No. 763,038. PATENTED JUNE 21, 1904.

H. P. BALL.

PERFORATING DEVICE FOR MUSIC ROLLS.

APPLICATION FILED APR. 10, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

FIG. 1.

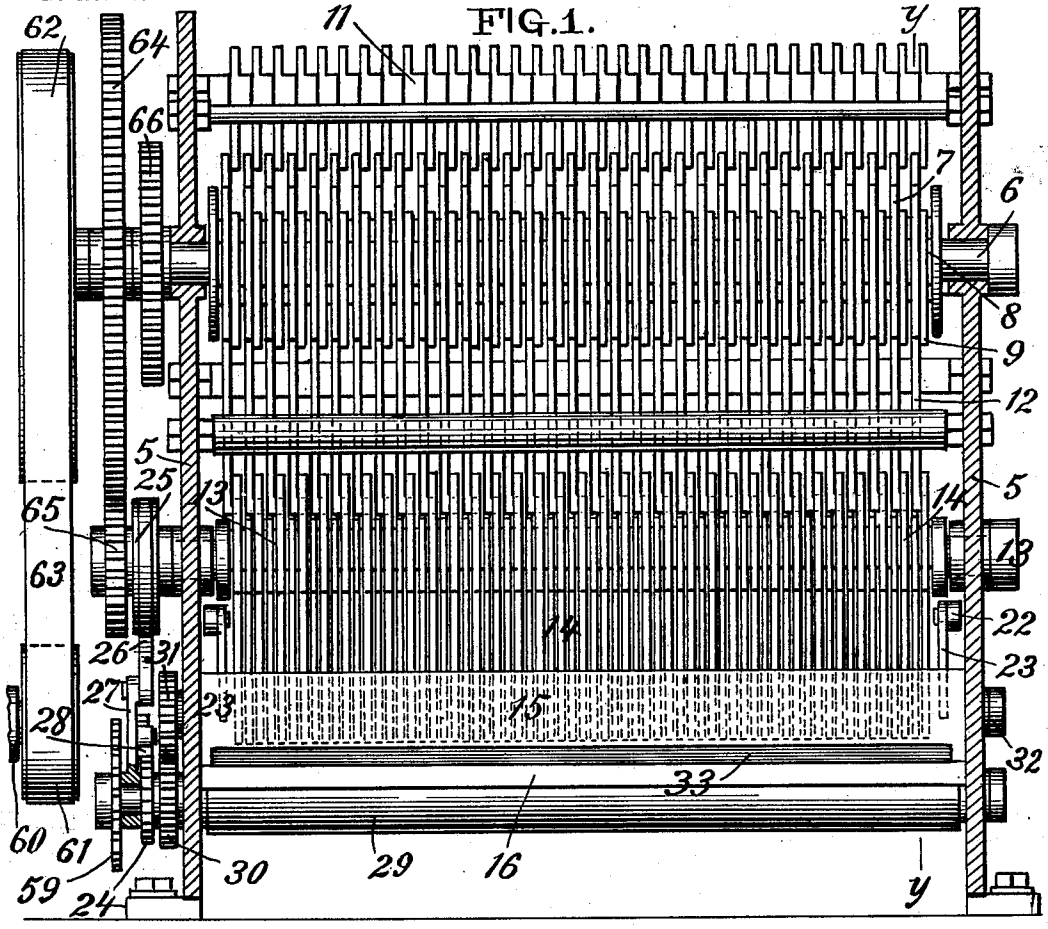
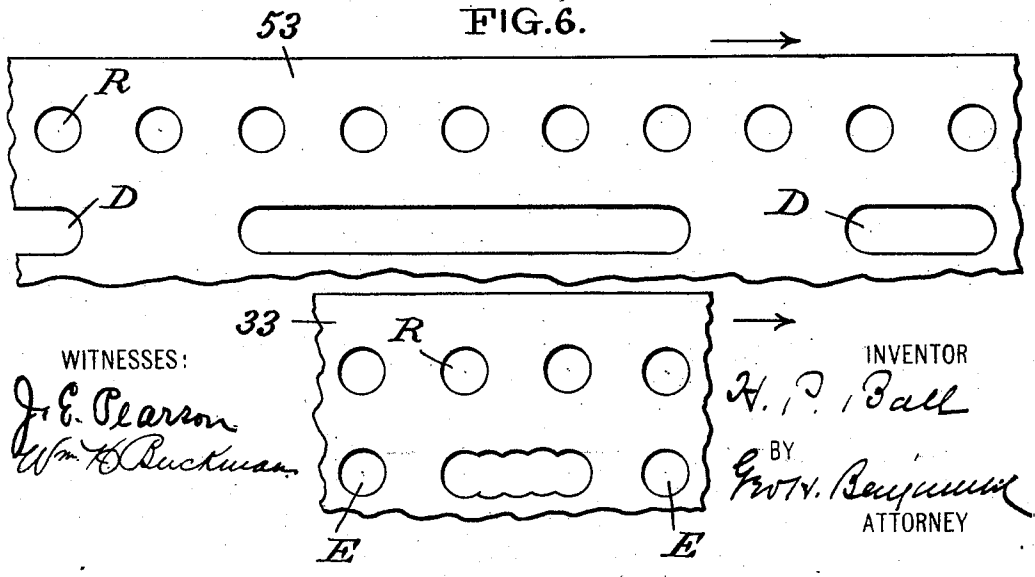


FIG. 6.



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NO MODEL. 2 SHEETS—SHEET 2.

FIG. 3.

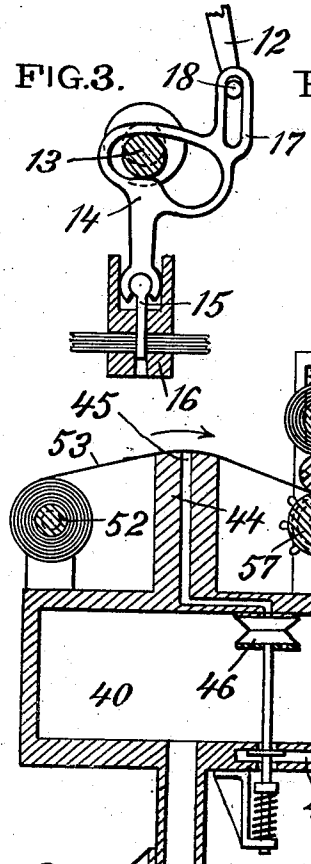


FIG. 2.

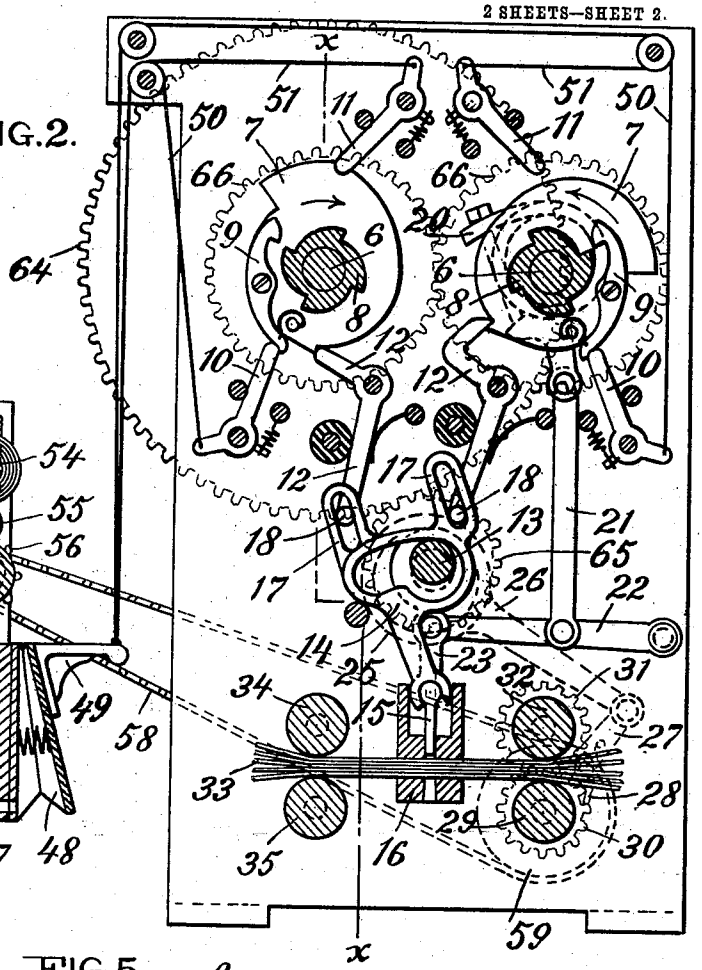


FIG. 5.

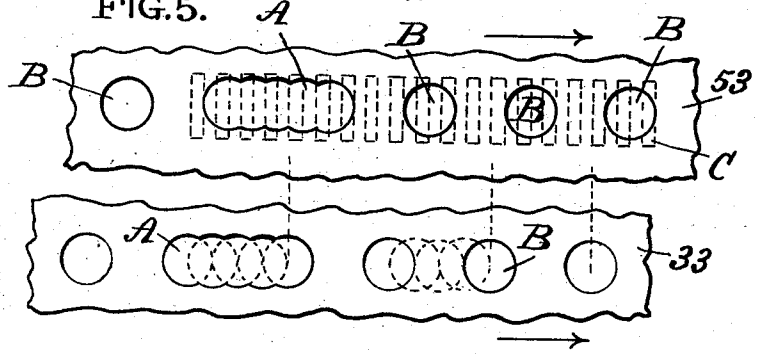
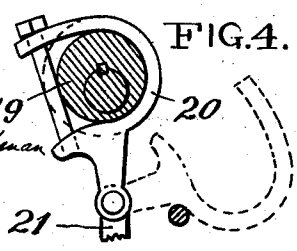


FIG. 4.



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No. 763,038. Patented June 21, 1904.

UNITED STATES PATENT OFFICE.

HENRY PRICE BALL, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO SAMUEL INSULL, OF CHICAGO, ILLINOIS.

PERFORATING DEVICE FOR MUSIC-ROLLS.

SPECIFICATION forming part of Letters Patent No. 763,038, dated June 21, 1904.

Application filed April 10, 1902. Serial No. 102,226. (No model.)

To all whom it may concern:

Be it known that I, HENRY PRICE BALL, a citizen of the United States, residing at New York city, county and State of New York, have invented a Perforating Device for Music-Rolls, of which the following is a specification.

My invention relates to a machine for reproducing music-rolls, and comprises in its construction a device thrown into action by the movement of the music-roll and a second device energized by the first device which will serve to reproduce upon one or a number of moving strips of paper the perforations of the music-roll.

The object of my invention is to mechanically and automatically produce one or a number of music-rolls which shall be identical, so far as the perforations therein which produce the musical notes are concerned, with the perforations of the music-roll of which they are copies.

A further object of my invention is a construction whereby the ordinary commercial music-rolls, such as may be purchased in the open market, can be used as the originals from which the duplicate copies may be made, thus doing away entirely with the inconvenience and expense of employing what is known as "master" music-rolls.

The accompanying drawings will serve to illustrate my invention, and in which similar numerals and letters indicate like parts.

Figure 1 is a view taken on the line X X of Fig. 2. Fig. 2 is a view taken on the line Y Y of Fig. 1 and also showing in vertical section the mechanical device employed for actuating the perforating mechanism. Fig. 3 is a detail of the eccentric for operating the punches. Fig. 4 is a detail of the eccentric for operating the punches which perforate the rack-holes. Fig. 5 shows two diagrams, illustrating in the upper diagram the position of the openings in the master-roll relative to the openings in the tracker-board of the mechanical device for actuating the perforating mechanism and in the lower diagram the position of the perforations in the reproduced music-rolls. Fig. 6 shows two diagrams, illustrating a master music-roll and a reproduced music-roll, and which diagrams are intended to show that the perforations in the reproduced music-roll may be altered in shape and made closer together than those in the master-roll.

In two former applications for Letters Patent, Serial Nos. 94,633 and 97,353, filed, respectively, February 18 and March 8, 1902, I have described machines for perforating music-rolls.

My present machine embodies in its construction, together with other mechanism, substantially the mechanism described in the first-named application for perforating music-rolls. I wish it understood that I may also use the mechanism described in my second application. As the mechanism for perforating the music-rolls is fully described in the aforesaid applications, I will only describe such of the mechanism of the present application as is necessary to give a full understanding of my present invention, referring to my former applications for the special features of construction.

In this specification and for the purpose of clearness of the description I shall make use of the term "master-roll" as referring to the roll which is to be duplicated. I wish it understood, however, that instead of employing a master-roll as the term is now understood in the art I may use any commercial music-roll.

In the drawings, 5 indicates the side frames of the perforating-machine. Mounted in these frames and in the same horizontal plane are the shafts 6. In my application Serial No. 94,633 I have shown but a single shaft. In the present application there are two shafts. My object in using two shafts instead of one is to form a compact machine, within which the number of punches required to produce the necessary perforations shall be located within a space corresponding to the width of the present commercial music-roll and at the same time leave room for free movement of the cams, eccentrics, and latches necessary to operate the punches. In other respects the machines are substantially the same.

Mounted upon the shafts 6 are a series of

cams 7, and between these cams and fast to the shaft 6 are a series of toothed wheels 8. These wheels have four teeth. Mounted upon the cams 7 and moving with them are the latches 9. These latches are held out of engagement with the toothed wheels 8 by means of the bell-cranks 10. Located within the path of movement of the latches 9 are the bell-cranks 11, and located within the path of movement of the cams 7 are the bell-cranks 12.

Arranged transversely of the machine is a shaft 13, and mounted on this shaft are a series of eccentrics 14. Each of these eccentrics carry a punch 15, adapted to reciprocate through a die-seat 16. The upper end of each eccentric is provided with a slotted extension 17, within which is located a pin 18, projecting from the long arm of a bell-crank 12.

Mounted upon one of the shafts 6 are the eccentrics 19, over each of which is arranged the detachable strap 20, Fig. 4. Connected to the strap 20 is a link 21, loosely connected to the pivoted lever 22. On the inner end of this lever is a punch 23, by means of which rack-holes R, Fig. 6, are formed in the music-roll.

Mounted upon shaft 13 is an eccentric 25, connected through the strap 26 with the lever 27, carrying the pawl 28. The pawl 28 takes in a ratchet-wheel 24 on the end of shaft 29. This shaft is provided with a gear 30, which takes in a gear 31 on the shaft 32. The shafts 29 and 32 receive between them the strips of paper 33, which are designed to be perforated to form the music-rolls.

34 35 are shafts which serve as directing-shafts for the paper.

At the left of Fig. 2 I have indicated a mechanical device for operating the perforating device. This device may be of any suitable type. For instance, it may be of the type known as the "Pianola," "Angelus," or other mechanical pneumatic device. I wish it understood, however, that I do not limit myself to the use of a pneumatic device, as other devices operated electrically, mechanically, or otherwise may be used. I have not shown or described such devices in this application, as it is my intention to make them the subject of future applications.

Described briefly, the pneumatic device consists of an air-chest 40, to which is connected in a manner well known the bellows 41 42, designed to be operated by a foot-treadle 43 in the usual manner. Mounted over the chest is a tracker-board 44, provided with the usual number of openings 45. The openings in the tracker-board connect with a series of pneumatic valves 46, (only one shown,) which control channels 47, connected to bellows 48. On the back of each bellows is a lever 49, connected through two cords 50 51 with the bell-cranks 10 11, controlling a cam 7. It will be understood that each cam has a pair of bell-cranks, and each pair of bell-cranks is connected through two cords, united to form one cord, to one lever, 49, and, further, that there is a cam for each opening 45 in the tracker-board.

52 indicates a roller from which the master paper-roll 53 is unwound; 54, roller upon which master-roll 53 is wound.

55 is a roll which serves to direct the master-roll onto the roller 54. The roller 55 is provided with a series of depressions around its periphery at each end, and these perforations coact with teeth 56 on the roller 57. The roller 57 is driven by means of a chain 58, passing over a sprocket-wheel 59, mounted on shaft 29.

Motion is transmitted to the perforating-machine by means of a motor (not shown) connected to shaft 60, Fig. 1. On this shaft is a pulley 61, and on one of the shafts 6 is a corresponding pulley 62. Between these pulleys is a belt 63. This belt gives movement to the pulleys and to the large gear 64, which communicates its movement to the small gear 65 on shaft 13. Mounted also upon one of the shafts 6 is gear 66, in gear with a corresponding gear on the other of shafts 6.

The operation of my device is as follows: When the controlling-motor is started, the shafts 6 and 13 are set in rotation; but owing to the fact that the cams 7 are loose upon the shafts 6 and the eccentrics 14 are thrown to the left, so as not to be actuated by the shaft 13, no motion is communicated to the punches 15, which perforate the paper to form the musical notes. The punches 23, however, which form the rack-holes, are reciprocated, owing to the action of the eccentrics 19, strap 20, links 21, and lever 22, and pass through the paper with each reciprocation. The eccentric 25, strap 26, lever 27, and pawl 28 are also set in motion, which, acting upon the shaft 29, communicate a continuous intermittent forward movement to the strips of paper 33, which are to be perforated to form the music-rolls. It will be understood that the movement of the strips of paper 33 forward will bear a definite relation to the reciprocations of the shaft 13—namely, one-twentieth of an inch for each revolution. In the present case shaft 13 is adapted to make four revolutions to one of the shaft 6. As the shaft 29 is rotated the sprocket-wheel 59 is rotated, which gives movement to the roller 57 and to the master-roll 53. The teeth 56 on the wheel may be caused to enter the rack-holes R on the music-roll, or I may do away with the teeth and use a frictional device. As the master-roll moves forward in the direction of the arrow across the openings 45 in the tracker-board 44 and assuming the bellows 41 42 to be operated to give a sufficient exhaust of air the pneumatic valves 46, corresponding to the openings in the master-roll, will be actuated downwardly to give motion

to the bellows 48 and through the bellows 48 to the lever 49 by cords 50 51 to the bell-cranks 10 11.

When movement is imparted to the bell-cranks, a latch or latches, depending upon the number of notes actuated, will be released, which coacting with a toothed wheel or wheels 8 on shaft 6 will cause the cam or cams to be rotated in the direction of the arrow. When the cam or cams have passed through one hundred and eighty degrees, the latch will coact with the bell-cranks 11 and be released, bringing the cam or cams to rest. At the same time the cam or cams have actuated the bell-cranks 12, thereby shifting the eccentrics 14 to the right or left, respectively, and into the position where these eccentrics will be actuated by the rotation of the shafts 13. The movement of these eccentrics, it will be understood, reciprocates the punches, which reciprocation will continue until the lever 49 is no longer held down. If the lever is held down for any appreciable length of time, a long hole, such as is indicated at A, Fig. 5, will be made. If, however, the lever 49 is not held down, but is instantly released before the cam or cams 7 make a movement through one hundred and eighty degrees, then the cam or cams will make a movement through three hundred and sixty degrees and the bell-cranks 12 will be released, the punch therefore making but a single reciprocation to punch a single hole, as shown at B, Fig. 5. It will be observed that there is a time limit between the actuating of the lever 49 and the movement of the punches 15, and this is graphically indicated in the two diagrams Fig. 5. In the upper diagram the openings A B indicate the openings in the master-roll. Parallel elongated openings C indicate the openings in the tracker-board, and the paper of the master-roll is supposed to move in the direction of the arrow. By reason of the time interval caused by the cams 7 corresponding perforations upon the paper of the music-roll 33—*i. e.*, the music-roll shown at the bottom of Fig. 5—are displaced to the left relative to the perforations on the master-roll shown at the upper portion of the diagram. The diagram clearly indicates this condition.

If it is desired that the music-roll shall be a copy of the master-roll, but of less length than the master-roll, as indicated in Fig. 6, this can be accomplished by differentiating the speed of the master and music rolls.

Manifestly if the master-roll is driven faster than the music-roll the music-roll will be shorter in length and the openings in the music-roll which indicate the musical notes will be nearer together. Further, an opening in the master-roll, which is indicated as a slot—as, for instance, opening D—may in the music-roll be indicated by a round opening, as E. It will be understood that these openings, however, will produce the same musical sound, provided the master and music rolls are operated at the required speed.

In this application I have generally described a device to be used in connection with a music-roll and which has for its purpose to actuate a perforating device and also a perforating device which may be used in connection with the other described parts. I wish it understood that I do not limit myself to the particular mechanical device employed, as it will be obvious that very many changes may be made and parts substituted without in any wise departing from the intent of my invention.

Having thus described my invention, I claim—

1. A machine for reproducing music-rolls, comprising a device thrown into action by the movement of a music-roll, a time-limit device thrown into action by the movement of the first-named device, and a perforating device controlled by the action of the time-limit device.

2. A machine for reproducing music-rolls, comprising mechanism energized by air passing through perforations in a music-roll, a time-limit device thrown into action by said mechanism, and punching mechanism controlled by said time-limit mechanism.

3. A machine for reproducing music-rolls, comprising a pneumatic device energized by air passing through perforations in a music-roll, a time-limit device actuated by said pneumatic device, and punching mechanism controlled by said time-limit device.

4. A machine for reproducing music-rolls, comprising mechanism energized by air passing through perforations in a music-roll, punching mechanism, and a device introduced between said mechanism and which will when actuated by the first-named mechanism cause a certain time to elapse before permitting movement of the second-named mechanism.

5. A machine for reproducing music-rolls, comprising a series of pneumatic devices energized by air passing through perforations in a music-roll, a series of punches, a series of mechanically-driven time-limit cams, and the interposed mechanism between said pneumatic devices, cams and punches, whereby when a pneumatic device is energized a cam will be thrown into operation which, after a definite time, will actuate a punch to perforate a music-roll.

6. A machine for reproducing music-rolls, comprising a pneumatic device energized by air passing through perforations in a music-roll, a series of punches adapted to be moved through the instrumentality of a continuously-rotating eccentric-shaft, a series of time-limit cams normally at rest, and mechanism interposed between said pneumatic device and said cams, and said cams and said punches whereby when the pneumatic device is energized a time-limit cam or cams will be thrown into

operation and after a definite period actuate a punch or punches.

7. In a perforating-machine for music-rolls, the combination of a driven shaft, a series of toothed wheels fixed to the shaft, a series of cams movable on the shaft, a latch on each cam, a series of bell-cranks adapted to cooperate with the individual latches, a device having a series of levers adapted to be energized by a music-roll passing over the device, and means introduced between said levers and bell-cranks for controlling the movement of said bell-cranks.

8. In a perforating-machine for music-rolls, the combination of a driven shaft, a series of eccentrics upon said shaft, said eccentrics having such shape that when in one position they will be at rest and in another position will be reciprocated by the shaft, a series of punches connected to said eccentrics, and means for altering the position of the eccentrics at will.

9. In a machine for reproducing music-rolls, the combination of a pneumatic device having its moving parts thrown into operation by air passing through perforations in a music-roll, a mechanically-driven perforating device, together with mechanism introduced between the two, whereby when the pneumatic device is energized the mechanically-driven perforating device will not be thrown into operation until a definite period of time will have elapsed.

10. In a machine for reproducing music-rolls, the combination of a device provided with a series of levers corresponding in number with the keys of a musical instrument or the different notes upon a perforated music-roll, a perforating device provided with a series of punches corresponding in number with said levers, and means introduced between the two for causing a time interval between the movement of the levers and the movement of the punches.

11. In a machine such as described and in combination with a perforated music-roll, a controlling device for the perforating mechanism responsive to perforations in said roll, a timing device responsive to the movement of said first-named device, and a perforating device responsive, after a time interval, to the movement of the second-named device.

12. In a machine such as described and in combination with a perforated music-roll, a device responsive thereto, a time-lagging device responsive to said first-named device, and a perforating device responsive to said time-lagging device.

13. In a perforating-machine for music-rolls, a series of pneumatic mechanisms responsive to a master-roll, a series of punches, a series of time-lagging controllers for the punches, whereby time is allowed for a certain amount of unperforated material to be advanced through the machine between successive operations of any individual punch.

14. In a perforating-machine for music-rolls, a series of pneumatic mechanisms responsive to a master-roll, a series of punches, a series of mechanically-driven time-lagging controllers for the punches, and means for driving the punches at different speeds in relation to the speed of the master-roll.

15. In a perforating-machine for music-rolls, a series of pneumatic mechanisms responsive thereto, a series of punches, a continuously-rotating eccentric-shaft, means for throwing one or more of the punches into and out of action, and means for actuating the punches at certain relative speeds to the speed of the master-roll.

16. In a perforating-machine for music-rolls, a series of pneumatic mechanisms responsive to a master-roll, a series of punches, a continuously-rotating eccentric-shaft and means for throwing one or more of said punches into and out of action with said shaft.

17. In a perforating device for music-rolls, a perforated master-sheet, a pneumatic mechanism responsive thereto, a perforating mechanism, a time-lagging mechanism and means for producing a certain advance of paper between successive perforations.

18. In a perforating device for music-rolls, a perforated master-sheet, a pneumatic mechanism responsive thereto, a perforating mechanism, a time-lagging mechanism, means for producing a certain advance of paper between successive perforations and means for driving said master-sheet at various relative speeds to the speed of the perforating mechanism.

19. In a perforating device for music-rolls, a perforated master-sheet, a pneumatic mechanism responsive thereto, a perforating mechanism, a series of means for throwing said punches into and out of action and a time-lagging mechanism for controlling the actions of said punches, and means for advancing a definite amount of paper between successive operations.

20. In a perforating device for music-rolls, a perforated master-sheet, a pneumatic mechanism responsive thereto, a perforating mechanism, a separate source of energy for driving said perforating mechanism, a time-lagging mechanism and means for producing a certain advance of paper between successive perforations.

21. In a perforating device for music-rolls, a perforated master-sheet, a pneumatic mechanism controlled thereby, a perforating mechanism, means for advancing intermittently the material to be perforated, a time-lagging mechanism, and means for producing a definite advance of material between successive perforations of any individual punch.

22. In a perforating device for music-rolls, a perforated music-sheet, a pneumatic mech-

anism controlled thereby, a perforating mechanism and a time-lagging mechanism driven at a given relative speed to the perforating mechanism.

23. In a perforating device for music-rolls, a perforated master-sheet, a pneumatic mechanism controlled thereby, a perforating mechanism, means for driving the same, a time-lagging mechanism and means for causing a definite advance of material to be perforated between successive perforations of any individual punch.

24. In a perforating device for music-rolls, a perforated master-sheet, a pneumatic mechanism controlled thereby, a perforating mechanism, means for driving the perforating mechanism, means for throwing said perforating mechanism into and out of engagement, a time-lagging mechanism, and means for causing a given advance of paper between successive perforations.

25. In a perforating device for music-rolls, a perforated master-sheet, a pneumatic mechanism responsive thereto, a perforating mechanism, means for driving the same, a time-lagging mechanism and means for intermittently advancing material to be perforated.

26. In a perforating device for music-rolls, a perforated master-sheet, a pneumatic mechanism controlled thereby, a perforating mechanism, a separate source of energy for driving the same, a time-lagging mechanism, and means for producing a certain advance of material to be perforated between successive perforations.

27. In a perforating device for music-rolls, a perforated master-sheet, a pneumatic mechanism responsive thereto, a perforating mechanism, means for driving the same, a time-lagging mechanism, means for producing a certain advance of material to be perforated between successive perforations and means for driving said time-lagging mechanism at a given relative speed to the perforating mechanism.

28. In a perforating device for music-rolls, a perforated master-sheet, a pneumatic mechanism responsive thereto, a time-lagging mechanism, means for causing a certain advance of material to be perforated between successive perforations, a means for throwing said lagging mechanism into and out of action and a perforating mechanism controlled by said time-lagging mechanism.

29. In a perforating device for music-rolls, a perforated master-sheet, a pneumatic mechanism responsive thereto, a mechanically-driven perforated mechanism, a time-lagging mechanism, means for causing a definite amount of paper to be advanced through the perforating mechanism between successive perforations in the master-sheet and means for throwing said time-lagging mechanism into and out of action.

30. In a perforating device for music-rolls, a perforated master-sheet, a pneumatic mechanism responsive thereto, a perforating mechanism, a time-lagging mechanism, means for producing a definite advance of paper to be perforated between successive perforations in the master-sheet, means for driving said lagging mechanism at a definite speed to the perforating mechanism and means for throwing said lagging mechanism into and out of action.

31. In a perforating-machine, the combination of a continuously-rotating eccentric-shaft, a series of punches and a series of means interposed between the eccentric-shaft and the punches whereby one or more of the punches can be thrown into and out of engagement with said shaft.

32. In a perforating-machine, the combination of an eccentrically-driven shaft, a series of punches, a series of means for throwing one or more punches into connection with said shaft and means for maintaining the punches in engagement with the shaft for complete rotations thereof.

33. In a perforating-machine, the combination of an eccentrically-driven shaft, a series of cam-levers upon said shaft, means for individually throwing said cam-levers into and out of operative engagement with the shaft.

34. In a perforating-machine, the combination of an eccentrically-driven shaft, a series of punches, a series of cam-levers for throwing said punches into and out of action with said shaft and means for advancing the material being perforated a given amount between successive engagements with the shaft of the cam-levers.

35. In a perforating-machine the combination of a continuously-rotating eccentric-shaft, a series of punches and a series of intervening means for throwing one or more of said punches into operative engagement with said shaft.

36. In a perforating-machine, a continuously-rotating eccentric-shaft, a series of punches, a series of oscillating levers and means for oscillating one or more of said levers into and out of engagement with said shaft.

37. In a perforating device for music-rolls, a continuously-rotating eccentric-shaft, a series of punches, means for throwing the punches into and out of action with said shaft and a series of time-lagging controllers for the punches.

38. In a perforating-machine for music-rolls, a continuously-rotating eccentric-shaft, a series of punches, means for throwing one or more punches into or out of action with said shaft, and a series of time-lagging controllers for the punches, said controllers being driven at a fixed relative speed to the speed of said eccentric-shaft.

39. In a perforating-machine for music-rolls, a continuously-rotating eccentric-shaft, a series of punches, means for throwing one

or more punches into and out of engagement with said shaft, a series of time-lagging controllers for the punches and means for throwing one or more controllers into and out of action.

40. In a perforating-machine for music-rolls, a continuously-rotating eccentric-shaft, a series of punches, means for throwing said punches into and out of action, a series of time-lagging controllers for the punches, a driving means for said controllers, and means for throwing one or more of said controllers into and out of engagement therewith.

41. In a perforating-machine for music-rolls, a series of punches, a continuously-rotating eccentric-shaft, means for throwing one or more punches into and out of engagement with said shaft, a series of controllers for said punches and means for driving said controllers at a certain relative speed to that of the punches.

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

HENRY PRICE BALL.

Witnesses:
J. E. PEARSON,
WM. H. BUCKMAN.