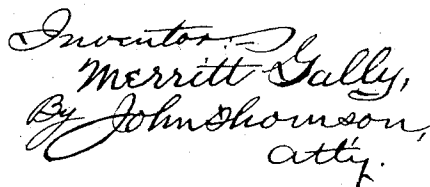


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UNITED STATES PATENT OFFICE.

MERRITT GALLY, OF NEW YORK, N. Y.

IMPROVEMENT IN MECHANICAL MUSICAL INSTRUMENTS.

Specification forming part of Letters Patent No. **210,249**, dated November 26, 1878; application filed June 14, 1878.

To all whom it may concern:

Be it known that I, MERRITT GALLY, of New York city, county and State of New York, have invented certain new and useful Improvements in Musical Instruments; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

In Figure 1, A A' C represent the pneumatic keys, substantially the same as those described in my patent of May 7, 1878, with certain modifications and devices for adapting them to different parts of the instrument. When a very rapid movement of the key is desirable I place the valve *a* to close an opening to the chamber of the key, so that the opening of the valve may accelerate the return movement of the key after its stroke is complete. In the position of rest of the key the valve *a* is held closed by the spring-tripper *b*, the end of which is bent at an angle, which rests against a bevel on the valve where the two are in contact. When the follower *d* is depressed the tripper moves with it until the next bend in the tripper is under the end of the valve. As the follower comes back on its return movement the next bend of the spring trips the valve and instantly opens the key-chamber. The valve may be held open a short or long movement, as desirable, by a proper shaping of the wire *b*, as may be seen in Fig. 3, the incline of the wire being longer or shorter for that purpose.

Fig. 4 shows a modification of the tripping-valve, the valve *a* being closed while at rest in the normal position of the key. The valve is sufficiently large to be held with some force by the exhaust when the air is being drawn from the chamber of the key. As the follower *d* is depressed the valve comes in contact with a spring-tripper, *b'*; but the spring being very light and sensitive the valve is still held by the exhaust until such exhaust is cut off by an unperforated part of the music-sheet. As the exhaust is cut off the recoil of the key, in connection with the force of the spring, opens the valve, which is held open during the return of the follower *d* until it reaches again its normal position.

When the musical tone is produced by a stroke, as on a bell or the string of a piano-forte, it is desirable to give at different times strokes of more or less power to correspond with the "expression" of the music to be rendered. For this purpose I use two or more sub-pneumatic keys, A A', any number of which may be made to act in combination on the sounding device. The line of perforations in the music-sheet corresponding with the key A opens to the air-duct R. The line of perforations representing the expression opens to the duct R'. The duct R' does not open directly into the chamber of key A', but connection is made between them by a valve, *e*.

In order that a single line of perforations may operate any one of the entire number of a complete bank of sub-pneumatic keys, the line of perforations is made to open through the duct R', leading to all the sub-keys in the bank, or any desirable number of them.

Instead of opening directly into the duct R', intervening mechanical action, pneumatically operated, may be used, if desirable, between the perforations of the sheet and the duct R'.

It will be seen, however, that the operation thus far will not yet cause any of the sub-keys to act, as their valves are all closed. When, however, any one of the primary keys is moved to produce a note, and the exhaust is operating on the duct R', the beginning of the movement of the primary key A moves with it the follower of its sub-key A', and opens valve *e* by means of the tripper *f*, which holds the valve open until the stroke is complete, when the tripper slips from its notch in the valve, and, the orifice being instantly closed, the sub-key is ready to return to place. The primary key, during the entire time of its exhaust, holds on to the note to give it its desired length. The sub-key gives its additional power to the stroke when required, the primary keys acting alone producing the softer touch.

I also construct, when desired, the tripping-valve of the primary key in the same manner as the tripping-valve of the sub-pneumatic, and place it on the upper surface of the follower *d*, the tripper projecting from above.

With another line of expression-perforations, or connected with the same, as duct R', I open

a duct, R², which operates pneumatics C to change the leverage of the devices operating to produce the stroke. As the follower *t* of pneumatics C is drawn to the right the leverage of bar X is changed in respect to the striking-pin Z, and the force of the stroke modified. The dotted line *h* represents the connection for moving the ordinary soft pedal attachment of the piano-forte, (shown as operated by the pneumatic,) to still further affect the expression of the music.

The key movement is shown in Fig. 1 as operating either on a reed of a wind instrument or piano-action. It may also be applied to any other instrument, or combination of instruments, that may be operated by mechanical movements.

The finger-keys are shown to indicate that the instrument may be played either manually or mechanically, at will. The finger-keys and the pneumatic keys are shown in the drawings as arranged to operate on the same push-pins which connect with the sounding devices.

The exhaust-bellows H and receiving-chamber G are represented diminished in size. The motor for music-sheet *m* is not shown, as any of the ordinary methods will be understood as answering the purpose.

In order that the operator may be able, when desirable, to hold on the time of a note without having to suddenly check the motor, be it whatever it may, I make the smaller fly-wheel F, which is the crank or driving wheel, loose on the motor-shaft Q, and attach to the wheel and shaft a coiled spring, J. This spring is strong enough in its tension to drive the motor-shaft without much winding. The fly-wheel E is made fast to the motor-shaft, and gives it a steady motion by its momentum. When, however, the brake *g* is applied to the wheel E the time of the shaft is retarded, while the spring J is wound by the crank-wheel until the main or driving power is gradually changed to the corresponding time, or the brake set free.

Fig. 2 shows a detached view of the motor-wheels and spring. The wheel E is made fast

to shaft Q; the wheel F loose on the shaft, but connected with it by spring J.

The several devices, essentially as shown in the drawings, may be used not only as forming a part of the construction of a musical instrument, but may be used as a movable attachment for performing upon an ordinary piano, organ, or other keyed instrument. In such case the stroke from the pin Z, or other suitable projection from the pneumatic key, may be applied directly or indirectly upon the surface of the ordinary finger-keys of the instrument, or may be applied more directly to the sounding devices independent of the finger-keys.

What I claim is—

1. The combination, with a pneumatic key-action in a mechanical musical instrument, of the perforated music-sheet and a tripping-valve, substantially as and for the purpose specified.

2. The combination, with the primary keys of a pneumatic key-action, of sub-pneumatic keys, substantially as and for the purpose specified.

3. The combination, with the sub-pneumatic key A', of air-duct R¹ and a tripping-valve operative during the movement of its primary key.

4. A movable fulcrum mechanically operated in the key-action of a musical instrument, for the purpose of increasing or diminishing the power of the stroke.

5. The combination, with pneumatic keys operated by a music-sheet, of finger-keys, the pneumatic keys and the finger-keys both arranged to act upon the push-pins Z, substantially as specified.

6. In a mechanical musical instrument, the motor-shaft Q, with a brake for retarding the same, and a yielding connection between the shaft and its driving device, substantially as and for the purpose specified.

MERRITT GALLY.

Witnesses:

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CHAS. KELLY.