

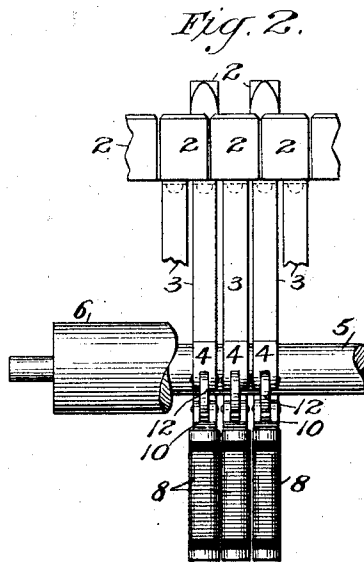
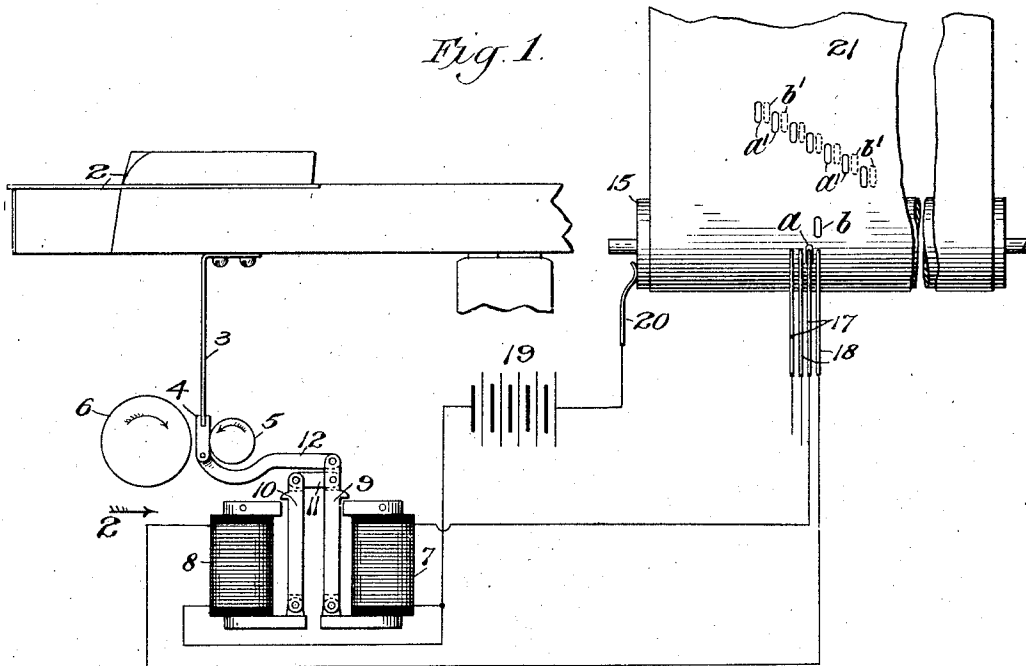
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PLAYING APPARATUS FOR PIANOS AND OTHER MUSICAL INSTRUMENTS.

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UNITED STATES PATENT OFFICE.

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PLAYING APPARATUS FOR PIANOS AND OTHER MUSICAL INSTRUMENTS.

984,677.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN F. KELLY, a citizen of the United States, residing at Pittsfield, county of Berkshire, and State of Massachusetts, have invented certain new and useful Improvements in Playing Apparatus for Pianos and other Musical Instruments, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to playing apparatus for pianos and other musical instruments of the class described in "Le Mélographe Répétiteur" by J. Carpentier in *La Lumière Electrique* of November 9th, 1881, or in United States Patent No. 371,422 granted to J. Carpentier, October 11th, 1887, in which the power for operating the keys of the piano is derived from a rotating shaft, mounted adjacent to which are a series of shoes, one of which is connected with each of the keys to be operated, and which shoes are adapted to be thrown into engagement with the rotating shaft and to be moved thereby to actuate the piano keys.

The object of the present invention is to provide an apparatus of this general character with means for accenting or emphasizing individual tones or for increasing the loudness of any part of the piece or composition being played.

To this end the invention consists in providing a plurality of rotating shafts or drums having different surface velocities and by providing means whereby each key may be actuated by bringing a shoe or friction contact device into engagement with either or any one of such rotating shafts or drums, so that when a shoe is moved against the shaft rotating with the lower surface velocity the corresponding key will be operated with a certain force, and when a shoe is moved against a shaft or drum with a higher surface velocity the corresponding key will be operated with greater force and the tone produced will be louder.

While the friction shoes may be forced against the rotating shafts or drums by any suitable means, electrically operated means are especially adapted for this purpose. Whatever means are employed, may be controlled in any suitable manner, either manually or automatically, for causing the pro-

duction of the desired tones of the desired loudness. The invention is, however, especially adaptable to automatic playing apparatus of that class in which the sounding of the tones is controlled by a so-called music sheet in which the various notes are represented by suitable actuating or controlling devices, usually perforations, positioned transversely of the sheet to determine the particular tones to be sounded and lengthwise of the sheet according to the time and succession of the tones; and in some of its features the invention relates particularly to such automatic apparatus.

A full understanding of the invention can best be given by a detailed description of an automatic playing apparatus embodying the invention in the preferred form, and such a description will now be given in connection with the accompanying drawings in which—

Figure 1 is a diagrammatic view illustrating such an automatic playing apparatus, this view showing the operating and controlling devices and electrical connections for causing the operation of a single key of a piano. Fig. 2 is a view looking in the direction of the arrow 2 in Fig. 1 showing the operating devices for three of the piano keys, and showing the friction drums or shafts broken away.

Referring to the drawings, keys of a piano keyboard are represented at 2. Extending downward from each key is a rod 3 which carries at its lower end a block 4 which normally lies midway between two rotating friction drums or shafts 5 and 6. The blocks 4 are each provided on each of their sides facing the drums with a suitable friction surface forming a friction shoe for engaging the face of the drum so that when a block is brought into engagement with either one of the drums it will be moved downward by the frictional engagement of the face of the drum with the friction surface on the block; and by such downward movement of the block the key to which it is connected by its rod 3 will be drawn or jerked downward so as to cause the sounding of the corresponding tone.

In order to provide for the actuation of the piano keys with different degrees of force, the drums 5 and 6 are caused to rotate with different surface velocities. This result

is preferably secured by making the drums of different sizes, so that they may rotate with different surface velocities while making the same number of rotations per minute.

5 As shown, the drum 5 is intended to cause the keys to be operated with a normal degree of strength for the production of tones of normal loudness, and the drum 6 which is of greater diameter, rotates with greater surface velocity so as to cause the keys to be

10 actuated with increased force with the consequent production of tones of increased loudness. If, therefore, any one of the friction blocks 4 is forced into engagement with the drum 5, a corresponding tone of normal

15 loudness will be produced, and if any one of the blocks 4 is forced into engagement with the drum 6, a tone of increased loudness will be produced. If any one or more

20 of a plurality of tones sounded simultaneously or in succession are to be accented or emphasized, therefore, it is only necessary to cause the blocks connected with the keys which produce such tones to be forced into

25 engagement with the larger drum 6, while the blocks corresponding to the keys which cause the production of the tones which are not to be accented or emphasized are forced into engagement with the similar drum 5.

30 So, also, if any part or passage of a composition is to be played louder than other parts, the tones forming such part will be produced by causing the blocks corresponding to the keys which produce such tones to

35 be forced at the proper times against the larger drum 6, while the tones which form the parts of the composition which are to be played with normal loudness are produced by causing the blocks which correspond to the keys which produce such tones

40 to be forced at the proper times against the similar drum 5.

For moving the blocks into engagement with the drums, two series of electromagnets 7 and 8 are provided, there being one magnet in each series corresponding to each tone to be produced, that is, one for each of the blocks 4 and keys 2. The armatures of these magnets are in the form of pivoted arms 9 and 10, shown as pivoted at the base of the magnets and extending upward past the poles at the upper ends of the magnets. The armature arms of the corresponding magnets in each series are connected by links 11

50 so as to move together, and each of such pairs of armature arms is connected by a link 12 with one of the friction blocks 4. When one of the magnets 7 is energized, therefore, its armature arm 9 will be drawn

60 to the right in Fig. 1, thereby moving the corresponding block 4 into engagement with the friction drum 5; and if one of the magnets 8 is energized, its armature arm 10 will be attracted and the corresponding block 4

will be forced into engagement with the friction drum 6.

Automatic control of the circuits to the two series of operating magnets is provided by means of a contact roll 15 and two series of contact fingers 17 and 18 adapted to make

70 contact therewith, there being a contact finger 17 in circuit with each of the magnets 7 and a contact finger 18 in circuit with each of the magnets 8. Each of the magnets is connected through a battery 19 to the roll 15 by means of a contact spring 20.

80 In the operation of the apparatus, the contact fingers 17 and 18 are normally held out of contact with the roll 15 by means of a music sheet 21 which is formed of paper or other suitable insulating material. The music sheet will be perforated in the usual manner, the perforations being arranged transversely of the sheet according to the

85 tones to be sounded, and lengthwise of the sheet according to the time and succession of the tones. As there will be two contact fingers for each tone to be sounded, that is, one in the series 17 corresponding to the magnets 7 which cause the production of

90 tones of normal loudness, and one of the series 18 corresponding to the magnets 8 which cause the production of tones of greater than normal loudness, there will consequently be two positions transversely of

95 the sheet in which perforations may be placed for causing the production of each tone, perforations in one of such positions causing the production of tones of normal loudness, and those in the other of such positions causing tones of greater than normal

100 loudness. The two series of contact fingers may be relatively arranged in any desired manner, but preferably the contact fingers of the two series will be alternated as shown

105 in Fig. 1. The position of the note perforations in the music sheet will, of course, correspond to the position of the contact fingers. In the portion of the sheet shown in Fig. 1, for example, the note perforation *a* will

110 cause the closing of the circuit to the magnet 7 shown in Fig. 1, thereby causing the production of a tone of normal loudness, and the note perforation *b* will cause the circuit to the magnet 8 shown in Fig. 1, to be

115 closed, thereby causing the production of a tone of increased loudness. Similarly the series of note perforations *a'* will cause the production of tones of normal loudness, whereas, if such perforations were in the

120 positions indicated by dotted lines at *b'* the same tones would be sounded with increased loudness.

It is to be understood that the invention is not to be limited to the exact construction and arrangement of parts as shown, but that it includes changes and modifications thereof within the claims.

It will be understood also that the invention in its broader aspect is not to be limited to an automatic apparatus, or to an apparatus, whether automatic or not, operated or controlled by electrically operated means.

What is claimed is:—

1. The combination with a tone producing device of a musical instrument, of a plurality of rotating friction drums having different surface velocities, and a plurality of friction surfaces connected to operate the tone producing device and each of which is adapted to be brought into engagement with one of the friction drums and to be moved thereby to actuate the tone producing device.

2. The combination with a tone producing device of a musical instrument, of a plurality of rotating friction drums, and a plurality of friction surfaces connected to operate the tone producing device and each of which is adapted to be brought into engagement with one of the friction drums and to be moved thereby to actuate the tone-producing device, each of said friction drums being adapted to move the friction surface which is brought into engagement with it with a different degree of force from the other or others and thereby cause the production of a tone of a different degree of loudness.

3. The combination with a tone producing device of a musical instrument, of two rotating friction drums mounted in adjacent positions and having different surface velocities, a member mounted between said friction drums and connected to operate the tone producing device, said member being normally out of engagement with the friction drums and having friction surfaces on opposite sides for engaging the friction drums, and means for moving said member into frictional engagement with said friction drums whereby said member will be moved to actuate the tone producing device with a greater or less degree of force according as it is brought into engagement with the friction drum moving with the greater or less surface velocity.

4. The combination with a tone producing device of a musical instrument, of two rotating friction drums having different surface velocities, a member connected to operate the tone producing device, and means for moving said member into frictional engagement with said friction drums whereby said member will be moved to actuate the tone producing device with a greater or less degree of force according as it is brought into engagement with the friction drum moving with the greater or less surface velocity.

5. The combination with the tone producing devices of a musical instrument, of a

plurality of rotating friction drums having different surface velocities, and a plurality of friction shoes connected to operate each of the tone producing devices, each of the friction shoes connected with each of the tone producing devices being adapted to be brought into engagement with one of the friction drums and to be moved thereby to actuate its corresponding tone producing device.

6. The combination with the tone producing devices of a musical instrument, of a plurality of rotating friction drums, and a plurality of friction shoes connected to operate each of the tone producing devices, each of the friction shoes connected with each of the tone producing devices being adapted to be brought into engagement with one of the friction drums and to be moved thereby to actuate its corresponding tone producing device, each of said friction drums being adapted to move the friction shoes which are brought into engagement with it with a different degree of force from the other or others and thereby cause the production of tones of a different degree of loudness.

7. The combination with the tone producing devices of a musical instrument, of two rotating friction drums mounted in adjacent positions and having different surface velocities, a series of members mounted between said friction drums one of which is connected to operate each of the tone producing devices, said members being normally out of engagement with the friction drums and having friction surfaces on opposite sides for engaging the friction drums, and means for moving said members into frictional engagement with said friction drums whereby said members will be moved to actuate the corresponding tone producing devices with a greater or less degree of force according as they are brought into engagement with the friction drum moving with the greater or less surface velocity.

8. The combination with the tone producing devices of a musical instrument, of two rotating friction drums having different surface velocities, a series of members one of which is connected to operate each of the tone producing devices, and means for moving said members into frictional engagement with said friction drums whereby said members will be moved to actuate the corresponding tone producing devices with a greater or less degree of force according as they are brought into engagement with the friction drum moving with the greater or less surface velocity.

9. The combination with a tone producing device of a musical instrument, of two rotating friction drums mounted in adjacent positions and having different surface velocities, a member mounted between said fric-

tion drums and connected to operate the tone producing device, said member being normally out of engagement with the friction drums and having friction surfaces on opposite sides for engaging the friction drums, and electrically operated means for moving said member into frictional engagement with said friction drums whereby said member will be moved to actuate the tone producing device with a greater or less degree of force according as it is brought into engagement with the friction drum moving with the greater or less surface velocity.

10. The combination with a tone producing device of a musical instrument, of a plurality of rotating friction drums, a plurality of friction shoes connected to operate the tone producing device and each of which is adapted to be brought into engagement with one of the friction drums and to be moved thereby to actuate the tone producing device, and a plurality of electromagnets, each of which is adapted to move one of said friction shoes into engagement with one of the friction drums, each of said friction drums being adapted to move the friction shoe which is brought into engagement with it with a different degree of force from the other or others and thereby cause the production of a tone of a different degree of loudness.

11. The combination with a tone producing device of a musical instrument, of a plurality of rotating friction drums having different surface velocities, a plurality of friction shoes connected to operate the tone producing device and each of which is adapted to be brought into engagement with one of the friction drums and to be moved thereby to actuate the tone producing device, a plurality of electromagnets, each of which is adapted to move one of the friction shoes into engagement with one of the friction drums, and sheet controlled contact devices for controlling the circuits to said electromagnets.

12. The combination with the tone producing devices of a musical instrument, of a plurality of rotating friction drums hav-

ing different surface velocities, a plurality of friction shoes connected to operate each of the tone producing devices, each of the friction shoes connected with each of the tone producing devices being adapted to be brought into engagement with one of the friction drums and to be moved thereby to actuate its corresponding tone producing device, and a plurality of electromagnets for moving said friction shoes into engagement with the friction drums.

13. The combination with the tone producing devices of a musical instrument, of a plurality of rotating friction drums having different surface velocities, a plurality of friction shoes connected to operate each of the tone producing devices, each of the friction shoes connected with each of the tone producing devices being adapted to be brought into engagement with one of the friction drums and to be moved thereby to actuate its corresponding tone producing device, a plurality of electromagnets for moving said friction shoes into engagement with the friction drums, and sheet controlled contact devices for closing the circuits to said electromagnets.

14. The combination with the tone producing devices of a musical instrument, of a plurality of rotating friction drums having different surface velocities, a plurality of friction shoes connected to operate each of the tone producing devices, each of the friction shoes connected with each of the tone producing devices being adapted to be brought into engagement with one of the friction drums and to be moved thereby to actuate its corresponding tone production device, and sheet-controlled means for moving said friction shoes into engagement with the friction drums.

In testimony whereof, I have hereunto set my hand, in the presence of two subscribing witnesses.

JOHN F. KELLY.

Witnesses:

E. G. FARRELL,
GEO. P. REES,