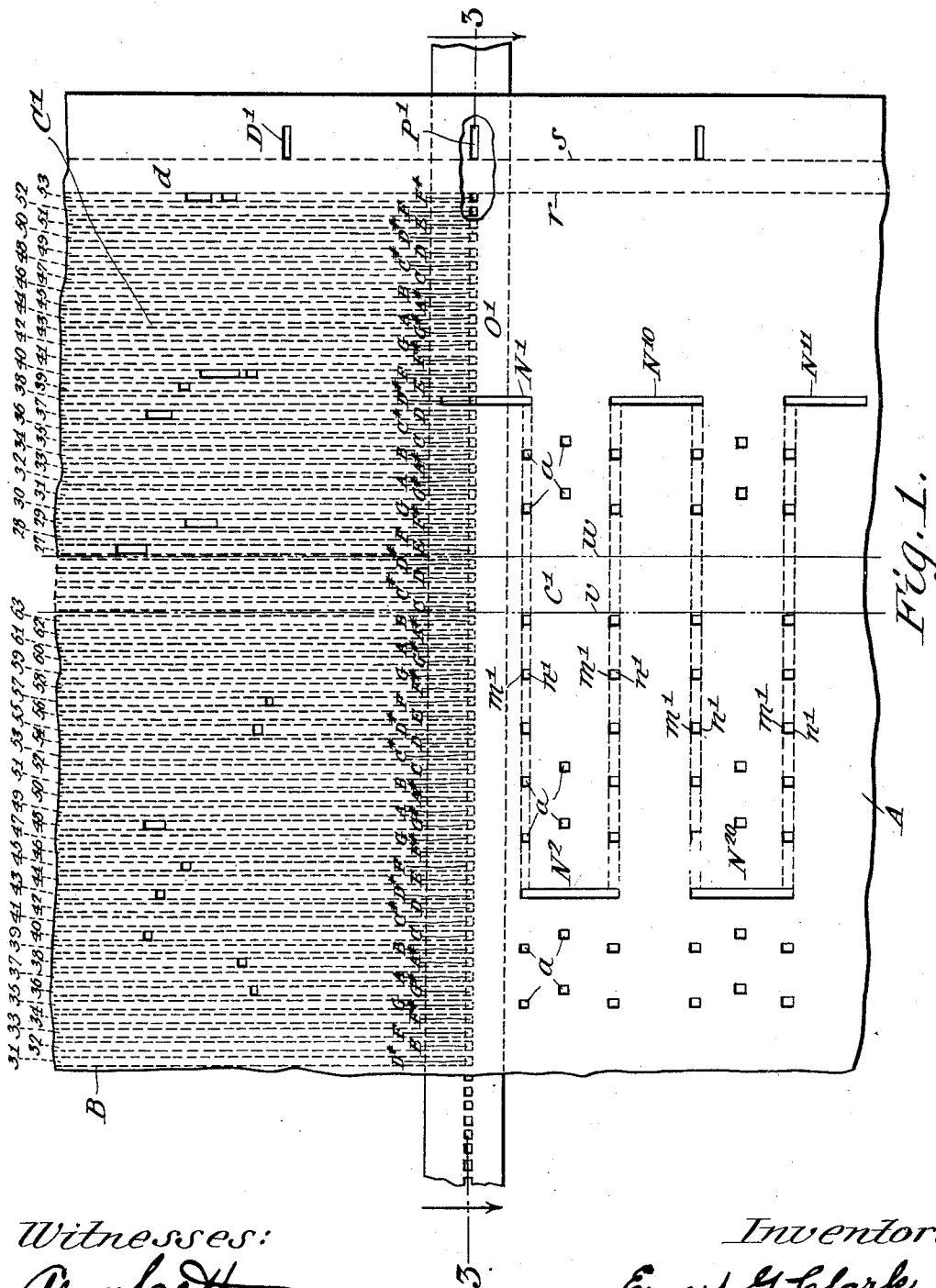


E. G. CLARK.
CONTROLLING DEVICE FOR AUTOMATIC MUSICAL INSTRUMENTS AND PLAYERS.
APPLICATION FILED MAR. 21, 1910.

1,005,413.

Patented Oct. 10, 1911.

4 SHEETS—SHEET 1.



Witnesses:

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D. W. Edlin

Inventor:

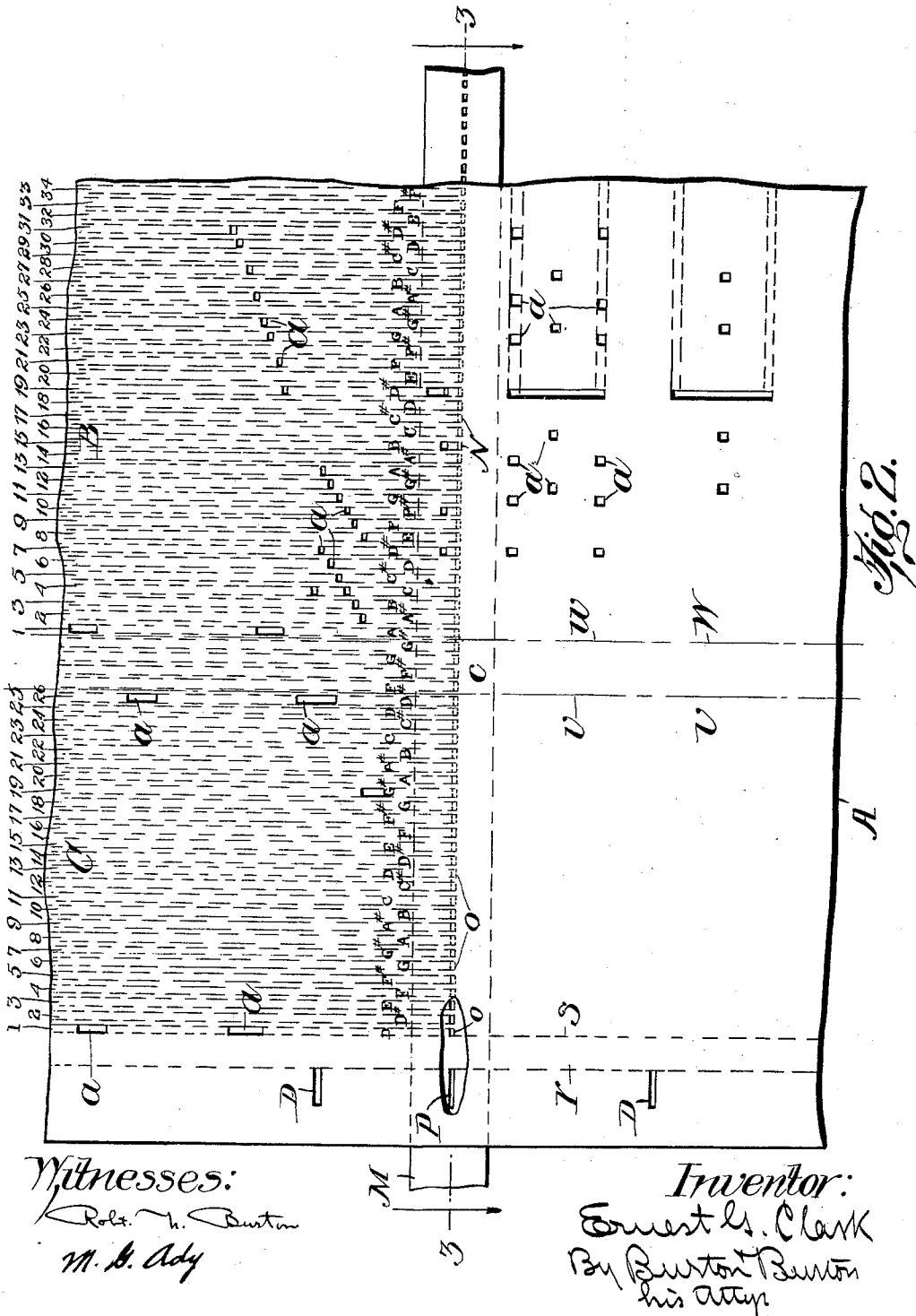
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4 SHEETS—SHEET 2.

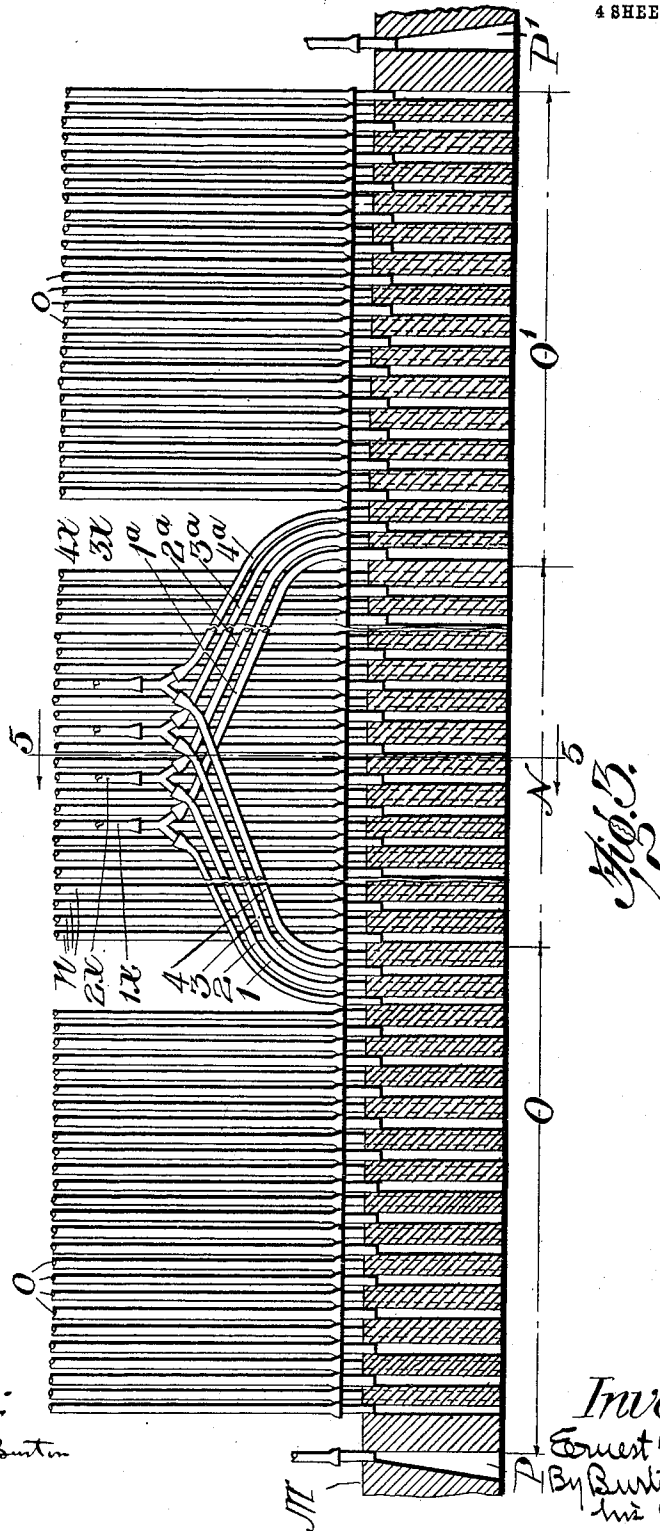


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4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.



Fig. 5.

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UNITED STATES PATENT OFFICE.

ERNEST G. CLARK, OF DE KALB, ILLINOIS.

CONTROLLING DEVICE FOR AUTOMATIC MUSICAL INSTRUMENTS AND PLAYERS.

1,005,413.

Specification of Letters Patent.

Patented Oct. 10, 1911.

Original application filed January 27, 1909, Serial No. 474,364. Divided and this application filed March 21, 1910. Serial No. 550,715.

To all whom it may concern:

Be it known that I, ERNEST G. CLARK, a citizen of the United States, residing at De Kalb, in the county of Dekalb and State of Illinois, have invented new and useful Improvements in Controlling Devices for Automatic Musical Instruments and Players, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

This application is a division of my application Serial No. 474,364, filed January 27, 1909, for controller sheet for automatic musical instrument players.

It relates to the coöperating features of construction of controller sheet and tracker board connected with two pneumatic actions for playing upon the same instrument.

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

In the drawings: Figures 1 and 2 are respectively upper and lower, or right and left hand portions of an elevation of a portion of a tracker board and portion of controller sheet embodying this invention, the view being divided in two figures, overlapping to the extent of a few notes, because of its extent. Fig. 3 is a section of the tracker board at the line 3—3 on Figs. 1 and 2, portions intermediate the middle and the ends respectively of the board being broken away to condense the view. Fig. 4 is a detail front elevation of tracker board and controller sheet and rolls showing customary means of relative adjustment of the tracker board and controller sheet. Fig. 5 is a fore-and-aft vertical section of an instrument equipped with this invention at a point in the length thereof indicated by the line 5—5 on Fig. 3.

The perforated sheet, A, is intended to be understood as having an aggregate of 116 rows of perforations, *a*, for playing, in addition to other apertures hereinafter mentioned for controlling expression. The middle group, B, of these rows of perforations is appropriated to playing one part of music, preferably the accompaniment, and is to be understood as having 63 of said rows, such rows being indicated on the drawings by numerals, 1 to 63, inclusive, at the head of Figs. 1 and 2, in position corresponding to the rows, respectively, perforations, *a*, being represented in certain of said

rows; and the lateral groups, C and C¹, intended to be understood as comprising, respectively, 26 and 27, rows of perforations whose positions are indicated in dotted lines numbered from 1 to 53, at the head of Figs. 1 and 2, are appropriated to playing another part as a solo or melody, the right-hand group, numbered from 27 to 53 inclusive, controlling the treble, and the left-hand group, numbered from 1 to 26 inclusive, controlling the bass of such solo or melody part. (It will be understood that these numerals are not placed on the perforated sheets themselves.) The sheet thus designed and constructed is designed to be mounted for coöperation, as will be readily understood, with a correspondingly constructed tracker board, M, having the middle group, N, of its ducts corresponding to the middle group, B, of the controller sheet perforations and connected by tubes, *n*, with the primary pneumatics of a pneumatic action, of which one pneumatic is shown at R in Fig. 5 for operating the playing devices, and having the end groups, O and O¹, corresponding to the groups, C and C¹, of the controller sheet perforations, connected also by ducts, *o*, with primary pneumatics of a pneumatic action, of which one pneumatic is shown at S in Fig. 5, for operating the playing devices.

The connections and operating mechanism and playing devices constitute no part of this invention and may be of any character known or customary in the art.

In order that the controller sheet of the construction indicated and the tracker board with which it coöperates may be relatively adjustable in direction transverse to the travel of the controller sheet for the purpose of transposition, the customary chromatic arrangement of the tracker ducts being in that case necessarily employed in the respective groups appropriated for solo and accompaniment, as indicated by the customary names of the tones applied to the duct mouths on Fig. 1, it is necessary to allow for a certain number of steps of such relative adjustment of the controller sheet and tracker without causing the middle group, B, of controller sheet perforations to lap onto either of the end groups, O or O¹, of the tracker ducts appropriated, for example, to the solo, or causing the lateral groups, C or C¹, of the controller sheet to

lap onto the middle group, N, of the tracker ducts appropriated, for example, to accompaniment. As illustrated, 63 rows of perforations constituting the group, B, of the controller sheet, appropriated for accompaniment, and a range of adjustment two steps in each direction from middle position being allowed for transposition, the tracker board has 67 ducts comprised in the middle group, N, so that the entire 63 rows of apertures *o* of the controller sheet of group B, are available throughout the entire range of transposition provided for, and this group, B, is spaced from the lateral groups, C and C¹, by the distance which would be required for four rows of perforations, creating what may be termed "blind areas or zones", *c* and *c*¹, (between the dotted lines, *v* and *w*) between the perforated areas appropriated to the groups of perforations, C, B and C¹. The two groups, C and C¹, comprising respectively 26 and 27 rows of perforations, correspond and are adapted to co-operate respectively with the end groups, O and O¹, of tracker ducts, each consisting of 30 ducts, the excess above the number of rows of perforations of the controller sheet being required for transposition.

In order that the available ducts of the groups, O and O¹, of the tracker board may constitute a continuous chromatic series at all positions of adjustment for transposition, it is necessary that four ducts of each group at the proximate ends of the two groups should be connected with pneumatics for playing the same four notes; thus, the ducts 1 and 1^a, of the groups, O and O¹, respectively, are connected to the same flexible tube, 1^x, for playing the same note. The ducts, 2 and 2^a, are likewise connected to similar flexible tubes, 2^x, for playing the next note. The ducts, 3 and 3^a, are connected to the same flexible tube, 3^x, for playing the next following note, and the ducts, 4 and 4^a, are connected to the same flexible tube, 4^x, for playing the same note, being the highest note which can be played upon the lower section, O, of the solo range.

It will be understood that the two sets of tracker ducts for connection with the separate set of pneumatics (not shown) are to be thus connected for playing the same notes, to the extent of the number of the smaller group which, as illustrated, is the group comprising the two solo sections, O and O¹. Of the resulting fact that for each of 53 notes, which is the range of the solo sections, there are provided two rows of perforations, one row in the solo areas and one row in the accompaniment area of the controller sheet, advantage may be taken to overcome a mechanical difficulty which has been experienced in providing perforations for long-sustained notes. The mechanical objection to long perforations in the con-

troller sheet is obvious and well understood, viz., that the paper is thereby rendered liable to spread laterally, very slight warping of the paper tending to produce this result. This difficulty has been in part met heretofore by interposing the shortest possible bridges at intervals in such long apertures, the intention being to have such bridges of less width, or extent in the direction of the length of the paper, than the dimension in that direction of the tracker mouth, so that the air will not be totally cut off while the bridge is passing the tracker. This, however, is not usually practically accomplished, and the result is liable to be the interruption of the tone whenever such a bridge passes the tracker mouth, thus defeating the purpose, which is to obtain a sustained tone. In such cases,—that is, where long-sustained tones are to be produced, whether in the accompaniment or solo,—an initial portion of the aperture is cut in the area pertaining to the part to which the tone in question belongs, so that the expression or intensity will be controlled in accordance with that part; and a succeeding portion of the aperture, or, in fact, a supplemental aperture, is cut in the area pertaining to the other part of the music at the longitudinal line corresponding to the same note. If the length of the tone is greater than can be provided for by the two slots supplementing each other, each of only practical or unobjectionable length, a third supplemental slot or portion will be cut in the area in which the initial portion was cut, and of course in the same longitudinal line; and the same process may be continued by cutting a fourth section or portion of the slot in the other area, and so on indefinitely to any necessary extent, or to any extent to which a tone may practically be sustained from the original stroke, each section or portion of the slot being thus made so short as to entirely avoid any danger of causing the paper to spread. In Fig. 1, the slots or elongated perforations, N¹, N¹⁰, N¹¹, N² and N²⁰, are of this character, the slot, N¹, in the solo area being the initial slot for a sustained tone of the solo, the slot, N², in the accompaniment area being positioned for playing the same note, and the slot, N¹⁰, in longitudinal line with the slot, N¹, being provided to succeed the action of the slot, N², while the slot, N²⁰, in the same line with the slot, N², in turn succeeds the slot, N¹⁰, being succeeded by the slot, N¹¹, for completing the tone to the end of the time for which it is required to be sustained. In order that there may be no possibility of interruption of the tone in passing the control thereof from the slot in one area to the supplemental slot in the other area, the consecutive slots, one in one area and the next in the other area, are overlapped in the length of the sheet, as seen and indi-

cated by the transverse dotted lines, m^1 and n^1 , located at the position of the terminal and initial ends of the slots, N^1 and N^2 respectively,—for example, the space between these dotted lines indicating the overlap.

In connection with the double sets of perforations and corresponding double sets of tracker ducts described, and for the purpose of independently controlling the expression or intensity of the playing resulting from the control of the instrument by the respective areas, there may be provided lateral perforations, D and D^1 , outside the areas, C and C^1 , respectively, of the controller sheet, such apertures coöperating with ducts, P and P^1 , correspondingly situated in the opposite end portions of the tracker board,—that is, outside the areas appropriated to the ducts, O and O^1 , respectively. The aperture, D , and tracker duct, P , are designed for connection with suitable devices (not shown) for controlling the expression of one part of the music, as the accompaniment, and the apertures, D^1 , and tracker duct, P^1 , are similarly designed for connection with means for controlling the expression of the other part, as the solo. In order that these supplemental apertures and ducts may be in register throughout the whole range of transposition, and that said apertures may not at any time overlap any of the tracker ducts for playing notes of the music, and that the apertures of the adjacent groups O and O^1 , may not, in any transposition, overlap the supplemental tracker ducts and so affect the expression, there are left unperforated zones or areas, d , d , between the groups of perforations, C , and the supplemental perforation, D , and between the group, C^1 , and the supplemental perforation, D^1 , said unperforated areas (represented between dotted lines r and s), being in width equal to half the range of movement allowed for transposition, which, as illustrated, is four steps; and in order that this width shall be sufficient for the purpose, the supplemental tracker ducts, P and P^1 , are spaced from the extreme ducts of the groups O and O^1 , respectively, by an equal amount,—that is, half the range of transposition movement. At the middle position of the tracker sheet on the tracker board, the zones or paths of the supplemental perforations, D and D^1 , coincide at their lateral boundaries with the lateral boundaries of the mouths of the ducts, P and P^1 , respectively, and at the extreme adjustment of the tracker board relatively to the paper in either direction said zones or paths lap one-third of their width at the opposite side of said duct mouths respectively, and at such position the blind areas, d , d , of the paper at one side cover the extreme tracker duct mouths of one of the solo groups, and at the other side the other two-thirds of the

tracker duct mouth, P , P^1 , as the case may be.

It will be understood from Fig. 5 that the pneumatics of the action to which the pneumatic, S , belongs operate the hammer action of the several keys to which said pneumatics, S , respectively pertain by means of bell crank levers such as S^1 , rocked by the collapse of the pneumatic, S^2 , and by their horizontal arms, s^1 , engaging hooks, s^2 , upstanding from the manual keys respectively, so that the rear ends of the manual keys are uplifted by the collapse of the pneumatic. It will be understood also that the motor pneumatics, R^1 , operate the hammer action by the stroke of the pitman, R^2 , extending from said motor pneumatics, respectively, as indicated by the one shown in Fig. 5, downwardly upon the forward portion of the manual keys which the pneumatics respectively overhang; and it will be seen that the two pneumatics operating upon the same manual key perform their work each independently of the other.

As stated, the features which distinguish the perforated sheet in its relation to the tracker board, are designed with reference to the adaptation of the sheets and tracker board to each other, when the two are relatively movable transversely of the direction of travel of the perforated sheet for transposition; and in Fig. 4 I have shown a customary construction for such relative adjustability of the tracker board and perforated sheet. The means for adjustment consisting in the tracker board being mounted for movement longitudinally, that is transversely of the sheet, in its support, and having means for so moving it consisting of a screw X , mounted in one of the supports, engaging an arm Y , connected with the stem Z , of the tracker board, which extends through the support, the screw when turned to the right or left causing the tracker board to be moved in its bearings transversely of the sheet A . This construction will be recognized as old and familiar. In itself it forms no part of the novelty of the present invention.

I claim:—

1. A perforated controller sheet for an automatic musical instrument having a middle group and two lateral groups of rows of perforations, the middle group being spaced from the lateral groups by areas devoid of perforations and equal in width to a multiple of the space unit or distance from center to center of consecutive rows of apertures in the groups, in combination with a tracker board having a middle group of ducts for registering with the middle group of perforations comprising ducts exceeding in number the number of perforations of said middle group by a number equal to the number of perforations which can be ac-

commodated in the width of one of said unperforated areas of the controller sheet and having end groups of ducts for registering respectively with the lateral groups of perforations of the controller and equal in number to the rows of perforations in said lateral groups respectively.

2. A perforated controller sheet for an automatic musical instrument having a middle group of rows of perforations and two lateral groups, the middle group being spaced from the lateral groups by unperforated areas or zones equal in width to a multiple of the unit space or distance from center to center of consecutive rows of perforations in said groups, in combination with a tracker board having a middle group of ducts for registering with the middle group of perforations and exceeding in number said middle group by the number of ducts occupying space in said tracker board equal to the width of one of said unperforated areas or zones of the controller sheet, and having end groups adapted to register with the lateral groups of perforations of the sheet, the ducts of the proximate ends of said middle group to the number at each end occupying space equal to said unperforated areas respectively, being connected for playing the same consecutive notes, and means for relatively adjusting the tracker board and controller sheet transversely with re-

spect to the travel of said sheet, said elements being relatively mounted for said adjustment to the extent of the width of said unperforated areas.

3. In combination with a tracker board having two sets of ducts all comprised in one row extending lengthwise of the tracker board, two pneumatic actions with which said two sets of ducts respectively communicate positioned for operating upon the same set of manual keys of the instrument to be played; a perforated controller sheet having rows of perforations in groups corresponding to the position in the length of the tracker board of the two sets of ducts for registering with said sets respectively, and having perforations in said two groups positioned for controlling pneumatics of their respective actions for striking the same manual key, such perforations having their proximate ends lapping by each other for causing the action upon the manual key controlled by the later of said perforations to communicate before the action controlled by the earlier of them ceases.

In testimony whereof, I have hereunto set my hand at De Kalb, Illinois, this eighteenth day of March, 1910.

ERNEST G. CLARK.

Witnesses:

EUGENE WHITMORE,
ZIEGNER SWANSON.