(No Model.)

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AUTOMATIC MUSICAL INSTRUMENT.

No. 564,385. Patented July 21, 1896.

Fig. 1.

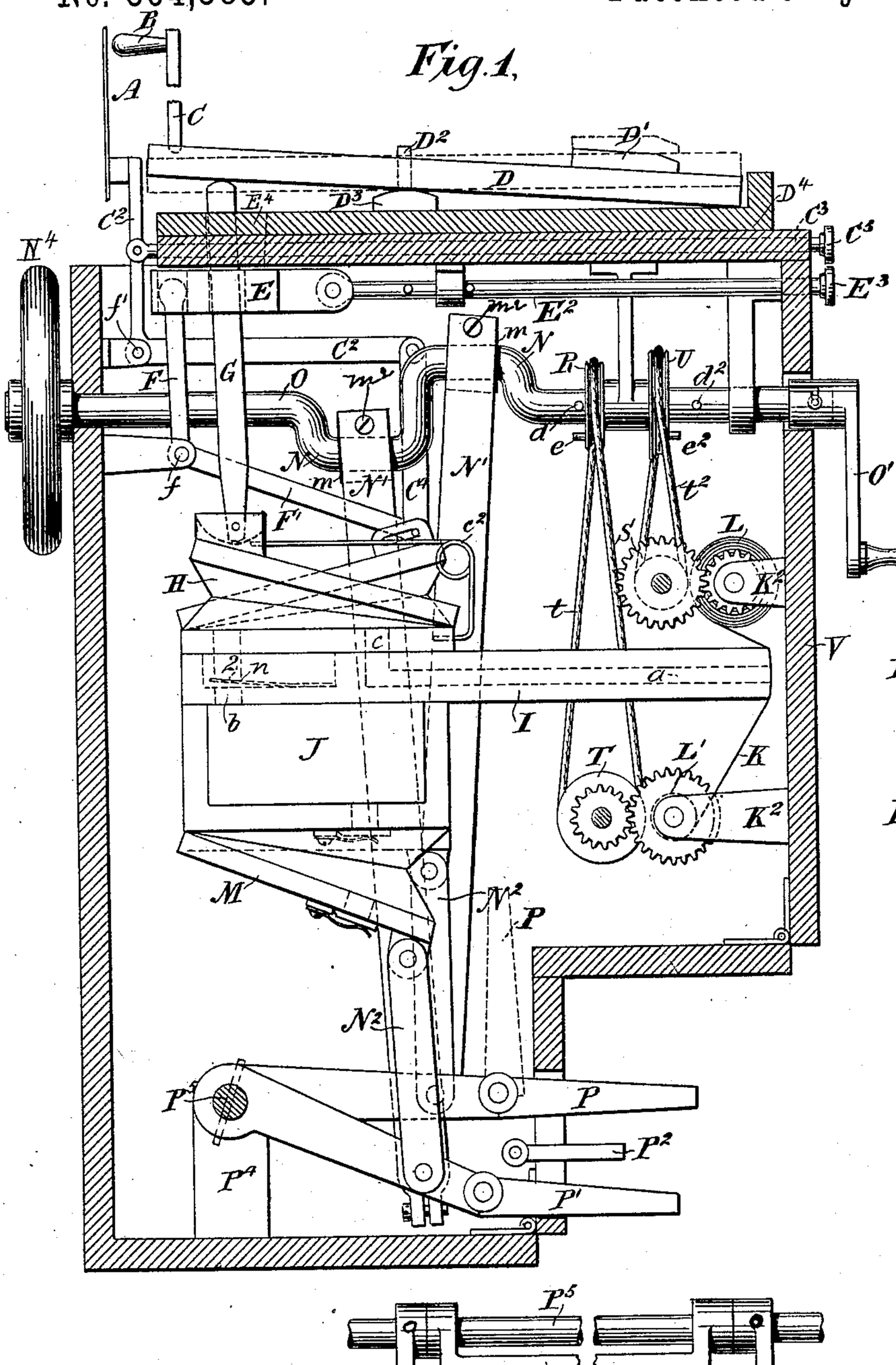

Fig. 2.

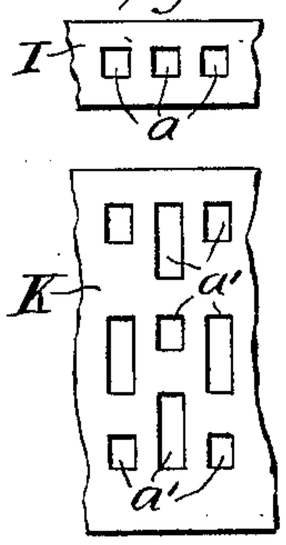

Fig. 3.

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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. 564,385, dated July 21, 1896.

Application filed July 1, 1892. Serial No. 438,645. (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 musical instruments in which a sheet of perforated paper, representing a musical composition, controls the devices which operate the sounding devices hereinafter described and claimed. It is especially adapted to pianos, but is applicable to other instruments.

In the drawings, Figure 1 is a view showing the leading features of the invention. Fig. 2 is a view of the duct-bridge and the perforated sheet. Fig. 3 is a detail view of the treadle mechanism.

A represents the strings of pianoforte, B the hammer for operating the strings, and C the rods which actuate the hammer.

The rods C are moved upward by the keys D, which are fulcrumed between their ends upon a rail D^3 on keyboard D^4 and held in position by pins D^2.

C^2 is a bell-crank lever having a damper at its upper end in contact with the strings A.

C^3 is a rod having a thumb-nut C^5.

C^4 is a pitman-rod connecting the damper-lever C^2 with an operating-motor such as H.

The keys are operated by the push-rods G acting on the keys between the fulcrum and the sounding device, which are pivoted to the pneumatic motor H, and are moved upward when the motors are inflated by air admitted through the ducts *a*.

E is a movable push-rod guide.

E^2 is a rod connected to the push-rod guide E, having a thumb-nut E^3, adapted to move the guide E manually.

E^4 is an elongated hole or opening in the keyboard D^4, long enough to permit the lateral movement of the push-rod G by the guide E.

F F′ is a bell-crank lever connected to the pneumatic motor H and to the movable guide E.

f is a rock-shaft to which one or more of the levers F are secured.

G is a push-rod pivoted to the pneumatic motor and passing through openings in guide E and keyboard D^4.

H is a pneumatic motor.

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

J is a vacuum-chamber.

K is the music-sheet having the perforations *a*′.

K^2 K^2 are bearings fixed to the hinged door V.

L is the music-sheet roller.

L′ is a take-up roller.

M is a bellows.

N N are cranks on shaft O for operating the bellows M.

N′ N′ are pitman-rods connecting the pedal-levers P with the cranks N.

N^2 N^2 are pitman-rods connecting with pedal-levers P with the bellows M.

n is a check-valve of the usual kind, having the usual vent-hole 2, so that the pneumatic H is emptied after an imperforate portion of the sheet covers an orifice of duct *a*.

When a perforation in the music-sheet comes over a duct *a*, the inrushing air closes the valve *n* down on the orifice *b*, thereby preventing the air which actuates the motor H from escaping into the vacuum-chamber J, so that the effective force of the sudden rush of air shall be exerted on the pneumatic motor H.

P^2 is the usual pedal for operating the damper by foot.

P^3 is a connecting-bar between the arm P′ and W.

P^4 P^4 are bearings for pedal-shaft P^5.

R is a pulley on shaft O.

S is a pulley driven by belt t^2.

T is a pulley on shaft O, driven by belt *t*.

U is a pulley on shaft O.

V is a hinged door.

W W^2 are pedal-arms having ball-pins connecting the pitmen N′ N′ to the cranks N N.

The pedal-shaft extends some distance along the back part of the piano, so as to bring the arms W W^2 immediately under the cranks N. The cranks N are provided with split-blocks *m*, and the ends of the pitmen N have holes large enough to surround them, and a screw m^2 connects the blocks with the pitmen N.

The operation is as follows: By turning the crank-shaft O either by the pedals or by the crank O′ a vacuum is created in the chamber J by the operation of the bellows M. As perforations a' in the music-sheet K pass over the ducts a in the duct-bridge I, the pneumatic motor H, by inrushing air, expands and moves the push-rod G upward against the key D and actuates the hammer mechanism, causing the hammer B to strike the string A, producing the requisite sound. As each key in the instrument has to operate it a pneumatic motor and push-rod, any musical composition represented by perforations in the music-sheet may be played.

For the purpose of causing a light or heavy touch of the keys, the positions of the push-rods G are varied by movable guides E, so as to strike nearer to or farther from the center of motion of the key, so as to strike the sounding device with more or less force. The guide E is arranged to be operated manually by the rod E^2, having a thumb-nut E^3. To operate the guides E automatically, it is suitably connected with one or more pneumatic motors H by an intervening bell-crank lever F and secured to a rock-shaft f, said motor being operated by air through perforations in the music-sheet. As the push-rod touches the keys near or more distant from their centers of motion at D^2, the touch will accordingly be light or heavy.

For the purpose of automatically operating the damper a lever C^2 is suitably connected with a pneumatic motor H, said motor being operated by air passing through perforations in the music-sheet. The music-sheet is fed from roller L to take-up roller L′, which are operated by the loose pulleys R and U, having pins e e^2, and the pulleys S and T, the pulleys R and U being alternately brought in engagement with pins d and d^2 in shaft O. By pushing the shaft O forward the pins d^2 and e^2 are brought into engagement and the pins e d, which are engaged during the playing of a piece, are now disengaged and the sheet is rewound back on the roller L. The music-sheet roller is removed after opening the hinged door V, bringing the door into horizontal position, when another roller may be inserted to replace the former. The pedals P are jointed, as shown, that they may be folded and placed inside the casing of the instrument.

As the actuating mechanism is intended to be operated by foot, the ordinary damper-actuating pedal cannot therefore be operated by the feet, but the damper may be operated by a hand-operated device. For this purpose a manual damper-operating device is provided in the push-bar C^3, having thumb-nut C^5.

The arms P and W are rigidly connected to the shaft P^5, as shown.

Having described my invention, I claim—

1. In an automatic musical instrument in combination, a perforated sheet, a duct-bridge having ducts a, a vacuum-chamber, a pneumatic motor, a push-rod guide and a lever operating said guide suitably connected to said pneumatic motor and guide, substantially as set forth.

2. In an automatic musical instrument, a perforated sheet, a duct-bridge having ducts a, a vacuum-chamber and means to create said vacuum, a pneumatic motor, a push-rod guide and a bell-crank lever operating said guide, suitably connected to said guide and said pneumatic motor, substantially as set forth.

3. In an automatic musical instrument, a movable guide E, a rock-shaft as f having guiding-arms F F′ and a rod as E^2 adapted to manually operate said guide, substantially as set forth.

4. In an automatic musical instrument in combination, a perforated sheet, a duct-bridge, a vacuum-chamber, a pneumatic motor, a push-rod guide and a bell-crank lever connected with said pneumatic motor and push-rod guide, substantially as set forth.

5. In an automatic musical instrument, a jointed pedal-lever projecting outside the case and having a joint adapted to fold over inside of the case, substantially as set forth.

6. In an automatic musical instrument in combination, a push-rod, a push-rod guide and means for moving it in combination with a keyboard, having an enlarged opening to permit the lateral movement of said push-rod, substantially as set forth.

7. In an automatic musical instrument in combination, a push-rod as G, a movable guide as E, a rock-shaft f having arms F F′ in combination with a pneumatic motor as H and a sounding device, substantially as set forth.

8. In an automatic musical instrument in combination, a perforated sheet, a duct-bridge, a vacuum-chamber, a pneumatic motor, a push-rod, a movable push-rod guide and means to move it, substantially as set forth.

9. In an automatic musical instrument, a key, a push-rod arranged to operate said key, a pneumatic motor and operating connections between said motor and push-rod, in combination with a movable push-rod guide through which said push-rod extends, and means controlled by said motor for moving said guide, substantially as set forth.

10. In an automatic musical instrument, a key-operating push-rod and a movable push-rod guide, operating-levers for said push-rod and push-rod guide, and a pneumatic motor whereby said operating-levers are moved into operative contact with an actuating device, substantially as set forth.

11. In an automatic musical instrument, a key, an operating push-rod therefor and means for automatically operating said push rod, a movable guide for the push-rod, and

means for moving said guide to vary the action of said push-rod upon the key, substantially as set forth.

12. In an automatic musical instrument, a key, an operating push-rod therefor, and means for automatically operating said push-rod, a movable guide for the push-rod whereby the same is adjusted to vary its action upon the key, means for automatically moving said guide, and a pull-bar connected with said guide whereby it may be manually operated when desired, substantially as set forth.

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