

No. 775,237.

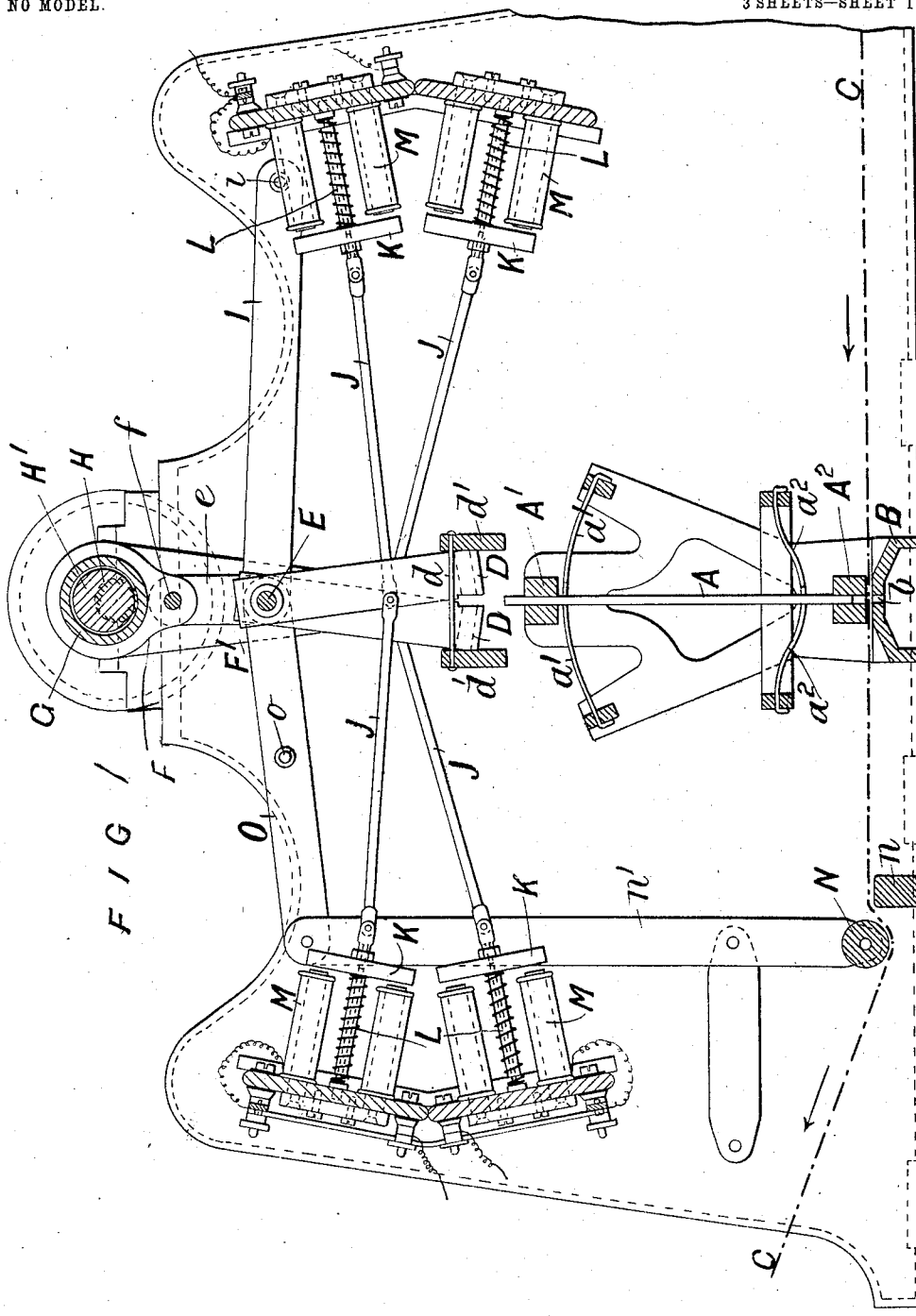
PATENTED NOV. 15, 1904.

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MACHINE FOR MAKING TUNE SHEETS OF MUSIC.

APPLICATION FILED AUG. 8, 1904.

NO MODEL.

3 SHEETS—SHEET 1.



WITNESSES :

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S. C. Kinnon

INVENTOR

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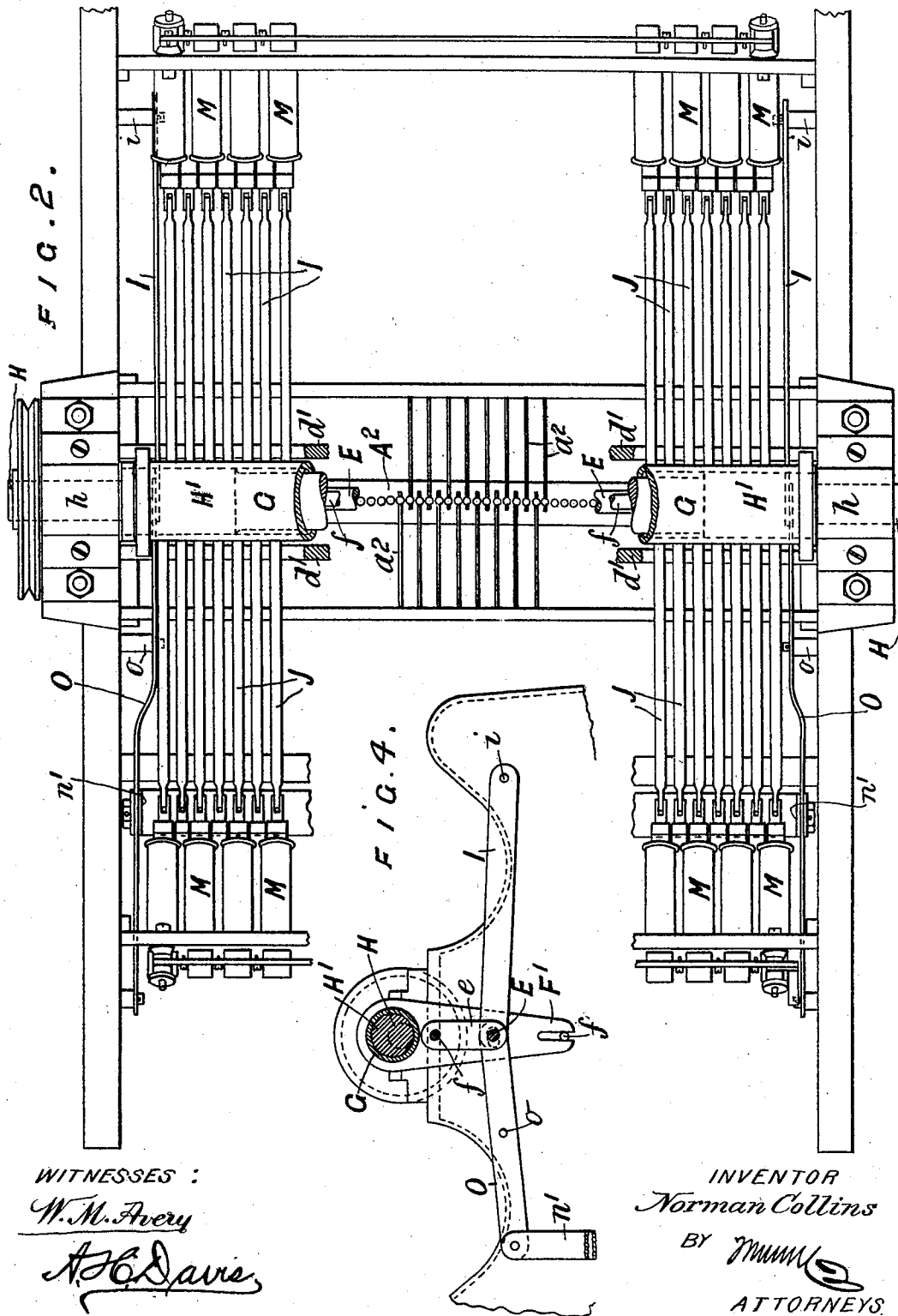
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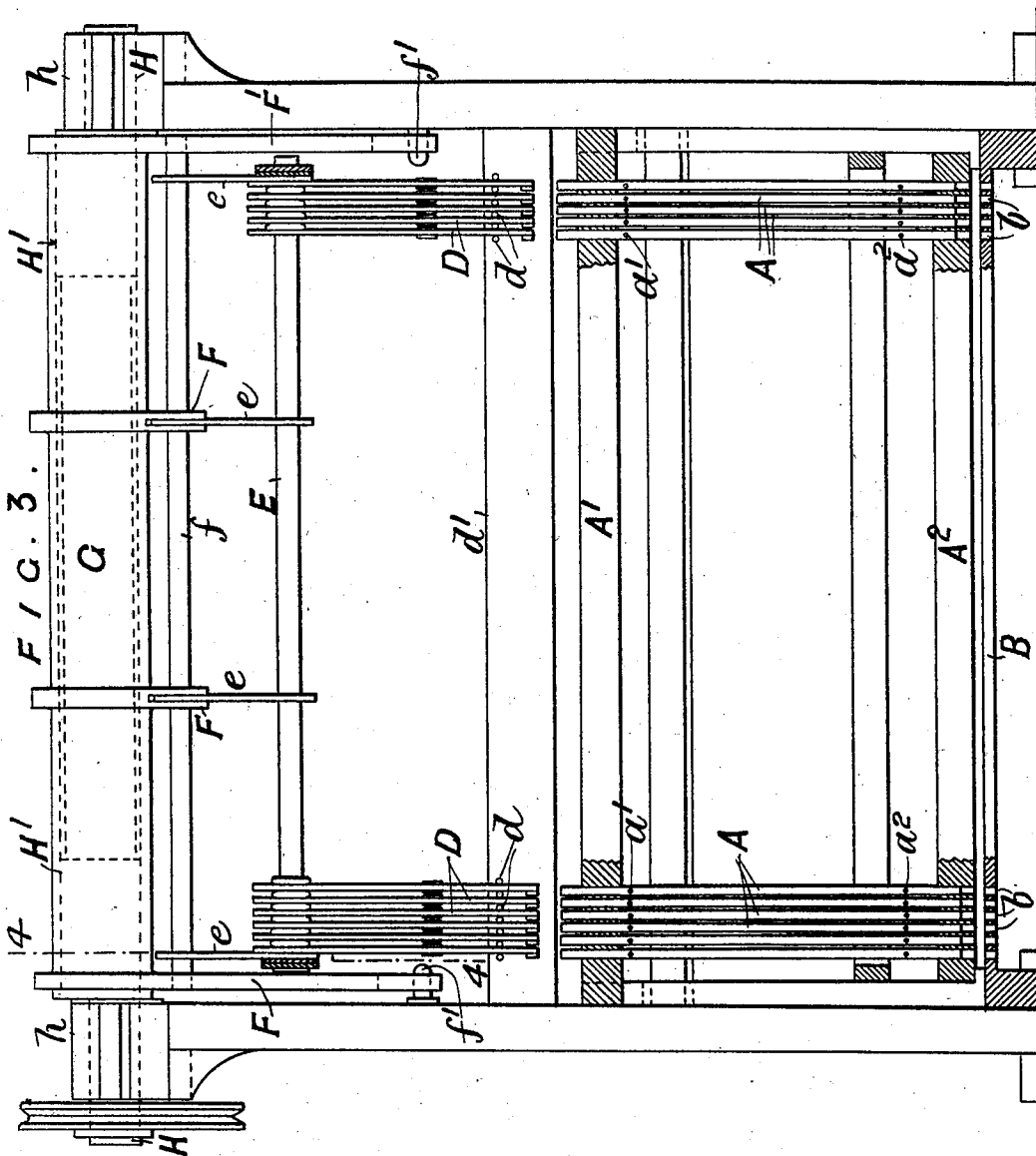
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UNITED STATES PATENT OFFICE.

NORMAN COLLINS, OF LONDON, ENGLAND.

MACHINE FOR MAKING TUNE-SHEETS OF MUSIC.

SPECIFICATION forming part of Letters Patent No. 775,237, dated November 15, 1904.

Application filed August 8, 1904. Serial No. 219,900. (No model.)

To all whom it may concern:

Be it known that I, NORMAN COLLINS, consulting engineer, a subject of the King of Great Britain, residing at 22 Grays Inn road, London, England, have invented certain new and useful Improvements in Machines for Making Tune-Sheets of Music, of which the following is a specification.

This invention relates to improvements in machines for making "note" or "tune" sheets of music which are used in connection with automatically-played musical instruments.

As usual with tune-sheets, the notes are represented by perforations in the sheet, there being a line of perforations corresponding to the notes of each pitch in the scale, the length of the several perforations and of the intervals separating them representing the length of the respective notes and intervals in the piece of music to be reproduced.

Reference is to be had to the accompanying drawings, forming part of this specification, wherein—

Figure 1 is a sectional end elevation of the main portion of my improved machine. Fig. 2 is a plan of the same, parts being broken away to show the construction and other parts being omitted for the sake of simplicity and clearness. Fig. 3 is a front elevation, partly in section, parts only of the machine being shown. Fig. 4 is a view similar to Fig. 1, but showing only the upper portion of the machine, the section being taken on line 4 4, Fig. 3.

The same letters of reference denote like parts in all the figures.

In my improved machine the perforations are produced by means of a row of punches A, the number of the punches and their pitch apart being equal to the number and pitch of the lines of perforation. The punches A, which preferably work in a vertical direction, as shown, (the descending movement being the active stroke,) consist each of a length of steel-wire rod, (preferably of circular section,) the entire row of punches being mounted to reciprocate through guide-holes in upper and lower guide-bars A' A², fixed to the machine-frame. Beneath the lower ends of the punches is fixed the bed-die B, consisting of a bar per-

forated with holes *b* to correspond with the punches A and of such form at the under side as to allow the punchings to escape freely. The blank sheet C is drawn over the bed-die B beneath the punches A by a step-by-step motion, as hereinafter described, in such manner that the sheet is stationary when the punches are operating, and vice versa.

The punches A are normally held raised by means of a spring or springs, of which there are preferably two to each punch, one, *a'*, toward the upper and a second, *a''*, toward the lower end of the punch, these springs consisting of wires fixed at one end to bars forming part of the frame and at their other end entering holes in the punches.

The means whereby the punches are operated are as follows: Above each punch A and substantially in alinement with it is a striker-bar or driver D, which so long as the machine is in work receives constant up-and-down reciprocating movement in the direction of its length, the driver D being so hung that its lower end may be swung into or out of line with the punch. When the lower end of the driver D is in line with the punch, it strikes and depresses the latter at each reciprocation; but when out of line it passes clear of and does not operate the punch. The entire series of drivers D (which are separated from one another by guide-bars *d*) are reciprocated simultaneously by all being jointed at their upper ends to a horizontally-extending rod E, slung, by means of links *e*, from another horizontal rod *f*, connecting together a suitable number (according to the length of the machine) of arms F F', which are integral with and extend downward from an eccentric sheave or cylinder G, mounted upon an eccentrically-formed portion H' of a horizontal shaft H, which is caused to rotate continuously in bearings *h* in the end frames of the machine, so that by the rotation of the shaft H and eccentric H' the rod E, and consequently the punches A, are caused to move up and down alternately.

The axis of the shaft H lies in the plane of the punches A, and the arms F are guided by the arms F' at the ends of the series being prolonged downward and forked or slotted at

their lower ends to engage with studs f' , fixed (also in the plane of the punches) to the end frames of the machine. The rod E is guided so as to reciprocate approximately in the plane of the punches by its ends being jointed to radius-links I, pivoted, as at i , to points in the end frames of the machine at the mean level of the rod E.

The means whereby individual punches are brought into action as required are as follows: Each of the drivers D normally depends from the rod E, with its lower end retracted transversely of the machine against a stop-bar d' , so as to be just clear of the upper end of the corresponding punch A, but is swung into alinement with the punch when the latter is to be struck, and so caused to operate upon the tune-sheet. For this purpose each driver D is coupled by a connecting-rod J to the armature K of an electromagnet M, the armature being normally—*i. e.*, so long as the magnet M is not energized—held away from the poles of the magnet by a spring L, so as to retain the connected driver D out of alinement with the corresponding punch A, so that the up-and-down reciprocations of the driver D, imparted to it by the action of the eccentric H' , can then take no effect on the punch. When, however, current is allowed to flow through the coils of the electromagnet M, the latter, being energized, attracts its armature K and through the connecting-rod J brings the driver D into alinement with the punch A, which accordingly is forced down through the tune-sheet at each reciprocation of the driver so long as the electromagnet remains energized.

In order to admit of the punches A being set as close together as is necessary for producing the closely-juxtaposed lines of perforation required in ordinary tune-sheets, the electromagnets M and connecting-rods J are preferably arranged as indicated in Figs. 1 and 2—that is to say, in two tiers at each side of the row of punches.

The relative arrangement of the rod E, drivers D, armatures K, and connecting-rods J is such that the vertical oscillations of the rod E are caused to impart a slight reciprocating movement to the armatures K toward and away from the poles of the magnets M, this motion (which is extremely rapid) having for effect to facilitate the movement of the armatures into and out of position when attracted by the magnets.

For the purpose of producing the required step-by-step feed of the sheet past the punches the sheet C, which is drawn from a braked but otherwise freely-running supply-spool (not shown) situated at one side of the machine by being wound upon a continuously-rotated take-up spool (not shown) situated at the opposite side is caused to pass after leaving the bed-die B over a guide or stretcher-bar n , situated between the bed-die and the

take-up spool, the intermittent feed of the sheet being caused by the alternate descent and ascent at the outer side of the bar n of a presser-roller N, which is operated in time with the reciprocations of the rod E, and consequently with those of the punches (if any) which are being operated. The forward rotation of the take-up spool being continuous prevents any retrograde movement of the sheet C when the roller N is depressed, and consequently the descent of the roller N (which occurs only while the punches are raised) causes a certain length of the sheet C to be then drawn from the supply-spool across the bed-die B and to form a bight around the under side of the roller. When the punches thereafter descend to perforate the sheet, the roller N is raised, and concurrently the slack in the bight of the sheet formed by the previous descent of the roller is taken up by the take-up spool, but without any feed of the sheet past the punches taking place meanwhile, since the length drawn off the supply-spool by the action of the roller N is adjusted to correspond to the total length taken up by the take-up spool during each complete reciprocation of the rod E and punches.

The roller N is mounted on an axis which connects together the lower ends of a pair of vertically-guided rods n' , one at either end of the machine, the upper end of each rod n' being coupled to one end of a rock-lever O, pivoted at o to the machine-frame and having at its other end a pin-and-slot connection with the adjacent end of the rod E, so that as the rod E is raised the roller N is depressed, and vice versa.

The length of each step in the feed motion of the sheet C is less than the length of hole ordinarily punched in the sheet, the continuous operation of any one punch having for effect to form in the sheet a slot whose length is proportionate to the number of times the punch is operated, or, in other words, to the length of time during which the corresponding electromagnet M continues to be energized.

The energizing of the electromagnets M may be effected and controlled by means of a keyboard musical instrument, upon which is performed the music to be recorded upon the tune-sheet. For this purpose the number of electromagnets M and punches A in the machine is equal to the number of keys comprised in the keyboard of the instrument, and each key is adapted to close (by means of a suitable contact spring or switch) the circuit of the corresponding electromagnet of the series. Hence when any note is played upon the instrument the corresponding magnet M is energized, and the punch A controlled by that magnet is brought into operation, thus causing a perforation corresponding in position to the note played to be made in the tune-sheet, while if a key in the instrument is op-

erated so as to produce a sustained note the punch controlled by the corresponding magnet is caused to act during the time the note is sustained and to produce a slot in the sheet of a length proportionate to the length of the note played.

Usually a considerable number (say twelve) of blank sheets C are drawn through the punching-machine at one time, the sheets being superposed one upon another, so that as many copies are obtained at a single operation. Moreover, by a mere duplication of the parts or elements, as above described, any number of sheets or of sets of superposed sheets may be perforated under the control of a single musical instrument, as will be readily understood.

I claim—

1. A machine for producing perforated tune-sheets of music, comprising a row of punches, springs for normally retaining the punches in raised position, bed-dies with which the said punches act in conjunction for producing the sheets, striker-bars or drivers for the several punches, a rod to which the drivers are pivotally connected, the said rod being mounted to move in substantially the plane in which the punches operate, an eccentric coupled to said rod and adapted to be continuously rotated so as to constantly impart reciprocating motion to the rod and punch-drivers, electromagnets for the several punch-drivers and provided with armatures, rods connecting the armatures with the respective drivers, springs normally holding the armatures away from the poles of the magnets so as to retain the connected drivers out of alignment with the corresponding punches, the said magnets when energized moving the armatures to bring the corresponding driver or drivers into position to actuate the punches, and means for causing the sheet which is to be perforated to be fed across the bed-dies past the punches by a step-by-step motion, said means including a reciprocating presser device for engaging the sheet and actuated in unison with the rod to which the strikers are connected, substantially as specified.

2. In a machine for producing perforated tune-sheets of music for use in connection with automatically-played musical instruments, the combination with the bed-dies, of a row of punches working in conjunction with the bed-dies for perforating the sheets, striker-bars or drivers for the several punches normally held in inoperative position, driving-gear for continuously imparting reciprocating motion to said punch-drivers, means for bringing any driver or drivers of the series into position to operate upon the respective punch or punches, and means for causing the sheet which is to be perforated to be fed across the bed-dies past the punches by a step-by-step motion, said means comprising a guide-bar over which the sheet passes, and a reciprocating presser-

roller for engaging the sheet at the outer side of the guide-bar, substantially as described.

3. In a machine for producing perforated tune-sheets of music, the combination with the bed-die over which the sheet passes, of the punches acting in conjunction with the bed-die, means for normally holding the punches out of contact with the sheet, striker-bars or drivers for the punches normally held out of operative position, a horizontally-arranged rod to which the upper ends of the drivers are connected, a horizontal shaft mounted to turn and having an eccentrically-formed portion, a sheave or cylinder mounted on the eccentric portion of the shaft, arms extending from the sheave or cylinder, a horizontally-extending rod connected with the said arms, links connected with the said rod and supporting the rod to which the drivers are connected, means for bringing any driver or drivers of the series into position to operate upon the respective punch or punches, and means for causing the sheet which is to be perforated to be fed across the bed-dies past the punches by a step-by-step motion, substantially as specified.

4. In a machine for producing perforated tune-sheets of music, the combination with a bed-die, of a row of punches normally held retracted, striker-bars or drivers for the several punches normally held in inoperative position, a rod on which the striker-bars are mounted, driving-gear for continuously imparting reciprocating motion to said rod and the punch-drivers carried thereby, means for bringing any driver or drivers of the series into position to operate upon the respective punch or punches, a guide-bar over which the sheet passes, a presser-roller for engaging the sheet at the outer side of the guide-bar, rods connected at their lower ends with the shaft of the presser-roller, and levers connected at one end with the upper ends of said rods and at their other ends with the reciprocating rod carrying the drivers, substantially as described.

5. In a machine for producing perforated tune-sheets of music, the combination with a row of punches and springs for normally holding the punches in retracted position, of a bed-die over which the sheet passes, striker-bars or drivers for the several punches normally held in inoperative position, a horizontally-arranged rod to which the drivers are connected, links pivotally connected with the ends of the said rod and with the frame of the machine for guiding the rod to cause it to reciprocate approximately in the plane of the punches, a shaft mounted to turn and having an eccentrically-formed portion, a sheave or cylinder mounted on the eccentric portion of the shaft, guide-arms extending from the ends of the sheave or cylinder and having forked or slotted lower ends engaging studs on the frame of the machine, arms extending from the sheave or cylinder, a horizontally-arranged

rod connected with said arms, links connecting said rod with the rod carrying the drivers, means for bringing any driver or drivers of the series into operative position, and means
5 for causing the sheet to be fed across the bed-die by a step-by-step motion, substantially as described.

6. In a machine for producing perforated
10 tune-sheets, the combination with the bed-die over which the sheet passes, the punches, the striker-bars or drivers for the punches normally held in inoperative position, driving-

gear for imparting reciprocating motion to the punch-drivers, and means for bringing any driver or drivers of the series into operative position, of a guide or striker bar over
15 which the sheet passes, and a reciprocating presser device acting upon the sheet at one side of the bar to produce an intermittent feed of the sheet, as set forth.

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Witnesses:

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RD. MORGAN.