P. EHRLICH.

AUTOMATIC MUSICAL INSTRUMENT.

No. 184,600. Patented Nov. 21, 1876.

Fig. I.

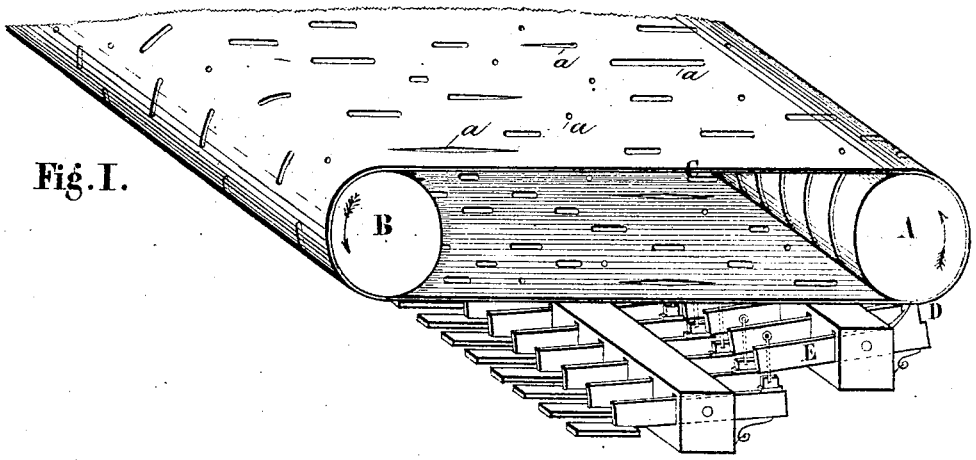


Fig. II.

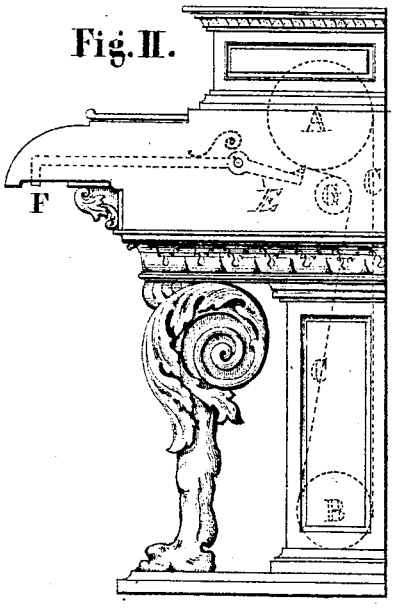
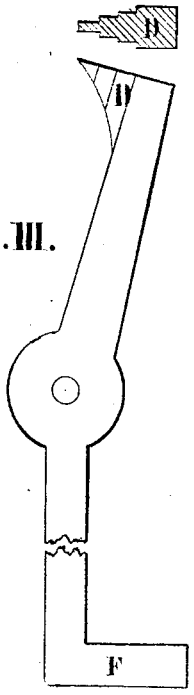


Fig. III.



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PAUL EHRLICH, OF GOHLIS, NEAR LEIPSIC, GERMANY.

IMPROVEMENT IN AUTOMATIC MUSICAL INSTRUMENTS.

Specification forming part of Letters Patent No. **184,600**, dated November 21, 1876; application filed October 3, 1876.

To all whom it may concern:

Be it known that I, PAUL EHRLICH, of Gohlis, near Leipsic, Saxony, Germany, have invented a certain new and useful Improvement in Musical Instruments, of which the following is a specification:

My invention is adapted for use with musical instruments, such as hand-organs, music-boxes, orchestrions, &c., wherein the vibrations producing the different tones are at present obtained by means of pegs or cams fixed on a slowly-turning cylinder, and made to move levers which, according to the kind of instrument, (such as organs, for instance,) open valves which allow the wind to pass into the corresponding pipes, in automatic pianos strike the strings, and in music-boxes set the oscillating tongues in direct vibration. This construction and mode of operation have the disadvantage that each instrument can be made to produce but a very few pieces of music, since a series of cams playing a different piece can only be brought into operative position by a lateral shifting of their carrier, which movement is necessarily very limited. If, for instance, a common hand-organ should be constructed so as to play more than four or five pieces, a duplicate cam-cylinder would be necessary, the price of which is well known to be very high. By the use of an endless perforated apron such mechanical instruments have been arranged to play any number of pieces, as well such as cannot be adapted to such instruments by reason of their great length; but such aprons actuating the note producing mechanism have not heretofore been constructed so as to effect the swelling and deadening (crescendo and decrescendo) of sounds.

My improved apparatus for governing the automatic production of the tones in musical instruments consists, mainly, in providing the endless apron with perforations of peculiar form, whereby a variable quality of sound is imparted to the notes, and it differs from the preceding devices in the arrangement of the cylinders and cams, as is particularly hereinafter set forth.

Instead of one cylinder, I provide two, A B, or more, and stretch over them an endless music-sheet, C, in the form of an endless belt. This music-sheet is cheaply manufactured of strong paper, or paper pasted on linen cloth, and, for better instruments, of thin sheet metal, &c. The music-sheet is, in certain places, provided with oblong or circular holes *a*, the form and position of which depend upon the kind of notes to be provided, as well as the time of their production, exactly in the same way as the cams of the ordinary cylinders are fixed at determinate points.

In producing the music-sheets upon a large scale, they may be made by large punches in a cheap and easy way, while the cylinders or barrels at present employed must be made by hand at a considerable cost. The number of pieces which a machine instrument may thus be made to produce becomes almost unlimited, and such instruments as the common hand-organ thereby lose their objectionable property of repeating the same four or six pieces again and again.

The movement of the music-sheet to produce the sounds is obtained in my apparatus by the following means: The noses D of the levers E, Fig. 1, fall into the holes of the music-sheet as the latter is moved to bring its holes into proper position by the revolution of the cylinders A and B.

When the hole in the music-sheet is a round one, the lever E will be quickly vibrated, and the sound produced will evidently be short. If the hole is of oblong form, the lever will keep the pipe open for a longer period, and the sound will be lengthened. When the holes are made narrow at their beginning, and widen more and more toward their end, they will allow the conical nose D to enter at first but slightly, and then to sink in deeper gradually, so as to open the pipe at first just a little, giving a weak tone, which swells out more and more to the strongest "forte" in proportion to the widening of the said hole. A softening of the sounds can be produced in the same way, only the holes must be formed so that the wider end is presented first to the noses of the levers E. When the holes in the music-sheet are given different widths, and many are so related that several tones are sounded simultaneously, said notes may vary in strength so as to accord in perfect harmony.

The valves opening the pipes are represented in Fig. 1 as lifting, and the pipe is opened

suddenly to some extent, so that the crescendo and decrescendo, according to the above arrangement, is but of little importance. In better instruments, however, the valves will, by an arrangement of levers, be made to slide in the foot of the pipes, so that the intonation of the sounds will correspond exactly with the width of opening of the valves. It is obvious, therefore, that music-pieces may be played with all possible tenderness and exactness.

One very important improvement in my apparatus consi ts in the cylinder A being provided with grooves in its periphery, as shown in Fig. 1, whereby the noses D of the levers E are allowed to enter as deeply as the width of the hole in the music-sheets admits, and not be limited in this motion to the thickness of the paper alone.

The hereinbefore-described arrangement is especially intended for organs, harmoniums, and similar wind-instruments.

The application of my playing-machine to a piano is represented by Fig. 2. The playing-machine may be constructed to form an ornamental piece of furniture, polished and built in the same style as a piano. It may be placed at the side of the instrument, and for use is placed before it, so that the hammers F are directly over the keys. The disposition of the cylinders A B, the music-sheet C, and the stretching-cylinder G will be understood from the drawing.

The noses D of the play-levers E F are not wedge-shaped in this case, but have the form of steps, as Fig. 3 shows clearly, so that the hammer can strike the key but slightly when a narrow hole passes before the nose, which falls quite through when a wide hole passes, and thereby produces a strong sound. Here the music-sheet has only rectangular holes, long and short, according to the necessity of lengthening the tones.

The pedals may be moved by turning a crank, or by any other means; or the pedal may be connected with the mechanism in any convenient way.

It is evident that this mechanism admits of playing all kinds of pieces on an instrument so much in use as the piano, and that the music-sheet may be so cheaply manufactured as to cost but little more than an ordinary sheet of printed music.

In applying the apparatus to such instruments as music-boxes, I provide the ends of the vibrating levers with hooks similar to the noses D, falling into the holes of the music-sheet, and thereby vibrating the tongues. The grooves of the cylinder ought to be here, of course, very deep, to allow a free oscillation.

It is to be understood that the music-sheet might be a long strip fed over the cylinder A in a manner similar to the mode of operating the pattern-card in a loom. This form of the invention will provide for a tune of very great length.

What is claimed is—

1. An endless sheet for actuating the note-producing mechanism of a musical instrument, perforated with holes of varying widths, substantially as described.

2. The endless perforated sheet, in combination with the grooved carrying-cylinder A, substantially as described.

3. The levers having conical or stepped noses, in combination with the sheet perforated with holes of varying widths, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PAUL EHRLICH.

Witnesses:

ROBERT SCHLIEDER, *Architect*,

HEINRICH KREUZER.