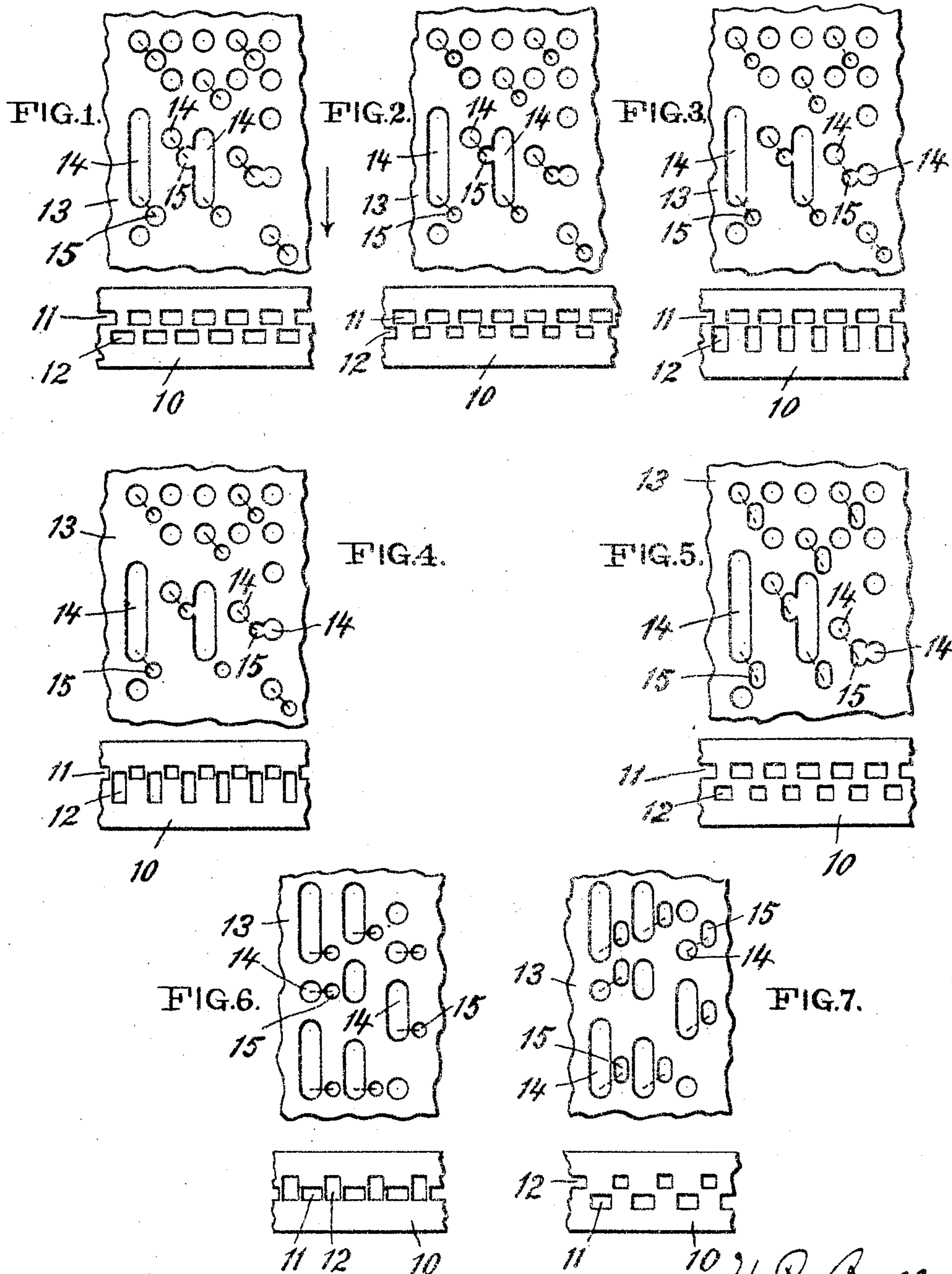


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PERFORATED MUSIC ROLL.  
APPLICATION FILED JAN. 29, 1902.

2 SHEETS—SHEET 1.



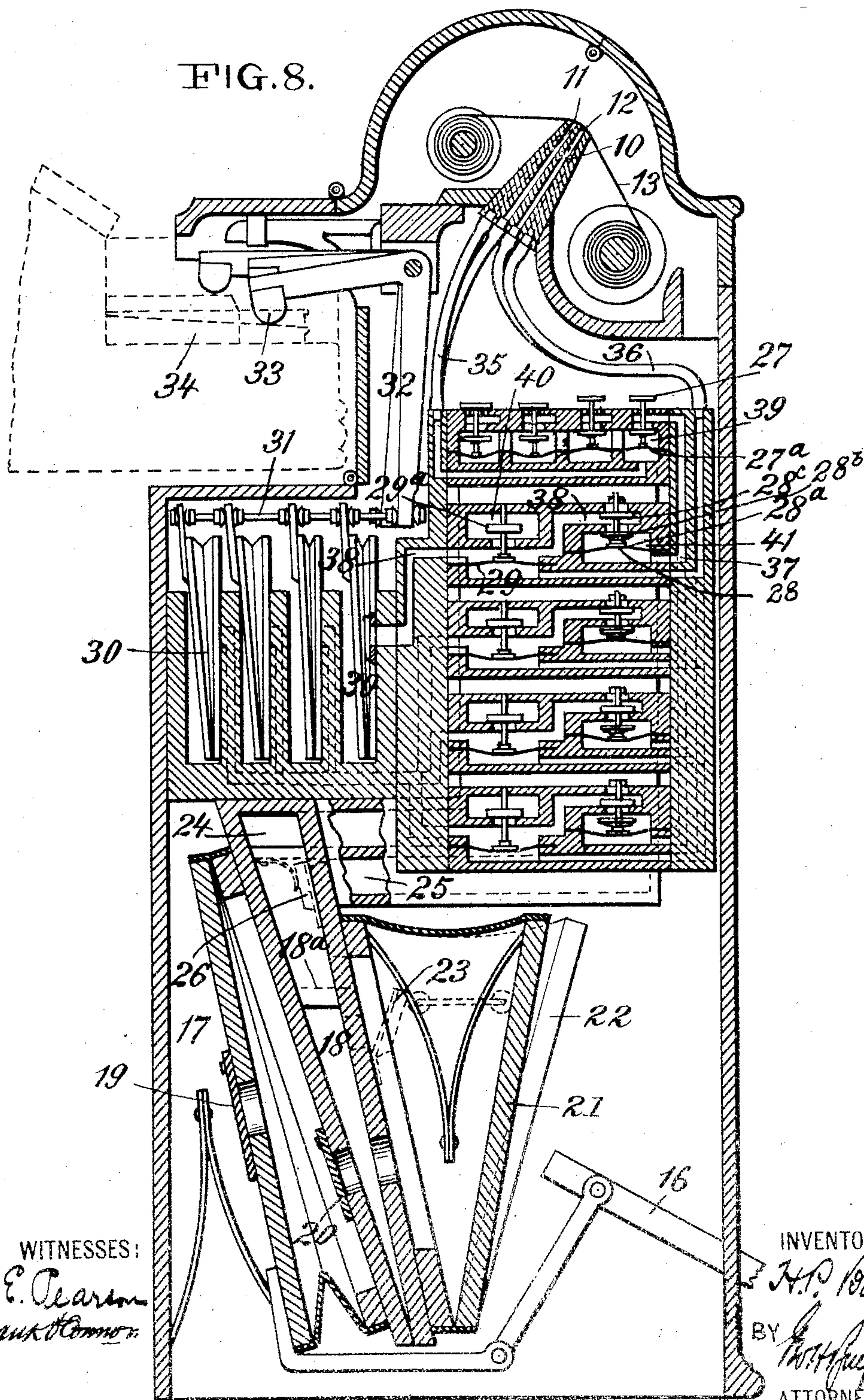
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2 SHEETS—SHEET 2.

FIG. 8.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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

## PERFORATED MUSIC-ROLL.

SPECIFICATION forming part of Letters Patent No. 778,436, dated December 27, 1904.

Application filed January 29, 1902. Serial No. 91,748.

*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  
5 invented certain new and useful Improvements in Perforated Music-Rolls, of which the following is a specification.

My invention relates to perforated music-rolls of the type used with mechanical musical  
10 instruments such as are adapted to be employed with a piano, organ, or other similar device; and it consists of a music-roll with two series of perforations, one series in all respects similar to those common to all mu-  
15 sic-rolls and adapted to produce when used in connection with a mechanical musical instrument a series of tones or sounds constituting a musical composition. The second series, which in a composition, however, may consist  
20 of but one perforation, situated in advance of and at a distance less than that between any two perforations of the first series and adapted to coact with the first series to produce certain results—for instance, to select, accen-  
25 tuate, or soften certain predetermined notes, to select certain predetermined notes, and cause the sounds which they represent to be produced by some sound-producing means other than that by which the majority of the sounds  
30 of the composition are produced, and to select certain predetermined notes and cause the sounds which they represent to be produced, accentuated, or oftended by some sound-producing means other than that by which the  
35 majority of the sounds of the composition are produced.

Music-rolls have heretofore been made with two or more series of perforations—in one construction one series adapted to produce the  
40 melody, the second the accompaniment, and the third arranged longitudinally of the music-roll and along one edge and adapted to modify all of the sounds produced by the perforations of the first or second series arranged  
45 transversely of the music-roll and in line with any one of the perforations of such third series. In another construction one series is adapted to produce the musical composition and another series arranged across the music-

sheet, each of which is adapted to modify the  
50 sound produced by the perforation of the first series alongside of which it is placed. My improved music-roll differs from such music-rolls in that the accentuating or modifying perforations are located in immediate prox-  
55 imity to, in advance of, and between the perforations whose normal sounds are to be modified. In other words, in my improved music-roll there is one perforation for each sound  
60 not to be modified and two proximate perforations for each sound to be selected or modified.

The object of my invention is to improve the musical results obtained through mechanical musical instruments by providing means  
65 for modifying in some manner any one or all of the musical sounds constituting a musical composition.

The accompanying drawings will serve to illustrate my invention, in which similar numerals indicate like parts.  
70

Figures 1, 2, 3, 4, 5, 6, and 7 are plan views intended to illustrate a portion of a perforated music-strip and a portion of a tracker-board and to show the relation of such parts, the  
75 various views indicating different arrangements of perforations and tracker-ducts, as also their size, &c. Fig. 8 is a vertical section taken through a mechanical musical instrument such as may be employed in connection with my improved perforated music-  
80 roll.

In the drawings, 10 indicates a tracker-board which has the usual location. The tracker-board 10 is provided with tracker-ducts 11 12. Arranged to move over the  
85 tracker-board in a well-known manner is the music-roll 13. The music-roll 13 has formed in it two series of perforations 14 15. The perforations 14 are those which are common to all music-rolls and differ in length according to the duration of the sound which it is  
90 desired to produce. The perforations 15 are shown as arranged in proximity to the perforations 14 and connected by a short line. This line is not intended to indicate a perforation in the paper, but merely to show the relation between the perforations 14 and 15. The perforations 15, it will be observed, in



each figure are situated to the right of the perforations 14, and in Figs. 1, 2, 3, 4, and 5 the perforations 15 are in advance of the perforations 14. In Fig. 6 the perforations 15 are on a line with the front end of the perforations 14, and in Fig. 7 the perforations 15 are situated back of the front end of the perforations 14. It will also be observed that the size and relation of the tracker-ducts 11 12 are different in the different figures.

The purpose of making the perforations 15 of different sizes and differently located as regards the perforations 14 of different music-rolls and also in varying the size of the tracker-ducts and their relation is to produce different modifying effects. For instance, in Fig. 1 the perforations 14 15 register simultaneously with the tracker-ducts 11 12, and the modifying effect of the perforation 15 will begin immediately that the perforation 14 commences to sound and will continue so long as the perforation 15 is passing over the tracker-duct 12. In Fig. 2 the relation is the same. The perforation 15 and tracker-duct 12, however, being smaller than the corresponding perforation and tracker-duct of Fig. 1, consequently the modifying influence of perforation 15 will be exerted for a shorter period. In Fig. 3 the relation of the perforations 14 15 is the same as in Fig. 2; but the tracker-duct 12 is longer. Consequently the modifying influence of perforation 15 will be exerted for a longer period. In Fig. 5 the relation is the same; but the perforation 15 is longer than in Figs. 1, 2, or 3, and consequently the modifying effect will exist for a longer period. In Fig. 7 the size of the perforation 15 corresponds to that of Fig. 5; but the tracker-ducts 11 12 are reversed in position. Consequently the perforations 14 15 will come into operation at the same time and the modifying effect continued for the length of the perforation 15.

I do not limit myself in anywise to the size, character, or position of the perforations 15, provided they are arranged proximate to the perforations 14 and through the instrumentality of a mechanical musical instrument provided with a tracker-board such as described act to in some manner modify the normal sounds due to such of the perforations 14 with which they coact.

It will be observed from an examination of Figs. 1 to 7 that the perforations 15 in the music-roll are always situated in spaces to the right of perforations 14, with which they coact, and that therefore the modifying perforations can be placed in any ordinary commercial perforated music-roll. It will also be noticed that some of the perforations 15 lap perforations 14, with which they coact. This, however, is not objectionable, as the amount of lapping is never sufficient to interfere with the normal action of such perforations 14.

Referring now to Fig. 8, which shows the construction of a mechanical musical instru-

ment such as I may employ, 16 indicates one of the usual foot-treadles, adapted to actuate the exhaust-bellows 17. The bellows 17 is mounted on the back of a wind-trunk 18. 19 20 are valves in the bellows 17 and wind-trunk 18, which open outwardly. Arranged in front of the wind-trunk are the compensating bellows 21 22. The bellows 21 I term the "high-pressure" bellows and the bellows 22 the "low-pressure" bellows. The high-pressure bellows is connected through wind-trunk 18 and air-passage 24 and the low-pressure bellows through wind-trunk 18<sup>a</sup> and the air-passage 25 with the upper part of the instrument. 26 indicates a valve in the low-pressure passage 25, which serves to prevent the air from the high-pressure wind-trunk 18 exhausting from the low-pressure wind-trunk 18<sup>a</sup>; 27, primary pneumatics; 28, secondary low-pressure pneumatics; 29, high-pressure pneumatics; 30, power-pneumatics connected through rods 31 with the bell-cranks 32. On the opposite ends of the bell-cranks 32 are felt cushions 33, adapted to be located over and to strike, when a power-pneumatic is operated, keys 34 of a musical instrument. (Shown in dotted lines.) The tracker-duct 11 is connected through a passage 35 with the under side of the primary pneumatic 27 and the tracker-duct 12 through the passage 36 with the under side of the high-pressure pneumatic 29. The upper side of the primary pneumatic 27 is connected through the passage 37 with the under side of the low-pressure pneumatic 28 and the upper side of the low-pressure pneumatic 28 through a passage 38 with the upper side of the high-pressure pneumatic 29 and with the exhaust-opening in front of a power-pneumatic 30. The space 39 above the diaphragm 27<sup>a</sup> of the primary pneumatics 27 is connected through an air-passage 24 with the high-pressure bellows 21, and the space 40, in which the valve 29<sup>a</sup> of the high-pressure pneumatic moves, is connected through passage 24 with the high-pressure bellows 21. The space 41 above the diaphragm 28<sup>a</sup> of the low-pressure pneumatic 28 is connected through air-passage 25 with the low-pressure bellows 22. Mounted on the top of the diaphragm 28<sup>a</sup> is a valve 28<sup>b</sup>, normally pressed by a spring in an upward direction.

The operation of my device is as follows: As a note-perforation is brought into relation with the tracker-duct 11 the air at the pressure of the atmosphere enters the tracker-duct 11 and by the passage 35 passes under the diaphragm 27<sup>a</sup> of the primary pneumatic 27, and thereby effects an upward movement of the primary pneumatic and allows air at the pressure of the atmosphere to pass through the passage 37 and under the diaphragm 28<sup>a</sup> of the secondary low-pressure pneumatic 28, raising the diaphragm 28<sup>a</sup> and the valves 28<sup>b</sup> 28<sup>c</sup>, carried by it. The pull of the



low-pressure bellows 22 exerted in the space 41 and over the diaphragm 28<sup>a</sup> will depress the valve 28<sup>b</sup> and cause it to assume the position shown in Fig. 8—*i. e.*, that of the second  
 5 secondary pneumatic counting from the top of the figure—and thereby permit the exhaustion of the air from one of the power-pneumatics 30 through the passage 38 into the space 41. The movement of the power-  
 10 pneumatic 30 actuates the bell-crank 32 and causes a cushion 33 on the upper arm of the bell-crank to impinge on a key 34 of a musical instrument striking the required note. Assuming now that an accenting-perforation  
 15 15 is located in the music-roll in approximate relation to a note-perforation 14, such perforation will register with a tracker-duct 12 at the same time or approximately the same time that a note-perforation 14 registers with  
 20 a tracker-duct 11. When this occurs, air at the pressure of the atmosphere will enter the tracker-duct 12 and through the passage 36 pass under the diaphragm of the high-pressure pneumatic 29, thereby lifting the dia-  
 25 phragm and its valve 29<sup>a</sup> and permitting the exhaust of air from the power-pneumatic 30 through the passage 38, valve 29<sup>a</sup>, and space 40 into the air-passage 24 and high-pressure bellows 21, the position of the valve 28<sup>b</sup> at  
 30 such time being that shown by the high-pressure secondary pneumatic at the top of Fig. 8.

It will be observed from the foregoing description that when any ordinary tone is sounded the low-pressure secondary pneu-  
 35 matic through the open valve 28<sup>b</sup> controls the exhaust of the power-pneumatic 30, but that when a note is to be accentuated or modified the exhaust is controlled by the valve 29<sup>a</sup> of the high-pressure pneumatic.  
 40 It will be obvious without further description that the character of any note produced will depend upon whether the exhaust is from the low or high pressure bellows. It will also be understood that instead of employing my  
 45 improved music-roll in connection with a piano or other similar instrument for the purpose of accentuating or modifying the sound produced by the piano I may use it in connection with a musical instrument where the sounds  
 50 are produced by an organ-pipe, a vibrating reed, or a vibrating string—as, for instance, in instruments of the type of the angelus when used with a piano or an æolian—and in such case I may use my improved music-roll  
 55 in the production of musical sounds constituting a musical composition where, for instance, all of the sounds are produced upon a piano and certain of the sounds produced through the instrumentality of the perfora-  
 60 tions 15 upon an organ or corresponding instrument, or vice versa—that is to say, my improved music-roll may be employed to play the musical composition upon one instrument through the perforations 14 and simultane-

ously play certain selected sounds upon another 65 instrument.

Having thus described my invention, I claim—

1. A music-roll having two series of proximate perforations therein, one series situated 70 in advance of the other and at a distance less than that between any two perforations of the other series.

2. A music-roll having two series of alternately-disposed proximate perforations there- 75 in, one series situated in advance of the other and at a distance less than that between any two perforations of the other series.

3. A music-roll having two series of alternately-disposed perforations therein, the situ- 80 ation of the perforations of one series relative to those of the opposite series such that the distance between centers of proximate perforations of the different series will be less than between proximate perforations of the same 85 series.

4. A music-roll having two series of alternately-disposed proximate perforations there- in, the perforations of one series being less 90 in number and situated in advance of those of the other series and at a distance therefrom less than that between any two perforations of the other series.

5. A music-roll having two series of perforations, the perforations of one series vary- 95 ing in size and arranged longitudinally in line in the music-sheet, and those of the other series uniform in size arranged longitudinally in a parallel line in advance of and in immediate proximity to those of the first series. 100

6. A music-roll having two series of perforations, the perforations of one series vary- ing in size and arranged longitudinally in line in the music-roll, and those of the other series of uniform size but relatively smaller 105 than the smallest perforation of the first series, arranged longitudinally in a parallel line in advance of and in immediate proximity to those of the first series.

7. A music-roll having two series of perforations, the perforations of each series ar- 110 ranged longitudinally in the music-sheet but alternating in position across the music-sheet, those of one series varying in size and those of the other series of uniform size, and lo- 115 cated in immediate proximity to those of the first series.

8. A music-sheet having perforations of various lengths located in parallel longitudi- 120 nal rows, and additional perforations of uniform length located in intermediate rows to the first-named rows and in advance of certain of the first-named perforations.

9. A music-sheet having perforations of various lengths located in equidistant parallel 125 longitudinal rows, and additional perforations of uniform size located in intermediate rows, certain of the last-named perforations in ad-



vance of certain of the first-named perforations.

10. A music-sheet having perforations of various lengths proportionate to the duration of the notes to be produced and a second set of perforations, all of one size, and arranged in advance of and in intermediate position laterally of the sheet to certain of the first-named perforations.
11. A music-sheet having perforations of various lengths located along longitudinal lines on the sheet and other perforations of fixed size located along intermediate lines and in advance of the first-named perforations.
12. A music-sheet having perforations of unequal lengths, arranged in parallel rows, said perforations having spaces between them and additional perforations of uniform length located in the line of said spaces and in advance of the first-named perforations.
13. A music-sheet having perforations of various lengths located in longitudinal rows along the sheet and perforations of uniform length located in rows intermediate to and in advance of the perforations of the first-named rows.
14. A music-sheet having perforations of various lengths located in longitudinal rows, and perforations of uniform lengths, the latter perforations being located in spaces between the first-named perforations and of equal or greater width than the width of said spaces.
15. A music-sheet having longitudinal rows of perforations of unequal length and intermediate rows of perforations of uniform size, said size being less in width than the width of the first-named perforations.
16. A music-sheet having longitudinal rows of perforations of various lengths and an equal number of rows of perforations of uniform lengths alternately located on the sheet with respect to the first-named rows of perforations.
17. A music-sheet having longitudinal rows of perforations of various lengths, an unequal

number of perforations of uniform length alternately located on the sheet with respect to the first-named rows of perforations and in advance of the first-named rows of perforations.

18. A music-sheet having alternate rows of perforations of uniform size and of various sizes, the perforations of uniform size being in advance of the perforations of various sizes.

19. A music-sheet having alternate rows of perforations of uniform size and of various sizes, the perforations of uniform size having a fixed relative location on the sheet to certain of the perforations of various sizes.

20. A music-sheet having alternate rows of perforations of a given width laterally of the sheet, said perforations having various lengths, and perforations of less width laterally of the sheet but having fixed lengths.

21. A music-sheet having alternate rows of perforations of fixed width with various lengths and less width with fixed lengths, the latter perforations being in advance of the former.

22. A music-sheet having alternate rows of slots and round holes, the round holes being located in advance of the slots.

23. A music-sheet having alternate rows of various-sized holes and rows of uniform-sized holes, certain of the latter-named holes being located in advance of certain of the first-named holes.

24. A music-sheet having perforations of uniform lateral width arranged in longitudinal rows along the music-sheet and equally spaced across the music-sheet, and additional perforations of less width located intermediate of said first-named perforations and diagonally in relation thereto.

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

HENRY PRICE BALL.

Witnesses:

J. E. PEARSON,  
C. E. STECHER.