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W. B. JEFFERSON.
PLAYER PIANO ATTACHMENT.
APPLICATION FILED MAY 17, 1912.

1,070,480.

Patented Aug. 19, 1913.
5 SHEETS—SHEET 1.

Fig. 1.

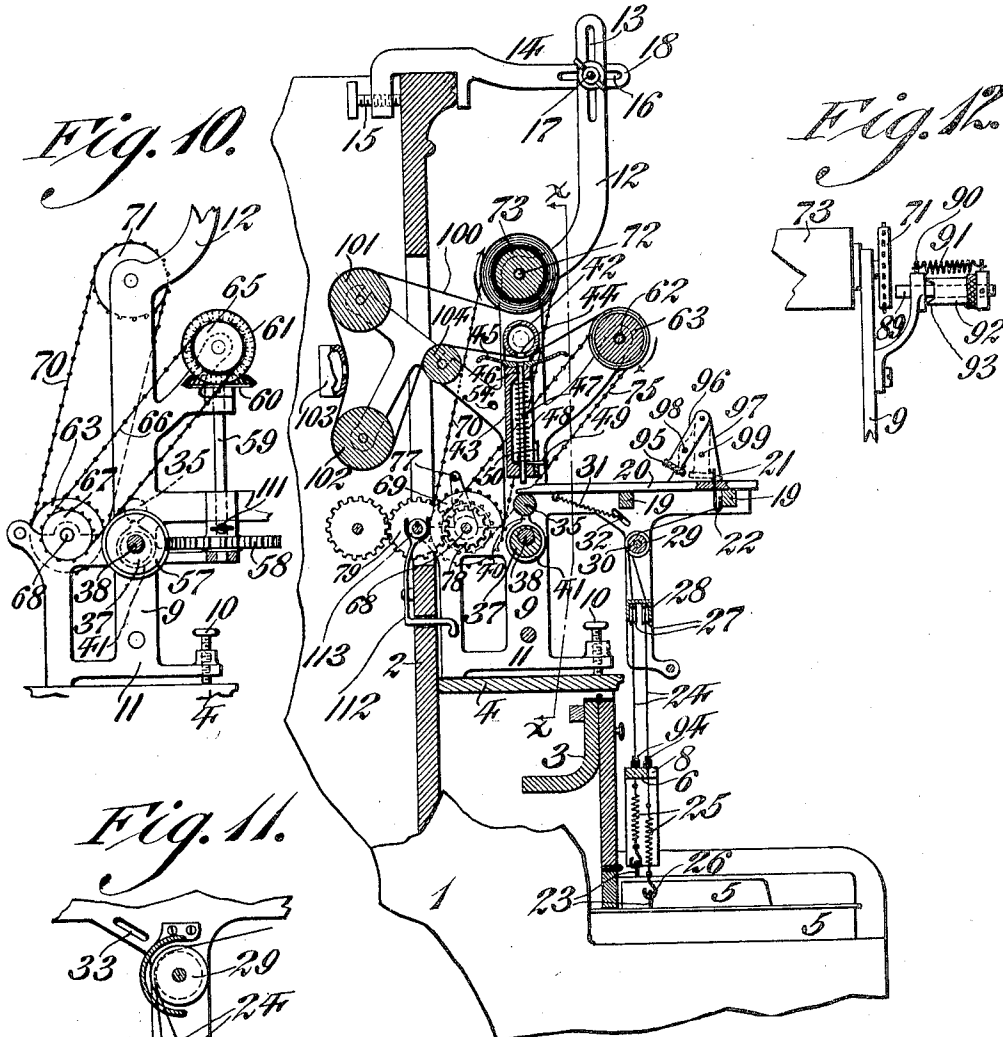


Fig. 10.

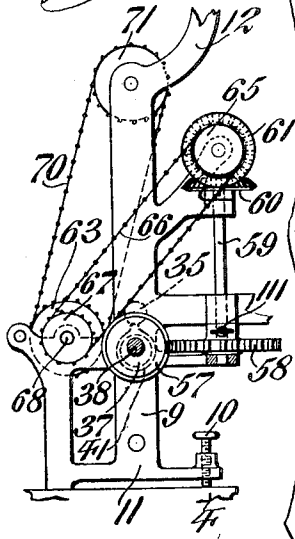


Fig. 12.

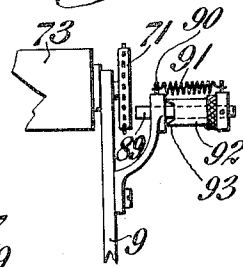
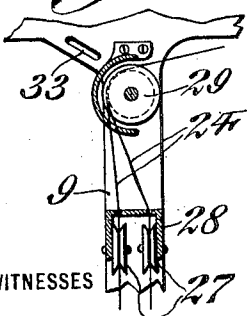


Fig. 11.



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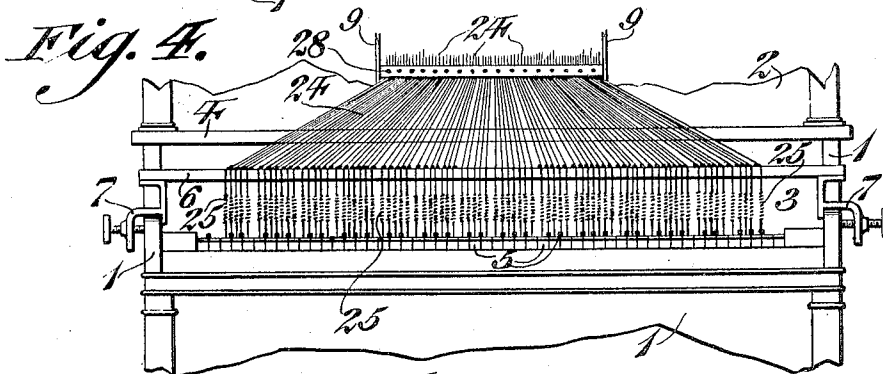
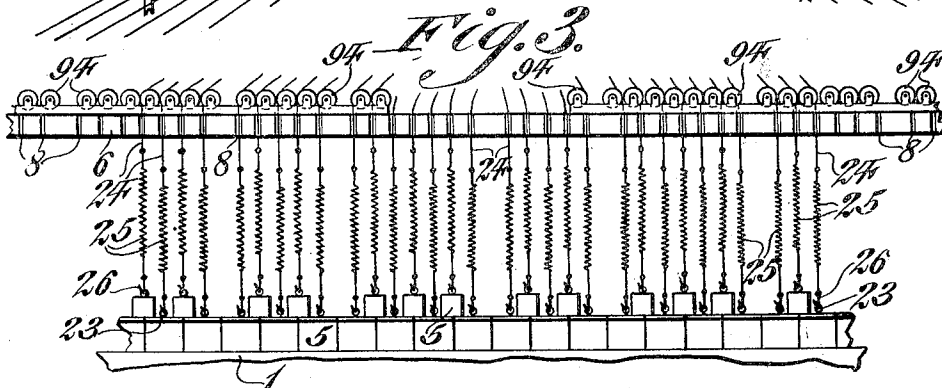
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5 SHEETS—SHEET 2.



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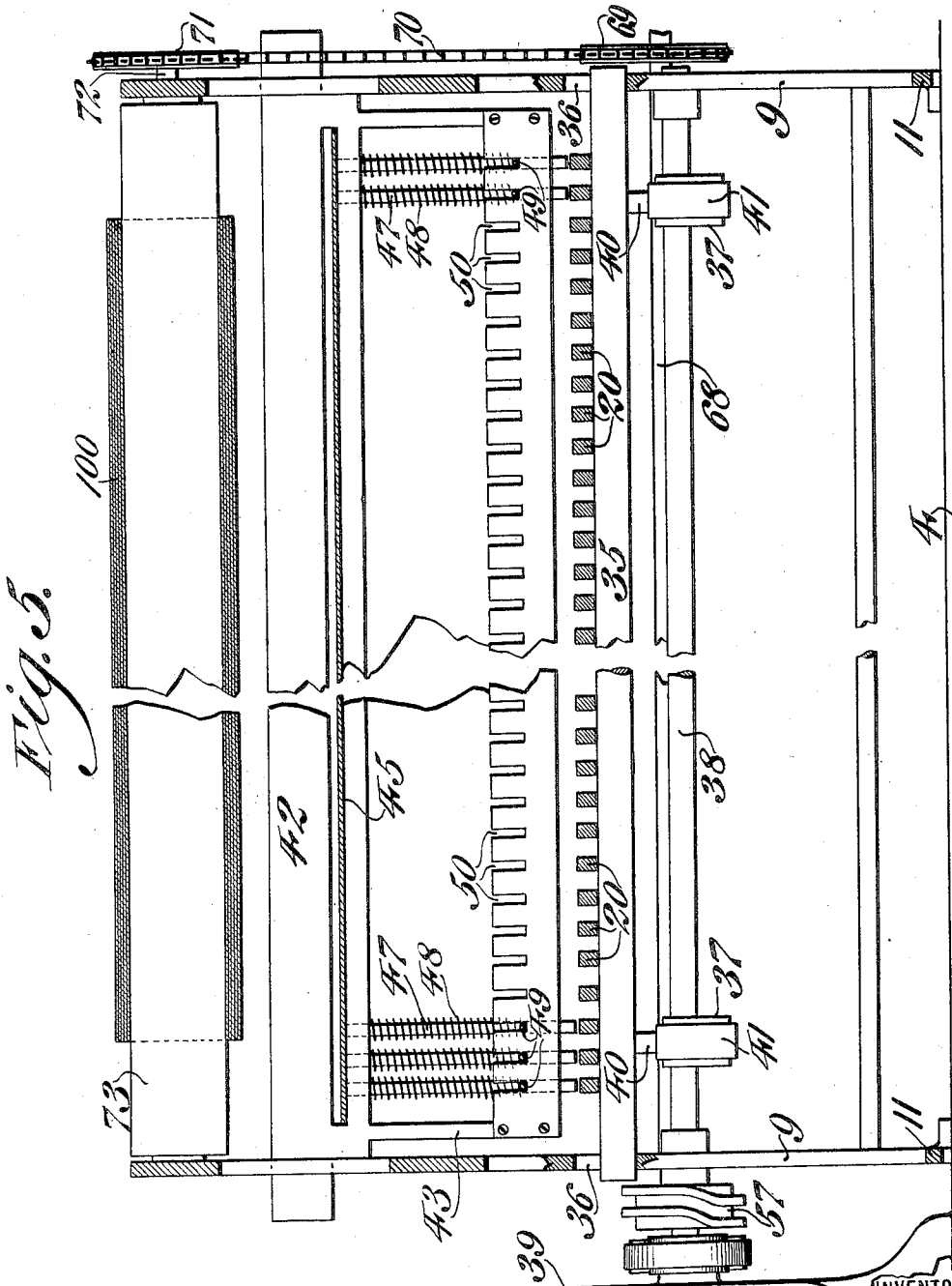
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5 SHEETS—SHEET 3.



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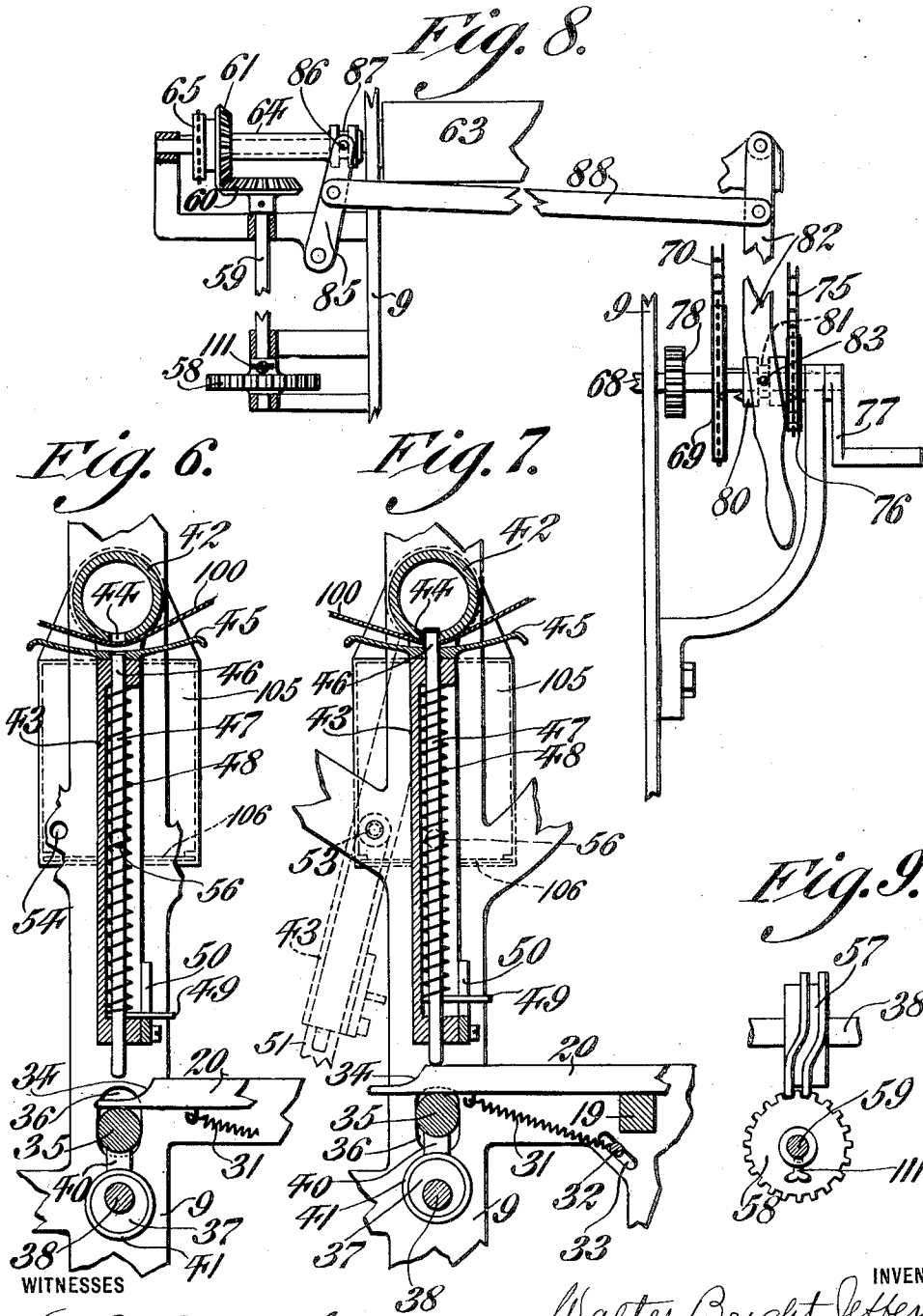
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5 SHEETS—SHEET 4.



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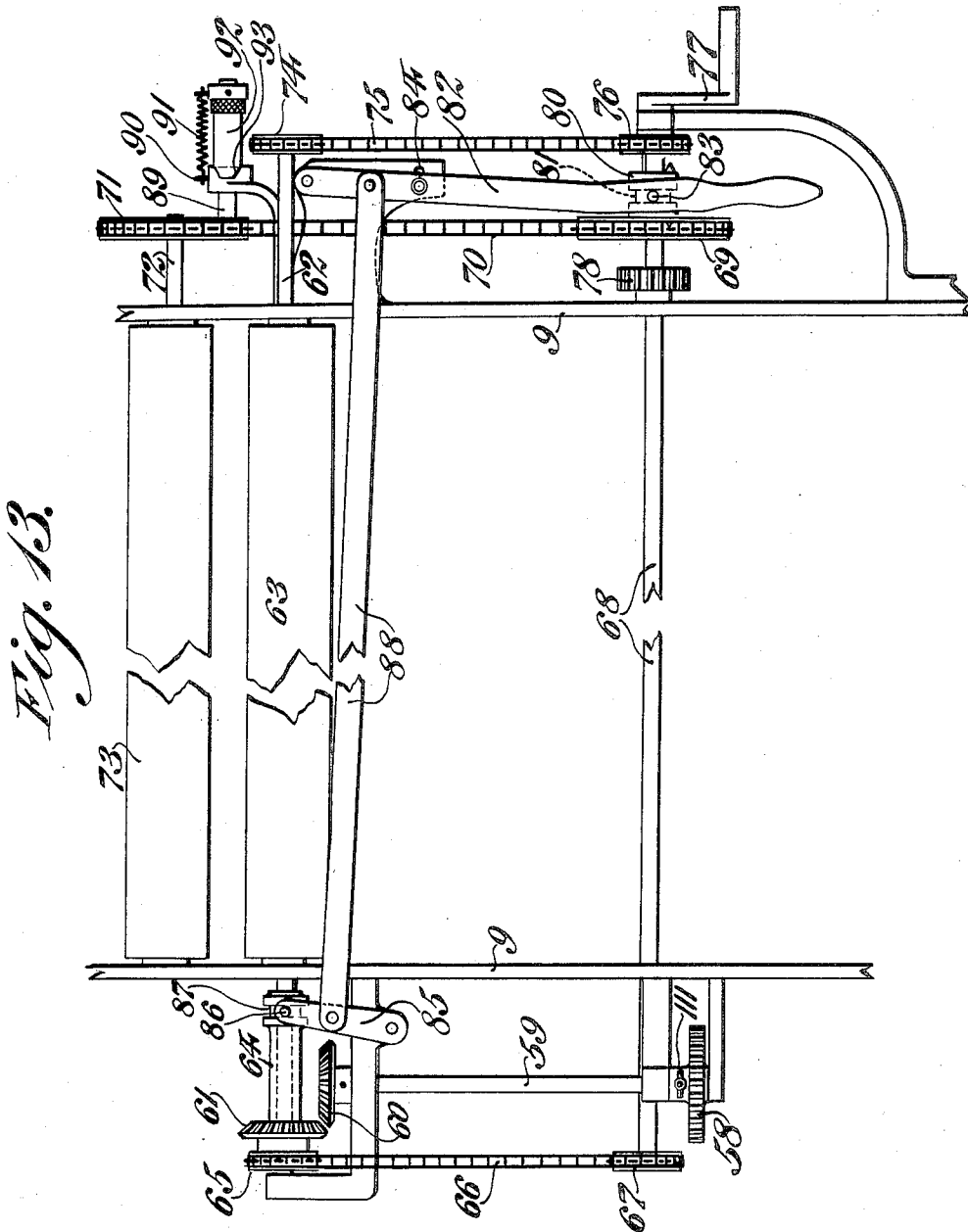
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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

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PLAYER-PIANO ATTACHMENT.

1,070,480.

Specification of Letters Patent.

Patented Aug. 19, 1913.

Application filed May 17, 1912. Serial No. 697,872.

To all whom it may concern:

Be it known that I, WALTER BRIGHT JEFFERSON, a subject of the King of Great Britain, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Player-Piano Attachment, of which the following is a specification.

My invention consists of an apparatus by means of which a sheet or strip of paper, a so-called "roll" for use in a piano-player or similar automatic music-reproducing instrument, may be punched or cut while a performer is playing the composition on such a piano, and again reproduced.

It further consists of such apparatus constructed to be detachably attached to a player piano without requiring any reconstruction of the same.

It further consists of an improved punching or perforating device for such apparatus.

It further consists of other novel features of construction all as will be hereinafter fully set forth.

The annexed drawings and the following description set forth in detail one mechanical form embodying the invention, such detail construction being but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings—Figure 1 represents a vertical section of the front portion of a player-piano, illustrating my attachment applied thereto, parts being omitted for the sake of clearness. Fig. 2 represents a part front elevation and part section of the punching or perforating mechanism. Fig. 3 represents a front elevation of a portion of the keyboard of a piano, the lower guide-bar and the operating cords and springs. Fig. 4 represents an elevation of the keyboard and a portion of the front of a piano, illustrating the manner of applying my attachment. Fig. 5 represents a part elevation and part section on the line $x-x$ Fig. 1, of the punching mechanism, parts being omitted for the sake of clearness. Figs. 6 and 7 represent sectional detail views of one of the punches and its cam-rod and coöperating parts, illustrating, respectively, the punch in lowered and raised position. Fig. 8 represents a detached detail view of the driving and re-winding mechanism for the receiving roller. Fig. 9 represents a detached detail view of

the cam upon the drive-shaft and the cog-wheel of the roller-driving mechanism engaged by the same. Fig. 10 represents a detached detail view of a part of the roller-driving mechanism. Fig. 11 represents a detail view of one of the cord-guides. Fig. 12 represents a detail view of the brake-device for the paper delivering roller. Fig. 13 represents an elevation of the receiving and delivering rollers and their operating mechanism. Fig. 14 represents a detail plan view of a portion of the guide-bar.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, the numerals 1 indicate the sides of the piano casing, having the front-board, 2, lid, 3, shelf, 4, and keys, 5, of the ordinary piano.

A guide-bar, 6, is secured above the key-board of the piano by means of clamps, 7, engaging the sides of the piano, and has a series of notches, 8, each of which registers with a key. Two side-frames, 9, rest upon the shelf of the piano and have leveling screws, 10, in their bases, 11. The upper ends of said frames have upwardly projecting arms, 12, having slots, 13, in their upper ends, and brackets, 14, engage the upper edge of the front-board of the piano and are clamped thereupon by screws, 15, and have slots, 16, in their outer ends, through which pass screw bolts, 17, also passing through the slots in the frame-arms, and having thumb-nuts, 18, so that said arms and brackets are adjustably connected. A forwardly extending support is formed between said side-frames by means of bars, 19, and cam-rods, 20, are guided to slide in said support. Pins, 21, are secured through the outer ends of said cam-rods, and have eyes, 22, at their lower ends. Eyes, 23, are secured in the upper surfaces of the piano-keys, and operating cords, 24, are guided in the notches of the guide-bar and over pulleys, 25, above the same, and have springs, 26, and hooks 26, engaging said eyes. The cords are converged from the guide-bar to a corresponding number of pulleys, 27, journaled in an angle-bar, 28, secured between the side-frames, and from said pulleys pass over pulleys, 29, journaled upon a rod, 30, between the side-frames, to the eyes upon the cam-rods, to which they are secured. Springs, 31, are secured to the cam-rods and to a rod, 32, adjustably secured at its ends in slots, 33, in the side-frames, and serve to

retract or pull outward the cam-rods. The cam-rods will be pulled inward by depressing the piano-keys. The inner ends of the cam-rods are formed with concavely curved and inclined reduced ends 34, and rest upon a rod, 35, having its ends guided in vertical slots, 36, in the side-frames. A number of eccentric disks, 37, are secured upon a shaft, 38, to which driving power is applied from a motor, 39, or other source of power, and rods, 40, extending from eccentric-straps, 41, upon said disks, are secured to the rod 35 to vibrate the same when the shaft for the eccentrics is rotated.

A tube, 42, is journaled at its ends to rock in the side-frames, and has a rectangular frame, 43, depending from it. The under side of said tube has a row of perforations, 44, and a curved guide-plate, 45, is supported beneath said tube and upon the upper edge of the depending frame, a narrow space being formed between said guide-plate and the tube through which the sheet to be perforated or cut travels. Punches, 46, having stems, 47, slide in said frame and register with the perforations in the tube to enter the same when raised. Springs, 48, around the stems of the punches bear against the upper cross-bar of the depending frame and against pins, 49, passed through the stems of the punches, which pins project forward to be movable in slots, 50, in the frame. The stems of the punches project downward to be engaged by the cam-rods and to be raised when the ends of said rods are raised by the transverse vibrating rod 35 and the eccentrics. An arm, 51, is secured to one end of the tube, and a latch, 52, is pivoted upon said arm and has a pin, 53, at one end, which engages a hole, 54, in the side-frame when the depending frame is tilted rearward. A spring, 55, serves to force the pin into engagement with said hole and into a hole, 56, in the side-frame when the depending frame is in its normal operative position. The two positions of the frame are illustrated in dotted and full lines, respectively, in Fig. 7 of the drawings.

The power-driven shaft 38 carries a disk, 57, having flanges or threads, 113, upon its periphery, which threads are in parallel radial planes for the greater portion of the periphery and have at one point lateral deflections or oblique jogs, 114, to the extent of the space between the threads, and the ends of the threads are tapered, as at 115, to correspond to said jogs. This threaded disk meshes with a cog-wheel, 58, which is detachably connected by a thumb-screw, 111, upon a shaft, 59, vertically journaled in one of the side-frames, and said shaft carries a bevel-gear, 60, at its upper end which meshes with a bevel-gear, 61, upon the shaft, 62, of the receiving roller,

Said latter bevel-gear is secured upon a sleeve, 64, sliding upon and rotating with the shaft 62. Said bevel-gear has a sprocket-wheel, 65, secured upon its face, around which passes a chain, 66, which passes around a sprocket-wheel, 67, upon a counter-shaft, 68, carrying at its opposite end a loose sprocket-wheel, 69, around which passes a chain, 70, which passes around a sprocket-wheel, 71, upon the shaft, 72, of a delivery roller, 73, from which the blank paper is unwound. A sprocket-wheel, 74, is secured upon the opposite end of the shaft of the receiving roller and a chain, 75, passes around said wheel and around a sprocket-wheel, 76, which is loose upon the counter-shaft. Said counter-shaft has a handle, 77, for manually turning it, and a cog-wheel, 78, which meshes with a cog-wheel, 79, forming a part of the operating mechanism of the player-piano and deriving rotary motion from such mechanism when the latter is operated. A clutch, 80, sliding upon and rotating with the counter-shaft, and formed with a circumferential groove 81, is provided between the two loose sprocket-wheels upon the counter-shaft, and is constructed to engage and drive either of said wheels when shifted against it. A hand-lever, 82, has a stud, 83, engaging the groove in said clutch, and said lever may be secured to keep the clutch in engagement with either sprocket-wheel by means of a pin engaging openings, 84, in the frame. An arm, 85, is pivotally supported to have a pin, 86, engage a circumferential groove, 87, in the sliding sleeve upon the shaft of the receiving roller, and a connecting bar, 88 is pivotally connected at its ends to said arm and to the clutch-operating lever, so that said sleeve and clutch may be simultaneously shifted. A brake-bolt, 89, slides in a bearing, 90, upon one side-frame to have its end bear against the face of the sprocket-wheel 71 upon the shaft of the delivery roller, and said bolt has a spring, 91, which forces it into frictional contact with such face. A cam-sleeve, 92, is secured to turn upon said bolt and has cam-projections, 93, which engage the bearing for the bolt to move the latter into and out of engagement with the sprocket-wheel, as the sleeve is turned.

A bar, 95, is secured in the lower ends of arms, 96, pivoted at their upper ends upon brackets, 97, upon the forwardly-projecting portions of the side-frames, to engage the upper ends of the pins in the cam-rods, and said bar may be swung to engage such pins or be swung out of the way of the same, and may be held in either position by means of a pin, 98, engaging holes, 99, in one of the brackets.

The sheet or strip of paper, 100, is guided from the delivery-roller around two guide-

rollers, 101 and 102, journaled in the side-frames above and below the tracker-board, 103, and is thence carried over a guide-roller, 104, also journaled in the side-frames and between the curved guide-plate and the die-tube, 42, to the receiving roller, upon which it is wound.

Boxes, 105, are secured upon the ends of the die-tube and have sliding doors, 106, in their bottoms and openings, 107, in their sides, registering with the ends of the tube and provided with pivoted covers, 108. A cleaner, 109, fits to slide within the die-tube, and is secured to the end of a rod, 110, and said cleaner may be introduced through the opening in a box and pushed and pulled through the tube to carry the pieces of paper, punched out of the sheet into either of the boxes, from which they may be removed by opening the doors.

A lever, 112, is provided in the front of the piano and engages the gear, 79, of the player-mechanism, to throw said gear into or out of engagement with the gear, 78, upon the shaft of the sheet-feeding mechanism.

In practice, the guide-bar is secured by its clamps above the key-board and to the sides of the piano-casing, and the other portion of the apparatus is placed upon the shelf of the piano and secured to the front board by the brackets and clamping screws. I have illustrated the apparatus applied to a player-piano, as I prefer to be able to test the sheet or roll directly after it has been cut and perforated. The winding roller of the player is preferably removed, and the two guide-rollers 101 and 102 of the apparatus occupy the places, on opposite sides of the tracker-board, of the music-roll and the winding-roller in the usual player-piano construction. After the apparatus has thus been secured to the casing of the piano, the operating cords are separately guided in the notches and by the pulleys in and upon the guide-bar across the keyboard, and each cord is secured by its hook to the eye upon its respective key. The swinging bar at the front edge of the frame is brought to bear against the pins through the cam-rods and held there by its pin, while the tension of the operating cords is equalized, so that the strain upon said cords will be even. A roll of imperforate paper is wound upon the delivering roller, carried over the upper guide-roller and across the tracker-board and beneath the lower roller, thence over the guide-roller 104 and between the die-tube and guide-plate and punch-frame, and finally to the receiving-roller, to which the end of the sheet or band is suitably secured. When now the motor is started and a performer plays a composition on the keyboard, the punches will perforate the paper and produce a record.

To understand the process of perforation, it is preferable to only describe the operation of one key and punch, and their connecting elements, as the operation of one set of elements is the same as that of the others. When the key is depressed, the operating cord is pulled downward and, being guided by notches and pulleys, the cam-rod corresponding to it will be drawn inward. The rod upon which the inner end of the cam-rod rests being rapidly vibrated by the eccentrics, such inner end will not come in contact with the lower end of the punch-stem so long as the cam-rod is in its forward position and its reduced end is between the vibrating rod and the punch-stem, but as soon as the cam-rod is moved inward and its thicker portion comes between the vibrating rod and the end of the punch-stem, the punch is raised and rapidly reciprocated by the vibration of the rod, thus perforating the paper. If the duration of the depression of the key only occupies the time of one upward reciprocation of the punch, one perforation, only, will be made, and the reciprocations of the punch and the speed of travel of the paper is so timed, that there will be no perceptible drag by the traveling paper upon the punch. If the key is held down for a longer space of time, the rapidly reciprocating punch will cut a series of overlapping holes in the paper and thus form a slot of a length corresponding to the length of time the key is held depressed. A record of holes and slots is thus formed while playing the piano, and each note is given its proper time-value by the holes and slots of greater or less length. If such record is found correct, the same may be used as a master-roll or master-record from which other records may be cut by suitable reproduction means. The brake acting against the face of the sprocket-wheel upon the delivering-roller shaft will maintain proper tension upon the paper to keep the same taut and smooth as it passes under the die-tube. While the perforating is taking place, and the driving shaft 38 is rotating, the hand-lever is in the position shown in Fig. 8, with the clutch in engagement with the sprocket-wheel 76 and with the bevel-gears in engagement, so that the receiving roller is positively driven while the delivering-roller is disengaged but controlled by the brake. When the record is completed, the hand-lever is thrown so as to disengage the clutch from the sprocket-wheel conveying motion to the receiving-roller and throw the clutch into engagement with the sprocket-wheel conveying motion to the delivering-roller and to disengage the bevel-gears. When now the counter-shaft is rotated by its crank or handle in the reverse direction of its former rotation, the delivering-roller will be rotated to wind the cut and

perforated record upon the same. When the record is thus wound, and it is desired to test the record in the piano-player, the cords are detached from the eyes upon the keys and the punch-frame is tilted back, as shown in dotted lines in Fig. 7, and secured in such position by the pin of its latch. The connection to the driving-shaft is interrupted by loosening the thumb-screw which secures the worm-wheel upon its vertical shaft or by any other suitable engaging and disengaging means. The motor is preferably stopped, stopping the rotation of the driving shaft and the vibration of the vibrating rod, although this is not absolutely necessary, as the punch-stems cannot be reached by the cam-rods when the punch-frame is tilted rearward, but it is desirable to dispense with unnecessary sound and vibration. The player mechanism is now thrown into gear with the gear on the counter-shaft, and such mechanism started. The receiving-roller will be driven from the player mechanism, through the counter-shaft and the sprocket-wheels and chains, the clutch having been thrown to disengage it from the sprocket-wheel driving the delivering-roller and to engage the wheel driving the receiving roller. The composition cut into the record will thus be reproduced in the manner usual in piano-players, and the performer may judge whether the record is perfect or faulty. If the record is correct, it may be used as a master-record for producing other records from it.

Besides the purpose of producing records for playing purposes, this apparatus may also be of great utility to the student of the piano, as he may play a composition and then reproduce and criticise the rendition during reproduction.

The die-tube may be cleaned and all the cut-out disks of paper removed without interrupting the action of the apparatus by sliding the cleaner through the tube and pushing or pulling the cuttings out into the receptacles at the ends.

As the cam-rods continually rest upon the vibrating rod, they are at all times beneath and in register with their respective punches and each rod will actuate its respective punch when moved inward to bring the thicker portion of the cam rod between the vibrating rod and the punch. The vibrating rod will have a true vertical movement, and the cam-rods, resting upon and vibrating up and down with said rod, will not get out of alinement with the ends of the punches, so that positive and accurate action of the apparatus is assured.

By placing the punches beneath the dies and guiding the paper in the manner disclosed, the sheet is perforated from that side which comes in contact with the face of the tracker-board, so that any burs or rough

edges which may be left in the perforations will not come in contact with the face of said board to cause leakage of air or irregularity in the pneumatic action of the player mechanism owing to irregularities of the perforations obstructing the holes in the tracker-board, as is liable to happen in roll-sheets punched in the usual manner, from the side opposite to that bearing against the face of the tracker-board.

The disk having the circumferential flanges or threads and meshing with the cog-wheel 58 of the paper-feeding mechanism will, as it is rapidly rotated by the eccentric-shaft imparting motion to the vibrating rod, rotate said cog-wheel with an intermittent motion, and will thus intermittently feed the paper-roll across the punches and beneath the dies. The cog-wheel and feeding mechanism will be rotated for the space of one cog of the wheel, each time the oblique jog of the flanges or threads engages a cog, and the wheel and feeding mechanism will be positively held against movement while the portions of the flanges or threads which are in radially parallel planes engage a cog of the wheel, which is so timed as to take place when the vibrating rod raises the cam-rods and the punches, and perforation of the sheet takes place. All possibility of tearing of the sheet during its forward, feeding movement is thus avoided, as the sheet is held immovable while the punches are raised and will not be moved until the jog engages a cog, which cannot take place until the punches are dropped or retracted.

The attachment may be applied to and removed from any player-piano without any changes in the mechanism of the latter being required, it being only necessary to remove the receiving roll of the piano and to secure the eyes to the keys. The guide-bar is detachably secured across the key-board, and the frame of the apparatus is detachably clamped to the upright front of the casing with the guide-rollers projecting through the usual opening in the front of the piano-casing.

Other modes of applying the principle of my invention may be employed for the mode herein explained. Change may therefore be made as regards the mechanism thus disclosed, provided the principles of construction set forth, respectively, in the following claims are employed.

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

1. In apparatus of the character stated, a series of dies, a series of vertically reciprocable punches registering with said dies to have their upper ends enter the same, a rod continuously vibrating in the vertical plane of said punches and beneath the lower ends of the same, a series of horizontally sliding

cam-rods having reduced ends and continually resting with such ends upon said vibrating rod and intermediate said rod and the lower ends of the punches and registering with the same, and means for individually sliding said rods.

2. In combination with a player-piano comprising a key-board, and a tracker-board, a frame provided with means for detachably securing it to the casing of the piano, guide-rollers journaled in said frame to be located at opposite sides of the tracker-board, a perforating device supported in said frame and comprising a series of punches, means for detachably connecting such punches to the keys of the piano, a delivering roller, a receiving roller, means for actuating said rollers to feed the sheet through the perforating device, and means for connecting and disconnecting the player mechanism with and from the receiving roller.

3. In apparatus of the character stated, a piano-player comprising a key-board and a tracker-board, a receiving-roller, a delivering roller, guide-rollers on opposite sides of the tracker-board, a perforating mechanism having punches, means for actuating said perforating mechanism, means for connecting and disconnecting said actuating means and perforating mechanism, means for connecting individual keys to individual punches, means for rewinding the delivering-roller, and means for connecting the receiving roller to the piano-player mechanism.

4. In apparatus of the character stated, a die-tube formed with a series of die-openings and having a depending frame, a series of punches registering with said die-openings and having stems guided in said frame and springs for retracting them, a rod beneath the ends of said stems, means for vibrating the same, cam-rods supported transversely to the punch-stems and having reduced ends continually resting upon said vibrating rod, springs for retracting said cam-rods, and cords, each having one end attached to a cam-rod and the other end adapted to be connected to a key of a piano.

5. In apparatus of the character stated, a player-piano comprising a key-board and a tracker-board, a die-tube formed with a series of die-openings, a series of punches registering with said die-openings, a vibrating rod, a driving shaft connected to vibrate said rod, cam-rods having reduced ends resting upon said rod and movable between said punches and rod, individual means for retracting said cam-rods, individual cords, each connected to a key and a cam-rod, a receiving roller, means connected to said driving-shaft for rotating said roller, means

for connecting and disconnecting said rotating means to and from said roller, a delivering roller, guide-rollers arranged on opposite sides of the tracker-board to guide the music-sheet across the same, and means for connecting and disconnecting the player mechanism with and from the receiving roller.

6. In apparatus of the character stated, a player-piano, a guide-bar having clamps for securing it to the sides of the piano casing and formed with guide notches and pulleys, a frame having brackets formed with clamps for engaging the front board of the piano and bases for resting upon the shelf and provided with leveling-screws, a bar in said frame and provided with guide-pulleys, a perforating mechanism in the frame comprising a series of punches corresponding to the keys of the piano, operating cords having means for detachably securing their ends to the keys of the piano and guided by the guide-notches and pulleys to converge to the perforating mechanism and individually connected to operate the several punches, a receiving roller journaled in the frame, means for rotating the same, a delivering roller journaled in the frame, and guide-rollers journaled in the frame to extend into the piano casing at opposite sides of the tracker-board to guide the sheet across the same.

7. In apparatus of the character stated, side-frames, a die-tube formed with a series of die-openings and having a depending frame and journaled with its ends in said side-frames, a series of punches registering with said die-openings and having their stems guided in said depending frame, a vibrating rod beneath the ends of said stems, cam-rods longitudinally movable between said ends and rod and having their ends resting upon the same, an arm secured to one end of the die-tube, and a latch upon said arm and engaging one side-frame.

8. In apparatus of the character stated, a perforating mechanism, longitudinally sliding cam-rods for operating such mechanism and having pins secured through their outer ends, cords secured to the lower ends of said pins and having their other ends adapted to be detachably secured to the individual keys of the piano key-board, a bar having arms at its ends pivoted to admit of its being swung into and out of engagement with the pins in the cam-rods, and means for securing said bar in its adjusted positions.

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Witnesses:

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