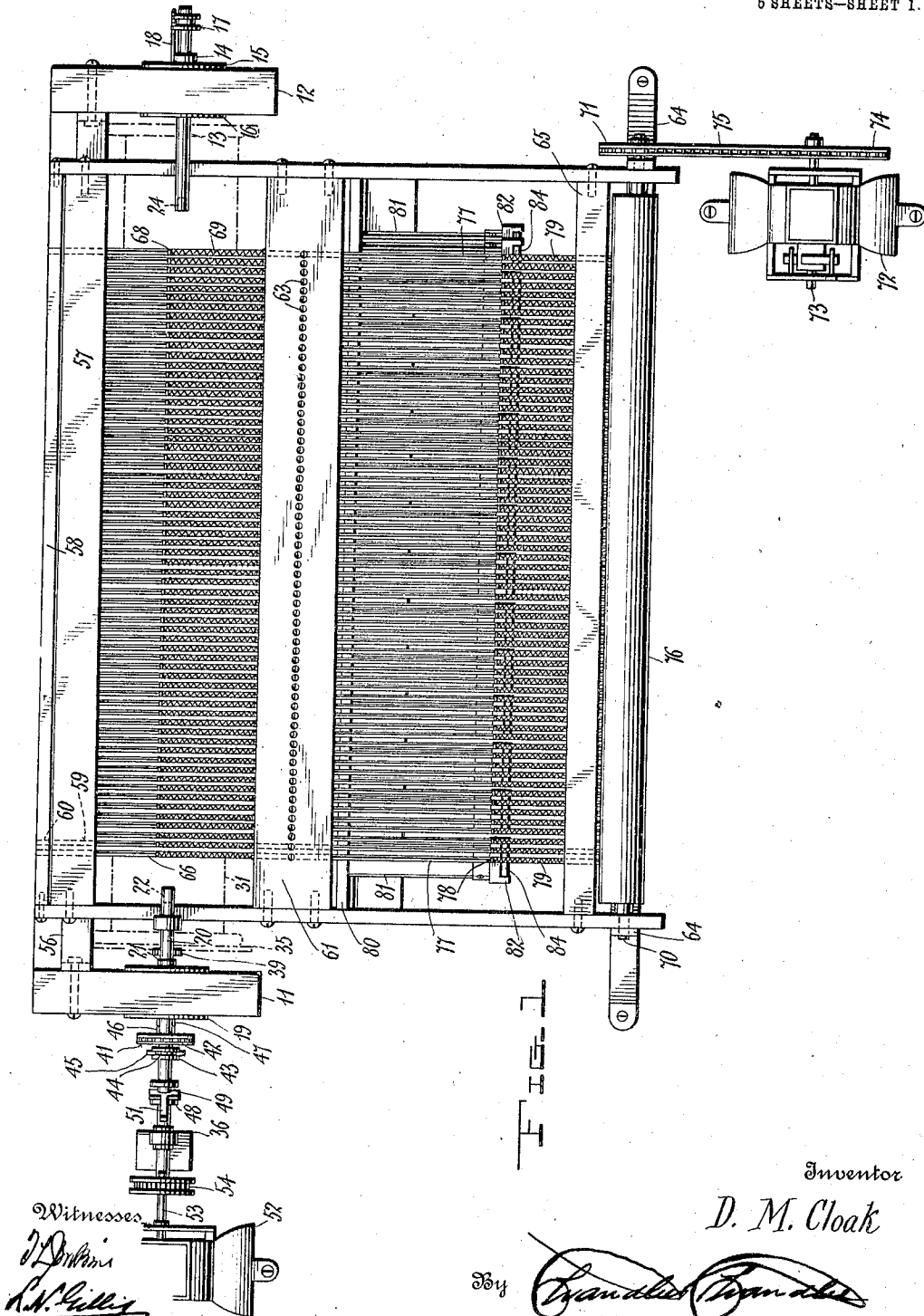


D. M. CLOAK.
MUSIC ROLL PRODUCER FOR SELF PLAYING PIANOS.
APPLICATION FILED DEC. 22, 1909.

961,754.

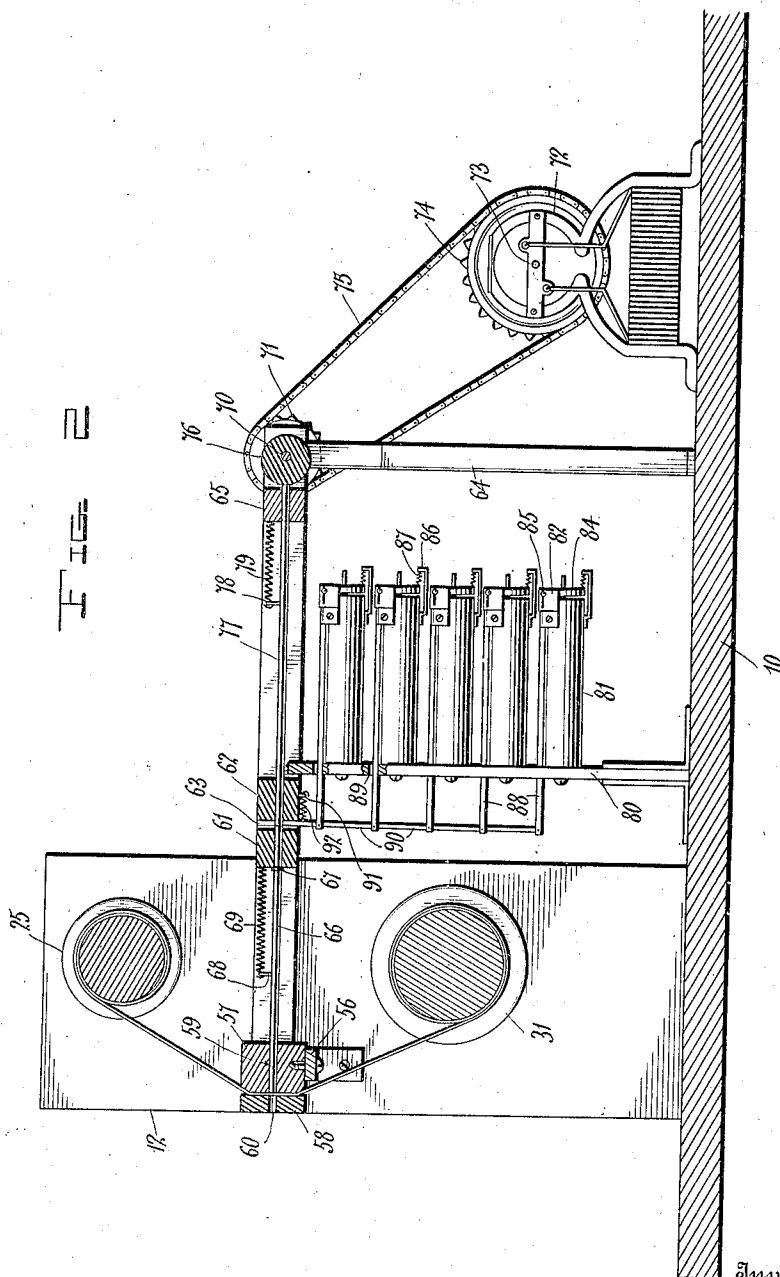
Patented June 21, 1910.

5 SHEETS—SHEET 1.



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5 SHEETS--SHEET 2.



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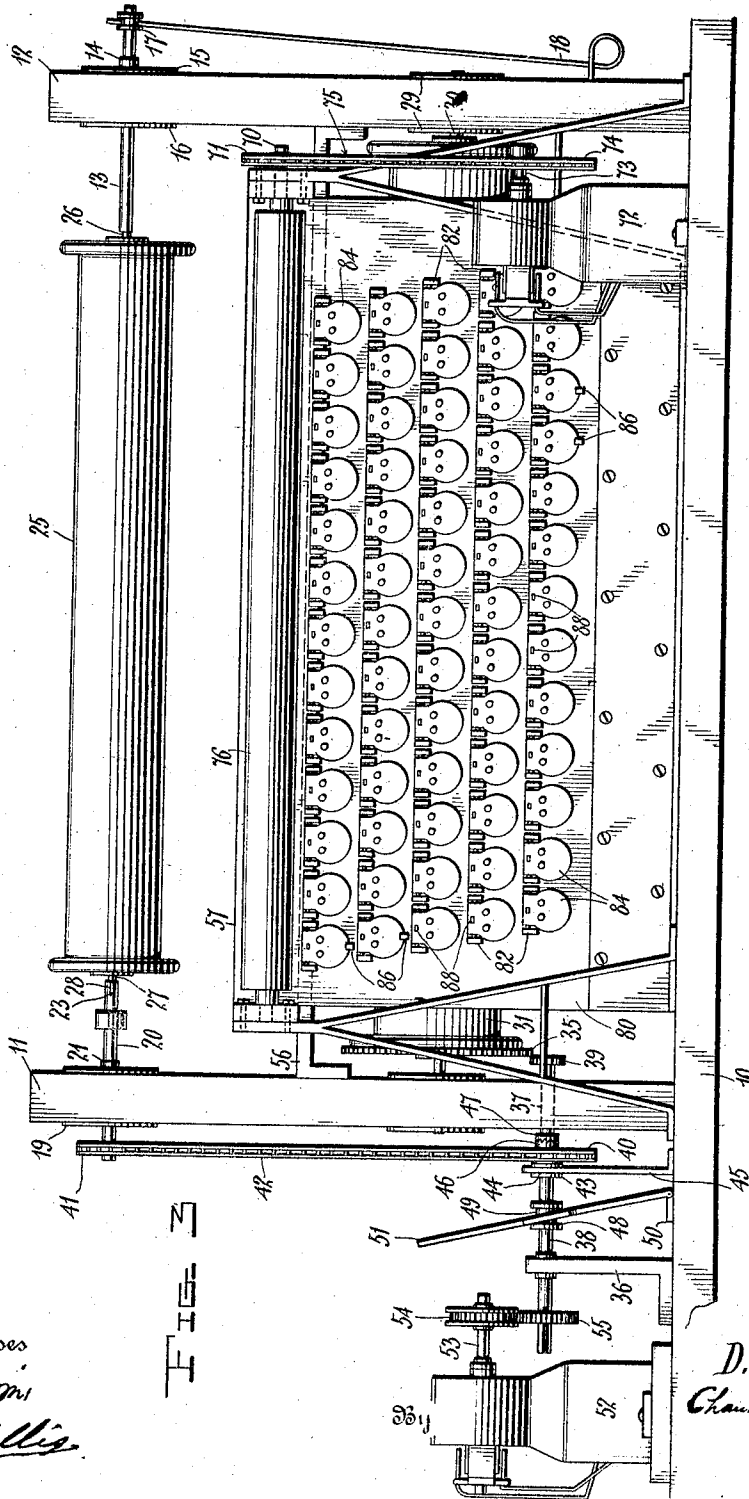
Attorneys

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5 SHEETS—SHEET 3.



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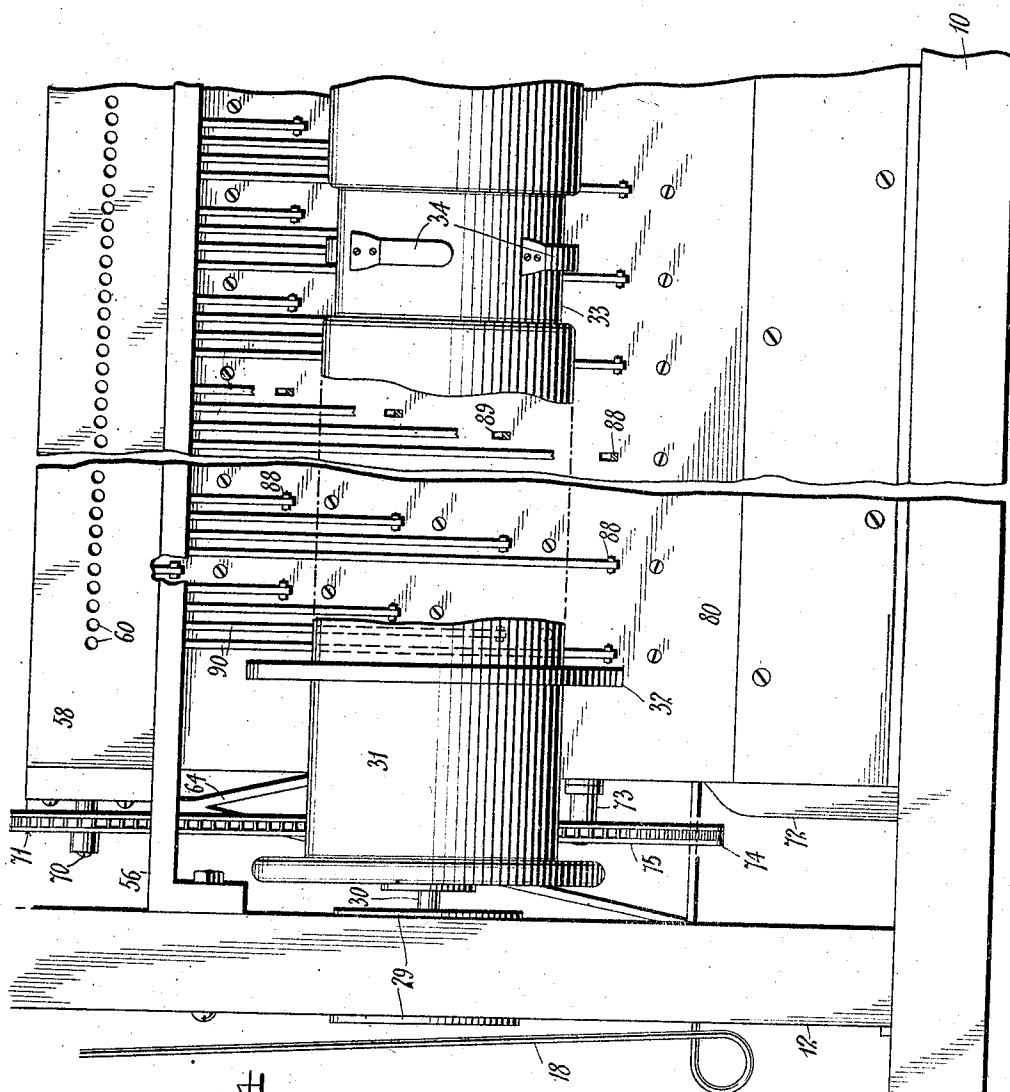


FIG. 4

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5 SHEETS—SHEET 5.

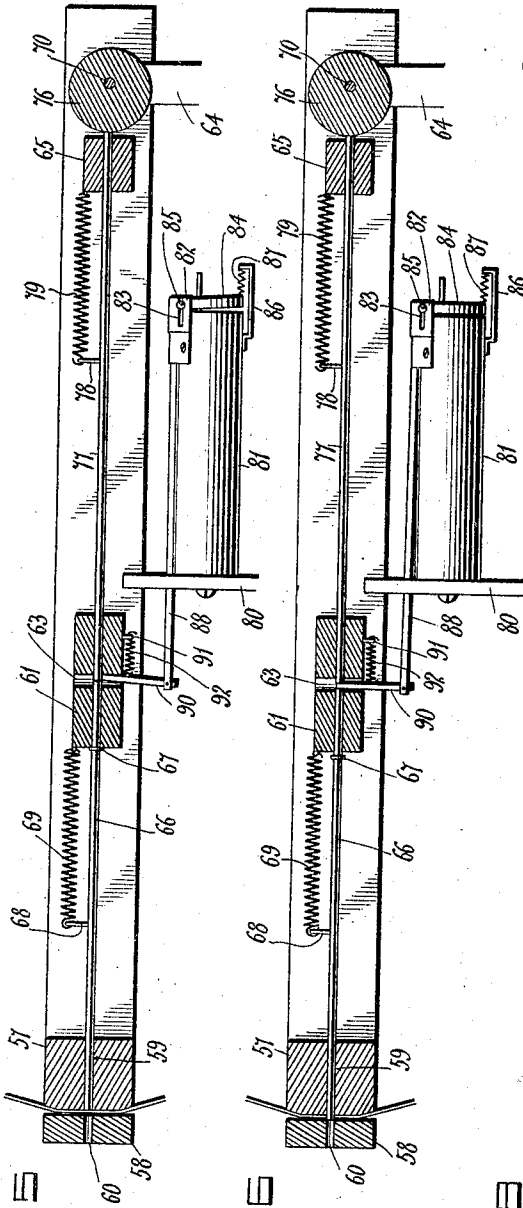


FIG. 1

FIG. 2

FIG. 3

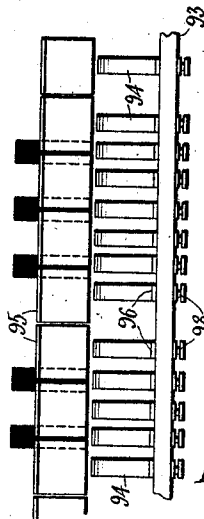


FIG. 3

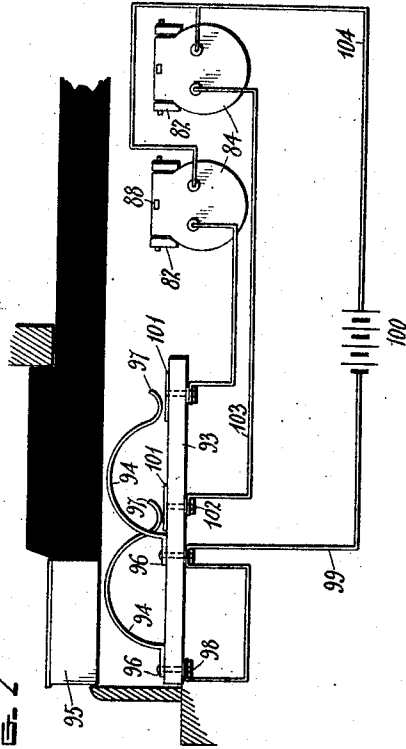


FIG. 4
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UNITED STATES PATENT OFFICE.

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MUSIC-ROLL PRODUCER FOR SELF-PLAYING PIANOS.

961,754.

Specification of Letters Patent. Patented June 21, 1910.

Application filed December 22, 1909. Serial No. 534,507.

To all whom it may concern:

Be it known that I, DONALD M. CLOAK, a citizen of the United States, residing at Dover, in the county of Kent, State of Delaware, have invented certain new and useful Improvements in Music-Roll Producers for Self-Playing Pianos; 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 relates to devices for producing music rolls for use with what are known as automatic pianos wherein a roll or length of paper provided with perforations is used to regulate the action of the instrument.

The invention especially has reference to a device which may be attached to a piano of the ordinary type, and which, when so attached, will operate to punch holes of the proper position and length in a moving web of paper during the time that the piano is being played.

One object of the invention is to provide a construction of this character which shall be electrically operated and wherein the depression of the key will act to punch a hole in a moving web of paper, the length of the holes being regulated by the time that the key is kept depressed and the position of the hole sidewise of the web being regulated by the specific key which may be depressed.

Another object of the invention is to provide means whereby the punching operation may be entirely independent of the speed at which the web of paper moves so that a person can play as slowly and carefully as may be desired when producing the roll while at the same time the roll so produced will, when run through an automatic piano at the ordinary speed, produce the proper tempo in the music.

A third object of the invention is to provide a novel means whereby the striking of a chord will so actuate a number of punches that the paper will be simultaneously punched in the place indicative of such keys as may be struck, thus enabling the web to effect the simultaneous striking of the keys of the chord when run through an automatic piano.

A fourth object of the invention is the provision of a simple mechanism which may be placed beneath the keys of a piano

and which will not take up room or interfere with the ordinary playing thereof, said mechanism being arranged so that the depression of each key will close a separate electric circuit adapted to actuate certain mechanism which will effect the punching of the holes in the paper.

With the above and other objects in view, the invention consists in general of a series of electro-magnets, means actuated by the depression of piano keys whereby each key controls the closing of the circuit through a respective magnet, a punching mechanism, means controlled by the respective magnets whereby the punches are rendered operative or inoperative according to the keys depressed, and motor mechanism to run said punches.

The invention further consists in certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings, and specifically set forth in the claims.

In the accompanying drawings, like characters of reference indicate like parts in the several views, and Figure 1 is a top plan view of the punching mechanism used with this invention. Fig. 2 is a transverse section through the mechanism shown in Fig. 1. Fig. 3 is a rear elevation of the mechanism shown in Fig. 1. Fig. 4 is an enlarged partial front elevation of the mechanism shown in the foregoing figures. Fig. 5 is an enlarged detail section showing one of the punches and its magnet in inoperative position. Fig. 6 is a view similar to Fig. 5 showing the mechanism in operative position. Fig. 7 is a section through a piano key-board showing the circuit closing elements and diagrammatically disclosing their relation to a battery and certain of the magnets. Fig. 8 is a front elevation of a piano key-board with the casing removed and the circuit closing mechanism in position.

The numeral 10 indicates a base board whereon the various elements comprising this invention are carried.

It is preferred that the mechanism herein illustrated should be cased in but the casing has been omitted in the different views in order to better convey an idea of the operative portions of the device. Upon this base board and adjacent the front thereof are spaced standards 11 and 12. Extending

through the standard 12 is a sliding shaft 13 and on the outside of the standard 12 this shaft is provided with a collar 14 adapted to contact with a stop plate 15 also carried on the outside of the standard. This stop plate 15 is provided with a suitable opening to receive the sliding shaft 13 and upon the inside of the standard 12 is a similar plate 16 similarly provided with an opening for the shaft, the two plates together forming the bearings for this shaft. Upon the shaft 13 there is also carried a grooved collar 17 and in the groove of this collar there is held the end of a spring 18 which is fixed to the standard 12 adjacent the lower end thereof, the spring constantly tending to force the collar 14 against the plate 15. Upon the standard 11 are plates 19 provided with suitable openings alining with the openings in the plates 15 and 16 and in these openings is held a shaft 20 which is free to rotate in the plates but is prevented from movement longitudinally thereof by means of suitable collars 21 on each side of the standard 11. The shaft 20 is provided with a recess 22 in its inner end and this recess is slotted as indicated at 23. The shaft 13 is also provided with a recess 24.

At 25 is indicated a roll or cylinder of the usual type common with automatic pianos and this roll or cylinder has a journal 26 at one end which fits within the recess 24 while the opposite end thereof is provided with a journal 27 whereon is a key or feather 28 adapted to be received in the slot 23 so that any rotation of the shaft 20 will rotate the roll. The cylinder 25 is placed in position by drawing back the shaft 13, slipping the journal 27 into the recess in such manner that the key fits the slot and then allowing the shaft 13 to spring back into position so that the journal 26 fits the recess 24.

The standards 11 and 12 are also each provided with wear plates 29 near the bottoms of these standards and these wear plates and the standards are provided with alined perforations which are adapted to receive the journals 30 of a winding roll 31, this roll being provided with flanges 32 to properly guide the paper thereon. Furthermore, the winding roll 31 is provided with a reduced central portion 33 and around the roll in this reduced portion are fixed a plurality of spring fingers 34 in one of which the ring, common on the ends of the strips of paper used for the production of music rolls, engages in order to effect the winding of the paper on the roll 31 as the same is rotated. At one end of this roll 31 there is provided a gear 35.

At 36 is a bearing block provided with a bearing at its upper end and the standard 11 is also provided with a perforation 37 in alinement with this bearing and likewise constituting a bearing. In these bearings is

held a shaft 38 which is both slidable and rotatable in the bearings and on the end of this shaft between the standards 11 and 12 is a pinion 39 which is adapted to be brought into engagement with the gear 35 when the shaft 38 is slid in the proper direction.

Splined upon the shaft 38 is a sprocket 40 and keyed to the shaft 20 is a sprocket 41, the two sprockets being connected by means of a sprocket chain 42. The sprocket 40 is provided with a boss 43 having a groove 44 therearound and in this groove fits the end of a standard 45 which is fixed to the base 10 so that as the shaft 38 is moved the sprocket 40 will be prevented from moving sidewise therewith. The sprocket 40 furthermore is provided with a clutch member 46 and fixed upon the shaft 38 is a second clutch member 47 adapted to engage with the clutch member 46 and rotate the same when the shaft is moved in such direction as to disengage the pinion 39 from the gear 35. By means of this arrangement it will be noted that the cylinder or roll 25 or the roll 31 may either be driven from the shaft 38 while the undriven one of the two runs idly so that the paper can unwind freely therefrom. In order to slide the shaft 38 endwise there is provided on said shaft a shipper collar 48 having the usual groove 49 therein and hinged to a plate 50 on the base 10 is a shipper lever 51 which engages the shipper collar 48 and as this lever is moved to the right or left so also will the shaft 38 be moved in like manner.

At 52 is indicated a motor and this motor is of the type adapted to rheostatic control but is here indicated simply as a typical motor since neither the motor nor rheostat need be of any specific construction. This motor is provided with the usual shaft 53 and on this shaft is mounted a shrouded gear 54. Splined to the shaft 38 is a gear 55 which meshes with the gear 54, the shrouds of said gear preventing the gear 55 from becoming disengaged therewith when the shaft 38 is moved laterally. By means of this construction it will be plain that when it is desired to run a roll of paper through the machine the motor, through its rheostat, is arranged to run at the proper speed. The paper roll 25, which has previously been filled, is placed in position and the ring at the end of the paper connected to one of the hooks or fingers 34. The lever 51 is then moved so as to bring the gears 35 and 39 into engagement and consequently to disengage the clutch members 46 and 47. The motor being started the paper will unwind from the roll 25 on to the roller 31. When all the paper has been thus wound on to the roll 31 the operation may be reversed by moving the lever 51 to disengage the gear 35 and pinion 39 and engage the clutch members 46 and 47. This will let the roll 31 run idly while the

roll 25 will be driven, in such direction as to wind the paper thereon, by means of the sprockets and their chain.

Considering now the mechanism by means of which the paper is punched. Supported on the standards 11 and 12 and intermediate in height between the rolls 25 and 31 is a bar 56 and on this bar is carried what may be termed a tracker board 57 in slightly spaced relation to which is a die board 58. Both the tracker board and die board are provided with punch receiving openings 59 and 60 respectively. The tracker board and die board are spaced very slightly apart so that the paper on the paper roll may be led therebetween and yet not allowed any great amount of play, it being merely necessary to have sufficient space to permit the paper passing freely between the two.

At the rear portions of the standards 11 and 12 are mounted guide bars 61 and 62 the same being spaced apart as clearly indicated at 63, this being the opening between the bars. These guide bars 61 and 62 are also each provided with a series of holes and the four series in the members 57, 58, 61 and 62 are all alined.

On the base 10 and immediately behind the standards 11 and 12 are plates 64 and these plates serve to assist in the support of the bars 61 and 62 and also serve to support a third guide bar 65 likewise provided with a series of perforations in alinement with the series before mentioned.

Slidably mounted in the opposed perforations in the tracker board 57 and guide 61 is a series of punch members 66 each provided with a collar 67 which prevents its moving too far toward the rear of the machine through its respective perforation in the bar 61. These bars 66 are furthermore each arranged so that at no time can they project entirely across the opening 63 between the bars 61 and 62 but, on the contrary, never project except to a slight degree into said opening. In order to normally hold the bars in such position that the collars 67 are in contact with the bar 61 each of the punches 66 is provided with an upstanding arm 68 whereto is secured one end of a spring 69, the opposite ends of said springs being secured to the bar 61. The bar 66 is of such length that when retracted by the spring 69 the opening between the die board 58 and tracker board 57 opposite said bar will be left clear, while when slightly projected forward against the action of the spring the end of the bar will project slightly into its respective opening 60 so that any paper lying between the tracker board 57 and the die board 58 will thereby be punched.

Supported in suitable bearings in the plate 64 is a shaft 70 upon one end of which is mounted a sprocket 71. At 72 is a motor provided with a shaft 73 whereon is mounted

a sprocket 74 and a chain 75 connects the sprockets 71 and 74. Fixed upon the shaft 70 is a cylinder 76 which is mounted on the shaft eccentrically so that said cylinder forms a cam.

In the openings of the guide bars 62 and 65 is held a series of punch actuating rods 77. These rods 77 are each provided with an upstanding arm 78 to which is connected one end of a spring 79, the other ends of said springs being connected to the guide bar 65 so that the rear ends of the rods 77 are at all times pressed against the cam 76. These rods 77 are of such length and the cam 76 of such eccentricity that the forward end of each rod 77 almost touches the rear end of its respective punch 66 when the cam has forced the rod forward. The cam 76 is so connected to the motor and the latter is driven at such speed that the cam revolves very rapidly so that the rods 77 have a high number of reciprocations in a given time. Now it will be plain that if any substance be interposed between the forward end of one of the rods 77 and its respective punch 66 the forward movement of such rod will move the punch forward at the same time. In order to accomplish this purpose there is mounted upon the base 10 a plate 80 and on this plate, to the rear thereof, is secured a series of electro-magnets 81. It should be observed that the number of punches 66 correspond in number to the keys of a piano or such of them as may be desired to be used, and that the number of magnets correspond exactly to the number of punches, each magnet being located directly beneath a respective one of the punch actuating rods 77. In order to accomplish this and yet keep the punches and rods 77 close together the magnets 81 are arranged in staggered relation as can be seen clearly by reference to Fig. 3. Each of the magnets 81 has secured thereto a pair of spaced ears 82 each provided with a slot 83 and the magnets are furthermore provided with armatures 84 which are held in adjusted position with relation to the end of the magnet by means of certain screws 85 which pass through the respective slots 83. In order to normally hold the armatures 84 away from the magnets each magnet has projecting therefrom an arm 86, and a spring 87 has one end connected to an armature and the other end to the respective arm 86 belonging to the magnet carrying said armature. From an inspection of Figs. 5 and 6 it will be seen that the different armatures are pivoted preferably at the upper portions thereof so that the armature moves to and from its magnet with a swinging motion. Secured to the upper portion of each armature is an arm 88 and this arm is fastened rigidly to its armature so that as the armature swings toward the magnet the free end of the arm will be

raised. The free ends of all of these arms project sufficiently far forward to lie immediately beneath the opening 63 and in order that they may move up and down as previously described the plate 80 has formed therein slots 89 through which these arms project. Pivoted to the free end of each arm is a distance piece 90, each of these being of such length that when the armature belonging thereto is drawn away from the magnet the end of the distance piece will lie just beneath the path of its respective punch actuating rod while, when the armature is attracted toward its magnet by the passage of current therethrough, this distance piece will be raised to project into the path of said rod. In order to hold the free end of the distance piece against the guide bar 62 this guide bar is provided with downwardly projecting pins 91 each lying immediately behind a respective distance piece and a spring 92 connects each of these pins with its respective member 90. It is to be observed that while the punch 66 at no time projects entirely across the opening 63, yet it projects sufficiently far that when the distance piece is interposed between the punch and its actuating rod, the rod can cause sufficient movement of the punch to penetrate the paper. This arrangement is clearly shown in Figs. 5 and 6.

Turning now to the means by which the various magnets are energized as the piano keys are depressed and referring especially to Figs. 7 and 8, at 93 is what is preferably termed a contact board and this contact board supports a series of spring contact members 94 so arranged that each of these members lies beneath a respective key 95 of a piano when the contact board is in position. In order to accomplish this arrangement the spring members 94 each consists of an arcuate portion from which extends an end 96 secured to the board while opposite to this end is a reversely curved free end 97. These contacts are arranged in two banks to be struck by the white and black keys of the piano respectively, this arrangement being clearly seen in Fig. 7. Extending downward through the board 93 and through the ends 96 of the contact members 94 are binding screws 98 which are all connected by means of suitable wires as at 99 to a battery 100. Beneath the free ends of the members 94 are contacts 101 held to the board by means of binding screws 102 and from each of these binding screws 102 a wire 103 is led to a respective one of the magnets 81, care being taken that each wire shall be connected to the proper magnet. These magnets are furthermore all connected in multiple to a wire 104 which leads to the battery 100. These spring contact fingers are of such dimensions that the instant the key is depressed contact will be

made between the free end of the respective spring member and the fixed contact and as the key is further depressed the free end of the spring contact will slide along the fixed contact so as to maintain the circuit in closed condition throughout the entire operation of depressing the key.

In the operation of the device the depression of any key of the piano serves to close the circuit through the respective magnet controlled by that key. This attracts the armature of said magnet and raises the distance piece connected thereto. The paper having been set in motion at the desired rate of speed and the motor 72 having also been set in motion the rods 77 will at this time be reciprocated rapidly. As the distance piece is moved up the same is caught between the rod and its respective punch with the result that the punch is likewise reciprocated rapidly. This causes the punch to penetrate the paper and punch out a series of circular disks which, owing to the rapid reciprocation, form substantially a slot. Just so long as the key is kept depressed so long will the reciprocation of the specific punch controlled thereby continue so that the slot may be made as long as desired to reproduce the length of the depression of the key. Furthermore, a staccato blow upon the key will in like manner produce but a single punching of the paper and thus reproduce a staccato effect in the automatic player. It will also be noted that when a chord is struck, by reason of the cam being a cylinder and actuating all of the rods 77 simultaneously, the punches will also be actuated simultaneously so that the reproduction of the chord is assured in the exact manner in which it was struck. The paper having all been wound on the roll 31 the operation is completed and the paper is then rewound as previously described on the roll 25 which can then be removed and a fresh unpunched roll substituted.

The mechanism, other than that beneath the key-board can be located at any convenient position such as on top of the piano, on a table, or the piano itself may have this mechanism built in.

There has thus been provided a simple and efficient device of the kind described and for the purpose specified.

It is obvious that minor changes may be made in the form and construction of this invention without departing from the material principles thereof. It is not therefore desired to confine the invention to the exact form herein shown and described, but it is wished to include all such as properly come within the scope of the appended claims.

Having thus described the invention, what is claimed as new, is:—

1. In a device of the kind described, a reciprocable punch, a reciprocable punch

actuating rod in alinement therewith, spaced guides for supporting the adjacent ends of said punch and rod, a spacer movable into and out of position between said rod and punch, a spring holding said spacer against the guide for the rod end, means to reciprocate the rod, and electro-magnetic means to move said spacer between the rod and punch.

2. In a device of the kind described, a reciprocable punch, a reciprocable punch actuating rod in alinement therewith, spaced guides for supporting the adjacent ends of said punch and rod, a spacer movable into and out of position between said rod and punch, a spring holding said spacer against the guide for the rod end, means to reciprocate the rod, a normally open electric circuit, electro-magnetic mechanism in said circuit to move said spacer between the rod and punch, and piano key controlled means to close said circuit.

3. In a device of the kind described, a reciprocable punch, a guide for one end thereof, a collar on said punch to limit its movement through said guide, a spring connected to said punch and guide to normally hold the collar against said guide, a reciprocable punch actuating rod in alinement with the punch, a guide for said rod in spaced relation to the first mentioned guide, a reciprocable spacer movable in the space between said guides, means to reciprocate said bar continuously, key controlled elements to reciprocate said spacer, and a spring connected to said spacer and the guide for said rod to hold the spacer against said guide.

4. In a device of the kind described, a series of independently reciprocable punches, a guide bar supporting the juxtaposed ends of said punches, a collar on each punch to limit its movement through the guide, springs each having one end connected to one of said punches and the other end to said guide, said springs normally holding said collars against said guide, a series of reciprocable punch actuating rods equal in number to said punches and each in alinement with one of the punches, means to simultaneously reciprocate all of said rods, said rods being at all times spaced from said punches, a series of spacers equal in number to said rods and movable into and out of the paths of the respective rods, and key controlled elements for so moving said spacers.

5. In a device of the kind described, a series of punches, a series of punch actuating rods each in alinement with one of the punches, a series of springs each yieldingly holding one of said rods away from its re-

spective punch, a shaft adjacent the ends of said rods opposite the punches and lying in the plane of the rods, a cam cylinder eccentrically carried by the shaft and against which the ends of the rods rest, and means to rotate said cam cylinder and simultaneously cause all of said rods to reciprocate.

6. In a device of the kind described, a reciprocable punch, a reciprocable actuating rod in alinement with said punch, spaced guides for the adjacent ends of said punch and rod, an open electric circuit, an electro-magnet therein, a swinging armature for said magnet, an arm fixed to said armature, a spacer pivoted to the end of said arm and having its free end movable into position between said rod and punch when the magnet is energized, a piano key actuated circuit closer in said circuit, and means to reciprocate the rod.

7. In a device of the class described, a reciprocable punch, a reciprocable actuating rod in alinement with said punch, spaced guides for the adjacent ends of said punch and rod, an open electric circuit, an electro-magnet therein, a swinging armature pivoted to said magnet, an arm fixed to said armature, a spacer pivoted to said arm and having its free end movable into position between said rod and punch when the magnet is energized, a bracket extending from said magnet beyond said armature, a spring connecting said bracket and armature to draw the armature away from the magnet when the latter is deenergized, a piano key actuated circuit closer in said circuit, and means to reciprocate the rod.

8. The combination with a piano key; of a circuit closer adapted to be actuated thereby comprising a base, a spring contact consisting of a strip of resilient conducting material having one end fixed to said base, its central portion bowed upwardly to lie in juxtaposition to the key and its free end in juxtaposition to the base, a coacting contact lying beneath said free end and of sufficient size to permit the full depression of the key without breaking said contact whereby the free end of the resilient strip is depressed as the key begins its downward movement and brought into engagement with the coacting contact, said free end then sliding along said coacting contact during the remainder of the downward movement of the key, and means to attach wires to said contacts.

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

DONALD M. CLOAK.

Witnesses:

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M. HAYES WILSON.