O. H. NEEDHAM.

Mechanical Musical Instrument.

No. 213,442 Patented Mar. 18, 1879.

Fig 1.

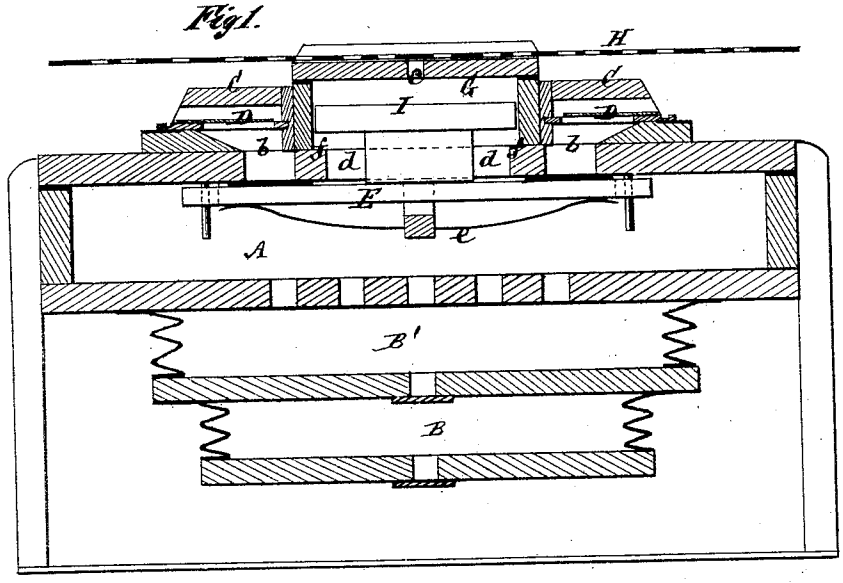


Fig 2.

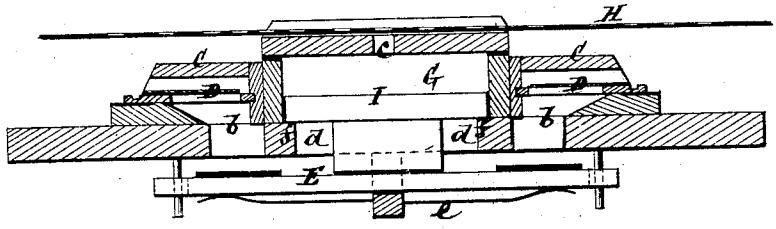
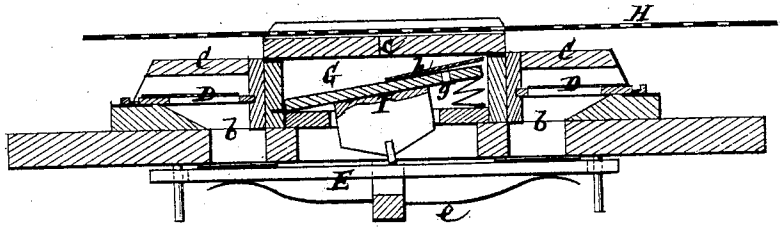


Fig 3.



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IMPROVEMENT IN MECHANICAL MUSICAL INSTRUMENTS.

Specification forming part of Letters Patent No. **213,442**, dated March 18, 1879; application filed January 9, 1879.

To all whom it may concern:

Be it known that I, ORWELL H. NEEDHAM, of the city and State of New York, have invented certain Improvements in Mechanical Musical Instruments, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form part of this specification.

This invention relates to organs and other musical instruments to be operated mechanically by what has been termed a "pneumatic key action," such action being controlled by means of one or more traveling perforated strips or sheets of paper or other suitable material, operating in combination with a suction bellows or pump.

Although the invention will here be described as automatically operating the reeds of a reed-organ, it is not restricted to any particular instrument, and may be constructed either as a part of the entire mechanism of the instrument or as an attachment to various instruments, including those having strings, bells, drums, &c. It may also be used to advantage for operating swells and tremolo actions.

The object of the invention is to provide for the free return movement of the keys of such an action; and to this end the invention consists in certain combinations with the reed-chamber of the instrument or with a main air-chamber into which air is drawn for working the said keys of supplementary air-chambers, each of which is provided with an air-inlet aperture, over or outside of which the perforated sheet or strip is arranged to travel, and with a follower or key, said supplementary air-chamber occupying an intermediate position relatively to the perforated strip and the reed-chamber or main air-chamber of the instrument, and the said follower or key being provided with a vent, by the opening and closing of which the free operation of the said follower or key is provided for, not only in the movement by which the sounding is produced, but also in the return movement.

Figure 1 represents a vertical section of a portion of a reed-organ having the invention applied, and showing a reed-valve closed; Fig. 2, a similar view to Fig. 1 of the same devices, in part, but showing the reed-valve open; and Fig. 3, a similar view to Fig. 1, in illustration of a modified construction of certain parts.

Referring, in the first instance, to Figs. 1 and 2 of the drawings, A represents the wind or main air chamber of the instrument; B, the pump or bellows, and B′ the usual yielding air-receiver, controlled by one or more springs, and in communication by valve and suitable apertures with the pump B and chamber A.

C C are reed-tubes, containing reeds D D, and in communication with the chamber A by apertures *b*. E is one of a series of valves which serve to open and close the apertures *b* leading to the reeds and controlling the reeds.

Arranged over the main air-chamber A are a series of supplementary air-chambers, G, each of which is provided with an air-inlet aperture, *c*, over or outside of which the perforated strip or sheet H is moved by any suitable means to produce the necessary musical effect. Each of these supplementary air-chambers G becomes a portion of the main-chamber A when the aperture *c* is closed by an unperforated portion of the strip H, but becomes an outside or independent chamber when the aperture *c* is opened by a perforated portion of the strip passing over it. To these ends each supplementary air-chamber G is in open communication by an opening, *d*, with the air-chamber A, and contains within it a follower or pneumatic key, I, which rests upon or is otherwise suitably connected with the reed-valve E, it serves to control, and which follower serves, when air is admitted through the aperture *c*, as a perforated portion of the strip H passes over the latter, both to open the reed-valve against the pressure of a suitable closing spring, *e*, thus allowing of the reed D being sounded, and by its coming down upon a seat, *f*, in the supplementary air-chamber G to shut off air from entering the main-chamber A by the apertures *c d*. This follower or pneumatic key I is of nearly the same size as the chamber G, so as to freely work within the latter, leaving only a moderate vent or space for leakage around it; consequently the pressure of the air in the main chamber A is not materially impaired by incoming air through the aperture *c* when the key I is closing, and when said key is closed over the aperture *d*

ingress of air by the said aperture *d* is still further stopped during any remaining travel of the perforated portion of the strip over the aperture *c*, thus reducing waste of air and power in working the instrument.

Furthermore, when an unperforated portion of the strip H comes over the aperture *c* the vent or leakage space around the key I serves to convert the air-chamber G from an outside or independent one to an integral portion of the main chamber A, and to establish an approximate equilibrium of pressure on opposite sides of the key I, thus providing for a free return action of the key and of the reed-valve controlled by it, external air-pressure, either directly or indirectly, on the reed-valve being shut off during the closing of the latter by the unperforated portion of the strip H over the aperture *c*.

In this way or by these means a quick and lively action is obtained for the reed-valve in closing, and there is but little waste of air in the working of said valve; but to still further reduce waste of air and power the key I, instead of being constructed as represented in Figs. 1 and 2, may be constructed, as represented in Fig. 3, of a hinged and close diaphragm form relatively to its seat *f*, with one or more air-vents, *g*, through it, covered by an elastic valve, *h*, so that as the vented key I commences to close by an unperforated portion of the strip H coming over the aperture *c*, the valve *h* will nearly shut down over the air-vent *g*, and restrict ingress of external air through it, and will cause to be utilized nearly the whole of such incoming air through the aperture *c* to the opening of the reed-valve E. When, however, an unperforated portion of the strip H comes over the aperture *c*, and closes further ingress of air by said aperture *c*, the air contained in the outer portion of the the supplementary air-chamber G will pass through the aperture *g* of the key I till a sufficient difference of pressure is established on opposite sides of it for the spring *e* of the reed-valve to close the latter.

The pneumatic key-action herein described is not applicable to reed instruments only, but to others by a suitable connection of the vented followers or keys in the supplementary air-chambers with sounding or playing devices other than reeds, so that the main air-chamber is not necessarily a reed one. Furthermore, independent bellows or pumps, if desired, may be used—that is, in the case of a reed-instrument—one pump for working the reeds, and the other for working the keys.

I claim—

1. In a mechanical musical instrument, in which the required musical effect is produced or controlled by one or more traveling perforated strips or sheets, the combination, with a reed-chamber or main air-chamber, of supplementary air-chambers arranged between the perforated strips and the main air-chamber, and provided with air-inlet apertures, over or outside of which the perforated strips pass, and containing followers or keys, substantially as specified, for operation as set forth.

2. The combination of the reed-chamber or main air-chamber A, the reeds D, the valves E, the supplementary air-chambers G, having air-inlets *c*, adapted to be opened and closed by perforated strips or sheets, as described, and the vented followers or keys I, substantially as shown and described.

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