(No Model.)

2 Sheets—Sheet 1.

F. E. P. EHRLICH.

MECHANICAL MUSICAL INSTRUMENT.

No. 433,935. Patented Aug. 12, 1890.

Fig. 1.

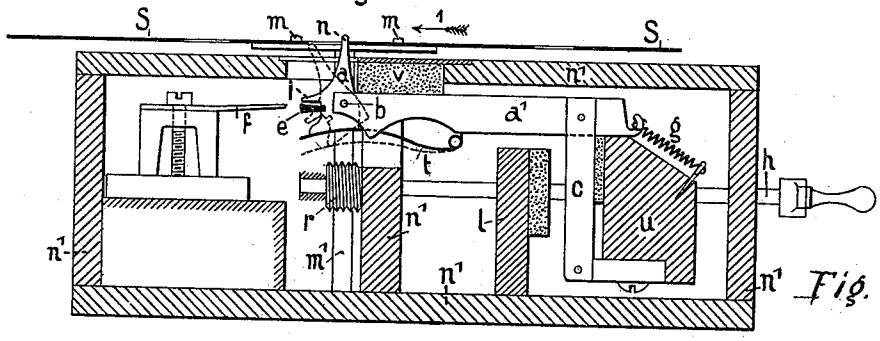

Fig. 3.

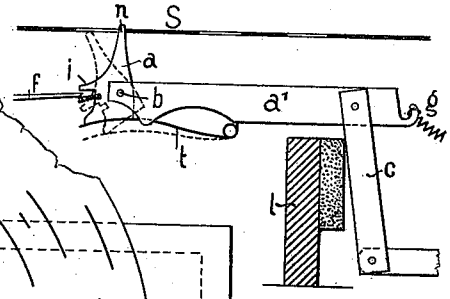

Fig. 2.

Witnesses:
Everard Peck
William H. Shipley

Inventor:
F. E. P. Ehrlich
by Marshall Bailey
his attorney

(No Model.) 2 Sheets—Sheet 2.

F. E. P. EHRLICH.

MECHANICAL MUSICAL INSTRUMENT.

No. 433,935. Patented Aug. 12, 1890.

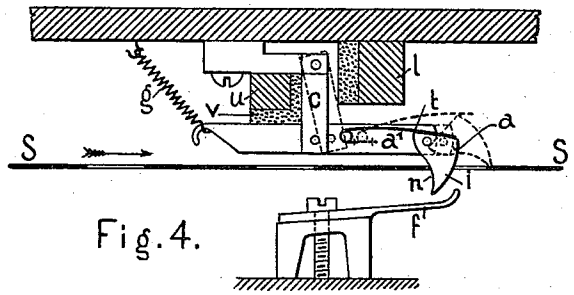

Fig. 4.

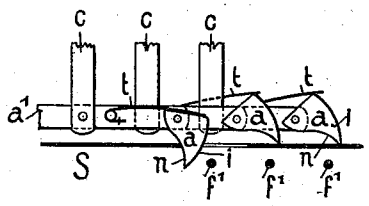

Fig. 5.

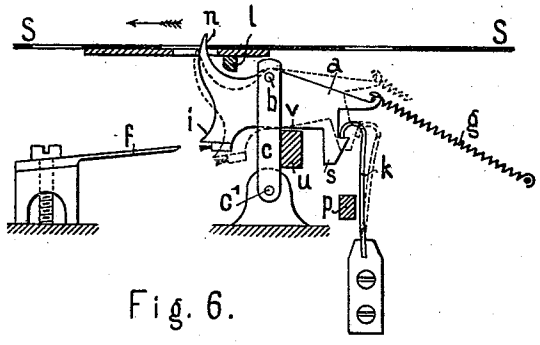

Fig. 6.

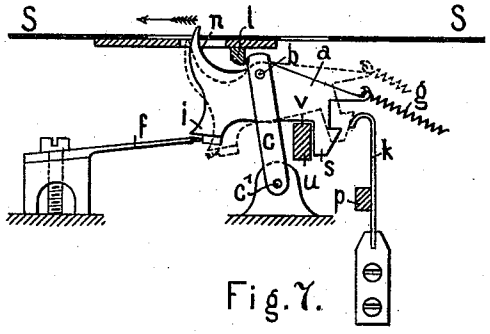

Fig. 7.

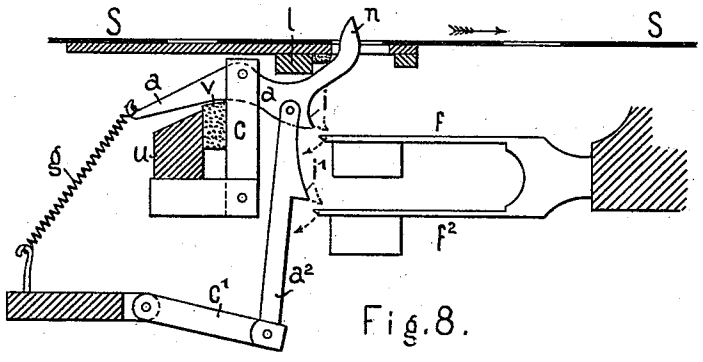

Fig. 8.

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his attorney.

UNITED STATES PATENT OFFICE.

FRIEDRICH ERNST PAUL EHRLICH, OF GOHLIS, GERMANY.

MECHANICAL MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 433,935, dated August 12, 1890.

Application filed January 6, 1890. Serial No. 335,948. (No model.) Patented in Switzerland December 20, 1888, No. 402.

To all whom it may concern:

Be it known that I, FRIEDRICH ERNST PAUL EHRLICH, a subject of the King of Saxony, residing at Gohlis, near Leipsic, Saxony, have invented new and useful Improvements in Mechanical Musical Instruments, (for which I have obtained Letters Patent in Switzerland, dated December 20, 1888, No. 402,) whereof the following is a specification.

My invention relates to mechanical musical instruments the sound-producing devices whereof consist in tongues, tines, or strings, and in which the operations of the mechanisms that cause the tongues, tines, or strings to vibrate is dependent upon an exchangeable music-sheet having perforations or recesses corresponding to the notes to be played. In instruments of this kind the said operations have heretofore ordinarily been produced by special driving devices connected to the crank of the instrument, while the music-sheets have served merely to control them. Now, the object of my invention is to obtain the said operations directly by means of the music-sheets, and thus to do away with the said special driving devices. The main instrumentality which I employ for this purpose consists in an oscillating piece having two tappets or fingers, one that serves to sound the tongue, tine, or string, and another against which the edges of the recesses or perforations of the music-sheet act. The said oscillating piece (tappet-piece) turns on a pin or pivot guided to move parallel to the music-sheet, or nearly so, and it is placed under the action of a spring or springs, which on one hand tend to draw it backward and on the other hand to put and maintain it in engagement with the music-sheet. By means of the said sheet and spring or springs the tappet-piece is so operated upon that the sounding-finger is first raised and moved forward into the path of oscillation of the tongue, &c., that thereupon it is caused to carry out an angular movement, so as to bend and slip past the tongue, and that finally it is withdrawn to its normal position or position of rest. In certain cases the two aforesaid fingers may be united into one which fulfills the functions of both.

In the annexed drawings, Figure 1 is a sectional view of a musical instrument having vibrating tongues and carried out according to my invention. Fig. 2 is a plan corresponding to Fig. 1. Fig. 3 shows the parts of the mechanism in different positions. Figs. 4 and 5 represent the mechanism modified in form and applied, respectively, to vibrating tongues and to strings. Figs. 6 and 7 are two views of a simplified arrangement of a tongue-operating mechanism. Fig. 8 represents this mechanism with a part added thereto for sounding another tongue simultaneously with the first one.

In Figs. 1 and 2, S is a perforated circular music-sheet carried by a disk at the top of the shaft m', which is rotated by means of a crank-shaft h and worm-wheel gearing, the sheet being caused to partake of the motion of the said disk by pins m, as usual. Instead of this sheet, a music-sheet S′, (indicated in Fig. 2 by broken lines,) which has the form of a band and is moved in a straight line, may be employed.

a is the tappet-piece having the fingers or tappets n and i, the former engaging with the perforations of the disk S, while the latter serves to sound the tongue or tine f. The tappet-piece is pivoted at b to a bar a', which in turn is pivoted to the oscillating arm c.

g is a spring connected to the rear end of bar a' and placed in an inclined position for the purpose of drawing the bar a' backward and pressing its fore end together with the piece a upward.

t is a spring fixed to the bar a' and acting against the lower surface of the tappet-piece, so that it tends to keep the said piece in upright position.

l and u are bars faced with felt, which serve as stops to limit the motion of the arm c, and v is a piece having the office to guide the bar a'.

The dotted lines in Fig. 1 show the tappet-piece in its normal position or position of repose, the piece being kept in an inclined state by the sheet S bearing with a solid portion against the finger n and preventing the spring t from raising it. As soon, however, as the forward edge of any perforation of the sheet S moving in the direction of arrow 1 has cleared the finger n, the spring t turns the piece a into upright position, (shown by full lines,) the finger being then engaged in the

perforation. Thereupon the rear edge of the latter, bearing against the said finger, pushes the piece *a* forward, together with the bar *a'*, against the strain of the spring *g* until the arm *c* touches the bar *l*, condition for this operation being, however, that the spring *t* have strength enough as not to yield to the pressure of the piece *a* so long as the only resistance to the motion of the parts *a*, *a'*, and *c* consists in the tension of the spring *g*. By the said motion, which puts the parts into the position shown by full lines in Fig. 3, the finger *i* is brought over the tip of the tongue *f*. The parts *a'* and *c* being now stopped by the bar *l*, the operating edge of the perforation in the music-sheet, proceeding to move forward, will turn the piece *a* about its fulcrum, thereby depressing the finger *i*, which consequently first bends the tongue *f* and then slips past it so as to put it in vibration. When the piece *a* has been turned over far enough so that the solid portion of the music-sheet may pass over the finger *n*, (see dotted position in Fig. 3,) the spring *g* draws the parts *a*, *a'*, and *c* back to their normal position.

The little brush *e*, fixed to the piece *a* below the finger *i*, serves as damper to stop any vibrations of the tongue previous to its being touched by the said finger.

The mechanism shown by Fig. 4 differs from the one described mainly in this, that the two fingers *n* and *i* are united into one, the rear edge of the single finger being the equivalent of the finger *n* and the fore edge that of the finger *i*. The said edges are therefore respectively marked in the figure by the same letters of reference. The whole mechanism is inverted and the tongue *f* is placed below the same and bent upward at its end, so as to be in the path of the edge *i* when the same moves forward. The mechanism carried out in this form is also adapted to be applied to string-instruments, as shown by Fig. 5, which represents the operating portions of three mechanisms and three strings *f'*, the former being placed laterally to each other and one forward of the other by an amount equal to the distance between the strings.

In the simplified disposition represented by Figs. 6 and 7 the tappet-piece *a* is provided with the two fingers or tappets *n* and *i* as portions thereof, and it is pivoted directly to the arm *c*.

The dotted lines in Fig. 6 show the parts in their position of rest. When a perforation of sheet S comes into register with the finger *n*, the spring *g* causes the tappet-piece to turn about its fulcrum until its lower edge rests on the upper surface of the bar *u*, (which is in this case the guiding-surface *v*,) the finger *n* thereby engaging in the said perforation, as shown by full lines in Fig. 6. The sheet S then pushes the tappet-piece forward against the force of the spring *g*, which, by drawing the rear end of the said piece downward, meanwhile prevents it from being rotated, and this motion continues until the arm C touches against the bar *l*, the finger *i* being at the time above the end of the tongue *f*. (See full lines in Fig. 7.) Thereupon the sheet S, continuing to press against the finger *n*, turns the tappet-piece so as to cause the finger *i* to sound the tongue *f*, and when the piece has attained the position shown by dotted lines in Fig. 7 the spring *g* retracts the same to its position of rest.

In view of increasing the certainty of action of the mechanism and of preventing the tappet-piece from being turned before the proper time by the sheet S, a resilient hook *k* has been arranged, which is adapted to cooperate with a projection *s* formed on the said piece. As soon as the latter is brought into the position shown by full lines in Fig. 6, the hook *k* engages with the projection *s* and remains in engagement therewith by virtue of its resiliency until it is retained by the bar *p*, the projection *s* being then free to slip away from under the hook so that the tappet-piece may turn.

Fig. 8 is a view of a mechanism substantially alike to the foregoing, but having combined with it another tongue f^2 and a tappet-piece a^2, provided with a finger *i'* for sounding the said tongue, the piece a^2 being pivoted to the tappet-piece *a* and guided by an arm *c'*.

I claim as my invention—

1. The combination of a perforated music-sheet, a vibrating tongue or string, a tappet-piece *a*, having the fingers *n* and *i* or their described equivalent, and pivot *b*, oscillating arm *c*, carrying the tappet-piece, stopping-bars *u* and *l*, spring *g*, whereby the piece *a* is impelled backward and with its finger *n* toward the music-sheet, and guides *v*, substantially as specified.

2. The combination of a perforated music-sheet, a vibrating tongue or string, a tappet-piece having the fingers *n* and *i* or their described equivalent and pivot *b*, bar *a'*, to which the piece *a* is pivoted, oscillating arm *c*, carrying the arm *a'*, and the tappet-piece, spring *g*, whereby the bar *a'* and the piece *a* are impelled backward and the latter is impelled with its finger *n* toward the music-sheet, spring *t*, fixed to arm *a'* and acting on piece *a*, stopping-bars *u* and *l*, and guide *v*, substantially as described.

3. The combination of a perforated music-sheet, the vibrating tongues *f* f^2, the pivoting tappet-piece *a*, having the fingers *n* and *i*, arm *c*, spring *g*, stopping-bars *u* and *l*, guide *v*, tappet-piece a^2, connected to the piece *a*, and having the finger *i'*, and arm *c'*, substantially as specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FRIEDRICH ERNST PAUL EHRLICH.

Witnesses:

CARL BORNGRAEBER,

HENRY W. DIEDERICH.