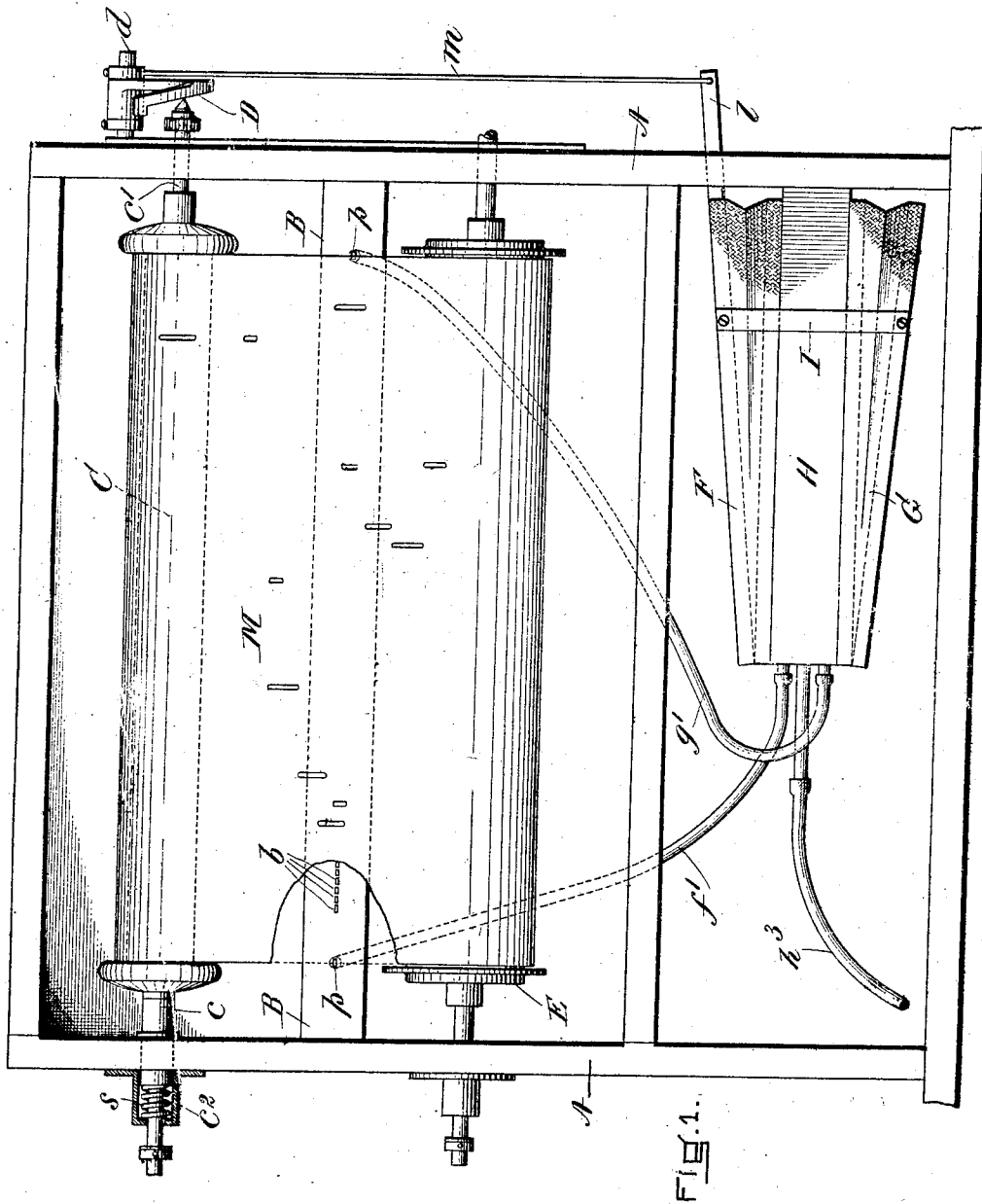


W. R. CRIPPEN.  
MUSIC SHEET GUIDE.  
APPLICATION FILED DEC. 7, 1911.

1,025,184.

Patented May 7, 1912.  
2 SHEETS-SHEET 1.



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2 SHEETS—SHEET 2.

FIG. 3-

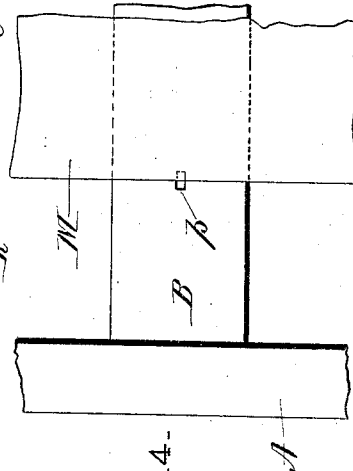
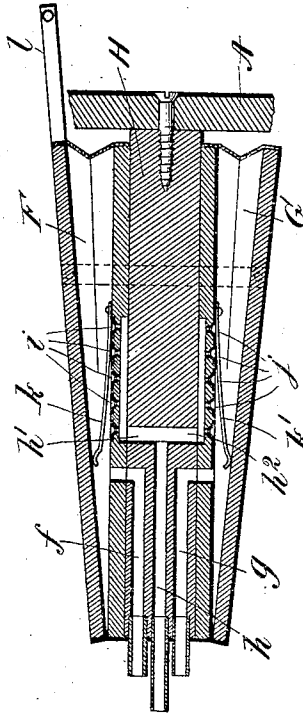


FIG. 4-

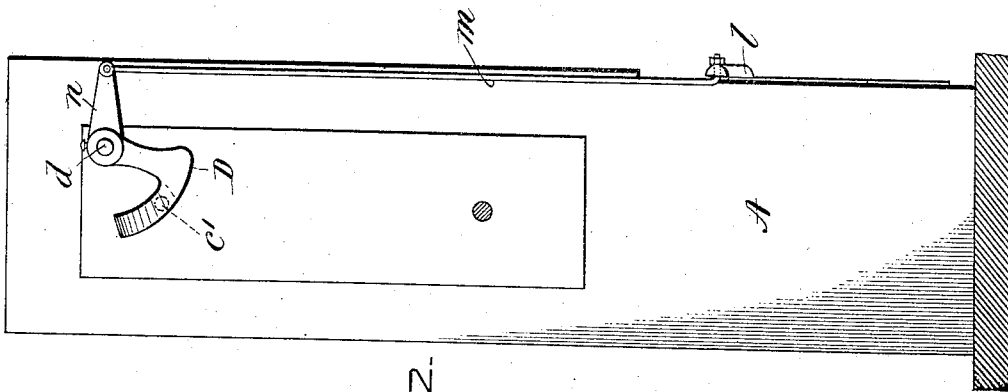


FIG. 2-

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# UNITED STATES PATENT OFFICE.

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## MUSIC-SHEET GUIDE.

1,025,184.

Specification of Letters Patent.

Patented May 7, 1912.

Application filed December 7, 1911. Serial No. 664,440.

*To all whom it may concern:*

Be it known that I, WALTER R. CRIPPEN, a citizen of the United States, and resident of Newton, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Music-Sheet Guides, of which the following is a specification.

This invention relates to pneumatic guide mechanisms for traveling music sheets, and its object is to provide an improved and a more sensitive and immediately responsive device than has heretofore been produced for maintaining correct registration between the perforations of a music sheet and the pneumatic music apertures in the tracker bar of an automatic musical instrument, and one in which the pneumatic motor for effecting the adjustment between the music sheet and the tracker bar is continuously in operation.

Pneumatic guiding mechanisms have heretofore been devised for this purpose in which the pneumatic guide openings governing the two bellows motors which effect the adjustment between the music sheet and the tracker bar, are maintained closed when the music sheet is in its normal position and is running in correct registration with the tracker bar. In such apparatus a lateral deviation of the music sheet if carried far enough opens one or the other of said normally closed guide openings and thereby inaugurates the action of the corresponding bellows motor which, in turn, effects the adjustment between the music sheet and the tracker bar. In contrivances of this sort it will be seen that both bellows motors for adjusting the music sheet are normally maintained in inoperative condition; that never more than one of them is brought into operation at a time; that the corrective effect in the adjustment of the music sheet is dependent on the action of one bellows motor independent of the other which is held inoperative; and that until the music sheet deviates far enough from its true path to uncover one of the guide posts, the action of the corresponding bellows motor for adjusting the sheet will not be inaugurated. The result is that a slight deviation of the music sheet from its true and normal path may be sufficient to prevent the accurate registration of the perforations of the music sheet with the music apertures of the tracker

bar, but may also be insufficient to open one of the guide apertures, since the margin of the music sheet must overlie the guide apertures far enough to act as an air tight valve to close the guide aperture. Furthermore, if the sheet moves far enough to begin to uncover one of the guide openings, the other necessarily remaining closed, the slight opening thus at first effected may not be sufficient to enable the bellows governed thereby to respond emphatically enough instantly to restore the music sheet and tracker bar to accurate adjustment. Again, there is a tendency in such devices, when one of the motors comes into action, for the music sheet to be shifted too far and so to bring the other motor into operation, thus producing a laterally reciprocating movement of the music sheet by reason of the alternate action of the two motors.

The purpose of the present invention is to render the pneumatic means for restoring the adjustment between the music sheet and the tracker bar more sensitive to slight deviations of the music sheet and more instantly and completely responsive to such deviations, and otherwise to remedy the defects in the guide mechanisms heretofore used. To this end I arrange the guide openings or ports which govern the pneumatic means for adjusting the music sheet and tracker bar, so that when the music sheet is running in its true and normal path and registering accurately with the tracker bar, said guide ports will be partially and equally, but not wholly, open, thus holding the pneumatic adjusting means controlled by said ports always in operation and normally balanced under equal air tension, and when the music sheet tends to deviate from said normal position any lateral deviation thereof effects simultaneously the increase of the area of the opening of one of said guide ports and the reduction of the area of the opening of the other guide port, thereby governing the pneumatic adjusting means by the differential between said areas. Thus it will be seen that the pneumatic adjusting means instead of being normally inoperative, are at all times normally in operation, and that the slightest deviation of the music sheet will not only instantly enlarge the opening of one of the guide ports, thereby producing an instantaneous effect upon the pneumatic adjusting motor with-

out waiting for the uncovering of a normally covered guide port as heretofore, but at the same time reduces the area of the opening of the other guide port, thereby gaining the increased effect of the differential between the two open areas of the guide ports upon the pneumatic means governed thereby.

In the accompanying drawings, which illustrate the preferred embodiment of my invention,—Figure 1 is a front elevation of a spool box mechanism of a mechanical piano player in which my improved music sheet guide is incorporated. Fig. 2 is an end elevation of the spool box mechanism shown in Fig. 1 viewed from the right of Fig. 1; Fig. 3 is a longitudinal, central section through the pneumatic motor which effects the adjustment between the music sheet and the tracker bar; and Fig. 4 is an enlarged detail view in front elevation showing the normal relation between the edge of the music sheet and the guide port controlled thereby.

A represents the casing or support for the operating parts of the music sheet and guide mechanism, and B the tracker bar mounted on said supports and having the usual pneumatic music openings *b*. The music roll or spool C is journaled as usual on spindles, *c* and *c'*, which are arranged to slide lengthwise in the casing A to provide for relative adjustment between the music sheet and the tracker bar. A coil spring, *s*, in a housing, *c<sup>2</sup>*, secured to the casing A normally urges the spindles and the music roll C toward the right as viewed in Fig. 1, and a segmental cam, D, pivoted to swing on an axis, *d*, engages the end of spindle, *c'*, and limits and adjusts the endwise movement of said spindles and music roll. E is the winding roll or drawing roll for drawing the music sheet M from the music roll across the tracker bar. The parts thus far described may be of usual construction and constitute no part of my present invention.

The tracker bar, B, is provided with two pneumatic guide ports, *p*, *p*, spaced apart a distance between centers equal to the standard width generally employed in music sheets. When the music sheet is in its normal, central position as shown in the drawings with its perforations registering accurately with the music apertures, *b*, in the tracker bar, the margins of the music sheet extend part way across said guide ports, *p*, *p*, (Figs. 1 and 4) leaving said guide ports partially and equally open, thereby admitting air equally to the two sides of the pneumatic motor which effects the adjustment of the music sheet, in both sides of which motor an equal and balanced air tension is normally maintained, thereby maintaining said motor in balanced condition and holding said music roll and tracker bar in equ-

stant adjustment so long as the port openings remain equal.

The pneumatic motor as herein shown consists of two bellows compartments, F and G, separated by a central partition wall H which is rigidly secured to the frame or casing A. The outer walls or leaves of the two bellows, F and G, are connected by a link, I, so that both will move together as one part. Bellows F communicates through duct *f* and pipe *f'* with the left hand guide port, *p*, and bellows G communicates through duct *g* and pipe *g'* with the right hand port, *p*. A suction passage, *h*, connected by pipe, *h<sup>2</sup>*, with suitable exhaust mechanism, such as the usual pumping apparatus of the instrument (not shown), communicates through branches, *h'* and *h<sup>2</sup>*, and several small ports, *i* and *j*, with the bellows, F, and G, respectively. Two leaf spring valves, *k* and *k'*, are secured to the inner walls of bellows, F and G, respectively, extend toward the fulcrums of said bellows, and bear at their free ends against the outer leaves of said bellows. When the two bellows compartments, F and G, are in the position shown in Fig. 3, that is, distended to equal extent, the valves, *k* and *k'*, respectively, leave open the same number of ports, *i* and *j*, and equal tension will be maintained in bellows F and G by the suction passage, *h*.

Motion is communicated from the pneumatic motor to the cam D for shifting the music roll C, through arm *i* secured to the outer wall of bellows F, link *m*, and arm *n*, which swings cam D on its axis, *d*.

The operation of the device is as follows: When the music sheet, M, is running true or in correct registration with the tracker bar, the two guide ports, *p*, *p*, are open to an equal extent and admit equal amounts of air to the bellows compartments, F and G, of the motor, which are also in their normal or central position with respect to the wall H as shown in Fig. 3, and are consequently under equal or balanced air tension. When the music sheet, M, deviates laterally from its normal path, no matter how slightly, the equality of area of the guide port openings is instantly upset by the enlargement of one of the guide port openings and the simultaneous and corresponding reduction of the other, which instantly increases the supply of air to one of the bellows compartments and correspondingly decreases the supply of air to the other bellows compartment, with the result that the balance between the two bellows compartments, F and G, is also upset causing the one receiving the greater supply of air to expand and the other to collapse. This movement of the motor is imparted through the intervening mechanism to the music roll C which is shifted, endwise in the required direction

and restores the music sheet to its correct position with relation to the tracker bar.

To describe more in detail the operation of the several elements: Suppose the music sheet to deviate to the right, as viewed in Fig. 1. The open area of the left hand guide port,  $p$ , would then be increased and the open area of the right hand guide port,  $p'$ , would be simultaneously and correspondingly reduced by the lateral shifting of the margins of the music roll which regulate the size of the open area of said guide ports. The supply of air will thereby be increased through pipe  $f'$  to the bellows compartment, F, and at the same time correspondingly decreased through the pipe  $g'$  to the bellows compartment G. Bellows F will instantly tend to expand and bellows G will instantly tend to collapse, thereby moving arm  $l$ , link  $m$  and arm  $n$  upward, and swinging the segmental cam D in a counter-clockwise direction. The end of spindle  $e'$  will then ride up on the inclined cam surface of D which will thereby thrust the music roll C and with it the music sheet M toward the left, compressing spring  $s$ , and so restore the music sheet to correct registration with the tracker bar. The instant the bellows F expands and the bellows G contracts by reason of the unequal air supply through the guide ports, the spring valve  $k$  is permitted to rise by the movement of the outer leaf of bellows F and uncovers additional ports  $i$ , and spring valve  $k'$  is compressed by the outer leaf of the bellows G and closes additional ports,  $j$ , thus tending to increase the suction area from bellows F and reducing it from bellows G, and facilitating the restoration of the music roll to normal position. Branch passages,  $h'$  and  $h''$ , together with the ports,  $i$  and  $j$ , serve as an equalizer passage between the compartments, F and G. As the music sheet M shifts back to normal and correct position, as described, the open areas of the guide ports,  $p$ , will again be equalized and until the balance of said areas is again upset by the lateral deviation of the music sheet, the air tension in the compartments, F and G, will remain balanced and hold the music sheet in the position to which it is for the time being adjusted. It will be understood that deviation of the music sheet in the opposite direction, that is, to the left as viewed in Fig. 1, will cause the parts to operate in reverse manner to that just described swinging cam D in a clockwise direction and permitting the end of the spindle,  $e'$ , to move down the cam surface and the music roll C to shift to the right under the influence of spring  $s$ . Thus, the deflection or deviation of the music sheet in either direction from its true or normal path to no matter how small an extent, varies the relative open areas of the guide

ports and thereby upsets the balance of air tension in the two sides of the motor, causing the music roll to be shifted instantly in the direction to correct such deviation, and the motor for effecting such adjustment being governed by the differential between the open areas of the two guide ports, responds instantly and emphatically to such deviation, restoring the music sheet and tracker bar to their proper relation before the deviation has become sufficiently pronounced to effect the correct playing of the instrument. It will also be noted that the regulating motor is at all times in operation and at all times tending to maintain the music sheet in correct registration with the tracker bar instead of being normally cut out of operation in the manner heretofore practiced in such devices which has necessitated a substantial disarrangement in the relation between the music sheet and the tracker bar to bring the motor into action.

While I have herein illustrated a device in which the music roll is shifted to adjust the music sheet and tracker bar, it will be understood that the relative adjustment could be obtained by shifting the tracker bar in a manner well known to those skilled in the art, instead of by shifting the music roll.

I claim:

1. In combination, a traveling music sheet, a tracker bar provided with two pneumatic guide ports, each partially open when the music sheet is in correct registration with said tracker bar, the lateral deviation of the music sheet effecting simultaneously the increase of the area of the opening of one of said guide ports and the reduction of the area of the opening of the other, and pneumatic means communicating with said guide ports and governed by the differential between said areas for adjusting the relation between the music sheet and the tracker bar.
2. In combination, a tracker bar provided with two pneumatic guide ports, a traveling music sheet, the margins of which extend part way across said guide ports, leaving each of said guide ports partially open, whereby the lateral deviation of the music sheet will simultaneously effect the increase of the area of the opening of one of said guide ports and the reduction of the area of the opening of the other, and pneumatic means communicating with said guide ports and governed by the differential between said areas for adjusting the relation between the music sheet and the tracker bar.
3. In combination, a traveling music sheet, a tracker bar provided with two pneumatic guide ports, each partially and equally open when the music sheet is in normal position, the lateral deviation of the music sheet effecting simultaneously the increase of the area of the opening of one

of said guide ports and the reduction of the area of the opening of the other, and a pneumatic for adjusting the relation between the music sheet and the tracker bar, comprising  
 5 two bellows compartments in which equal air tension is normally maintained, said compartments communicating with said guide ports respectively, and governed by the differential between the areas thereof.

10 4. In combination, a traveling music sheet, a tracker bar provided with two pneumatic guide ports, each partially and equally open when the music sheet is in normal position, the lateral deviation of the music sheet  
 15 effecting simultaneously the increase of the area of the opening of one of said guide ports and the reduction of the area of the opening of the other, a pneumatic for adjusting the relation between the music sheet  
 20 and the tracker bar, comprising two bellows compartments in which equal air tension is normally maintained, said compartments communicating with said guide ports respectively and governed by the differential between the areas thereof, and an equalizer  
 25 passage connecting said compartments.

5. In combination, a traveling music sheet, a tracker bar provided with two pneumatic guide ports, each partially and equally  
 30 open when the music sheet is in normal position, the lateral deviation of the music sheet effecting simultaneously the increase of the area of the opening of one of said guide ports and the reduction of the area  
 35 of the opening of the other, a pneumatic for adjusting the relation between the music sheet and the tracker bar, comprising two bellows compartments in which equal air tension is normally maintained, said com-

partments communicating with said guide ports respectively and governed by the differential between the areas thereof, and an exhaust passage communicating with each of said bellows compartments, controlled by valves automatically actuated by the movement of said bellows to vary the air passages between said bellows compartments and said exhaust passage.

6. In combination, a traveling music sheet, a tracker bar provided with two pneumatic guide ports, each partially and equally open when the music sheet is in normal position, the lateral deviation of the music sheet effecting simultaneously the increase of the area of the opening of one of said guide ports and the reduction of the area of the opening of the other, a pneumatic for adjusting the relation between the music sheet and the tracker bar, comprising two bellows compartments in which equal air tension is normally maintained, said compartments communicating with said guide ports respectively and governed by the differential between the areas thereof, an exhaust passage, a series of small ports connecting each bellows compartment with said exhaust passage, and a valve controlling each of said series of ports, said valves being actuated by the movement of said bellows to open one or more of the ports of one series and at the same time to close one or more of the ports of the other series.

Signed by me at Boston, Massachusetts, this 4th day of December, 1911.

WALTER R. CRIPPEN.

Witnesses:  
 ROBERT CUSHMAN,  
 CHARLES D. WOODBERRY.