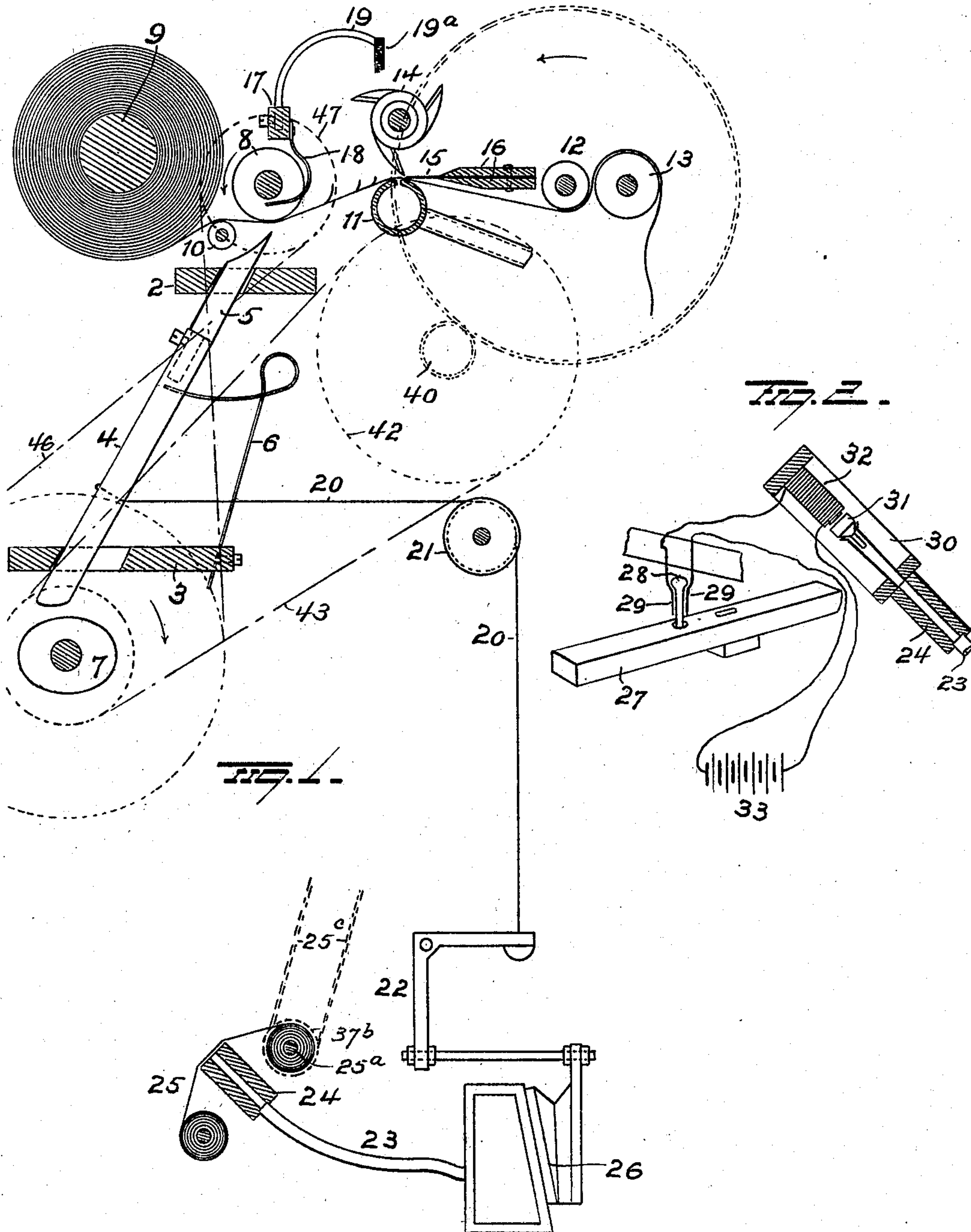


No. 854,822.

PATENTED MAY 28, 1907.

A. L. HART.  
PERFORATING MACHINE.  
APPLICATION FILED APR. 13, 1906.

2 SHEETS—SHEET 1.



WITNESSES  
E. Nottingham  
G. J. Downing.

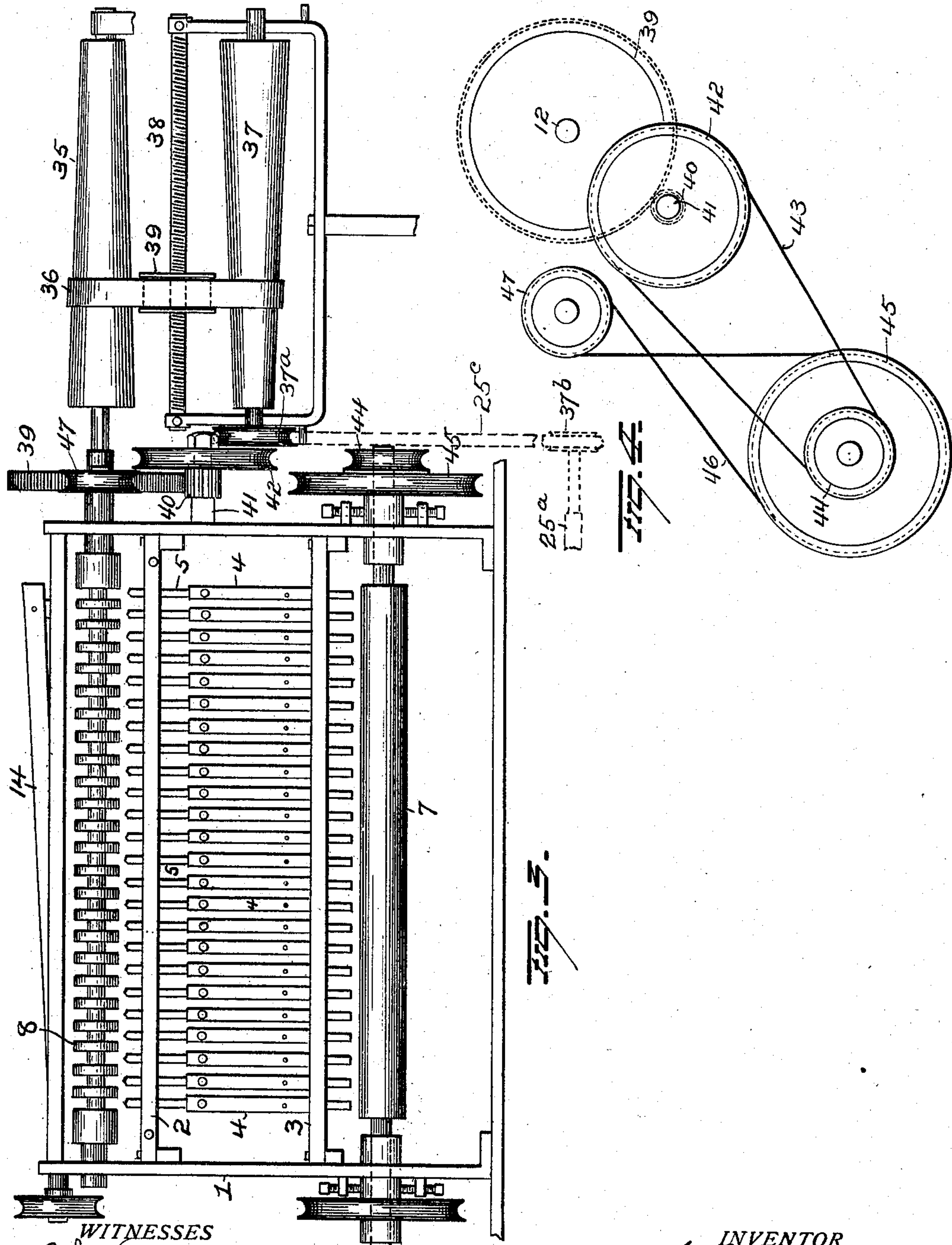
INVENTOR  
A. L. Hart  
By H. A. Seymour  
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# UNITED STATES PATENT OFFICE.

ALVIN L. HART, OF BURLINGTON, IOWA.

## PERFORATING-MACHINE.

No. 854,822.

Specification of Letters Patent.

Patented May 28, 1907.

Application filed April 13, 1906. Serial No. 311,527.

*To all whom it may concern:*

Be it known that I, ALVIN L. HART, a resident of Burlington, in the county of Des Moines and State of Iowa, have invented certain new and useful Improvements in Perforating-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in perforating machines, and more particularly to improved mechanism for perforating music rolls, the object of the invention being to provide improved punches and controlling mechanism therefor, which insure accurate punching of the sheet in accordance with a master sheet or with a piece played upon a piano or similar instrument, and the invention consists in certain novel features of construction and combinations and arrangements of parts as will be more fully hereinafter described and pointed out in the claims.

In the accompanying drawings, Figure 1 is a diagrammatic view illustrating my improvements controlled by a pianola. Fig. 2 illustrates a piano or similar key controlling mechanism. Fig. 3 is an end or face view showing the cutter mechanism and Fig. 4 is a view of the gearing.

1 represents a frame having parallel cross bars 2 and 3, and 4 represents cutter holders with cutters 5 secured therein. The cutter bars are mounted in elongated slots in lower bar 3, with the cutters 5 projecting up through slots in bar 2, and each cutter holder 4 is provided with a spring 6 which serves the twofold function of maintaining the holders out of the path of a double cam roll 7, and the cutters against the rear ends of the slots in the bar 2.

The springs as above explained, not only hold the cutter holders and cutters in inoperative position but also maintain the cutters against the rear ends of the slots in bar 2. The purpose of this is that when the cutter is first forced up through the paper, it will be carried forward by the paper and will not tear the same, as would be the case if the cutters had no forward movement to compensate for the moving of the paper.

Supported in frame 1, above bar 2 a roll 8 is located, this roll being preferably of hard steel and made with annular grooves to receive the cutters 5 and the grooves are but

slightly wider than the cutters to give the latter a shear cut therein.

9 represents a reel or spool, from which a strip to be perforated, is drawn over a guide roller 10, beneath and in close contact with roll 8, thence over a perforated air blast tube 11, and thence under a live roller 12, against which the paper is frictionally held by a roller 13. Above tube 11, a rotary cutter 14 is supported in the frame. This cutter comprises a series of elongated blades which have a shearing action with a fixed cutter bar 15, adjustably clamped between supporting bars 16.

A cross-bar 17 is secured above roll 8, and has a series of bowed spring fingers 18 projecting into the grooves of roll 8, to prevent the cut strips or tongues winding on the roll, and on arms 19, at the ends of bar 17, an oil saturated wick 19<sup>a</sup> is supported and is located in the path of the blades of rotary cutter 14 to keep the latter oiled, so that with the shearing action of the blades of the rotary cutter against the cutter bar, the blades will be kept sharp.

To each and every cutter holder, cords 20 are secured, passed over pulleys 21 and secured to angle bars or bell-cranks 22, and these bell-cranks are connected with and operated by the bellows 26 of a pianola or other instrument, each bellows being connected by a tube 23 with its proper opening in the tracker board 24 over which the masterpiece 25 is passed from roll to roll.

On the end of the shaft carrying paper live roll 12, a truncated conical roller 35 connected by a belt 36 with a similar truncated conical driving roller 37. On a journal of roller 37, a pulley 37<sup>a</sup> is secured, and from this pulley, motion is transmitted to a pulley 37<sup>b</sup> on the journal of master-sheet roll 25<sup>b</sup> by means of a belt 25<sup>c</sup>. Parallel with the rollers 35 and 37 is a screw 38 on which a flanged pulley 39<sup>a</sup> is located and turned by the belt 36 and as the pulley is turned it will move on the screw and feed the belt from end to end of the truncated conical rollers to gradually decrease the speed of master roll relative to its increasing size. A large gear 39 is also secured to the shaft of roll 12 and meshes with a pinion 40 on a stub 41 projecting from the frame of the machine. A pulley 42 is also mounted on the stub 41 to rotate with the pinion 40, and a belt 43 passes over this pulley and a pulley 44 on the shaft of cam roll 7. A larger pulley



45 is also located on the shaft of cam roll 7, and a crossed belt 46 passes over pulley 45 and a pulley 47 on the shaft of roll 8.

It will be borne in mind that as the master-sheet is rolled up on the roller on to which it is transferred in performing the piece of music, it will gradually increase its speed in passing through the machine as the paper winds upon the roller and if the piece of paper being slotted passed through the cutter at a uniform rate of speed this would vary the distance apart of the slots so that the piece would not be played in the same time. By means of these truncated rollers 35 and 37 the pulley being set at the extreme left at the beginning of the passage of the master-sheet through the machine, as the paper winds upon the roller the pulley passes to the right and so decreases the speed with which the master-sheet passes through the machine that the final result is that all the slots in the new roll are cut at exactly a uniform rate, so that a slot representing an eighth note at the beginning of the cutting will be exactly the same length as a slot representing an eighth note at the conclusion of the piece. If it were not for these truncated rollers, then the slot at the conclusion would be shorter than the slot at the beginning, although they represented the same notes.

The operation of my improvements, above described, is as follows:—The paper or other material to be perforated, is drawn off spool 9 over guide roller 10, under roll 8, over perforated blast tube 11, and between rollers 12 and 13. The rotary cutter 14 and cam roller 7 are continuously rotated at high speed, the gearing being illustrated in Fig. 4. When an opening in the master-sheet exposes an opening in the tracker board 24, the bellows 26 connected with said opening will move its bell-crank 22, and pull its cord 20, which will draw the cutter holder 4 forward into the path of cam roller 7 and the latter will force the cutter 5 up through the paper, and the cutter will be reciprocated to cut as long as it is held in position to be moved by the cam roller. When the master-sheet opening passes over the opening in the tracker-board 24, the bellows 26 will move the bell-crank 22 back to normal position, and spring 6 will move the cutter holder out of the path of cam roller 7 and draw the cutter out of the paper. It will thus be seen that the cutter will form a slot in the paper in exact accordance with the opening in the master-sheet as the cutter will be reciprocated by the cam roller just as long as the cutter holders are held in position to be engaged thereby. As the paper passes over tube 11, the air issuing from the perforations therein, will blow the tongues cut out by the cutters, up into the path of rotary cutter 14, which latter will cut off the tongues against bar 15 leaving a smooth rectangular opening in the paper.

When the keys of a piano or other like instrument are to be employed, a structure similar to that shown in Fig. 3 is used, and which will now be explained.

27 represents the key of a piano or similar instrument, provided with a headed pin 28 of copper or other material, located between metal contact strips 29 but normally out of contact therewith.

30 represents a frame to be tightly clamped on tracker-board 24 and is provided with a series of openings alining with the openings in the board, each of said openings being normally closed by a valve 31 controlled by an electro-magnet 32, in electric circuit with a battery 33 and contact strips 29. It will thus be seen that when a key is depressed, the head of its pin 28 will contact with strips 29 and close the electric circuit, which will result in the magnet 32 immediately opening valve 31 and compel the cutters to operate as above explained, it being understood that there is an electro-magnet for each key of the instrument and when any key is operated its magnet will open the proper valve to compel the proper cutter to act and the cutter will perforate the paper just as long and no longer than the key is depressed, for the circuit will be broken and the valve 31 will close immediately the key is released.

A great many changes might be made in the general form and arrangement of the parts described without departing from my invention, and hence, I do not restrict myself to the precise details set forth but consider myself at liberty to make such slight changes and alterations as fairly fall within the spirit and scope of my invention.

Having fully described my invention what I claim as new and desire to secure by Letters Patent:—

1. In a perforating machine, the combination with a roll having annular grooves therein, of a series of cutters to enter the grooves, means for reciprocating said cutters, and means for passing a sheet or strip between the roll and cutters.

2. In a perforating machine, the combination with a roll having annular grooves therein, of a series of cutters to enter the grooves, means for passing a sheet or strip between the roll and cutters, and a cam roll to reciprocate the cutters when the latter are moved into the path of the cam roll.

3. In a perforating machine, the combination with a roll having annular grooves therein, of a series of cutters to enter the grooves in the roll, means for passing a sheet or strip between the roll and cutters, a cam roll to force the cutters through the sheet and into the grooves of the roll, springs normally holding the cutters out of contact with the sheet or strip and cam roll, and independent means for each cutter to move it to position to be operated by the cam roll.



4. In a perforating machine, the combination with a roll having annular grooves, of cutters to enter the grooves, means for reciprocating said cutters, means for passing a sheet or strip between the roll and cutters, and spring fingers in all the grooves to prevent the tongues cut from the sheet or strip winding on the roll.

5. In a perforating machine, the combination with a series of movable cutters, of a cam roll to move any cutter brought into the path thereof, means for moving the cutters into the path of the cam roll, a grooved roll to receive the cutters, and means for passing a sheet or strip between the grooved roll and cutters.

6. In a perforating machine, the combination of means for cutting tongues in a strip of paper, means for projecting the tongues outwardly, and a rotary cutter for severing the outwardly projecting tongues from the strip.

7. In a perforating machine, the combination with means for cutting tongues in a strip of paper, of a perforated air blast tube over which the strip is moved and which serves to blow the tongues outward, a fixed cutter bar, and a rotary cutter to sever the tongues against the cutter bar.

8. In a perforating machine, the combination with means for cutting tongues in a strip of paper, of a perforated air blast tube over which the strip is moved and which serves to blow the tongues outward, a rotary cutter to sever the tongues, and a saturated wick in the path of the blades of said cutter.

9. In a perforating machine, the combination with a series of cutters, and a continuously rotating cam roller disposed under the cutters for operating them, of bell-cranks, cords connecting the bell-cranks and cutters, a bellows connected with each bell-crank to move the cutter into the path of the cam roll, a tracker board, and tubes connecting the openings in the tracker board with the bellows.

10. In a perforating machine, the combination with means for cutting tongues in a sheet, means for forcing the tongues outward, and means operating to remove the tongues from the strip.

11. In a perforating machine, the combination with means for cutting tongues in a sheet, pneumatic means for forcing the tongues out-

wardly, and means for removing the outwardly projecting tongues from the strip.

12. In a perforating machine, the combination with perforating mechanism, a roll to feed a sheet of paper past the cutting mechanism, and a roll for a mastersheet, of a conical roller mounted to rotate with said feed roll, another conical roller provided with means for gearing it to the mastersheet roll, a screw between the conical rolls, a flanged pulley mounted on said screw, and a belt passing over said conical rollers and said pulley, whereby the latter will be rotated and simultaneously moved longitudinally of the screw to automatically shift the belt on the conical rollers.

13. In a perforating machine, the combination with perforating mechanism, means for feeding paper past the perforating mechanism, a roll for a master sheet, means for operating said roll to wind the master sheet thereon, and means operating automatically to gradually decrease the speed of the master-sheet roll as the master-sheet accumulates thereon.

14. In a perforating machine, the combination with perforating means, of means for feeding paper past the perforating mechanism, a master sheet roll, means for driving said master sheet roll and said feeding mechanism from a common source of power, and means operating automatically to gradually decrease the speed of the master-sheet roll relatively to the speed of the feed mechanism.

15. In a perforating machine, the combination with perforating mechanism, means for feeding a sheet past the perforating mechanism, and a mastersheet roll, of a cone pulley connected with said feeding mechanism, another cone pulley, means for gearing the last-mentioned cone pulley to the master sheet roll, a belt passing over said cone pulleys and a shifter for said belt operated by the belt, to automatically change the speed of the mastersheet roll relatively to the speed of said paper feeding mechanism.

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

ALVIN L. HART.

Witnesses:

CHAS. C. CLARK,  
MARY FAWCETT.