

(No Model.)

2 Sheets—Sheet 1.

T. A. MACAULAY, Dec'd.

D. McCAULEY, Adininistrator.

AUTOMATIC MUSICAL INSTRUMENT.

No. 564,387.

Patented July 21, 1896.

Witnesses
Edward Thorpe.
Henry J. Carr

(No Model.)

2 Sheets—Sheet 2

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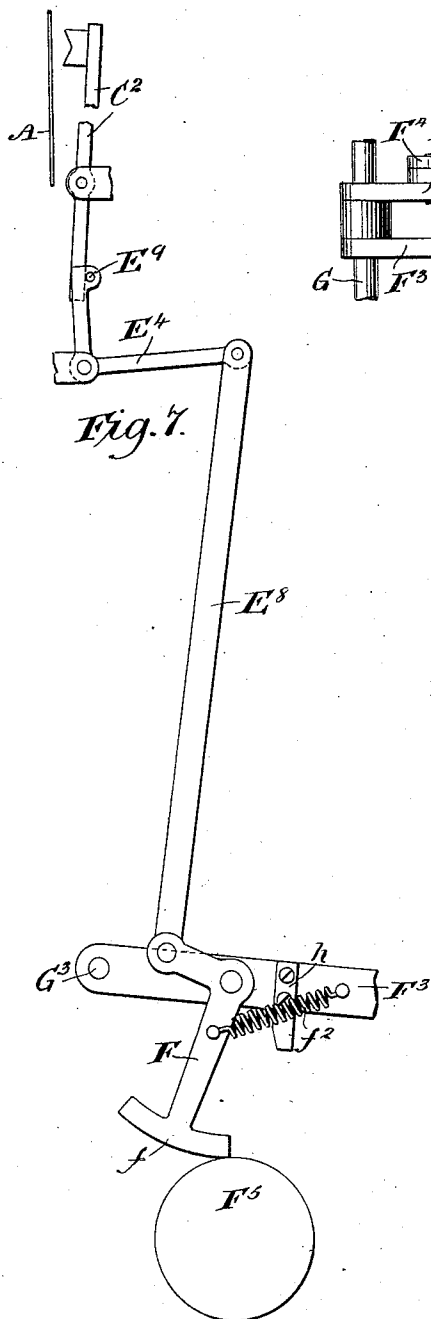


Fig. 7.

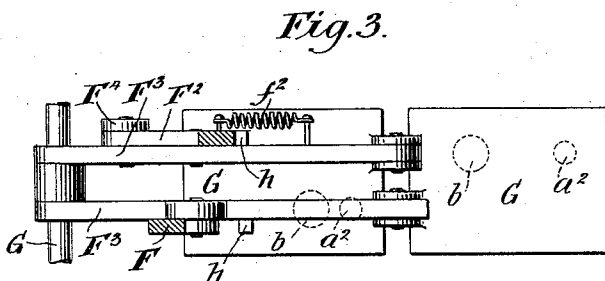


Fig. 3.

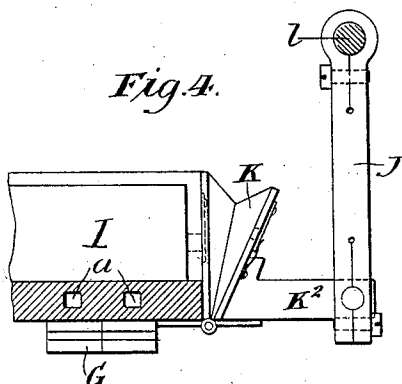


Fig. 4.

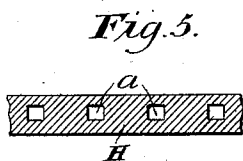


Fig. 5.

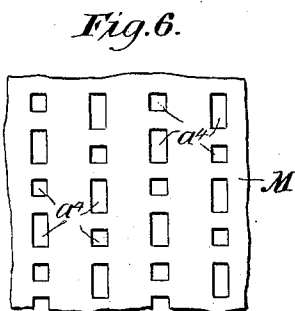


Fig. 6.

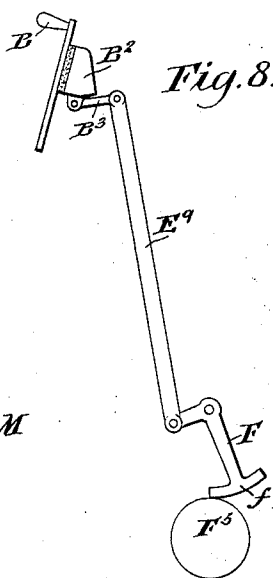


Fig. 8.

Witnesses
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Ferry & Co.

Inventor
Thos. A. Macaulay

UNITED STATES PATENT OFFICE.

THOMAS A. MACAULAY, OF NEW YORK, N. Y.; DANIEL MCCAULEY ADMINISTRATOR OF SAID THOMAS A. MACAULAY, DECEASED.

AUTOMATIC MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 564,387, dated July 21, 1896.

Application filed January 24, 1894. Serial No. 497,900. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. MACAULAY, of the city, county, and State of New York, have invented certain new and useful Improvements in Automatic Musical Instruments, of which the following, with the accompanying drawings, is a specification.

My invention relates to that class of automatic musical instruments in which a sheet of perforated paper controls the action of devices for operating the sounding devices.

In the drawings, Figure 1 is a central side view showing the leading features of my invention. Fig. 2 is a detailed view of a part of Fig. 1. Fig. 3 is an under view of the pneumatics and the operating-levers through line X X, Fig. 1. Fig. 4 is a detailed view of the exhaust-bellows and other parts. Fig. 5 is a sectional end view of the duct-bridge. Fig. 6 is a partial view of the music-sheet. Figs. 7 and 8 are detail views of damper-operating devices.

In the drawings, A represents the strings of a pianoforte.

B is the hammer for operating the strings. B² is a hammer-rail.

B³ is a link, C the rods which actuate the hammers.

C² is a damper-lever.

C³ is a bell-crank lever.

D are the manual key-levers fulcrumed on pins D².

D³ is the key-slip.

D⁴ is the keyboard.

D⁵ is an enlarged opening in the keyboard and in the key-slip.

E is a push-rod.

E² is a spring on the push-rod.

E³ is a movable guide-block.

E⁴ is a bell-crank lever.

E⁵ is a pull-bar.

E⁶ is a pull-bar knob.

E⁸ and E⁹ are connecting-rods.

F F² are bell-crank levers having shoes *f f* and pivoted to levers F³ F³.

F⁴ is a link.

F⁵ is a rotary cylinder.

F⁶ is a connecting-rod.

G G are pneumatic motors having their most expansive ends adjacent to each other

beneath the duct-bridge and having the usual check-valves *n n* with the vent-holes 2 2.

G² is a bracket fixed to the vacuum-chamber supporting fulcrum-shaft G³.

H is a duct-bridge having ducts *a a*.

I is a vacuum-chamber above the duct-bridge.

K is a bellows, of usual construction, at the end of the vacuum chamber for creating a vacuum in the chamber I.

K² is an arm on bellows K.

J J are pitmans for operating the bellows.

L is an operating motor-shaft having the manual-operating crank L² and the bellows-operating-cranks *l l*.

M is the music-sheet.

N is the music-roller.

N² is the take-up roller.

N⁴ N⁵ are operating-pulleys on shaft L.

N⁶ is a balance-wheel.

N⁷ is a driving-pulley.

N⁸ N⁹ are driving-gears for operating the music-sheet rollers.

O is a valve covering an opening in the vacuum-chamber I and provided with an arm O².

P is a tripping-lever pivoted to a bracket under the keyboard and provided with an enlarged opening through which the shaft L passes.

W is a door having a hinge W⁵, one part of which, W², forms a slide abutting against the end of a guide W³.

W⁴ is a stop-pin against which the sliding part W² abuts when pulled out.

The operation is as follows: By rotating the motor-shaft L by the manual-crank L² the cranks *l l* operate the pitmans J J, which operate the bellows K through the arm K², creating a vacuum in the chamber I, the pulley N⁴, through the band *t*², causes the music-sheet M to pass from the music-roller N to the take-up roller N². As perforations *a*⁴ in the music-sheet M come in line with ducts *a* in the duct-bridge H over which the music-sheet passes, air rushes into the pneumatic motor through holes *a*² *a*² (the check-valve *n* having the vent-hole 2 closing the opening *b*) and inflates it, causing a downward movement in the levers F³, which brings the bell-

crank levers F, having the shoe *f* and push-rod E, in contact with the rotating cylinder F⁵. This moves the bell-crank lever and carries with it push-rod E, which strikes the key D and through the rods C operates the sounding devices. When an imperforate part of the perforated sheet covers the ducts, the vacuum-chamber draws the air out of the pneumatic motor through the holes *b b*, then the pneumatic will collapse and raise the lever F³, the bell-crank lever F comes back against the stop *h* and will be in position again to be operated by the cylinder F⁵.

As each key intended to be operated automatically has a duplicate set of the devices above described, any tune from a perforated sheet may be played.

For the purpose of causing a strong or light blow on the key D, the push-rod E is passed through a movable block E³ and is operated automatically by a perforation in the sheet which causes a pneumatic G to inflate and bring a bell-crank F² in contact with the cylinder F⁵ and move the bell-crank C³ through the connection F⁶, bringing the push-rod to strike the key near its center of motion D² and also to strike it sooner by reason of the interposed wedge or incline *d* on the end of the key-lever D.

When a piece is played to the end, the music-sheet is rewound back from the take-up roller N² to the music-roll N. For this purpose the motor-shaft L is pushed forward. This brings the pin *e* in shaft L in engagement with the pin *e*³ in pulley N³ and brings out of engagement the pin *e*⁵ in shaft L with pin *e*⁴ in pulley N⁴, and brings *e*⁶ out of engagement with pin *e*⁷ in pulley N⁷. This forward movement of shaft L also brings in engagement the pin *e*⁸ with the lever P, which presses on the arm O² of valve O, admitting air to the vacuum-chamber I, thereby breaking the vacuum in the chamber I and causing the cessation of the action of the sound-operating devices.

When the music-sheet is rewound, the door W may be slid out on the slide W² and laid in a horizontal position, when a new music-roller may be put in place and the last one removed by pushing back the door W until the slide W² touches the end W³ of its casing, when the operating-gears N⁸ N⁹ will properly mesh with the gears on the sheet-roller shaft, and the instrument may be played as before.

For the purpose of controlling the damper automatically by perforations in the sheet a pneumatic motor is provided and two bell-crank levers F and E⁴, connected by a pitman E⁸, the bell-crank F being operated by the rotating cylinder F⁵.

I have shown levers operated by a cylinder to move a push-rod guide and to operate a damper, said levers being brought in contact with said cylinder by a pneumatic motor controlled by a perforated sheet; but it is manifest that said levers may be operated by

using such devices for moving said lever, as shown and described in patent to Emile Captaine, No. 429,419, in which the cylinder and push-rod-operating mechanism are operated by a perforated sheet and a train of angle and other levers to make and break contact of the push-rod-operating device with the rotating cylinder.

The incline *d* on the end of the key may be reversed in position if deemed more desirable, so as to strike the extreme end of the key with greatest force and to strike the key nearer its center of motion with the lighter blow.

It is also manifest that a lever and suitable devices may be operated by a cylinder as F⁵ and may be used to operate the movable hammer-rail B², so as to limit the movement of the hammer, as shown in Fig. 8.

Having described my invention, I claim—

1. In an automatic musical instrument, a pneumatic key-motor, a lever F³ pivoted at one end to said motor so as to be moved thereby but fulcrumed on a support independent of said motor, a bell-crank lever pivoted on said lever F³ and moved by said lever F³ into operative contact with an actuating device so as to be positively actuated thereby, and connections between said bell-crank lever and a sounding device, substantially as set forth.

2. In an automatic musical instrument, a pneumatic key-motor thereof, a lever F³ connected to said motor having stop *h*, a bell-crank lever pivoted to said lever F³, and a spring holding said bell-crank lever normally against said stop *h*, in combination with actuating-cylinder F⁵ into contact with which said bell-crank lever is moved by said motor, and operating connections between said bell-crank lever and a sounding device, substantially as set forth.

3. In an automatic musical instrument, a perforated sheet and means to move it, a duct-bridge, a pneumatic motor, a lever operated by said motor, a bell-crank lever, adapted to be operated by an actuating device, pivoted to said lever, a push-rod operated by said bell-crank lever, a push-rod guide moved by devices actuated by a pneumatic and a bell-crank lever suitably connected to said push-rod guide, substantially as set forth.

4. In an automatic musical instrument in combination, a perforated sheet and means to move it, a duct-bridge, a vacuum-chamber, a pneumatic motor, a lever operated by said pneumatic motor, a bell-crank lever pivoted to said lever, a push-rod, operated by said bell-crank lever, a sliding block and means to automatically move said block and a key-lever having an incline on one of its ends, substantially as set forth.

5. In an automatic musical instrument in combination, a perforated sheet and means to move it, a bell-crank lever adapted to be operated by a rotary cylinder, a push-rod

operated by said bell-crank lever, a movable guide adapted to control the position of said push-rod and a key-lever as D, having an incline as *d*, substantially as set forth.

5 6. In an automatic musical instrument in combination, a perforated sheet and means to move it, intermediate devices controlled by said perforated sheet, a bell-crank lever adapted to be operated by said intermediate
10 devices, and a rotary cylinder, a push-rod operated by said bell-crank lever, a movable guide controlling said push-rod moved by devices operated by said rotary cylinder and a key-lever as D having an incline as *d*, sub-
15 stantially as set forth.

7. In an automatic musical instrument in combination, a perforated sheet and means to move it, intermediate devices operated by said perforated sheet, a bell-crank lever
20 adapted to be operated by a rotary cylinder, a push-rod and guide as E³ and suitable devices for moving said guide, whereby said push-rod is caused to strike the incline *d* on the key-lever D in different positions so as to
25 cause a loud or soft tone from the sounding device, substantially as set forth.

8. In an automatic musical instrument in combination, a perforated sheet and means to move it, intermediate devices controlled
30 by said sheet for operating a bell-crank lever as F, said bell-crank lever operating a push-rod E, a bell-crank lever as F² and suitable

intermediate devices for operating a movable push-rod guide E³, substantially as set forth.

9. In an automatic musical instrument in combination, a hinged door as W, having the
35 music-sheet and rewinding mechanism, a sliding part as W² connected to the hinge-door by hinge W⁵, adapted to be slid out so as to bring the music-rollers out beyond the
40 keyboard, substantially as set forth.

10. In an automatic musical instrument in combination, a hinged door carrying the music-rolls, a sliding part as W² and a stop
45 as W⁴, substantially as set forth.

11. In an automatic musical instrument with pneumatic key-motors, a vacuum-chamber having relief-valve O, bellows K for ex-
hausting said chamber, shaft L for operating said bellows, and connections whereby said
50 relief-valve can be operated by movement of said shaft, substantially as set forth.

12. In an automatic musical instrument, the keys D, each having an operating-rod E, an incline surface *d* on the key wherewith
55 said rod E coöperates to move the key, and means for adjusting the position of said rod E with respect to said inclined surface *d* to vary the action of the operating-rod upon the key, substantially as set forth.

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Witnesses:

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