

No. 650,268.

Patented May 22, 1900.

P. NORWOOD.
MUSIC ROLL PUNCH.

(Application filed Nov. 29, 1899.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

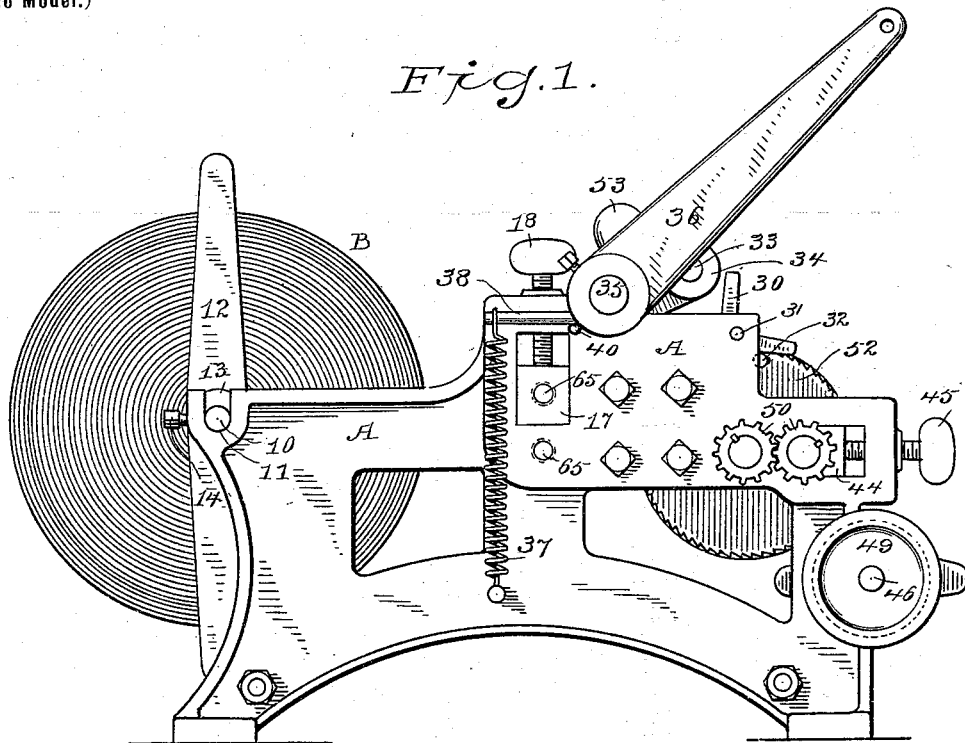


Fig. 2.

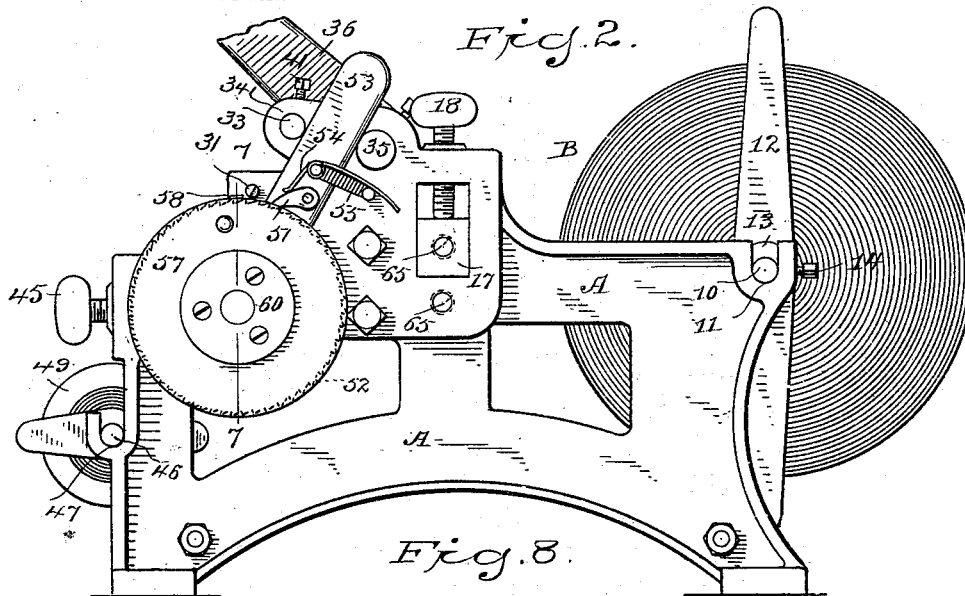
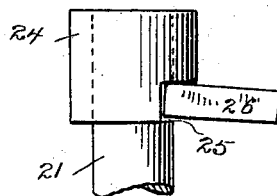


Fig. 3.



WITNESSES

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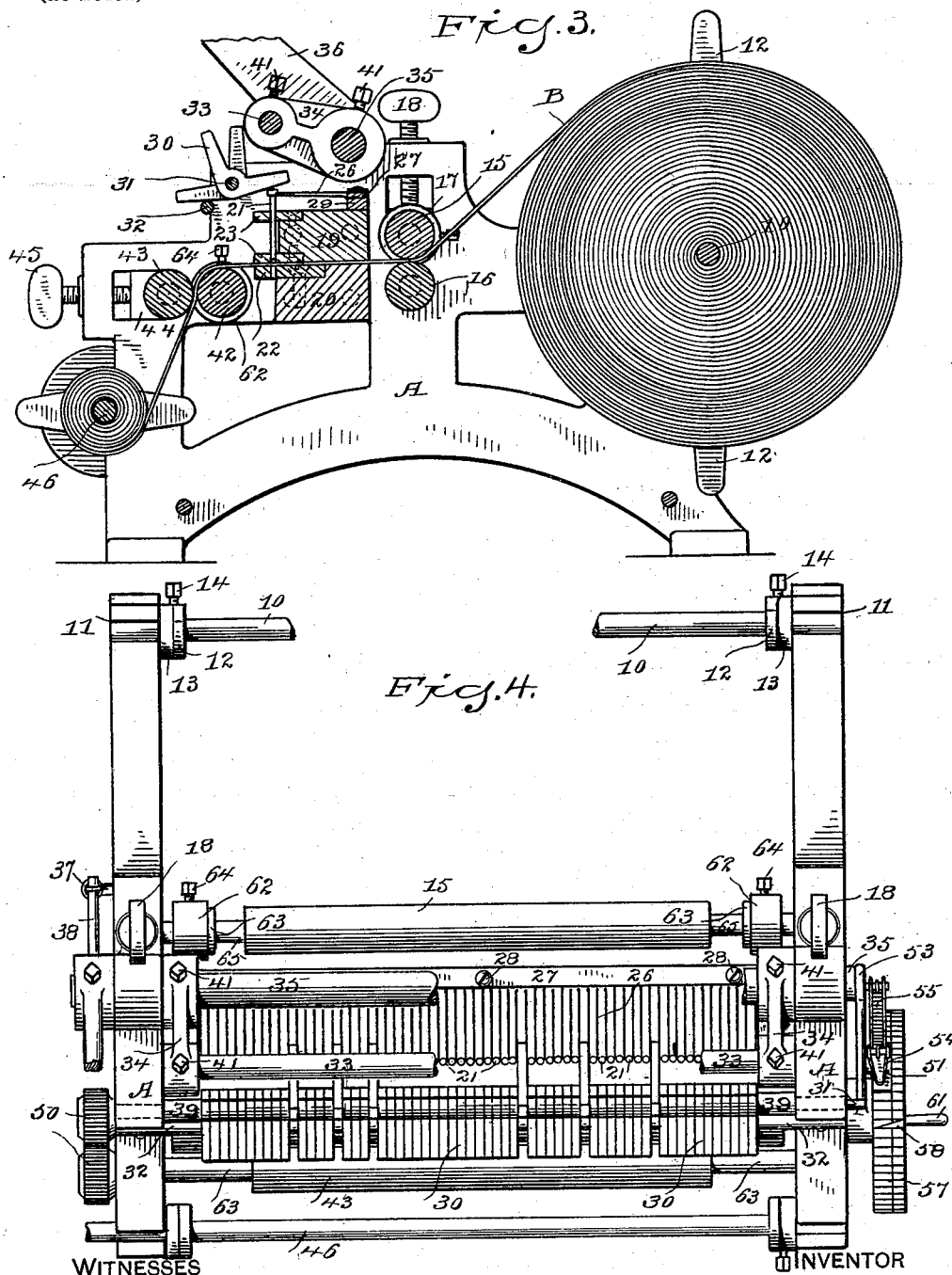
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3 Sheets—Sheet 2.



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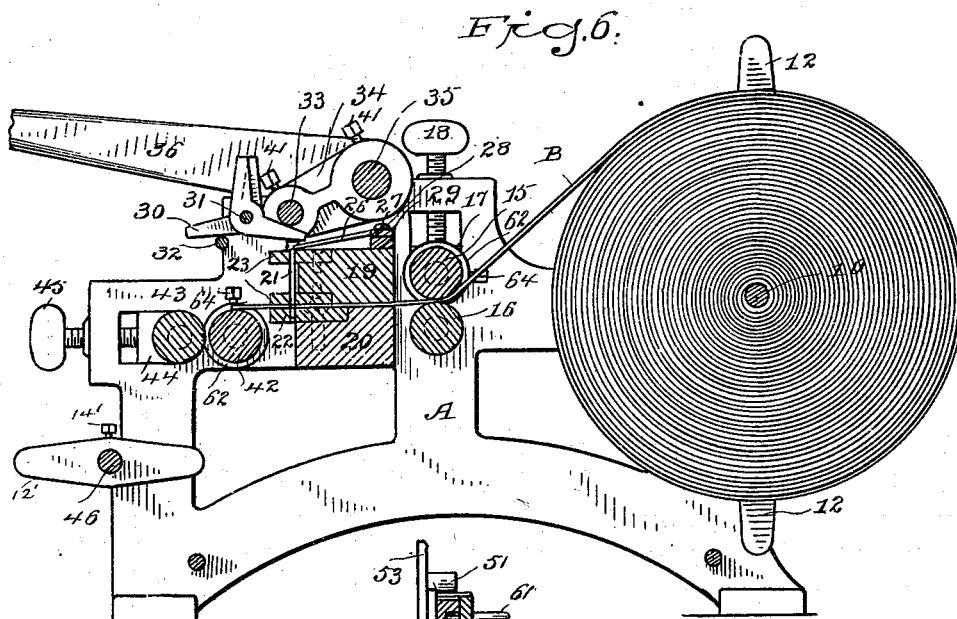
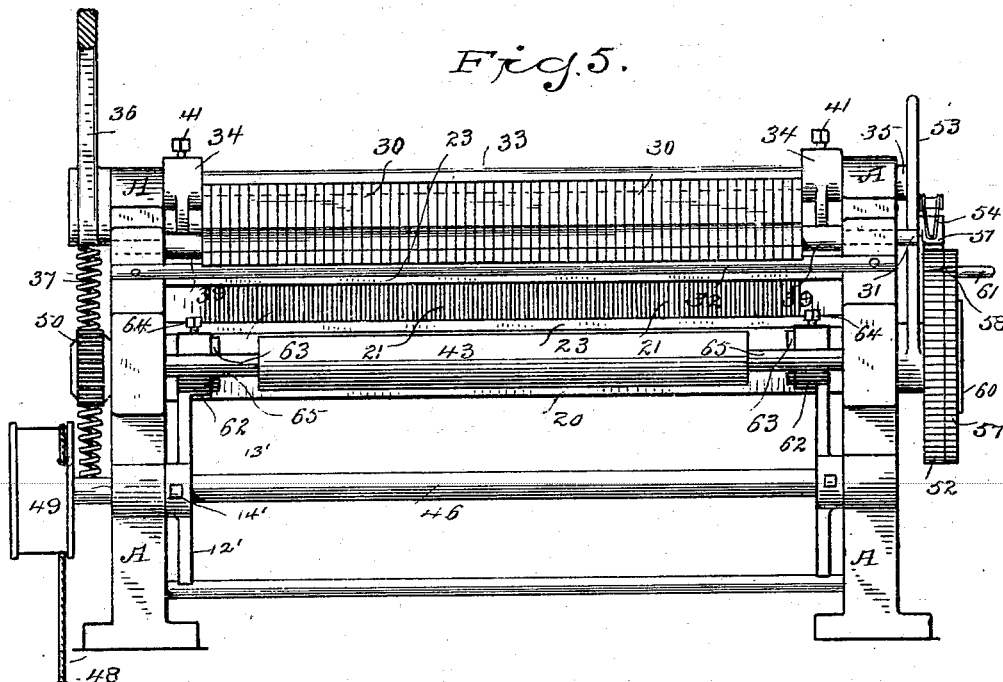
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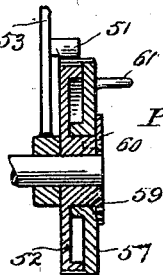
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3 Sheets—Sheet 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

PAUL NORWOOD, OF ANSONIA, CONNECTICUT.

MUSIC-ROLL PUNCH.

SPECIFICATION forming part of Letters Patent No. 650,268, dated May 22, 1900.

Application filed November 29, 1899. Serial No. 738,655. (No model.)

To all whom it may concern:

Be it known that I, PAUL NORWOOD, a citizen of the United States, residing at Ansonia, county of New Haven, State of Connecticut, have invented a new and useful Music-Roll Punch; of which the following is a specification.

My invention has for its object to provide a punch which will enable music-dealers and musicians to make their own music-rolls for use in pianolas, angeluses, æolians, and other mechanical musical instruments, it being simply necessary in order to produce music-rolls with my novel punch for a person having a slight knowledge of the theory of music to place before him the score of a piece of music which it is desired to play upon a mechanical instrument and then to punch in one or more strips of any suitable material—as paper, glazed linen or cotton or thin metal—the openings necessary to produce the desired result, music-rolls produced by my novel punch being for all practical purposes identical with and in some respects superior to music-rolls now in use, and which are, moreover, so expensive to produce as to make it impossible for musicians or even for music-dealers to produce them. In order to overcome this serious objection to the common use of mechanical musical instruments—i. e., the cost of the music-rolls—and make it quite practicable for musicians and music-dealers to produce their own music-rolls, I have devised the novel music-roll punch which I will now describe, referring by reference characters to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation of the machine complete; Fig. 2, a reverse side elevation thereof; Fig. 3, a vertical section; Fig. 4, a plan view, certain parts being broken away; Fig. 5, a front elevation; Fig. 6, a vertical section corresponding substantially with Fig. 3, but showing an operating position of the parts; Fig. 7, a detail sectional view on the line 7 7 in Fig. 2, illustrating the construction of the counting device; and Fig. 8 is a greatly-exaggerated detail view of one of the punch-heads and the corresponding lifting-spring.

A denotes the framework, which may be of any ordinary or preferred construction, and B

a strip of paper or other suitable material, the supply of material being wound on a roll 10, the ends of which are received in sockets 11 in the framework. As the material of which the rolls are made is not of the essence of my invention and as paper is the material ordinarily used, I shall refer to that material only in this specification. For convenience in illustration I have shown but one supply-roll in the drawings. It will be perfectly obvious, however, that a plurality of supply-rolls may be used and a plurality of music-rolls made at the same time by supporting a number of supply-rolls on separate suitable bearings and leading the several sheets of paper through the machine together or superimposed, the number depending, of course, upon the material used and the strength of the machine, as well as upon the strength of the operator.

The paper upon roll 10 is centered thereon and is caused to feed freely by means of guides 12, whose hubs 13 are adapted to slide on the rolls and are locked in place by set-screws 14. The strip of paper to be operated upon passes from the supply-roll between tension-rolls 15 and 16, one of which—in the present instance tension-roll 15—is journaled in boxes 17, which are adapted to slide in the framework and are adjusted and retained in position by means of screws 18, which pass through a portion of the framework. The strip of paper next passes between upper and lower blocks 19 and 20.

21 denotes the punches, and 22 a bed-plate coacting therewith, the bed-plate being rigidly secured to block 20 and the punches being adapted to slide in openings through guide-plates 23, which are rigidly secured to block 19. The punches are provided with heads 24, having recesses 25, which are engaged by springs 26, the action of which is to retain the punches at the raised position. These springs may be independent, if preferred, or may all be formed from a single plate of metal having a back 27, by which said plate and the entire set of springs are secured to a cross-piece 29 by means of screws 28. The number of punches and springs corresponds with the greatest number of notes in the compass of any instrument for which music-rolls are to be made.

30 denotes a series of pivoted punch-se-

lectors corresponding in number with the punches. These selectors I have shown as bell-crank levers in shape, although that is by no means an essential feature of construction. It is essential, however, to the simplicity of my machine and the ease with which it is utilized for the purpose described that the selectors shall be pivoted and each have an integral arm adapted to be laid on or removed from contact with the head of its respective punch 21, and preferably another arm by means of which the selector may be turned on its pivot to move it into or out of operative position. These selectors are adapted to be oscillated on a cross-rod 31 and to rest when out of operative position on a cross-rod 32. In Fig. 5 the punch-selectors are all shown as out of operative position, and in Figs. 3, 4, and 6 they are shown as partly in and partly out of operative position, as during the operation of making a music-roll. These selectors lie normally out of operative position—that is, out of engagement with the punches and resting on cross-rod 32. They are retained in alignment by means of sleeves 39 on cross-rod 31, which lie between the end selectors and the framework and are placed in operative position by simply turning them on rod 31 and placing them in engagement with the heads of the punches. In practice these punch-selectors may be marked in any way to correspond with the notes it is required to produce—that is, they may be marked to correspond with the letters of the musical scale or a portion of them may be made white and a portion black to correspond with the white and black notes of the keyboard of a musical instrument. The punch-selectors that may be in operative position at any time are operated and caused to actuate the corresponding punches in making a music-roll by means of an operating-rod 33, which is carried by arms 34, extending from a rock-shaft 35, which is journaled in the framework and is provided with a hand-lever 36, by which it is oscillated to cause the selectors that have been placed in operative position to press down the corresponding punches, as will be more fully explained. The operating-rod is retained at its normal or inoperative position by means of a spring 37, one end of which is attached to the framework and the other to a pin 38, extending from the hub of hand-lever 36, the upward movement of said lever being stopped against the power of the spring in any suitable manner, as by a pin 40, which is engaged by pin 38. Operating-rod 33 is locked in arms 34, and said arms are locked to the rock-shaft in any suitable manner, as by set-screws 41.

The strip of paper is drawn from the supply-roll through the tension-rolls and under the punches by means of feed-rolls 42 and 43, one of which—in the present instance feed-roll 43—is journaled in boxes 44, which are movable in the framework and are locked in position after adjustment by means of screws

45. The music-roll as completed is wound upon a roll 46, journaled in sockets 47 in the framework. This winding-roll is provided with guides 12', whose hubs 13' are locked to the roll by means of set-screws 14' in the same manner as the guides upon the supply-roll. The winding-roll may be operated in any suitable manner, as by a weight (not shown) attached to a cord 48, which passes over a pulley 49 on the end of the winding-roll, the latter passing through the sockets and extending outward from the framework. Feed-roll 43 receives motion from feed-roll 42 by means of gear-wheels 50 on said rolls outside of the framework. Feed-roll 42 is driven by means of a pawl 51, engaging a ratchet-wheel 52, fixed to said roll, said pawl being carried by a hand-lever 53, which is adapted to oscillate on the same axis as that of the roll.

54 denotes a spring whose action is to retain the pawl in engagement with the teeth of the ratchet, and 55 a spring whose action is to retain hand-lever 53 in the retracted position, said hand-lever being stopped in its retracted position in any suitable manner, as by engagement with the end of the rock-shaft, (see Fig. 2,) and at the other extreme of its movement by engagement with cross-rod 31, which extends through and slightly beyond the framework.

In order that the operator may tell at a glance at any time just how many actuations of a punch have been made in a measure or in punching a long note, I have provided a counting-disk 57, carrying a pointer 58, which operates in connection with the ratchet-wheel. The counting-disk is free to be turned on the hub 59 of the ratchet-wheel, but is held in any position in which it may be placed, so as to normally turn with the ratchet-wheel, by means of a friction-washer 60, carried by the reduced end 65 of the driving feed-roll.

61 is a handpiece for convenience in turning the counting-disk. In practice graduations are conveniently placed for counting. For example, in Fig. 4 I have shown graduations upon the periphery of the counting-disk, these graduations being in practice provided with corresponding numerals. In starting upon a measure or upon a note the counting-disk is turned by means of the handpiece and the pointer is caused to register with the tooth of the ratchet-wheel with which the pawl is in engagement. As the feed-ratchet is actuated in punching notes the counting-disk will move with it and the graduations and numerals upon its periphery will indicate the number of actuations of the feed-ratchet since the pointer was set—i. e., the number of punches made in a measure or in punching a note. As soon as the measure or note is finished the counting-disk is oscillated again by means of the handpiece to cause the pointer to again register with the tooth of the ratchet-wheel which is engaged by the pawl, it being understood that while the friction-washer holds the counting-disk firmly in position and pre-

vents it from being moved in use it permits it to be moved freely by the operator.

In order to provide for making rolls for instruments requiring different widths of rolls, I reduce the ends 65 of both the tension-rolls and the feed-rolls, as is clearly shown in Figs. 4 and 5, and provide sliding collars 62 on the reduced ends of rolls 15 and 42. These collars are provided with reduced portions 63, whose diameters correspond with the diameters of the rolls proper, and said collars are locked in place on the reduced ends by set-screws 64. For the narrowest width of music-rolls the collars are set up close to the ends of the rolls proper. For wider music-rolls the collars are moved outward away from the ends of the rolls proper, as in Fig. 4, the collars being adjusted in each instance so that the edges of the strip of paper will rest upon reduced portions 63 and against the shoulders at the ends of said reduced portions. The corresponding roll in each pair is made short enough to lie between the collars at their closest adjustment.

The operation is as follows: The punches may of course be of any required diameter; but for making music-rolls for the ordinary mechanical musical instruments—*i. e.*, pianolas, angeluses, and æolians—as at present made they are one-tenth of an inch in diameter. The necessary feeding movement must be one-half the diameter of the punches; otherwise it would be impossible to produce music-rolls that would cause one key to be released at the instant another was depressed, as is necessary in order to produce a legato effect in rendering a piece of music. The number of teeth, therefore, in the feed-ratchet must correspond with the number of twentieths of an inch in the periphery of the driving feed-roll. The note of least value in a piece of music is taken as the unit and may be produced by one or any number of punches, but preferably by one punch. For example, taking a sixty-fourth note as the unit and allowing one punch for each sixty-fourth note, a thirty-second note would require two punches, a sixteenth note four punches, an eighth note eight punches, a quarter-note sixteen punches, a half-note thirty-two punches, and a whole note sixty-four punches. For a moderately-fast piece, in which a thirty-second note was the note of least value, a whole note might be made by thirty-two punches, and in a very fast piece, in which no notes of less value than a sixteenth note would be required, the whole notes might be made by sixteen punches. It will of course be understood that in music-rolls made by my novel punch the continuous openings for long notes will not be straight sided, but will clearly indicate that they are cut by successive operations of a round punch. These slightly-irregular edges of the openings are under no circumstances a disadvantage and are under certain circumstances, in the hands of skilled musicians, a positive advantage in producing delicate effects in shading. For

example, in producing a legato effect a note may be suspended for two punches and then resumed without losing continuous effect. In order to produce a staccato effect, there must be an actual space—that is, solid paper—between the notes. This effect may be produced by simply using one or two only of the allotted number of punches to each note or by robbing each note of one or more punches, thus stopping a given tone before the sounding of the succeeding tone. In fact, the use of round punches for producing the openings in music-rolls enables a skilled musician to change the effects to an almost unlimited extent, as his fancy may suggest—in fact, to produce almost all of the effects in interpreting a composition that could be produced on a non-mechanical instrument, effects, in brief, which cannot possibly be produced on mechanical instruments by any musician, no matter how skilled, using ordinary music-rolls. It is, as a matter of fact, impossible as music-rolls are ordinarily produced to secure the effects which I produce with music-rolls made by my novel punch. Should a mistake be made in punching, the operator places tissue-paper over the portion of the strip which has been incorrectly punched and then, starting at the end of the correct portion, punches it over again.

The mechanical act of punching the openings will be readily understood from the description already given. In starting a measure the operator places all of the punch-selectors corresponding with notes to be sounded in operative position and then manipulates the operating-rod by means of the rock-shaft and hand-lever. After each actuation of punches and their return to their normal elevated positions, the hand-lever 53 is operated to actuate the feed. Then the selectors corresponding to notes not required to be sounded longer are turned out of operative position and selectors corresponding to new notes that are required to be sounded are turned into operative position. The operation of the counting-disk has already been fully described. Its use will be apparent when it is taken into consideration that sixty-four or even more actuations of a punch may be required to punch an opening in the strip that will cause the instrument upon which the completed roll is used to produce a whole note. It is of course of no consequence so far as the operation of the machine is concerned how many punches are caused to operate by each actuation of the operating-rod. So far as operating the machine in the ordinary sense is concerned but slight knowledge of music is required, it being simply necessary that the operator know the value of notes, that he watch the count made by the counting-disk, and that he have the very slight technical skill required to place selectors out of operative position when the punches corresponding therewith have given to the notes their full value and to place new selectors in

operative position the instant new notes are required to be sounded. In brief, then, any person skilled or unskilled as a musician can produce music-rolls that are approximately correct by means of my novel machine and without the use of a previously-prepared pattern or master-sheet. In the hands of a skilled musician, however, who thoroughly enters into the spirit of the composer, music-rolls may be produced which will cause a mechanical instrument to play the music in a far more expressive and satisfactory manner, so far as fineshading is concerned, than is possible with the ordinary music-rolls of commerce.

Having thus described my invention, I claim—

1. In a device of the character described the combination with a series of punches, guides therefor, a bed-plate and springs for holding the punches in the raised position, of a series of pivoted punch-selectors corresponding with the punches and adapted to be moved into and out of engagement with the punches, and free to be left indefinitely in either position, an operating-rod adapted to engage said selectors when in operative position and means for actuating the operating-rod whereby the punches corresponding to the selectors in operative position are caused to act.

2. In a device of the character described the combination with a series of punches, of a corresponding series of pivoted punch-selectors adapted to be moved into and out of engagement with the punches and free to be left indefinitely in either position, and means for simultaneously actuating the selectors when in operative position whereby the corresponding punches are caused to act.

3. In a device of the character described the combination with a series of punches, of a corresponding series of pivoted punch-selectors, each free to remain in either one of two positions, means for simultaneously actuating the selectors when in operative position, and feeding mechanism whereby the strip to be acted upon is drawn under the punches with uniform actuations.

4. In a device of the character described the combination with a series of punches, a series of pivoted punch-selectors corresponding therewith, each of said selectors being free to remain in operative or inoperative position, and means for actuating said selectors when in operative position, of feed-rolls geared together and a pawl-ratchet and hand-lever for actuating one of said feed-rolls.

5. In a device of the character described the combination with a series of punches one-tenth of an inch in diameter, corresponding pivoted punch-selectors, each free to remain in either one of two positions, and means for simultaneously actuating the operating-selectors when in operative position, of feed-rolls and a ratchet-wheel, hand-lever and pawl for actuating one of the feed-rolls, the number of teeth in the ratchet-wheel corresponding with the number of twentieths of an inch in the

periphery of the operative feed-roll so that the strip to be acted upon will be moved a distance corresponding to one-half the diameter of the punches at each actuation of the feed-ratchet.

6. In a device of the character described the combination with a series of round punches, of a corresponding series of pivoted punch-selectors adapted to be placed into and out of engagement with the punches, means for simultaneously actuating the selectors in operative position, and feeding mechanism which carries the strip forward at each actuation a distance corresponding to one-half the diameter of the punches, each of said selectors being free to remain in operative or inoperative position.

7. In a device of the character described the combination with the punches, pivoted punch-selectors and operating-rod, of a feed-ratchet, hand-lever and pawl, a counting-disk adapted to be rotated independently of the feed-ratchet and a friction-washer engaging the counting-disk whereby the latter is normally caused to rotate with the feed-ratchet.

8. In a device of the character described the combination with the punches, pivoted punch-selectors and operating-rod, of a feed-ratchet, lever and pawl, a counting-disk adapted to rotate on the hub of the feed-ratchet and carrying a pointer, and a friction-washer carried by the shaft and engaging the counting-disk so that the latter is normally caused to rotate with the feed-ratchet but may be turned back to cause the pointer to register with the pawl after the completion of a measure or note.

9. In a device of the character described the combination with a series of punches, of a series of pivoted punch-selectors corresponding therewith and adapted to be tilted out of engagement with the punches and to remain so indefinitely, and means for simultaneously actuating the selectors when in engagement with punches.

10. In a device of the character described the combination with a series of punches having heads 24 and recesses 25 formed in said heads, of independent springs adapted to engage said recesses to retain the punches at the raised position, pivoted punch-selectors adapted to engage heads 24 and to be thrown out of engagement and left so, and an operating-rod which is adapted to engage simultaneously all selectors in engagement with punches whereby said punches are operated.

11. In a device of the character described the combination with a series of punches and independent springs therefor, of a series of bell-crank pivoted punch-selectors adapted to engage the punches, a rest for said selectors when out of operative position, and means for simultaneously actuating the selectors in operative position, each of said selectors being free to remain in operative or inoperative position.

12. In a device of the character described the combination with a series of punches, a

corresponding series of pivoted punch-selectors adapted to engage or disengage the punches and to remain in either of such positions, and an operating-rod adapted to engage the selectors in engagement with punches, of feeding mechanism which, at each actuation, carries the strip being acted upon forward a distance equal to one-half the diameter of the punches.

13. In a device of the character described the combination with a series of punches, corresponding pivoted punch-selectors, and an operating-rod adapted to engage selectors in operative position, of feeding mechanism for the strip to be acted upon and a pointer and counting-disk, substantially as described and shown, for indicating punches made in a measure or upon a note.

14. In a device of the character described the combination with a series of punches, corresponding pivoted punch-selectors, each free

to remain in either one of two positions, and an operating-rod adapted to engage selectors that are in operative position, of feeding mechanism for the strip to be acted upon and a winding-roll for the completed music-roll.

15. In a device of the character described the combination with a series of punches, corresponding pivoted punch-selectors, and an operating-rod, of feeding mechanism for the strip to be acted upon, a winding-roll for the completed music-roll, and counting mechanism actuated from the feeding mechanism for indicating the number of punches made for a measure or note.

In testimony whereof I affix my signature in presence of two witnesses.

PAUL NORWOOD.

Witnesses:

FRED. M. DREW,
CHAS. E. REMER.