No. 782,263. PATENTED FEB. 14, 1905.

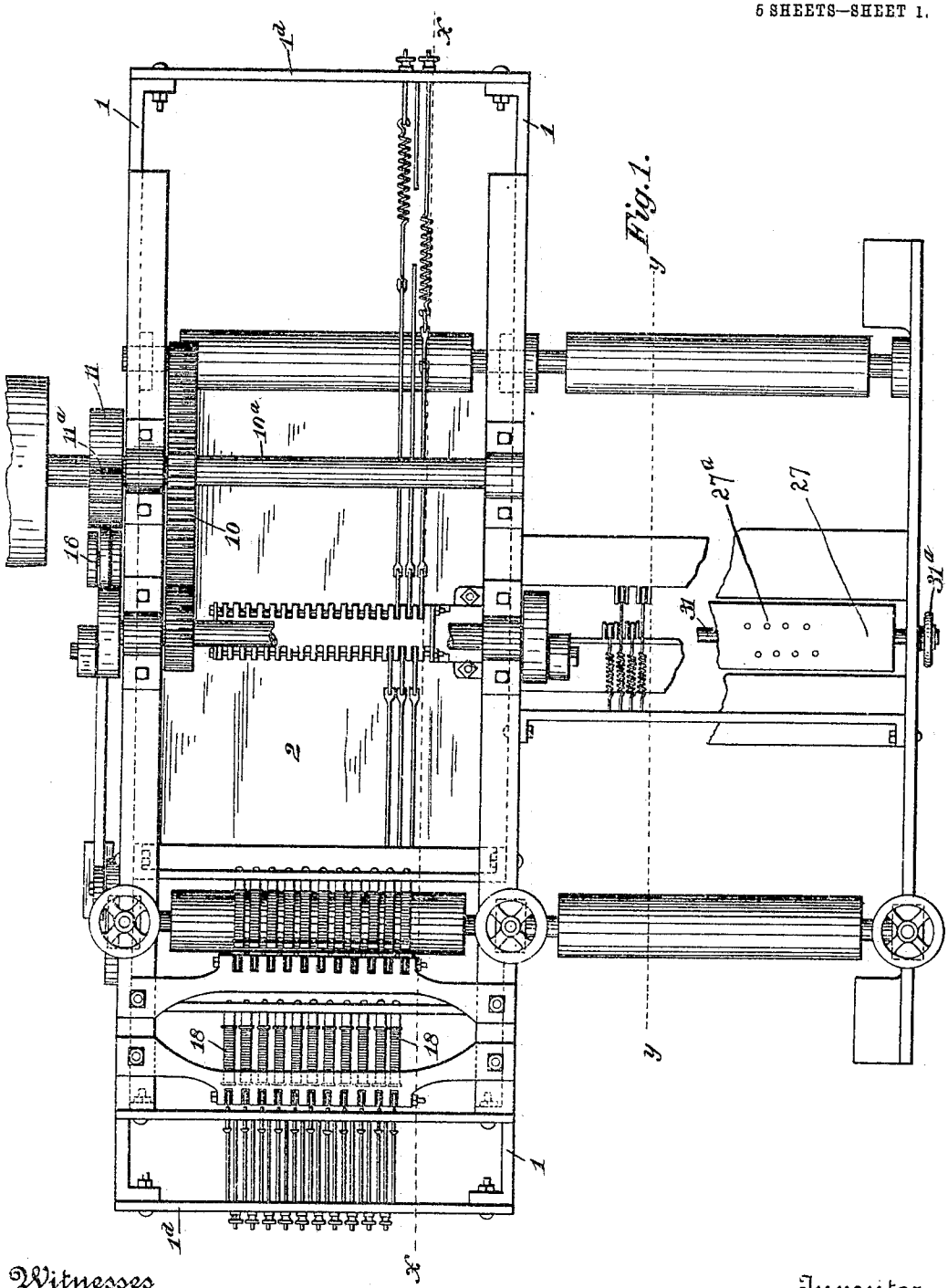
E. H. McCLOUD.

PAPER PERFORATING MACHINE.

APPLICATION FILED JUNE 20, 1903.

5 SHEETS—SHEET 1.

Fig. 1.



Witnesses
Benjamin Finckel
Thomas P. Davis

Inventor
Edward H. McCloud
by Finckel & Finckel
his Attorneys

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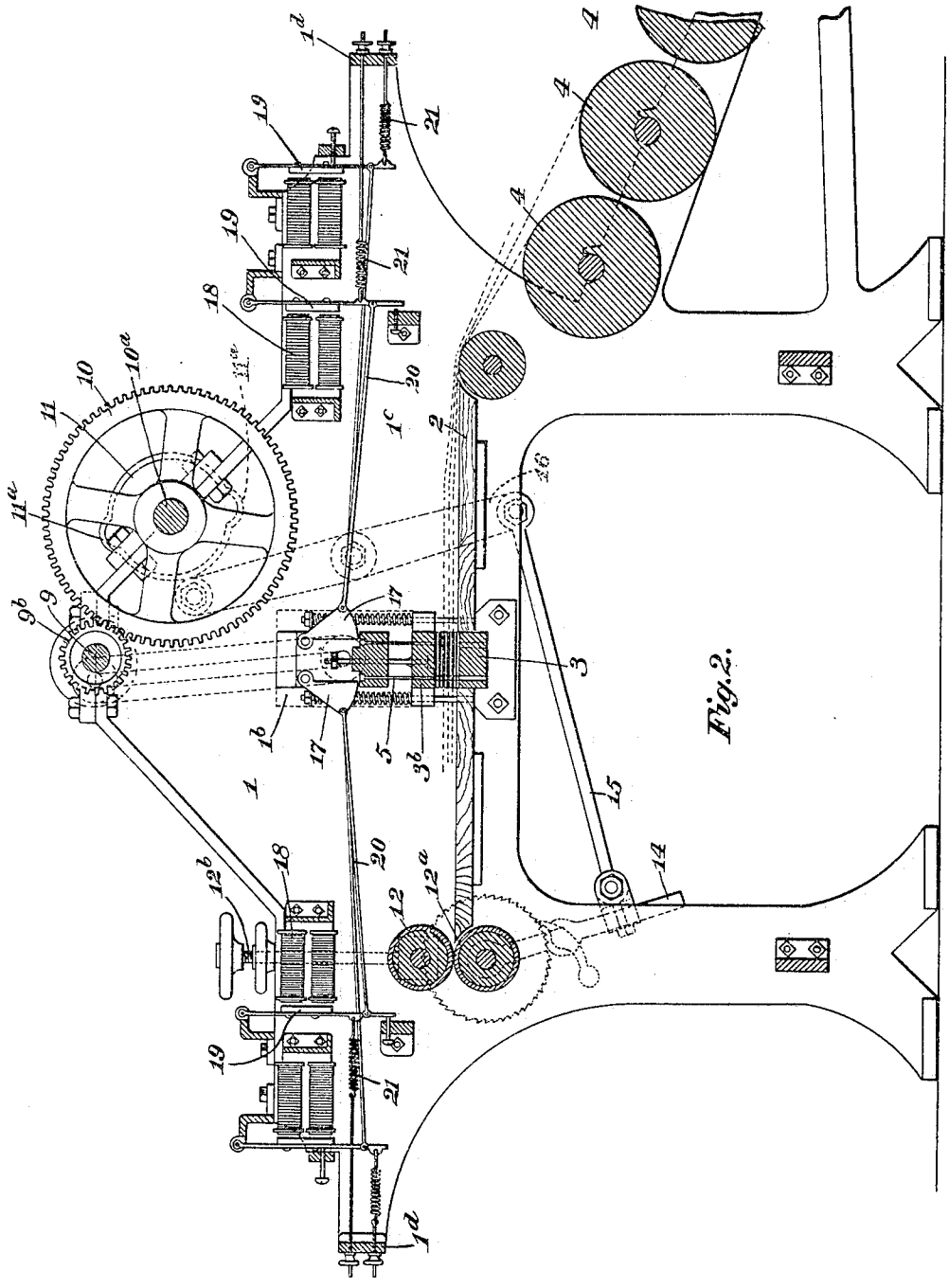


Fig. 2.

Witnesses

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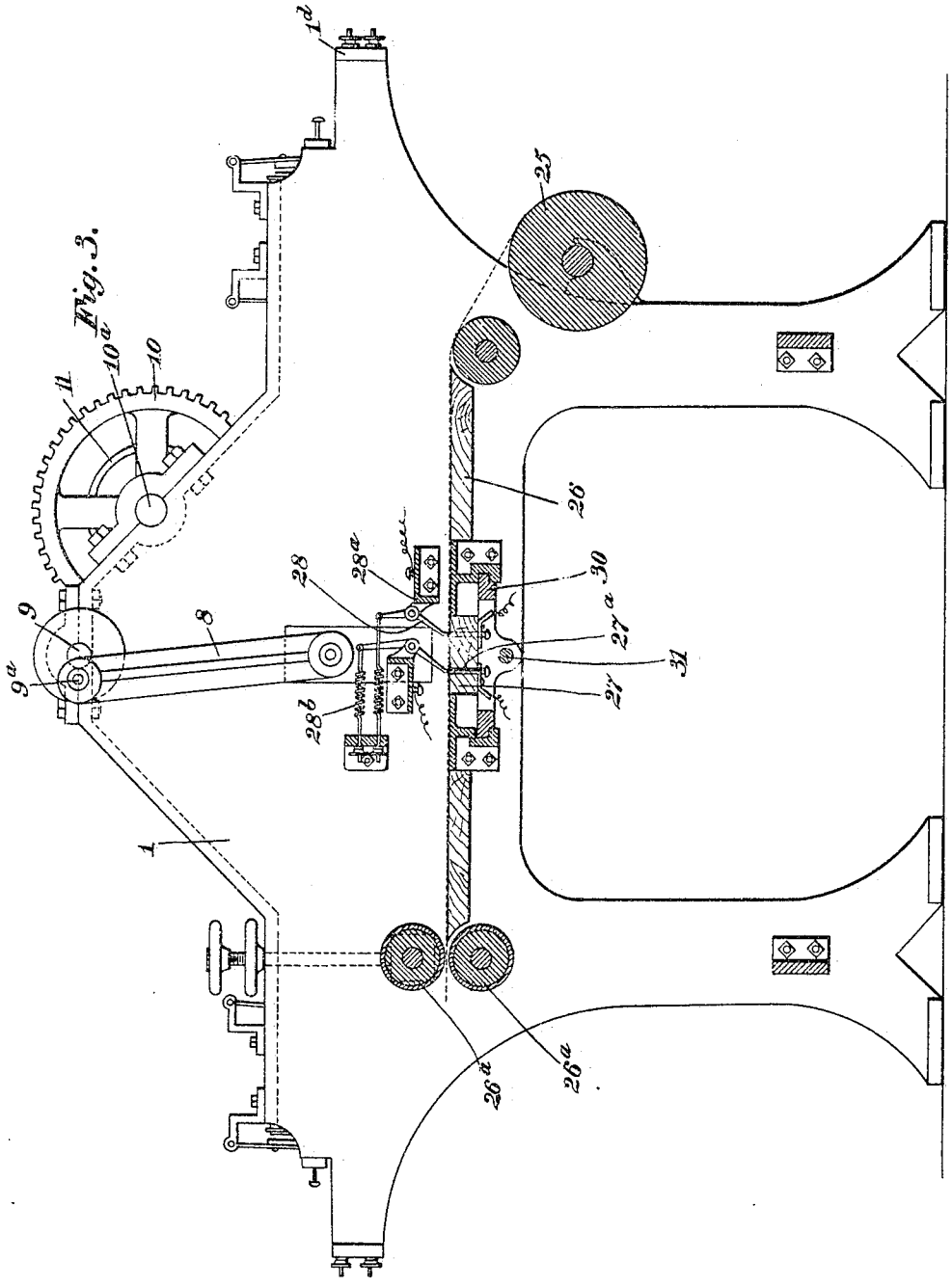
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5 SHEETS—SHEET 3.

Fig. 3.



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5 SHEETS—SHEET 4.

Fig. 4.

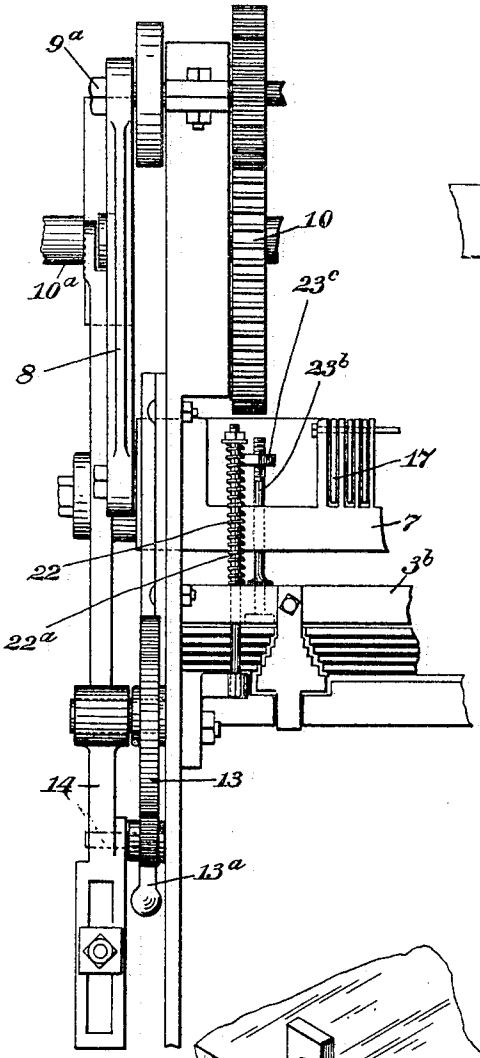
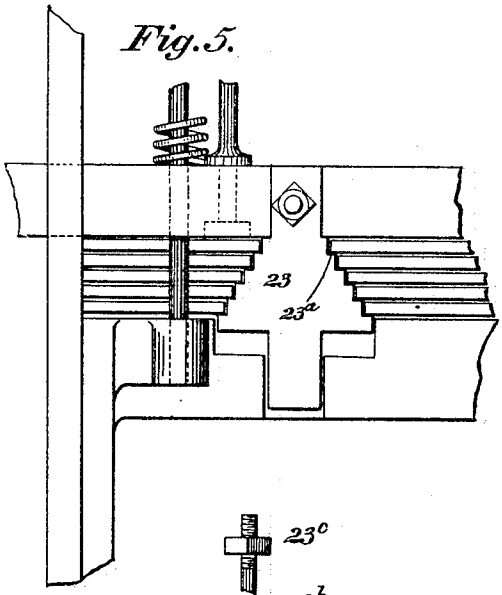


Fig. 5.



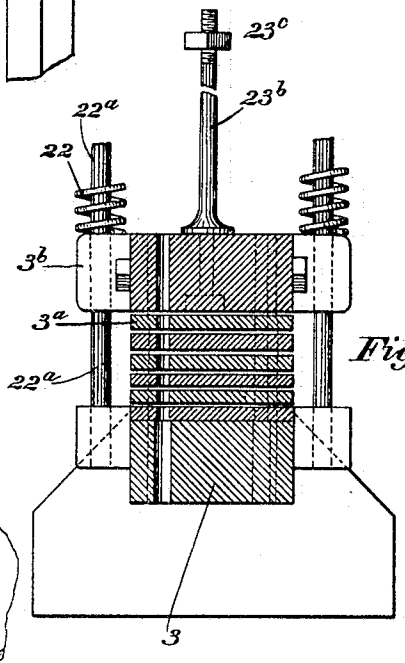


Fig. 6.

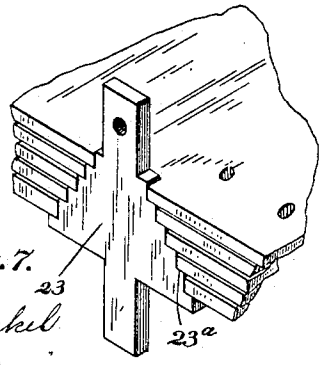


Fig. 7.

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Thomas P. Davis

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his Attorneys

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5 SHEETS—SHEET 5.

Fig. 8.

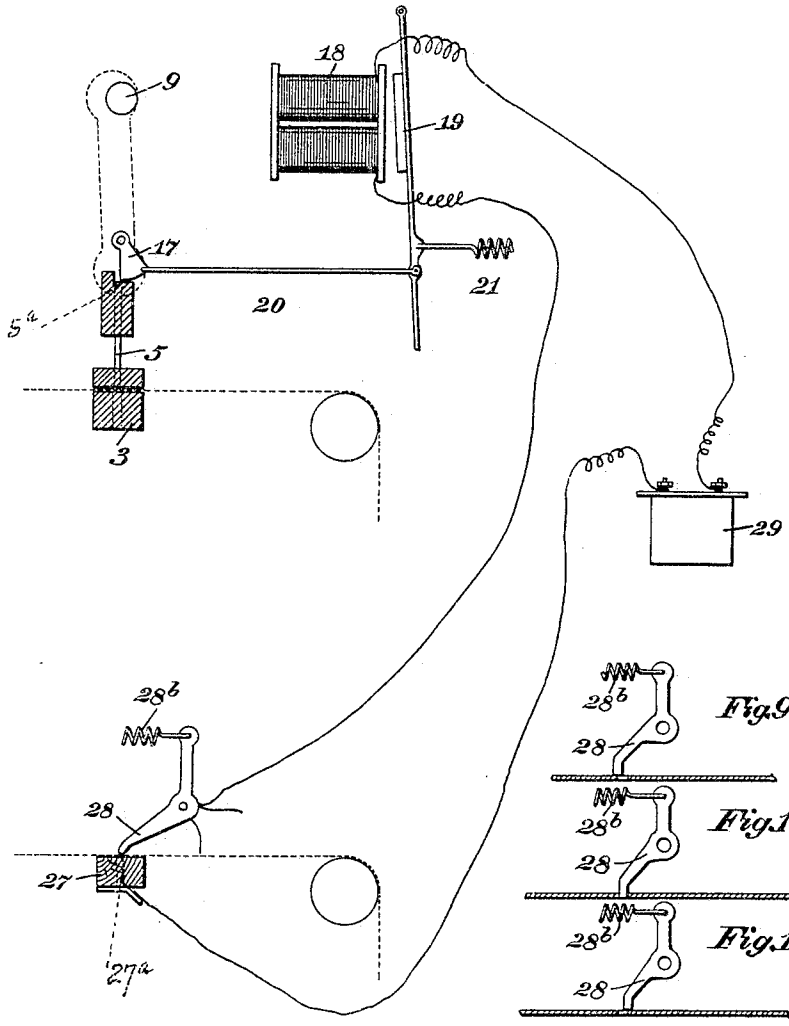


Fig. 9.

Fig. 10.

Fig. 11.

Witnesses

Benjamin Finckel

Thomas P. Davis

Inventor

Edward H. McCloud

by Finckel & Finckel

his Attorneys

No. 782,263. Patented February 14, 1905.

UNITED STATES PATENT OFFICE.

EDWARD H. McCLOUD, OF COLUMBUS, OHIO, ASSIGNOR OF ONE-HALF TO JACOB GOEHL, OF COLUMBUS, OHIO.

PAPER-PERFORATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 782,263, dated February 14, 1905.

Application filed June 20, 1903. Serial No. 162,347.

To all whom it may concern:

Be it known that I, EDWARD H. McCLOUD, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Paper-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.

This invention, relating to machines for the production of perforated sheets such as are used, for example, in operating automatic or mechanical musical instruments, has for its object principally the provision of an improved machine whereby two or more of such sheets can be simultaneously produced by one passage of the master or controlling pattern through the machine.

The invention is embodied in the construction hereinafter described, the essential features being pointed out in the claims.

In the accompanying drawings, illustrating one embodiment of the invention, Figure 1 is a plan view, some parts being broken out and others omitted to promote clearness and avoid unnecessary multiplication of parts in the illustration. Fig. 2 is a vertical sectional view taken longitudinally through the paper-perforating side of the machine or on a plane indicated by the line *x x*, Fig. 1. Fig. 3 is a similar view taken through the master-pattern side or on the plane indicated by the line *y y*, Fig. 1. Fig. 4 is a detail showing the die-depressing devices, the die-separator, and the gearing or mechanism for operating the paper-feed. Fig. 5 is a detail fractional view, on a larger scale, of the die-separator and die-depressing device, the die-separator being in raised or die-separating position. Fig. 6 is a sectional view, on a larger scale, of the dies and depressing devices. Fig. 7 is a perspective view to show the die-separator and its relation to the dies. Fig. 8 is a diagrammatic view illustrating the electromechanical apparatus employed in connection with the punches. Figs. 9, 10, and 11 illustrate in larger detail the circuit-closing or selectors and how contact and separation are made.

The present machine has two sides or organizations coöperating with each other—to wit, a paper-perforating side and a master-pattern side. The operation of the paper-perforating side is controlled by the master-pattern side. I will describe the paper-perforating organization first.

In the views, 1 1 designate parallelly-arranged vertical frame-pieces suitably secured together by cross-pieces or tie-bars, and between the frame-pieces the perforating organization is installed. Intermediate the frame-pieces is secured a horizontal table 2, across the middle of which is a perforated stationary part or die-bed 3. Above the stationary die is placed one or more vertically-movable plates 3^a, also constituting dies, such dies having perforations coinciding with those in the stationary die 3. The paper to be perforated is taken from rolls 4, each strip preferably passing above a separate die, as indicated in Fig. 3.

5 designates the punches or perforating-tools, each consisting of a small shaft or rod having a head 5^a with a flat paper-cutting end. Each punch is supported to slide freely in a hole in a holder or beam 7, that is arranged to reciprocate vertically between the frame-pieces in suitable guides 1^b. The punch-holder 7 is reciprocated by means of crank-rods 8, attached to wrist-pins 9^a on a shaft 9. The shaft 9 contains a pinion 9^b, driven by a gear-wheel 10 on a power-shaft 10^a. The circumference of the gear-wheel 10 is to that of the pinion 9^b substantially as four is to one or such that one revolution of the gear-wheel works four of the pinion and the shaft 9. The reason for this will presently be explained. Arranged on the shaft 10^a is a disk 11, having two cam projections 11^a.

12 and 12^a designate upper and lower friction-rolls, respectively, for drawing the paper strip from the rolls 4 across the table and though the dies as fast as it is perforated. The pressure of the upper roll on the lower one can be regulated by means of a screw 12^b

in the usual manner of regulating the pressure of one roll on another. The shaft of the lower roll is provided with a ratchet-wheel 13, engaged by the tooth end of a gravity-pawl 13[a], hung in an oscillating arm 14. This arm 14 is oscillated by means of a link 15, attached to the lower arm of a lever 16, pivoted to the frame, the upper end of said lever bearing on the disk 11. The projecting portion 11[a] of the disk 11 will intermittently rock said lever, and therefore intermittently rotate the friction-rolls 12 and 12[a], thus drawing the sheet or sheets step by step over the dies. The cam projections 11[a] are at diametrically-opposite points on the disk 11, and these projections are also located with respect to the position of the wrist-pins for operating the paper-punches that the punches will have been lifted out of the dies when the paper is moved over them. This is to prevent the punches from tearing the paper.

Pivoted on risers from the punch-holder are sector-shaped latches 17, arranged to be swung into and out of position to cover the heads or upper ends of the punches and when covering said heads temporarily hold said punches fixed in the holder and compel them to descend with the holder.

Arranged on a tie-bar 1[c] between the side frames 1 1 are electromagnets 18, each having an independent armature 19. Hingedly connected to the armature and to the punch-latch is a rod 20, and for retracting each armature when the electromagnet is demagnetized is a spring 21, attached to the armature and to a tie-bar 1[d] between the frame-pieces 1. The lines of perforations in the ordinary music-sheet are for the sake of compactness, convenience, and economy made somewhat close together, and in order to compactly assemble the parts of my machine I have arranged the electromagnets on opposite side of a plane transversely of the center thereof, as shown, and the punch-holes in the holder will be located in staggered arrangement, so that each punch will perforate the blank paper in a different line.

When the several sheets of paper are to be perforated, it is important in order to prevent tearing and the making of ragged irregular perforations that they be held tightly against the dies. Therefore I provide a top die-compressing die 3[b], made with perforations the same as the dies proper, to compress the dies proper with the intervening music-sheet together. The pressure of the die 3[b] is augmented by means of springs 22 pressing on the four corners of the die 3[b], each of said springs arranged on stationary rods 22[a] on the main frame, as clearly seen in Fig. 4.

When the music-paper is to be fed or moved in the intervals between the punching operations, I provide means for separating the several dies so that the pressure between the dies will not interfere with such feeding or movement. One of the devices for doing this is illustrated in Figs. 4 and 5. It consists of a plate 23 of the general form of an isosceles triangle, the equal sides of which are made with shoulders 23[a], like the treads of steps, the risers between the shoulders being of greater height than the gage or thickness of the die. The several movable dies 3[a] are notched out at their sides, so that each die will rest upon and be lifted by a horizontal pair of the shoulders when the separator is raised, and when the separator is lowered the dies will lie upon each other or upon the music-sheets interposed between them. The separator is conveniently attached to the side of compressor-die 3[b], and there will be in practice four of them, so that all four corners of the dies may be uniformly lifted and lowered. In order that the compressor-die 3[b] may be automatically lifted during the strip-feeding time, I secure in each end thereof a bolt 23[b], which is passed upward through the punch-holder and provided at its upper end with an adjustable stop-nut 23[c], so that when the punch-holder is lifted nearly to its limit the said compressor-die is also lifted.

From the construction described it will be observed that two descents of the punches are made before the music-sheet blank is fed. This double punching of the paper insures perfect perforation, because oftentimes a single punching operation will not completely detach the struck part of the paper. The extent of the movement or feeding of the paper between the punching operations can be regulated by adjusting the connection of the arm 15 up or down on the arm 14 and the rapidity of the perforating process nicely adapted to the character of the paper, &c.

We come now to the master-pattern side of the machine. The organization constituting this side is conveniently, as shown, arranged alongside the perforating organization, so that a portion of the frame of the perforating side can be utilized to support the parts of the master-pattern side. The pattern itself of course will be the homologue of the music-sheets to be reproduced. The said pattern will be drawn from a roller 25 across a table 26 through rollers 26[a]. Transversely across the middle of the table is a board or plate 27, in which is a series of contact-pins 27[a], insulated from the board or plate 27 and for economy's sake set in staggered arrangement, but on lines conformable to the lines of perforations in the master-pattern. Each of these pins has attached to it a wire or electric conductor. Pivoted in cross-bars 28[a] above the board or plate 27 is a series of levers 28, also preferably in staggered arrangement, having their lower ends adapted to make contact with the contact-pins 27[a], a spring 28[b] being provided to hold the lower ends of said levers toward or against said pins. The lower ends of the levers are also arranged on lines conformable to the lines

of perforations of the master-pattern or so that they will all simultaneously touch the contact-pins if nothing intervenes. Each of the levers 28 is connected by a wire conductor with the electromagnet in the perforating mechanism, and each magnet occupies when the machine is set the same position with respect to the other magnets as that occupied by the lever 28 with respect to the other levers, so that when a particular lever 28 closes an electric circuit the electromagnet in that circuit effects the latching of the punch corresponding in position to that of the lever.

A unit in the scheme of punches, latches, electric magnets, circuit-closing levers, and source of electricity is illustrated in Fig. 8. In this view 29 symbolizes a cell or source of electricity with conductors extending from the cell to the magnet and contact-pins and from the magnet to the circuit-closing lever 28. The other parts indicated in Fig. 8 have already been described.

The notation of the perforations on the master-pattern will usually be in a particular key, and music-sheets as ordinarily furnished the public are in a particular key. This is because the perforations are in a particular position with respect to the edges of the strip, and the strip is passed through the musical instrument to be operated in a particular position with respect to the playing mechanism of that instrument. With my present apparatus I propose to reproduce the same composition in different keys. To accomplish this, the contact-pin-bearing board or plate 27 is mounted on a sliding frame 30, and said frame is made adjustable by means of a rotatable but longitudinally stationary screw 31, having a hand-wheel 31^a.

The levers 28 will be termed "selectors," because they select, with the aid of the master-pattern, the punches to be operated.

The usual means for adjusting the upper roller 26^a toward its companion roller can be provided.

I do not confine myself to the precise construction shown. The machine can of course be used for perforating one sheet only, or it can be used for perforating two or more. If two sheets only are to be perforated, one only of the movable dies need be used, one sheet passing above the fixed or bed die and one above the movable die or between the movable die and the presser-die. The advantage in separating the sheets to be perforated is that the punch in descending meets the resistance of one sheet only at a time. One source of electricity can supply a group or all of the magnets, or each magnet can have an independent source of electricity.

I propose that the contacting ends of the selectors shall be flat and of a size to just fit the smallest hole in the master-pattern or the diameter of such hole longitudinally of the master-pattern, so that the latching of the punches shall be effected at the instant the hole or the forward end of the hole in the master-pattern is fully under the contacting end of the selector and so that the contacting end of the selector is entirely lifted out of said hole at the instant the rear end of the hole presses against the selector. This construction and operation insures the making at the paper-punching side of the machine music-sheets accurately homologous to those of the master-pattern, because the punch is not held in punching position for a period of time greater or less than that required to make an accurately homologous hole in the music-sheets.

What I claim, and desire to secure by Letters Patent, is—

1. In a sheet-perforating machine the combination with a series of punches, of a bed-die, a compression-die, and a die for separating the sheets to be punched and means for moving the sheets between said dies.

2. In a sheet-perforating machine the combination with a series of reciprocable punches, of a bed-die, and a movable die for separating the sheets to be punched, means for compressing against the die the sheets to be punched during the punching operation and means for feeding the sheets in the intervals between the punching operation.

3. In a sheet-perforating machine, the combination of a bed-die, a compression-die and a die for separating a plurality of sheets to be perforated, means for intermittently feeding the sheets to be punched between said dies, a series of reciprocable punches and means for effecting a plurality of punching operations in the intervals of the sheet-feeding operation.

4. In a sheet-perforating machine, the combination of a bed-die, a compression-die and a die or dies for separating a plurality of fed sheets, said separating die or dies being located between the bed and compression dies, means for pressing the dies together, means for intermittently feeding the sheets to be punched between said dies, and a series of reciprocable punches to coöperate with said dies to effect the perforating operation.

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

EDWARD H. McCLOUD.

Witnesses:
GEO. M. FINCKEL,
SAMUEL W. LATHAM.