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PNEUMATIC SHIFTING DEVICE FOR MOVABLE MEMBERS OF AN AUTOMATIC MUSICAL INSTRUMENT.  
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1,166,430.

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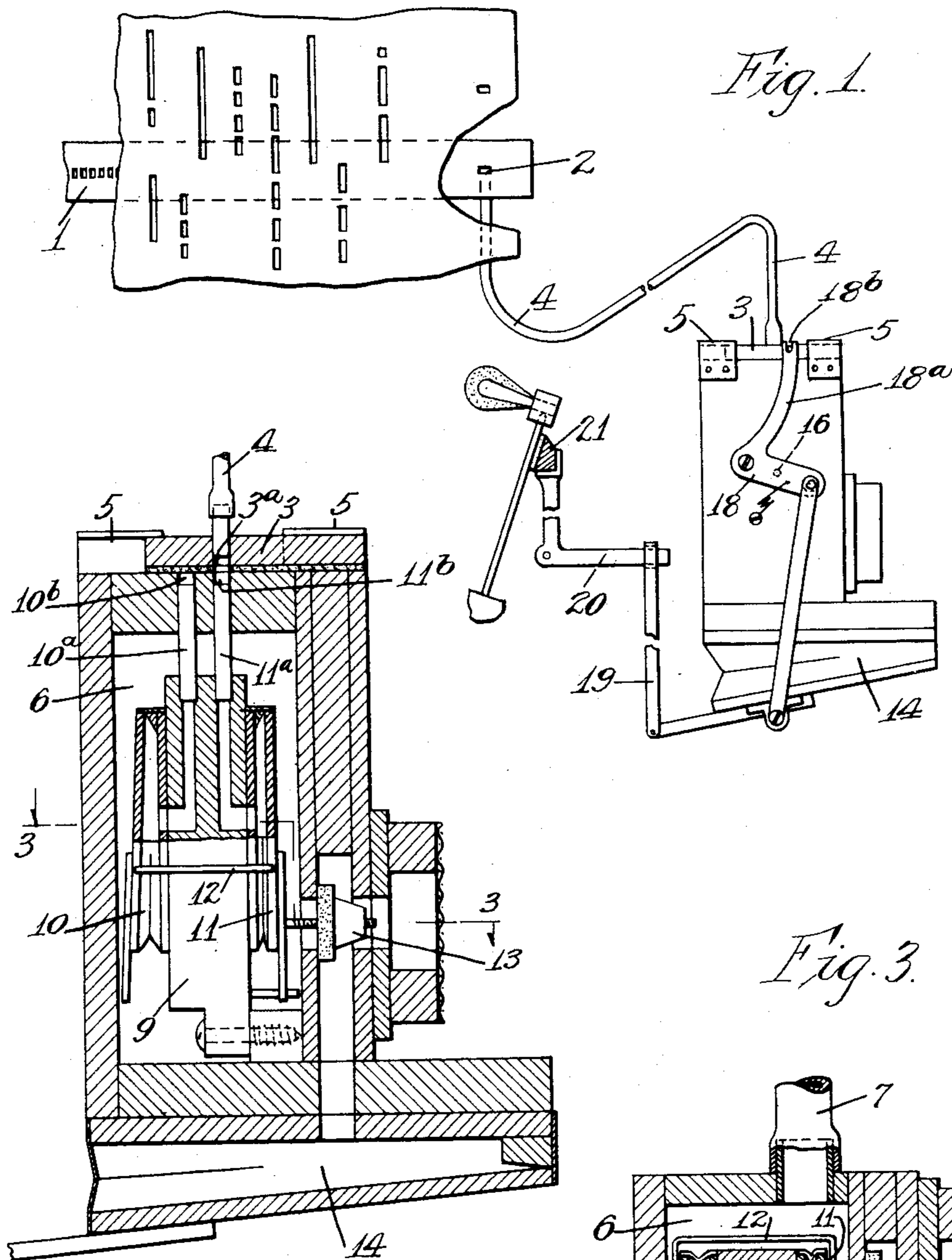


Fig. 2.

Fig. 3.

Witnesses:

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# UNITED STATES PATENT OFFICE.

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PNEUMATIC SHIFTING DEVICE FOR MOVABLE MEMBERS OF AN AUTOMATIC MUSICAL INSTRUMENT.

1,166,430.

Specification of Letters Patent.

Patented Jan. 4, 1916.

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*To all whom it may concern:*

Be it known that I, CHARLES S. BURTON, a citizen of the United States, residing at Oak Park, in the county of Cook and State of Illinois, have invented new and useful Improvements in Pneumatic Shifting Devices for Movable Members of Automatic Musical Instruments, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved device of a pneumatic character for the purpose of shifting any part of the mechanism of an automatic musical instrument or player action which may require change of position for the various musical effects.

It consists of the elements and features of construction shown and described and as indicated in the claims.

In the drawings:—Figure 1 is a partly diagrammatic representation of a portion of the tracker and note sheet of an automatic player mechanism having associated with it parts constituting the present invention. Fig. 2 is a section at the line 2—2 on Fig. 3 of the valve-controlling device whose operation is controlled by the duct connections with the tracker. Fig. 3 is a section at the line 3—3 on Fig. 2.

In respect to certain features of the construction, the device shown in this application is substantially that which is shown in Patent No. 1,005,771 granted to Melville Clark, dated October 10th, 1911. In that patent there is shown pneumatic means for shifting a movable element of a player action in which the control is effected by apertures in the note sheet controlling ducts leading to the device, the construction being such that upon a given aperture venting a given duct in the tracker which is connected with the device, a motor pneumatic is energized and caused to shift the parts to be moved in one direction, the motor pneumatic being maintained in collapsed condition,—that is, in communication with the exhaust chamber of the instrument,—not by the continuation of the apertures in the note sheet maintaining atmospheric communication through the connecting duct, but by means of an atmospheric communication which is opened when the pneumatic is en-

energized so that it remains thus energized after the perforation of the note sheet has passed the tracker and closed the duct therein. The advantage of this construction is that it avoids the necessity of prolonging the controlling slot in the note sheet and making it possible by a single short slot to produce a continued action of the motor pneumatic for the purpose of holding the part moved in the position into which it is moved; but this necessitates providing of an aperture of the note sheet in another line from that of the first aperture for reversing the connections to permit the motor pneumatic to be inflated when the part moved by its collapse is to be moved back to its normal or original position. In this construction, therefore, two lines of apertures in the note sheet are required. In player mechanisms which are controlled entirely automatically, as where a motor is provided for operating the device, all manual control being dispensed with, it is necessary to employ apertures in the tracker for a large number of purposes, that is, to produce a variety of movements of the different parts to control the expression, the tempo, the soft pedal, the sustaining pedal, and expression controlling devices. In view of the large number of these auxiliary or controlling devices, a large number of lines of perforation are required in the note sheet; and the fact that the width of the note sheet for 88-note music, so-called, is substantially standardized and cannot be departed from without great inconvenience in the marketing of the music (note sheets) it becomes of great importance to reduce to the minimum the number of lines of perforations required for any particular device; and the present invention is directed to the purpose of cutting down the number of lines of perforations required for the device in question from two lines, as in said patent, to a single line. The construction of the device in general which is shown in said Clark patent will be described sufficiently to make clear the relation of the present invention thereto.

In the drawings, the device embodying the invention is illustrated as applied for the purpose of operating the hammer rest rail, which is ordinarily operated by the soft pedal of the piano for lightening the

stroke of the hammer and softening the tone. It will be understood that this particular use of the device is selected merely for illustration, and that the device is designed to be employed, and is adapted to be employed, for moving any part which has to be moved back and forth, so that its alternate movements are in opposite directions.

The tracker board, 1, may be understood to be of usual construction for the usual purpose of such tracker board, viz., cooperating with the perforated music sheet for controlling the pneumatic action of the instrument with which it is associated. For the purposes of this invention it has in addition to the ducts for controlling the sounding devices, an additional duct, 2, connected by a tube, 4, with the valve-governing device which is shown in Fig. 2. This valve-governing device comprises a small exhaust air chamber, 6, which is connected by a trunk tube, 7, with the main exhaust chamber, of the pneumatic action, not shown. In this exhaust chamber there are mounted on a support, 9, two primary pneumatics, 10 and 11, from which tubes, 10<sup>a</sup> and 11<sup>a</sup>, extend to ports, 10<sup>b</sup> and 11<sup>b</sup>, in one end wall of the chamber, 6; and upon this end wall there is mounted a valve slide, 3, having a port, 3<sup>a</sup>, adapted to register with either of the ports, 10<sup>b</sup> or 11<sup>b</sup>, the slide being mounted for movement longitudinally to shift registration on said port, 3<sup>a</sup>, from one to the other of said ports, 10<sup>b</sup> and 11<sup>b</sup>. The port, 3<sup>a</sup>, is connected by a nipple with the tube, 4, so that that tracker duct, 2, from which said tube, 4, leads is adapted to be brought into communication with one or other of the primary pneumatics, 10 and 11, according to the adjustment of the valve slide, 3. The two primary pneumatics, 10 and 11, have their moving walls connected by a rigid loop, 12, so that they move together, and each of said pneumatics is collapsed when the other is expanded. The primary pneumatic, 11, carries a valve, 13, which operates in the usual manner of a primary pneumatic valve to control a motor pneumatic, 14, which is mounted outside the chamber, 6.

It will be seen that for producing collapse of the motor pneumatic, 14, the primary pneumatic, 11, will be inflated, and for producing inflation of said motor pneumatic, 14, the primary pneumatic, 10, will be inflated. The inflation of the primary pneumatic, 11, which occurs if the port, 3<sup>a</sup>, is registered with the port, 11<sup>b</sup>, when atmospheric air is admitted the tube, 4, to said primary pneumatic, 11, by the registration of a proper aperture of the perforated note sheet with the tracker duct mouth, 2, will cause collapse of the primary pneumatic, 10, the usual bleeder, not visible in the drawings, being present (by reason of the rigid loop

connecting the two pneumatics); but by reason of unpreventable leakage of the pneumatic, 11, the two pneumatics would resume their normal position upon the passage of the aperture of the note sheet away from the duct mouth, 2, unless some provision were made to the contrary. Such provision consists in providing a duct, 16, leading out through the partition bar or rib, 9, on the inner wall of the chamber, 6, on which rib the two primary pneumatics are mounted, such duct leading out by way of said rib to the side of the chamber, 6, and being controlled by a valve, 18, which is mounted upon the outer side of the chamber for seating over the outer mouth of the duct, the motor pneumatic, 14, being connected with said valve, 18, so as to move the valve for closing the duct when the motor pneumatic is inflated, and to open the valve when the motor pneumatic is collapsed. It will be understood that the collapse of the motor pneumatic occurs when the primary pneumatic, 11, is inflated under the conditions above described. It thus results that when such registration of an aperture of the note sheet with the tracker duct mouth, 2, has occurred, and the note sheet aperture has passed the duct mouth so as to close it again, the air supply to the primary pneumatic, 11, which is provided first by the registration of said note sheet aperture with the tracker duct mouth, 2, is afterward maintained through the duct, 16; and the motor pneumatic, 14, is thereby held in collapsed position until another aperture of the note sheet registers with said tracker duct mouth, 2, at a time when the port, 3<sup>a</sup>, is registered with the port, 10<sup>b</sup>, of the duct leading to the primary pneumatic, 10, causing inflation of said primary pneumatic, which reverses the position of the valve, 13, admitting atmospheric air to the motor pneumatic, 14, causing the latter to be inflated and to close the valve, 16.

The valve, 18, is formed as one arm of a bell crank lever whose other arm, 18<sup>a</sup>, extending up along the surface of the end of the chamber, 6, has its end provided with a slot, 18<sup>b</sup>, engaging a stud upon the edge of the valve slide, 3, so that the valve slide is moved one way or the other in its slide bearings, 5, upon the movement of the valve, 18, derived from the moving member of the pneumatic, 14. At the position of said valve shown in Fig. 3, which is the same as that shown in Fig. 1, that is, when the pneumatic, 14, is inflated normally, and the mouth of the duct, 16, is closed by the valve 18, the port, 3<sup>a</sup>, of the valve slide, 3, is registered with the port of the duct, 11<sup>b</sup>, leading to the primary pneumatic, 11; and when under this condition of the parts an aperture in the note sheet registers with the tracker duct mouth, 2, and admits atmo-

spheric air to the primary pneumatic, 11, the resultant movement of the valve 13, opening communication of the exhaust chamber with the pneumatic, 14, and causing it to collapse, not only opens the port to the duct, 16, leading to the primary pneumatic, 11, causing it to remain inflated and continue holding the valve, 13, in the position for connecting the motor pneumatic, 14, with the exhaust chamber and causing the pneumatic to remain collapsed, but also operates the valve slide, 3, so as to bring the port, 3<sup>a</sup>, into registration with the port of the duct, 10<sup>b</sup>, leading from the primary pneumatic, 10. Nothing will result from this shift of the valve slide until another aperture of the note sheet comes into registration with the tracker duct mouth, 2, and when this happens the resultant inflation of the pneumatic, 10, causes reversal of the position of the valve, 13, and the inflation of the pneumatic, 14, by admission of atmospheric air thereto. It will be seen, therefore, that by means of the valve slide, 3, carrying means of connecting a single tracker duct alternatively with the two primary pneumatics, 10 and 11, it is made possible to control the motor pneumatic, 14, and the part which is to be moved thereby for both its movements by apertures in a single line of the note sheet, each alternate aperture in that line operating to reverse the position of the valve, 13, and the condition of the pneumatic, 14, as either being collapsed or inflated.

The moving wall of the motor pneumatic, 14, is shown connected by means of a link, 19, with the lever arm, 20, of the hammer rest rail, 21, so that the alternate collapse and inflation of the motor pneumatic rocks the hammer rest rail with the purpose and effect which is ordinarily produced by the soft pedal of the piano. This serves to illustrate the application of the device to the purpose of moving any part of an automatic player action which requires movement alternately in opposite directions.

I claim:—

1. In an automatic playing device for a musical instrument having a motor pneumatic for operating a movable part of the mechanism, in combination with the motor pneumatic, primary pneumatics for controlling the same, and connections by which

the control is effected adapted to cause the motor pneumatic to be collapsed when one of said primary pneumatics is expanded, and to be inflated when the other of the primary pneumatics is inflated; a valve device having a port adapted to be in communication alternatively with said two primary pneumatics; a tracker having a duct provided with connections leading to said valve device port, and mechanical connections by which the motor pneumatic shifts said valve device port for establishing communication with one of the primary pneumatics when said motor pneumatic is collapsed, and with the other of said primary pneumatics when the motor pneumatic is inflated.

2. In an automatic playing device for a musical instrument having a motor pneumatic for operating a movable part of the mechanism, in combination with the motor pneumatic, primary pneumatics for controlling the motor pneumatic, and connections by which such control is effected, adapted to cause the motor pneumatic to be collapsed when one of said primary pneumatics is inflated, and to be inflated when the other of said primary pneumatics is inflated, the primary pneumatic whose inflation operates to cause collapse of said motor pneumatic, having a supplementary air supply port; a valve controlling such port, and connections from the moving wall of the motor pneumatic for opening said valve by the collapsing movement of the motor pneumatic, a valve device having a port adapted to be in communication alternately with either of said primary pneumatics; a tracker having a duct provided with communication leading to said valve device port, the connections which operate the valve for controlling said supplementary air supply port being connected for operating said valve device to shift the tracker duct connections thereof from one primary pneumatic to the other when the supplementary air supply port valve is operated.

In testimony whereof I have hereunto set my hand at Chicago, Illinois, this 13th day of November, 1914.

CHARLES S. BURTON.

Witnesses:

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LUCY I. STONE.