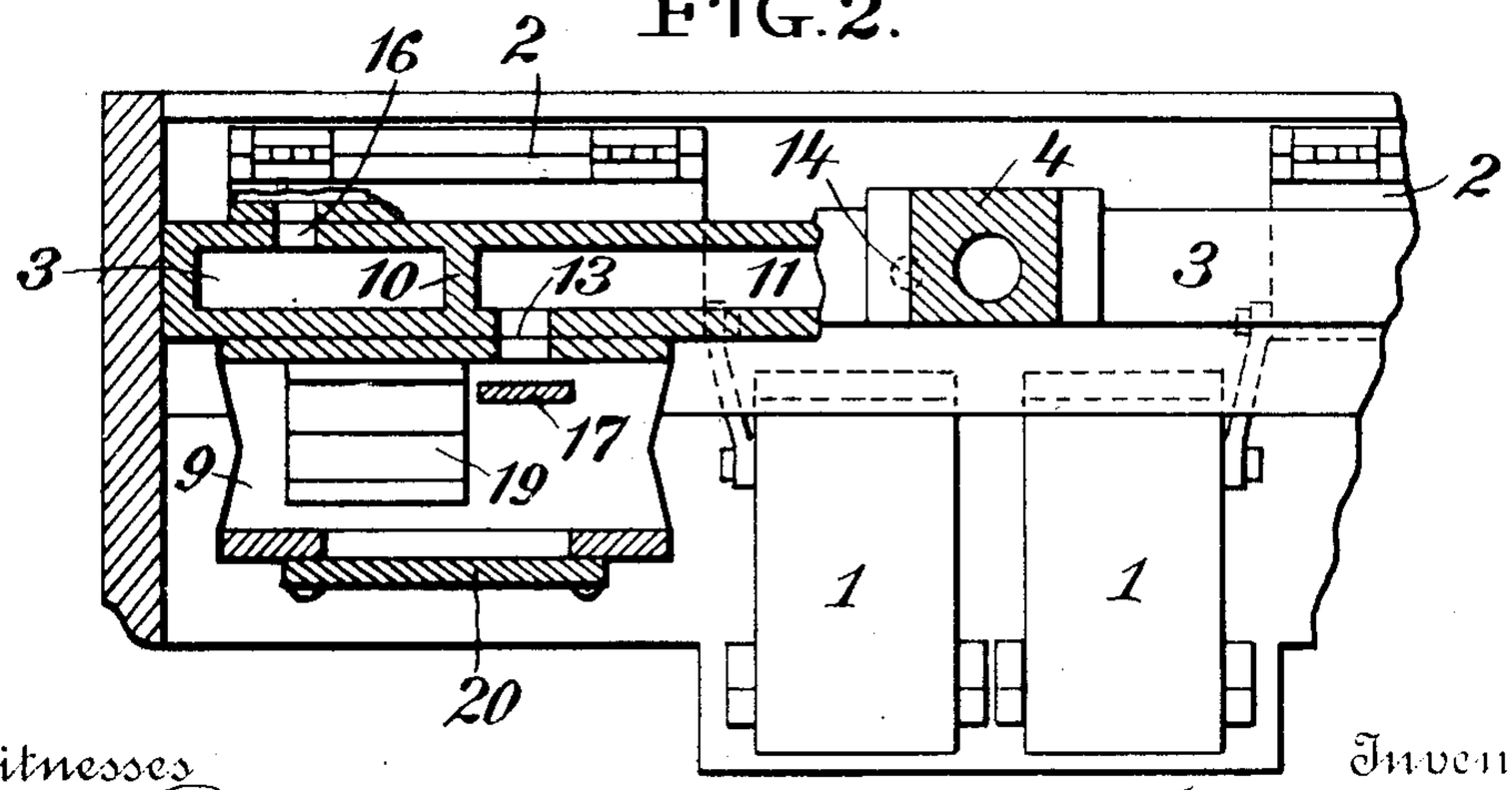


FIG. 2.



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FIG'D LITHOGRAPHED BY SACKETT & WILHELMS LITHO & PTG. CO. NEW YORK

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2 SHEETS—SHEET 2.

FIG. 3.

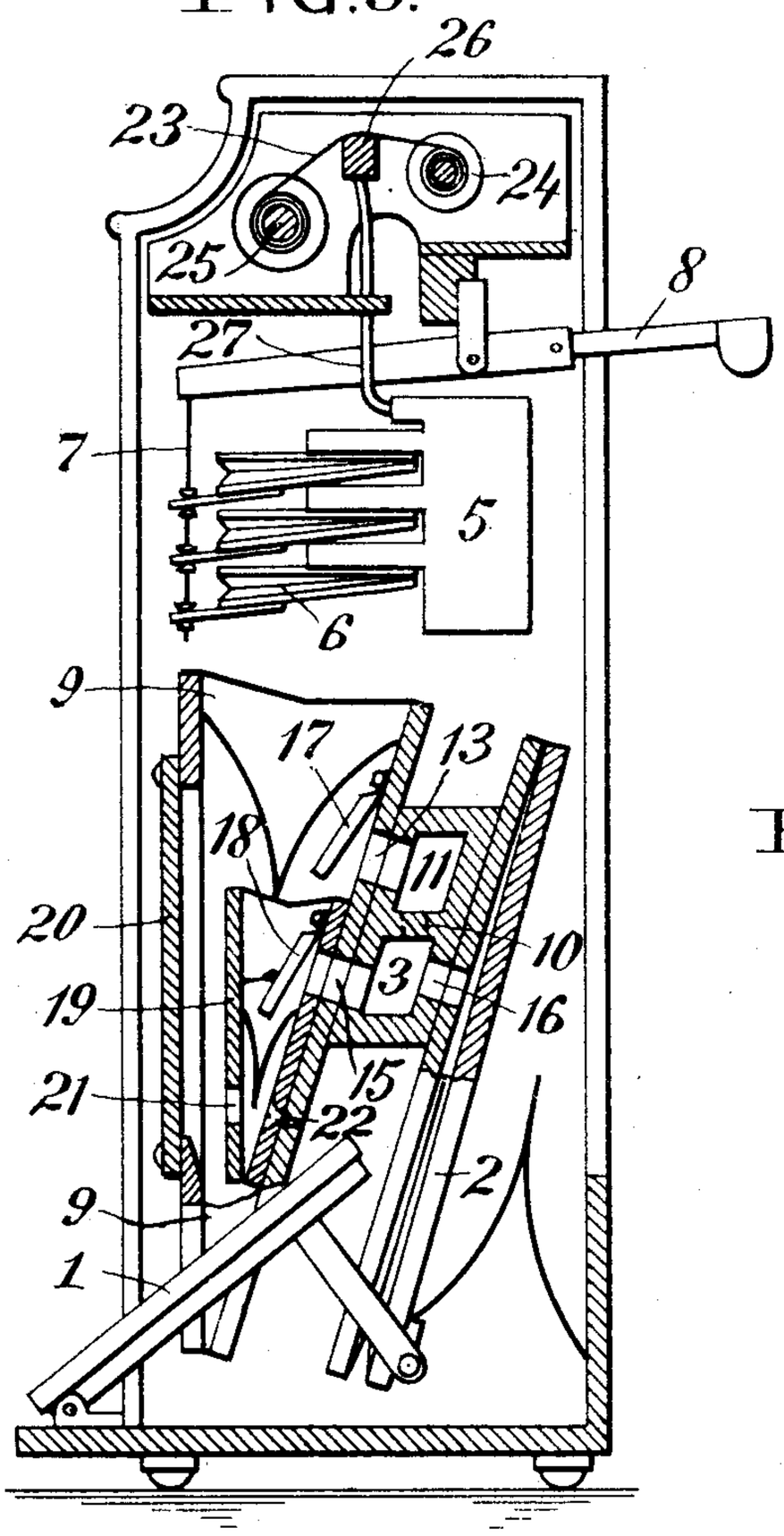


FIG. 4.

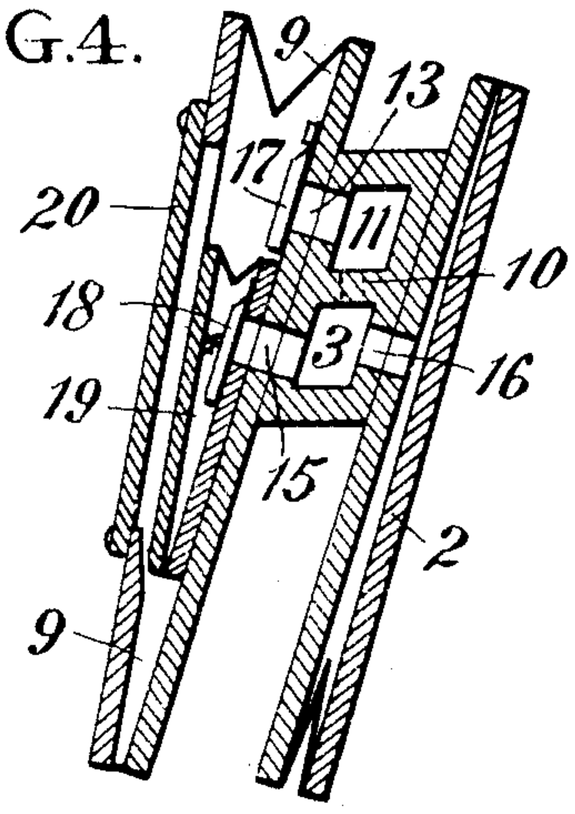


FIG. 5.

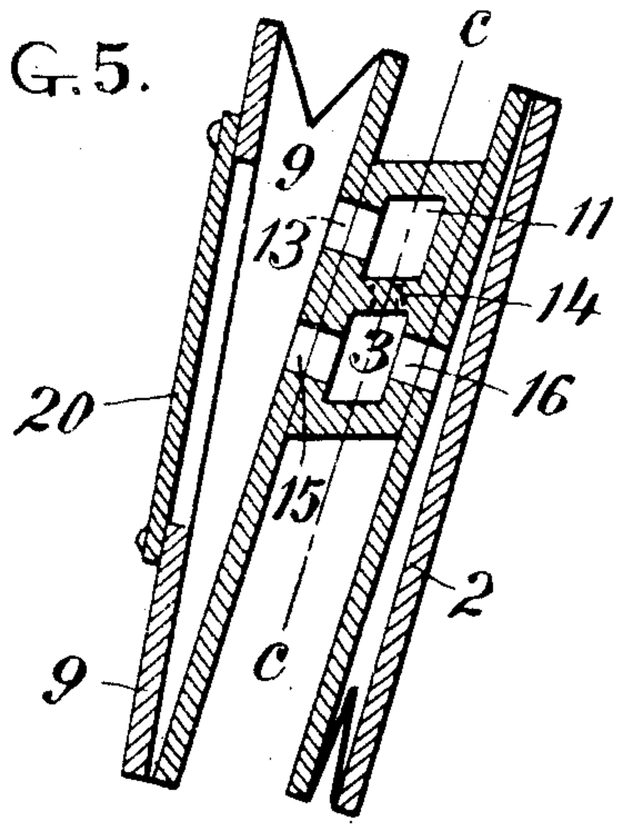
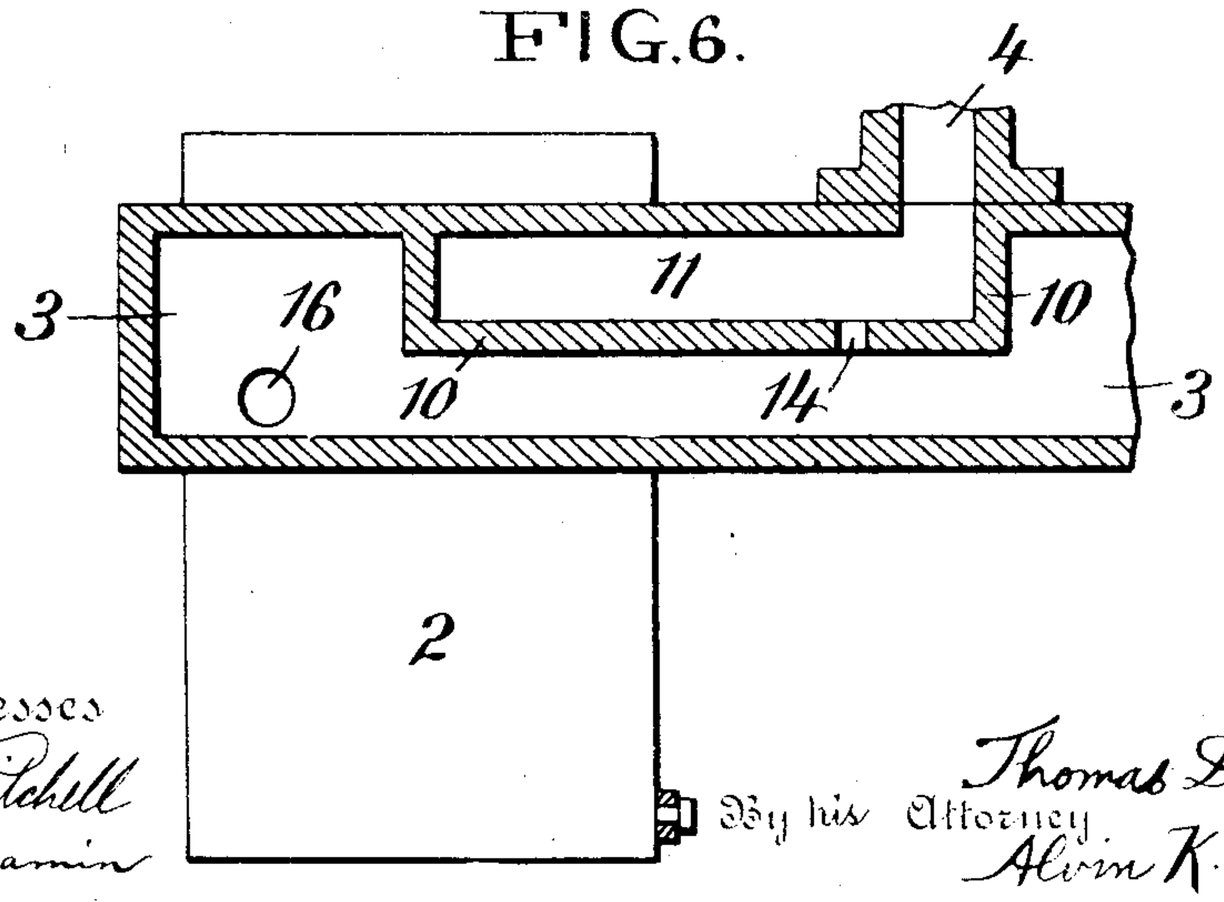


FIG. 6.



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No. 791,542. Patented June 6, 1905.

UNITED STATES PATENT OFFICE.

THOMAS DANQUARD, OF NEW YORK, N. Y., ASSIGNOR TO THE AUTO-PIANO COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

AUTOMATIC EXPRESSION DEVICE FOR MECHANICAL MUSICAL INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 791,542, dated June 6, 1905.

Application filed October 8, 1904. Serial No. 227,625.

To all whom it may concern:

Be it known that I, THOMAS DANQUARD, a citizen of the United States of America, residing in the city of New York, State of New York, have invented certain new and useful Improvements in Automatic Expression Devices for Mechanical Musical Instruments, of which the following is a specification.

This invention relates to autopneumatic mechanical musical instruments, and more particularly to their wind inducing and utilizing devices, and to means or mechanism controlling the wind-currents for producing varying "expression" or loud and soft tone effects from the sound-producing devices. These devices may be the pneumatically-operated keyboard-striking levers of an automatic piano-player or may be pneumatically-actuated parts operating the action of a self-playing piano.

The invention will first be described and then will be particularly defined in claims hereinafter set forth.

Reference is made to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a front view of main portions of an autopneumatic piano-player with parts removed and other parts in vertical section. Fig. 2 is a partly-broken sectional plan view taken mainly on the line *a a* in Fig. 1. Fig. 3 is a vertical transverse section through the player, taken on the line *b b* in Fig. 1. Fig. 4 is a vertical section of the reservoir of Fig. 3 and adjacent parts with the reservoir collapsed. Fig. 5 is a detail vertical section showing portions of a modified wind-chest and reservoir, and Fig. 6 is a front view with the reservoir removed and with portions of the wind-chest in section on the line *c c* in Fig. 5.

The numeral 1 indicates pedals suitably linked to main bellows or pumps 2 2, which communicate with the main wind-chest 3, which opens by a trunk 4 into the action-chest 5. This chest 5 has channeled and valved shelves, to which are held the striking-pneumatics 6, the abstracts 7 of which are herein shown coupled to levers 8, adapted to operate the keys of a piano or organ to the front of which the automatic player may be adjusted. In a self-playing piano the abstracts 7 will either directly or indirectly operate the piano-action in any approved manner. To the wind-chest 3 is secured a reservoir 9, having the usual function of an equalizer between the chests 5 3 and the main bellows. Experiments have proved the desirability of so arranging the reservoir 9 relatively to the main wind-chest 3 that sudden pulsations of the air-current, due to simultaneous operation of several of the pneumatics 6, may not jar the feet of a performer operating pedals working the bellows 2 or may not jar other devices operating these bellows. It also is desirable that the reservoir be arranged to permit it to be cut out of the air-current suddenly and entirely to enable the performer to produce heavy brilliant or "crash" tone effects at will by forcibly or quickly depressing either one or both of the pedals or by quickly actuating other devices operating the main bellows and without using hand-operated levers or stops of any kind. These results are attained by simple constructions shown in the drawings and next described with special relation to the use of pedals for operating the wind-inducing devices.

In Figs. 1, 2, and 3 of the drawings there is within the wind-chest 3 a box-like partition 10, forming within it an air-chamber 11, which opens at 12 directly into the wind-trunk 4 and also opens at 13 into the reservoir 9 and also opens by a hole 14 into the main air-chamber of the wind-chest. The reservoir also communicates by an opening 15 with this main air-chamber. The usual openings 16 connect the main air-chamber of the wind-chest 3 with the pumping-bellows 2. A suitable self-closing and preferably removable valve 17 (shown arranged within the reservoir 9) controls the opening 13, and the opening 15 is controlled by a suitable valve 18, arranged, preferably, within a pneumatic bellows 19, which is normally held open by a

suitable spring and is preferably located within the reservoir 9. This valve 18 is shown coupled to the outer movable wall of the pneumatic 19, so as to be opened by inflation of said pneumatic after the valve is closed by collapse of the pneumatic by the air-exhaust. The valve 18 may be otherwise arranged to close the opening 15 under influence of the air-exhaust. The valved pneumatic 18 19 is specially made easily attachable and accessible and removable by providing in the front wall of the reservoir an opening which is closed by a plate 20, preferably fastened by screws. Openings 21 in the outer wall of the pneumatic 19 connect the interiors of the reservoir 9 and the pneumatic 19, and said openings are specially located opposite screws 22, passed through the rear wall of the pneumatic 19 and into the inner fixed wall of the reservoir 9. By thus making the valved pneumatic attachable within the completed reservoir the manufacture is facilitated, so as to reduce the first cost. When the plate 20 is removed, the valved pneumatic 18 19 and also the valve 17 may be readily inspected. A screw-driver also may be passed through the pneumatic-wall openings 21 to easily remove the screws 22 to detach the valved pneumatic for necessary repairs, and the screw-fastened valve 17 also may be easily removed.

During ordinary operation of the pedals 1 air is drawn from the action-chest 5 through the trunk 4 and opening 12 into the chamber 11 and thence chiefly through the opening 13 past the open valve 17 into the reservoir 9 and thence via the openings 21 to the interior of the pneumatic 19 and past its open valve 18 through the opening 15 into the main chamber of the wind-chest 3 and thence through the openings 16 to the exhaust-bellows 2. Should a sudden loud brilliant or crash tone effect be desired, the pedals 1 will be forcibly and suddenly depressed, thereby causing sudden increase of exhaust through the opening 15 to overbalance the volume of air passing through the pneumatic-openings 21, thereby collapsing the pneumatic 19 and causing the valve 18 to close the opening 15. The connection between the reservoir 9 and bellows 2 is then for an instant through the opening 13, chamber 11, and hole 14, and the valve 17 then is closed by the air-exhaust, thus cutting out the reservoir and leaving the action-chest 5 directly connected with the bellows 2 via the trunk 4, opening 12, chamber 11, hole 14, and main wind-chest 3, and sounds then produced when the pedals are suddenly depressed will be markedly accentuated to produce the loud crash tone effects above named. Closing of the valves 17 18 is so prompt that this heavy crash tone effect is obtained immediately a sudden forcible downward impulse is given the pedals and without resort to hand-operated levers or stops of any kind. During ordinary pedaling the valves 17 18 remain open for free flow of air through the reservoir, and at such times the comparatively small hole 14 makes a sufficiently large direct connection with the bellows to permit a slight or less-pronounced accentuation of tones by giving correspondingly light but sudden impulses to the pedals. Should the heavy crash tone effects not be desired by any performer, they may be avoided by simply removing the valve 17 and the valved pneumatic 18 19, which reduces the construction to the modified arrangement sufficiently shown in Figs. 5 and 6 of the drawings. The partition 10, providing a chamber 11, opening at 12 to the action-chest 5 and at 13 15 to the reservoir and main wind-chest, prevents communication to the feet of the performer by the pedals of disagreeable jars, which otherwise would be felt from sudden impulses of the air-current due to simultaneous operation of several of the striking-pneumatics 6. Experiments have proved the desirability of the more complete structure shown in Figs. 1 to 4 of the drawings, which prevents foot jars at the pedals and also provides for either light or heavy positive accentuation of tones by correspondingly depressing the pedals or by suddenly actuating any other devices operating the main bellows.

Operation of the striking-pneumatics 6 and the levers 8 or other sound-producing devices actuated by the abstracts 7 may be controlled by a perforated music-sheet 23 moving from a music-roll 24 to a take-up roll 25 over a tracker 26, having air-passages communicating by tubes 27 with the valves in the action-chest 5, all in the usual or any approved manner.

Various modifications in the form and arrangement of parts of the herein-described invention in automatic expression devices may be made by the skilled mechanic within the scope of the appended claims.

I claim as my invention—

1. A mechanical musical instrument provided with wind-inducing devices and means operating them, and a wind-chest having an auxiliary chamber, an action-chest connecting with said chamber, an air-reservoir connecting with the wind-chest and with its auxiliary chamber, and automatic valves acting at the openings of the wind-chest and its auxiliary chamber into the reservoir; said auxiliary chamber also having an independent opening to the wind-chest, substantially as described.

2. A mechanical musical instrument provided with wind-inducing devices and means operating them, and a wind-chest having an auxiliary chamber, an action-chest connecting with said chamber, an air-reservoir connecting with the wind-chest and with its aux-

iliary chamber; said auxiliary chamber also having an independent opening to the wind-chest, a valve controlling the opening of said chamber to the reservoir, a pneumatic arranged at the opening of the reservoir to the wind-chest and opening into the reservoir, and a valve controlled by said pneumatic at the opening between the wind-chest and reservoir, substantially as described.

3. A mechanical musical instrument provided with wind-inducing devices and pedals operating them, and a wind-chest having an auxiliary chamber, an action-chest connecting with said chamber, an air-reservoir connecting with the wind-chest and with its auxiliary chamber, and automatic valves acting at the openings of the wind-chest and its auxiliary chamber into the reservoir; said auxiliary chamber also having an independent opening to the wind-chest, substantially as described.

4. A mechanical musical instrument provided with wind-inducing devices and pedals operating them, and a wind-chest having an auxiliary chamber, an action-chest connecting with said chamber, an air-reservoir connecting with the wind-chest and with its auxiliary chamber; said auxiliary chamber also having an independent opening to the wind-chest, a valve controlling the opening of said chamber to the reservoir, a pneumatic arranged at the opening of the reservoir to the wind-chest and opening into the reservoir, and a valve controlled by said pneumatic at the opening between the wind-chest and reservoir, substantially as described.

5. A mechanical musical instrument provided with wind-inducing devices and means operating them, an action-chest, a wind-chest having a partition 10 forming an auxiliary chamber 11 connecting at 12 with the action-chest, and an air-reservoir 9 opening at 13 to the chamber 11 and opening at 15 to the wind-chest.

6. A mechanical musical instrument provided with wind-inducing devices and means operating them, an action-chest, a wind-chest having a partition 10 forming an auxiliary chamber 11 connecting at 12 with the action-chest, and an air-reservoir 9 opening at 13 to the chamber 11 and opening at 15 to the wind-chest; said partition 10 having an opening 14 connecting the auxiliary chamber 11 with the wind-chest.

7. A mechanical musical instrument provided with wind-inducing devices and means operating them, an action-chest, a wind-chest having a partition 10 forming an auxiliary chamber 11 connecting at 12 with the action-chest and also connecting at 14 with the wind-chest, a reservoir 9 connecting at 13 with the chamber 11 and at 15 with the wind-chest, a self-closing valve 17 controlling the opening 13, a pneumatic 19 within the reservoir and connecting with it at 21, and a valve 18 within the pneumatic 19 adapted to close the opening 15 by collapse of said pneumatic.

8. A mechanical musical instrument provided with wind-inducing devices and means operating them, an action-chest, a wind-chest having a partition 10 forming an auxiliary chamber 11 connecting at 12 with the action-chest and also connecting at 14 with the wind-chest, a reservoir 9 connecting at 13 with the chamber 11 and at 15 with the wind-chest, a self-closing valve 17 controlling the opening 13, a pneumatic 19 within the reservoir and connecting with it at 21, and a valve 18 within the pneumatic 19 adapted to close the opening 15 by collapse of said pneumatic; said reservoir 9 having a removable wall portion permitting inspection of the valves 17, 18, and allowing removal of the pneumatic 19 and the valves 18, 17, substantially as described.

9. The combination with the wind-chest, of a reservoir 9 having a removable outer wall portion 20, and an inner wall opening at 15 to the wind-chest, and a detachable pneumatic 19 held to the inner wall of the reservoir and provided with a valve 18 controlling the opening 15; said pneumatic having holes 21 in its outer wall giving communication between the reservoir and the pneumatic and arranged opposite the removable fastenings of the pneumatic.

Signed at the city of New York this 7th day of October, 1904.

THOMAS DANQUARD.

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