

Oct. 29, 1929.

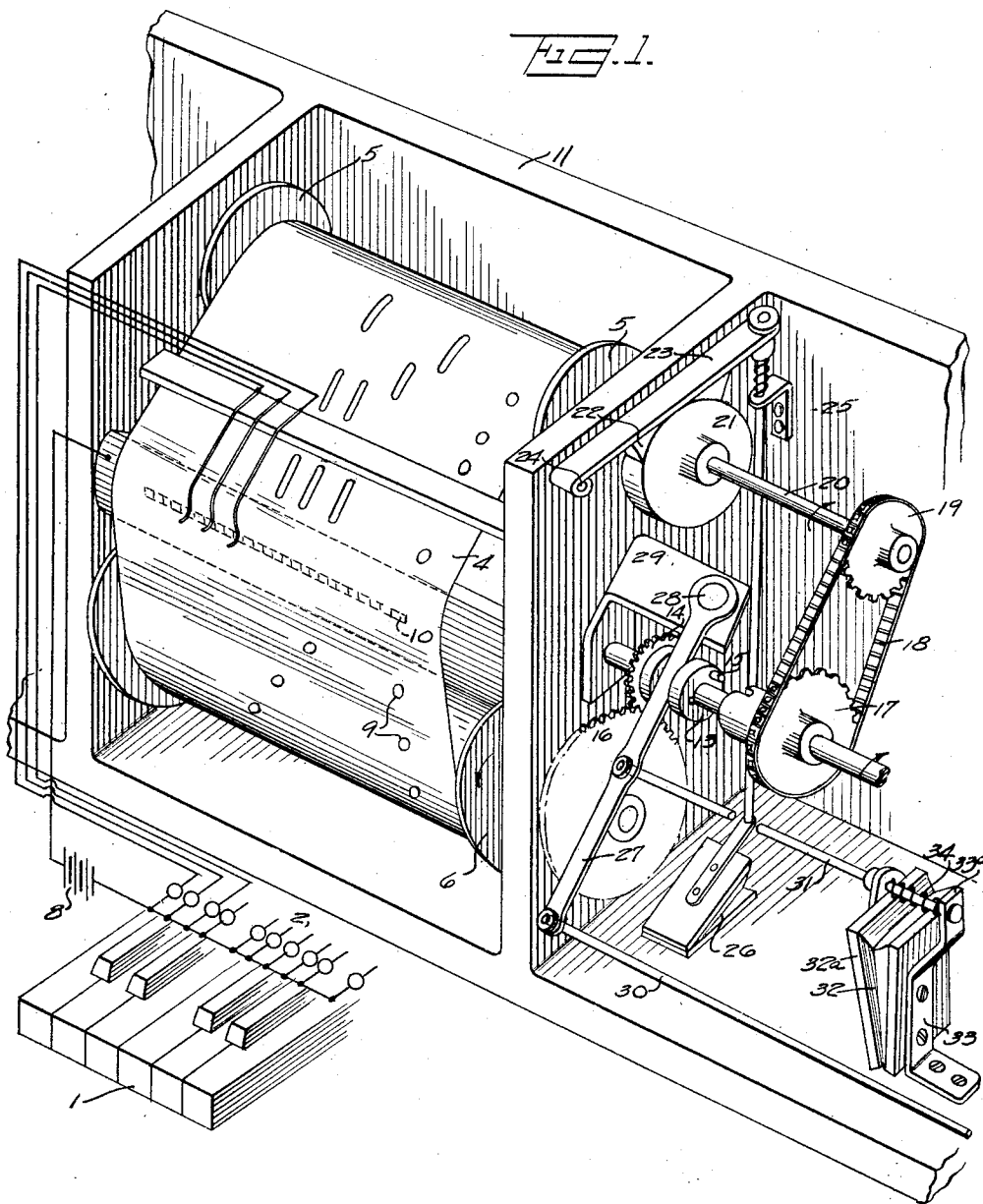
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1,733,477

INSTRUCTION DEVICE FOR MUSICAL INSTRUMENTS

Filed Aug. 28, 1926

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

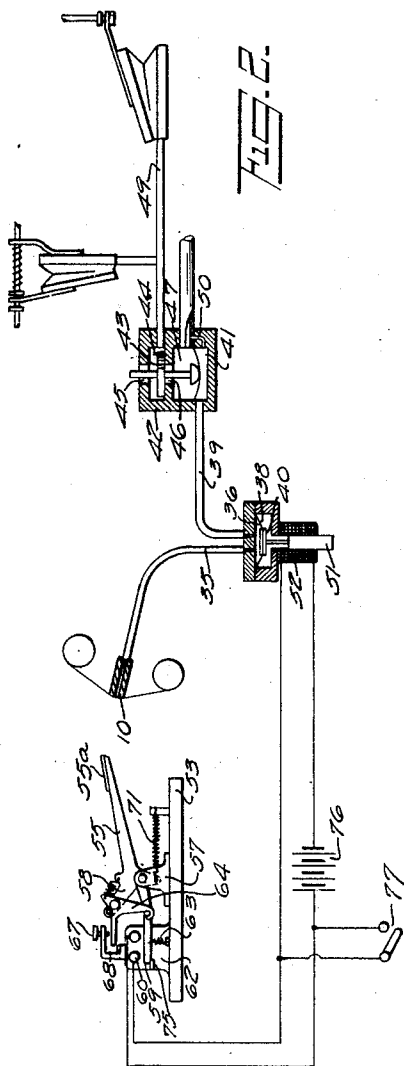


Fig. 3.

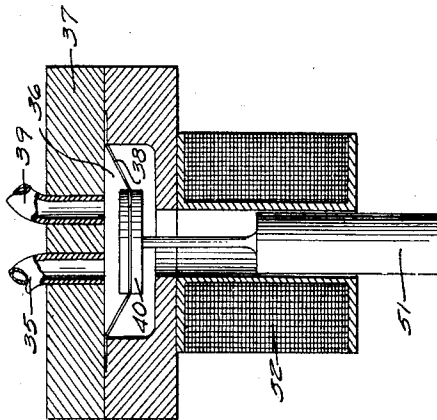
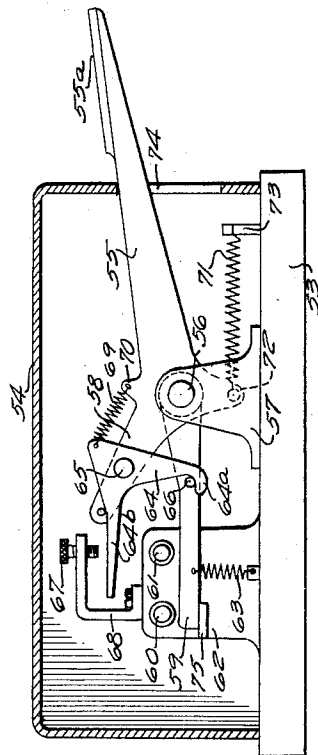


Fig. 4.



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INSTRUCTION DEVICE FOR MUSICAL INSTRUMENTS

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My present invention relates to improvements in means to teach the playing of a musical instrument such as a piano by actuating signals at the keys from a music-roll or record to indicate the keys to be played, my invention relating to improved means for automatically stopping the roll or record as each signal actuating perforation appears at the tracker bar, and for subsequently starting the roll after the pupil has struck the signal-indicated keys.

In the drawings, Fig. 1 is a perspective view of part of the device; Fig. 2 is a diagrammatic view of the various parts of the device including the interconnections; and Figs. 3 and 4 respectively are enlargements of parts of Fig. 2 to illustrate details. Like reference numerals have been used to indicate like parts throughout.

The drawings illustrate a preferred embodiment of my invention which I will now proceed to describe without, however, unnecessarily limiting the scope of my invention to the details of said embodiment either as shown by said drawings or as hereinafter described.

The keyboard 1 has signal lamps 2 adjacent the respective keys at the rear exposed portions thereof. 3 is a metal bar or tracker over which the perforated music-sheet 4 is driven, 5 being the supporting spool for said music-sheet and 6 being a take-up spool to which the front end or tab of the music-sheet is releasably attachable. When the take-up spool is driven in the direction of the arrow in Fig. 1, the music-sheet is carried down over the tracker 3 and under the electric contacts 7, one for each key of the instrument, spaced laterally so as to register with the note perforations in the music-sheet. This part of the device is shown only diagrammatically for the sake of simplicity.

One pole of the battery or other current source 8 is wired to one terminal of all of the lamps 2, whose other terminals are respectively wired to the contacts 7. Whenever a music perforation comes along, the related contact 7 drops or springs through the perforation into contact with the metal tracker 3 which thereby completes the circuit of the related

signal lamp because the tracker is wired to the other pole of the battery 8.

The means for automatically stopping the music-sheet each time a contact 7 drops into the front end of the music perforation, as above described, comprises a hole 9 in the music-sheet horizontally alined as shown with the front end of each music perforation or each row of said perforations. All of said holes 9 aline with one another lengthwise of the sheet so as to co-operate with a single port 10 in the tracker.

Before proceeding further with the description of said stop and start means, I will now briefly describe the illustrated means for winding and rewinding the music-sheet. The music-roll or spool 5 is removably supported for rotation in any convenient manner as by trunnions engaging its ends in the position shown in the box or frame 11 between whose sides the tracker bar 3 is stationarily supported as shown, and the take-up spool 6 is rotatably supported.

12 is a suitably supported drive shaft which in turn is driven by a motor, not shown, for effecting the winding and rewinding. Keyed to this shaft is a sleeve 13 slidable lengthwise of the shaft, said sleeve having a gear 14 integral with one end thereof, and a clutch pin 15 projecting from its other end. The said gear 14 by the sliding of said sleeve 13 is adapted to be brought into and out of mesh with another gear 16 secured to the end of the right hand trunnion of the take-up spool. The aforesaid clutch pin 15 is adapted by the sliding of said sleeve 13 to be brought into and out of clutching engagement with the corresponding clutch member on the hub of a sprocket wheel 17, said hub and gear wheel turning loosely or freely on the driving shaft 12 except when the clutch sleeve 13 has been slid along the shaft to engage its clutch member 15 with the clutch member on the hub of the sprocket wheel 17. Said sprocket 17 is connected by a chain 18 to another sprocket wheel 19 fixed on a suitably supported shaft 20 which projects through the right hand side wall of the frame or box 11. Within said box said shaft is provided with suitable means (not necessary to be shown) for engaging the

adjacent end of the music spool with a detachable clutching engagement. 21 is a disc fixed on the said shaft 20 outside of the box 11, and 22 is a brake shoe mounted on the under side of a bar 23 pivoted at one end 24 and provided at its other end with a depending rod 25 attached to the movable board of the pneumatic 26 whereby when said pneumatic is collapsed it applies the brake shoe to the disc and stops further rotation of the shaft 20 and therefore of the music spool clutched to said shaft. A butterfly spring (not shown) within this pneumatic keeps it normally expanded with the brake shoe out of operation.

27 is a lever continuously seated in a circumferential groove formed in the periphery of the heretofore described clutch sleeve 13, one end of said lever being pivoted at 28 to a stationary bracket 29 and its other end being connected by a rod 30 to a hand lever (not shown) whereby said lever can be operated either to pull said rod and lever 27 sufficiently to the right to clutch the sleeve 13 (splined on the drive shaft 12) to the hub of the sprocket wheel 17 (loose on the drive shaft 12), whereby the shaft 12 then drives the music-roll shaft 20 in the direction of the arrow to rewind the music-roll. Conversely, if the aforesaid hand lever (not shown) connected with the rod 30 be operated to push said rod and lever 27 to the left sufficiently far to mesh the gear 14 on the clutch sleeve 13 with the gear 16 of the take-up spool, then the said drive shaft 12 will be disconnected from the music-roll shaft 20, but on the other hand will be operatively connected with the said gear 16 of the take-up spool so that said spool will be driven in the direction of the arrow to wind the music-sheet off its spool and draw it down across the tracker.

Attached to said clutch sleeve lever 27 is another rod 31 secured to the movable board 32^a of a pneumatic 32 mounted in vertical position, with its fixed board secured to a bracket 33. The extent of collapse of this pneumatic is regulated or adjusted to be such that it pulls the lever 27 to the right sufficiently far to disengage the clutch sleeve gear 14 from the take-up spool gear but not sufficiently to engage the clutch sleeve with the hub of the sprocket wheel 17; in other words, collapse of the said pneumatic 32 stops the winding of the music-sheet onto the take-up spool without starting any rewind of said sheet.

The free end of the aforesaid rod 31 projects through a suitable opening in an extension 33^a from the bracket 33. A compression spiral spring 34 surrounding said rod between the movable and stationary boards of this pneumatic 32 expands said pneumatic when it is not on suction and meshes the

clutch sleeve gear 14 with the take-up spool gear 16.

I will now describe the pneumatic connections of the brake shoe pneumatic 26 and of the clutch pneumatic 32. These are shown in the diagrammatic view of Fig. 2. The heretofore referred to automatic stop port 10 in the tracker is connected by a tube 35 (Fig. 2) with a pouch chamber 36 formed between a board 37 and a flexible pouch 38 secured to the underside of said board (compare Fig. 3). Leading from said pouch chamber is another tube 39. Attached to the center portion of said pouch is a valve 40 which when raised is adapted to seat against the end of the tubes 35 and 39 where they project through the board 37 into the pouch chamber. Obviously, when the valve 40 is down there is free interconnection between the tubes 35 and 39 which is cut off when the valve is up. The object of this and the means for operating the valve 40 will be described later on.

The tube 39 runs to the pouch chamber 41 of a valve box 42 containing a regular or usual so-called "inside" valve 43 whose stem rests on the pouch of said pouch chamber 41. This valve 43 works in a chamber 44 having an upper port 45 leading to the atmosphere, and a lower port 46 leading to the chamber 47 connected by a tube 48 with an air exhauster (not shown). A bleed 50 connects the exhaust chamber 47 with the pouch chamber 41 so that the latter is normally on exhaust, together with the tubes 39 and 35.

The clutch pneumatic 32 and the brake shoe pneumatic 26 are both connected by a tube 49 with the above mentioned valve chamber 44 as shown.

The operation of the device as thus far described is as follows:

The music-roll having been inserted as shown in Fig. 1 and connected up to the take-up spool, and the motor having been started, and the clutch rod 30 having been pushed to the left to engage the clutch sleeve gear 14 with the take-up spool gear 16, the music-sheet will travel downwardly over the tracker until the contacts 7 drop through the front ends of the first music perforations 4^a of the music-sheet, whereupon said contacts by now touching the metal tracker will close the electrical circuits through the related signal lamps of the related keys of the piano, organ or the like, and will light said lamps as an indication to the pupil to strike said keys of the instrument. All the remaining electrical contacts 7 being insulated by the thickness of the non-perforated portions of the music-sheet, will, of course, remain unlighted and dark.

Simultaneously with the lighting of said signal lamps, the music-sheet will stop because the stop perforations 9 therein adjacent the front end of the said music perforations

will register with the automatic stop port 10 in the tracker. The resulting inrush of atmospheric air into the exhausted tubes 35 and 39 (Fig. 2) and into the exhausted pouch chamber 41, will lift said pouch and the supported valve 43 off its exhaust port and against its atmosphere port 45 with the result that both the clutch pneumatic 32 and the brake pneumatic 26 are cut off from the atmosphere and are now connected via the exhaust chamber 47 and the tube 48 with the air exhauster, whereupon they both immediately collapse. This immediately stops further travel of the music-sheet because the collapse of the clutch pneumatic disengages the clutch sleeve gear 14 from the take-up spool gear 16, and the collapse of the brake shoe pneumatic simultaneously applies the brake 22 to the disc 21 on the shaft 20 to which the music spool is clutched.

The signal lamps belonging to the particular music perforations at the tracker having been lighted as aforesaid, and further travel of the music-sheet having been automatically arrested as just described, the pupil is then able to find and strike the lighted keys whereupon the pupil operates the starting means which I will now describe to restart the sheet, which thereupon continues to travel until the next succeeding music perforation and adjacent automatic stop perforation 9 reaches the tracker, whereupon the sheet again automatically stops for the same reasons already described and remain stopped until the pupil again restarts the sheet by operating the means now to be described.

Part of this means consists of the heretofore described pouch chamber 36 (Figs. 2 and 3) connecting the tubes 35 and 39, also the valve 40 carried by the pouch 38 of said chamber. Attached to this valve is an iron core 51 depending freely within a solenoid 52. When the solenoid is energized, this core 51 is drawn up into it, thereby closing the valve 40 and disconnecting the tubes 35 and 39 from any pneumatic connection with each other. Reversely, when de-energized, the weight of the core 51 drops the valve 40 away from the mouths of the tubes 35 and 39 and thereby pneumatically connects them via the pouch chamber 36.

From the foregoing it will be seen that when the solenoid is de-energized the automatic stop port 10 in the tracker is uninterruptedly connected with the valve device 42 (Fig. 2) so that as soon as an automatic stop perforation 9 in the music-sheet registers therewith, the clutch and brake pneumatics are collapsed to arrest the travel of the sheet. If then the solenoid 52 be energized, the music-sheet will again immediately proceed because the core 51 drawn up into the energized solenoid will operate the valve 40 to shut off the connection between the automatic stop port 10 and the pouch chamber 41 of the valve device,

whereupon the bleed 50 will exhaust and collapse said pouch chamber and will operate the valve 43 to shut off the exhaust from the clutch pneumatic 32 and the brake pneumatic 26 and will connect both of said pneumatics with the atmosphere, whereupon both of said pneumatics will expand, the latter releasing the brake 22 and the former engaging the clutch sleeve gear 14 with the take-up spool gear 16 so that the sheet immediately recommences its travel.

In short, assuming that there is a music-sheet stop perforation 9 at the tracker port 10, the sheet automatically stops provided the solenoid 52 is de-energized; but it does not stop, or if stopped starts up again the moment the said solenoid is energized.

It now only remains to describe the means enabling the pupil to control at will this energization and de-energization of the said solenoid 52 for the purposes aforesaid. The particular means shown and now to be described is intended to be operated by the pupil's foot, but this or other equivalent devices for the purpose may be operated manually or in any other convenient way by the pupil.

Describing now the particular pedal device shown, 53 is a base plate intended to rest on the floor at the pupil's foot while seated at the keyboard of the piano or the like. 54 is a housing for the contained parts secured to said base plate, from which housing a lever 55 projects through a vertical slot, said lever having a toe-piece 55^a on its outer end for engagement by the toe portion of the pupil's foot, the pupil's heel resting on the floor. This lever 55 within the casing is supported to swing up and down on an axle 56 or the like supported at its ends by brackets 57 secured to the base plate 53. As a matter of fact the lever 55 is only one arm of a bell crank lever whose other arm is designated 58. 59 is another arm also pivoted on the axle 56 to swing up and down independently of the aforesaid bell crank lever. This arm 59 is conveniently called a contact arm because in its up position it wipes across the ends of the electrical contacts 60 and 61 and thereby electrically connects them, said arm, of course, being made of metal so as to be electrically conducting. The said contacts 60 and 61 are supported on a bracket 62 secured to the base plate 53 and, of course, are supposed to be insulated from each other.

A tension spiral spring 63 connects the contact arm to the base plate holding it normally out of engagement with the contacts. The means for raising said contact arm into engagement with said contacts from the down pressing of the lever 55 comprises the following: 64 is a latch depending from a pivot pin 65 projecting laterally from the lever arm 58 and having a hook 64^a on its lower end adapted to hook under a pin 66 projecting

laterally from the contact arm 59. A lug 64^b projects horizontally from the upper end of the latch under a stop adjustable as to height consisting of a screw 67 threaded into a vertical hole in an arm 68 supported by the bracket 62. The said latch 64 and its horizontal lug 64^b together constitute an elbow lever whereof the point of the elbow is connected by a tension spiral spring 69 with a lug 70 on the upper side of the main foot lever 58—55. Finally, another spiral tension spring 71 connects a lug 72 on the underside of said main foot lever with a pin 73 secured on the base plate as shown, whereby the toe end 55^a of said main lever whenever released by the pupil's foot automatically raises until stopped by any convenient stop such as the closed upper end (indicated by the arrow 74) of a vertical slot in the casing 54 through which the lever arm 55 projects. Similarly, 75 is a stop, preferably adjustable as to height, supported by the bracket 62 for engaging the underside of the contact arm 59 to limit its downward motion due to the tension spring 63.

The operation of the pedal device is as follows: When the pressure of the pupil's foot is relaxed on the arm 55 of the main lever by lifting the pupil's toes, the spring 71 elevates the said arm 55 and correspondingly depresses the other arm 58 of said lever. This latter carries down with it the latch 64 which, impelled by the spring 69, hooks under the pin 65 of the contact arm 59. When now the pupil's foot depresses the lever arm 55, said latch 64 is elevated by the lever arm 58 and carries with it said contact arm 59 until it bridges laterally and thereby electrically connects the contacts 60 and 61. However, it does this only momentarily because as the pupil's foot continues the down movement of the lever arm 55 and the up movement of 58, the lug 64^b of the latch engages the stop screw 67 and rocks thereby and disengages the latch 64 from the contact arm 59 which is thereupon immediately pulled downwardly by its spring 63 away from the contacts 60 and 61.

In short, each and every time the pupil down presses the foot lever arm 55, the contacts 60 and 61 are connected together only momentarily, it making no difference how long the pupil's foot may remain down. The object of this will now appear from the following description of the operation of the device as a whole, it first being premised, as will be seen from Fig. 2, that the said contacts 60 and 61 are in circuit through the battery 76 with the previously described solenoid 52.

The music-sheet having been started in motion by pushing the rod 30 to the left in Fig. 1 to connect the motor driven shaft 12 with the take-up spool, the first music perforation 4^a or horizontal row of said perfora-

tions to register with the contacts 7 at the tracker will light the related lamp or lamps 2 at the piano keys 1 corresponding to said music perforations. Also, the horizontally adjacent automatic stop perforation 9 will automatically stop said sheet due to the collapse of the clutch pneumatic 32 and of the brake pneumatic 26 as heretofore described.

The pupil will then find and strike the lighted keys 1 and after that will depress the arm 55 of the foot lever (Figs. 2 and 4), or if it be already depressed by the pupil, the foot will be momentarily raised and immediately depressed again. In either case the result will be the momentary connecting together of the contacts 60 and 61 resulting in the momentary energizing of the solenoid 52 and the momentary closing of the valve 40 for a sufficient time to stop the inflow of atmospheric air through the aforesaid stop perforation 9 of the now stationary music-sheet and through the stop port 10 of the tracker; and said valve 40 will remain closed for a sufficient time to permit the pouch chamber 41 of the valve 43 to be exhausted and thereby operate said valve to cut off the suction from the then collapsed clutch and brake pneumatics and now to connect them with the atmosphere, whereupon, impelled by their springs, they both instantly expand to unbrake the music-roll and re-clutch the take-up spool and so cause the sheet again to travel downwardly over the tracker. Incidentally, the given lights of course remain on for the length of the respective music perforations.

This travel of the sheet continues until the next succeeding music perforation or row of perforations with an adjacent stop perforation registers with the tracker, whereupon the lamp or lamps corresponding to said music perforations are lighted at the corresponding keys and the sheet is automatically stopped as before, even although the pupil's foot still remains down pressed on the arm 55 of the foot lever, because even so it will be remembered that the length 64 will then be tripped and the contact arm 59 will be down and the contacts 60 and 61 will be open circuited and therefore the solenoid 52 will be de-energized and the valve 40 will be down, the net result that there is a free connection between the aforesaid opened tracker stop port 10 to admit atmospheric air to the valve pouch chamber 41 to elevate said valve and pneumatically collapse the clutch and brake shoe pneumatics to stop the sheet.

The pupil having found and struck the lighted keys as before, then restarts the sheet by momentarily lifting the foot and immediately depressing it again.

By this stop and start method, the pupil plays each successive lighted key or keys and this is repeated until facility is acquired in playing the composition in this manner. After that a switch 77 (Fig. 2), theretofore

open, may be closed which cuts out the contacts 60 and 61 and the foot device entirely and now causes the battery 76 to energize the solenoid 52 continuously and by means of its

valve 40 to cut off the stop port 10 of the tracker continuously from the pouch chamber of the valve 43, with the result that said valve remains continuously down with the clutch and brake pneumatics continuously expanded on atmosphere. In short, the sheet now travels continuously because the stop perforations now have no effect and the pupil plays the lighted keys as fast as the signals come from the continuously traveling sheet. Having mastered this, the pupil is then ready to play the composition entirely from memory without the aid of music-sheet or lights.

1926.

EDWIN S. VOTEY.

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Changes and modifications may be made in the foregoing practical embodiment of my present improvements which will, nevertheless, still be within the spirit of the foregoing description and within the meaning and spirit of the annexed claims and which as such are accordingly intended to be covered thereby.

What I claim is:—

1. In combination, a musical instrument keyboard; an operably supported music-sheet having music-perforations and also having marginal stop-perforations severally in line with the front ends of said music-perforations; means for driving said music-sheet; signals severally adjacent the keys of said keyboard to indicate the keys to be manually played; means co-operating with the music-perforations for automatically operating said signals; stop-means which is co-operatively related to the music-sheet drive-means to stop it and which is thrown into operation by the several stop-perforations; and a single device operable by the performer as many times as there are stop-perforations to annul the sheet-stopping action of said perforations seriatim.

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2. In combination, a musical instrument keyboard; an operably supported music-sheet having music-perforations and also having marginal stop-perforations severally in line with the front ends of said music-perforations; means for driving said music-sheet; signals severally adjacent the keys of said keyboard to indicate the keys to be manually played; means co-operating with the music-perforations for automatically operating said signals; stop-means which is co-operatively related to the music-sheet drive-means, and which normally tends unto a condition permitting the music-sheet to be driven, such stop-means being operated by the several stop-perforations thereof to stop said sheet; and a device under the control of the performer, each operation of which momentarily annuls the music-sheet stopping action of the stop-perforation, thereby permitting the

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