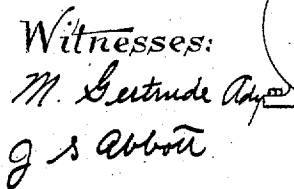


APPLICATION FILED MAY 17, 1909.

Patented Mar. 12, 1912.

4 SHEETS—SHEET 1



Inventor:
Merrill Clark
By Benton & Benton
His Attorneys:

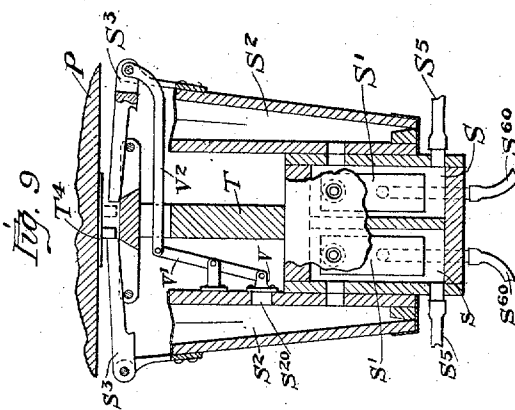
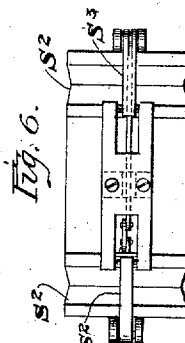
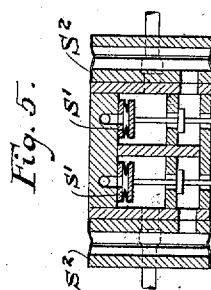
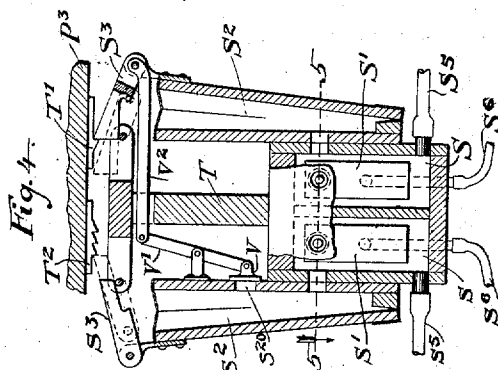
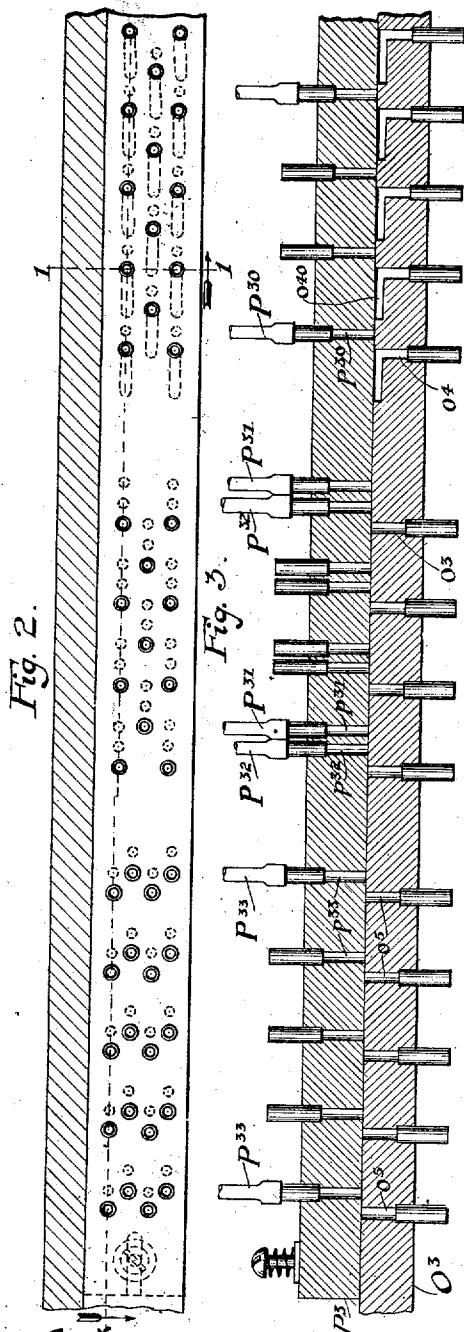
M. CLARK.
AUTOMATIC PIANO.

APPLICATION FILED MAY 17, 1909.

Patented Mar. 12, 1912.

4 SHEETS—SHEET 2.

1,019,758.

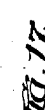


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APPLICATION FILED MAY 17, 1908.

4 SHEETS—SHEET 3.



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1,019,758.

Patented Mar. 12, 1912.

4 SHEETS—SHEET 4.

Fig. 10.

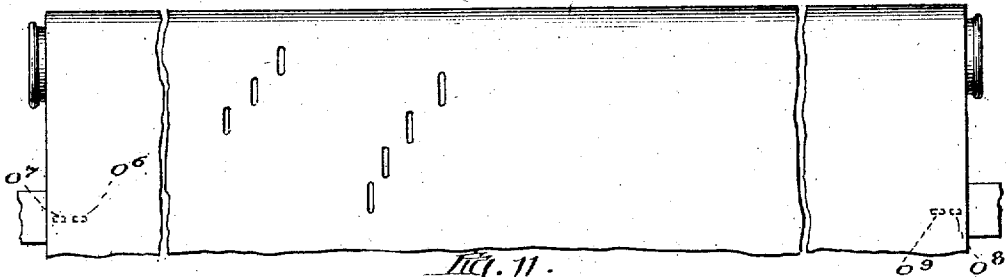


Fig. 11.

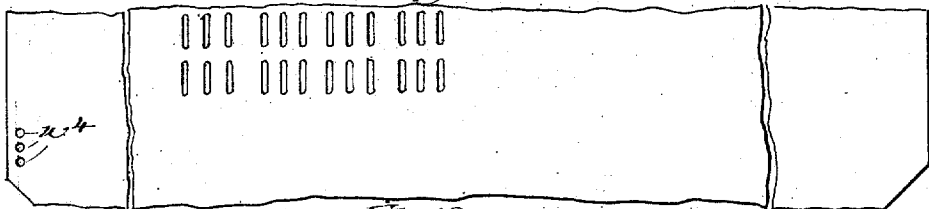


Fig. 12.

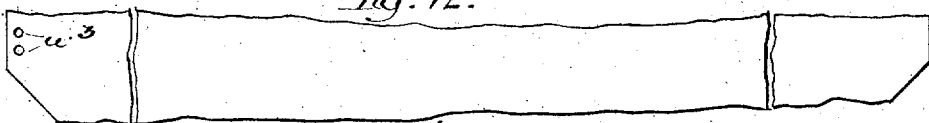


Fig. 13.

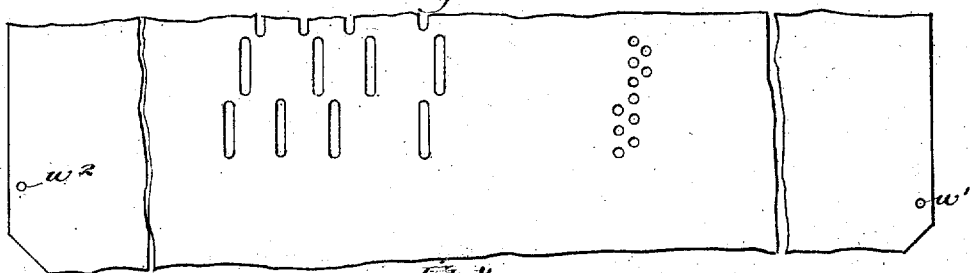


Fig. 14.

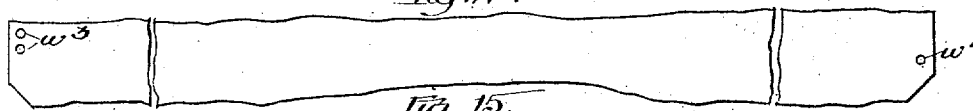
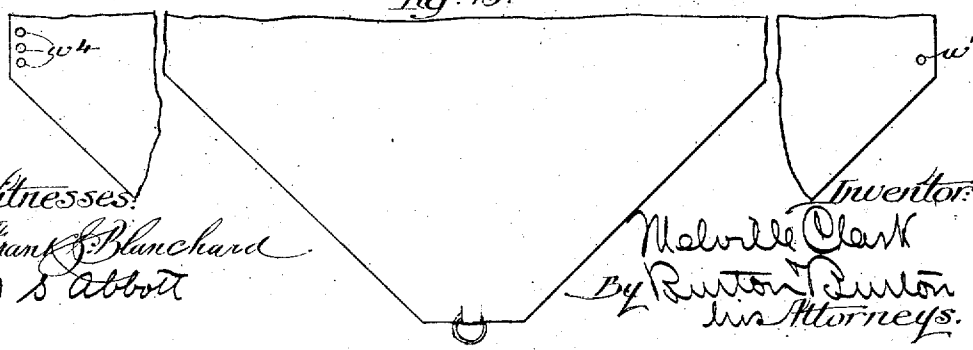


Fig. 15.



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UNITED STATES PATENT OFFICE.

MELVILLE CLARK, OF CHICAGO, ILLINOIS.

AUTOMATIC PIANO.

1,019,758.

Specification of Letters Patent.

Patented Mar. 12, 1912.

Application filed May 17, 1909. Serial No. 496,608.

To all whom it may concern:

Be it known that I, MELVILLE CLARK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Automatic Pianos, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

10 The purpose of this invention is to provide an improved construction of an instrument of the character of a piano, which is to be operated automatically under the control of perforated roll controllers for playing music of more than one part,—as a melody and accompaniment.

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

20 In the drawings:—Figure 1 is a vertical fore-and-aft section of the pneumatic action and controlling devices in a piano embodying this invention, section being made in vertical fore-and-aft plane through the tracker devices at the line 1—1 on Fig. 2. Fig. 2 is a section at the line 2—2 on Fig. 1. Fig. 3 is a section at the line 3—3 on Fig. 2. Fig. 4 is a vertical section of a pneumatic operating device for shifting certain valve slide bars. Fig. 5 is a section at the line 5—5 on Fig. 4. Fig. 6 is a top plan view of the device shown in Fig. 4. Fig. 7 is a front edge elevation of the tracker device. Fig. 8 is a section at the line 8—8 on Fig. 1. Fig. 9 is a detail section similar to Fig. 4 of a pneumatic device for operating another slide, showing a portion of the slide and operating connections. Figs. 10, 11, 12, 13, 14 and 15 are plan views of portions of controller sheets for cooperating with the tracker bar to control the automatic adjustment of the valve bars or slides. Fig. 16 is a detail elevation of a portion of a slide which is mounted at the plane 16—17 on Fig. 1, looking in the direction of the arrow 16. Fig. 17 is a section at the line 16—17, looking in the direction of the arrow 17.

50 The instrument shown in the drawings is in general of the nature of an upright piano without manual keys. Any suitable supporting and inclosing frame or case may be understood to be indicated by the conventional representation of parts of such case and frame thereof. At the position which would be suitable for manual keys if they

were present, there is provided a horizontal table, A, above which there is mounted a principal pneumatic action comprising motor pneumatics, B, mounted on a box containing the primary pneumatic chamber, B¹, in which are contained the primary pneumatics, B², all in the familiar form and construction of such devices for autopneumatic playing mechanisms. Supported by the same table, A, there is provided a supplemental action comprising motor pneumatics, C, which are mounted below the table, A, and which are connected also to the primary pneumatic chamber, C¹, in which are the customary primary pneumatics, C², identical in form, construction and operation with those of the principal action.

The exhaust devices comprise pumpers D, mounted below the foundation board E and bellows F and G mounted above said foundation board and provided with a communication in and through said foundation board in a manner well understood but not illustrated, through which both of said bellows are subject to the exhaust action of both the pumpers. Said bellows F and G are provided with the usual expanding springs, not illustrated, such springs of the bellows F being stronger than those of the bellows G, with the well understood purpose and result of making it possible to maintain a higher tension in the chamber E¹ with which the bellows F communicates, than in the chamber E² with which the bellows G communicates, the latter bellows being provided in a familiar manner with a valve, not illustrated, for closing its communication with the pumpers before the complete collapse of said bellows G, and so prevent further exhaustion of the chamber E² beyond the degree which will collapse it against the resistance of its relatively weak springs.

The tracker device for this instrument is designed to be substantially the same as that shown in my application Serial No. 488,625, filed April 8, 1909, comprising a tracker board, O, having two sets of tracker ducts, M and N, the former more widely spaced than the latter and comprising 88 ducts for playing over the full range of an ordinary piano, the latter being more narrowly spaced so as to comprise within the length of the series, M, 40 additional ducts, making a total of 128 ducts, beside as many more as may be desired to afford range for transposition and for supplemental purposes, certain of which

are hereinafter described. The ducts of the series, M, are formed in the main body of the tracker board, O, emerging at the end remote from the tracker edge through the rearwardly facing edge of said board. The ducts of the series, N, have their forward portions formed in a depending rib, O², from the rear edge of which the 88 middle ducts of this series are connected with the forward depending edge of a rib, O¹, at the rear side of the board by flexible tubes, N¹, said rib, O¹, being extended at both ends beyond the range of the 88 ducts of the series, M, and provided with ducts, n², to receive the 40 or more tubes, N², 20 or more at each end of the other series, the intermediate 88 tubes, N¹, connecting with the series, N, being diverged or splayed from their connection with the rib, O², to their connection with the rib, O¹, so that at the latter connection they are spaced the same as the other series. All the ducts in the rib, O¹, of the series, N,—that is, those in which the tubes, N¹ and N², are interposed,—emerge through the rearwardly facing surface of the rib, O¹, being distributed in that surface as fully explained in my said application Serial No. 488,625 so that a slide, P, mounted against said surface, having opening through it 88 ducts with which flexible tubes, P¹, are connected, may be adjusted to register its ducts either with the 88 ports of the ducts of the series, M, or with the 88 middle ports of the ducts of the series, N, for bringing into service either of said series, M or N, at will. From the slide, P, flexible tubes, p¹ and p², lead to a depending rib, O³, traversed fore-and-aft by the ducts, o³ and o⁴, with which the tubes, p¹ and p², respectively, connect, said ducts emerging upon the rear side of said rib. This rib is also traversed by ducts, o⁵, connected by tubes, p⁵, with the ducts, n², which connect with the forty tubes, N², twenty at each end, in the end extensions of the rib, O¹. All the ducts of the rib, O³, emerge at the rear side thereof for registration variously, as hereinafter explained, with ducts of a slide or valve bar, P³. The ducts, o⁴, in the rib, O³, have their mouths extended at the rear surface of the rib, O³, in grooves, o⁴⁰, for prolonged registration with the ducts, p³⁰, of the slide, P³. For each of the ducts, o³, in the rib, O³, the slide, P³, has two ducts, p³¹ and p³², positioned for registration, one at a time, with the respective ducts, o³ (see Fig. 3); and said slide, P³, has ducts, p³³, for registering with the ducts, o⁵, positioned for such registration at the same time; that is, at the same position of the slide as that at which the ducts, p³², register with the ducts, o³. All of said series of groups are distributed into a plurality of rows, as indicated in Fig. 2, staggered so as to obtain necessary space longitudinally for registration

and adjustment as indicated. From the ducts, p³⁰, p³¹, p³² and p³³, flexible tubes, P³⁰, P³¹, P³² and P³³, lead as follows,—the tubes, P³⁰ and P³², directly to the principal action, as indicated in respect to one of said tubes in Fig. 1, the tubes, P³⁰, being connected with 67 pneumatics at the middle portion of the action; and the tubes, P³¹, with 21 pneumatics, of which ten are at one end and eleven at the other end of said middle group of 67; the tubes, P³² and P³³ are connected, to the supplemental action, one of said tubes being shown so connected in Fig. 1; the tubes, P³², 21 in number, being connected to the pneumatics at the middle portion of said action, and the tubes, P³³, 40 in number, 20 at each end, being connected to the pneumatics at the opposite ends of said supplemental action.

From the arrangement of ducts in the rib, O³, and slide, P³, respectively, as above described, and as clearly described in Figs. 2 and 3, it will be seen that at one position of the slide within the range of its longitudinal adjustment,—viz., the position at which it is illustrated in Fig. 3,—all of the ducts of the slide are cut off from the corresponding ducts of the rib; that upon movement of the slide to the left in said figure far enough to bring the ducts, p³⁰, into initial registration with the ducts, o⁴, all of the ducts of the slide, except the ducts, p³¹, will be in registration with the corresponding ducts of the rib; and at this position, the middle 67 tubes, P³⁰, will be connected with the middle portion of the principal action, and the tubes, P³² and P³³, will be connected with the entire supplemental action; that upon movement of the slide another step in the same direction for bringing the ducts, p³¹, into registration with the ducts, o³, the ducts, p³⁰, will remain in registration with the elongated mouths, o⁴⁰, with the ducts, o⁴, while the ducts, p³² and p³³, will be carried out of registration with the ducts, o³ and o⁵, respectively; and that at this position, the instrument will be connected for playing 88 notes on the principal action, the supplemental action being put out of service; that upon movement of the slide another step in the same direction for carrying the ducts, p³¹, out of registration with the ducts, o³, the ducts, p³⁰, alone will remain in registration with the elongated mouths, o⁴⁰, of the ducts, o⁴, and that at this adjustment, the instrument will be connected for bringing into service the middle portion only—67 notes—of the principal action for playing what is commonly called "65-note music," the two additional notes being available for transposition if the tracker device is suitably mounted for that purpose.

It is designed that the adjustments provided, as described, for adapting the instrument to be controlled and caused to play

by perforated controller sheets of various sorts, shall be operated automatically by the controller sheet upon its insertion and before it begins to operate the tone-producing devices, the initial portion of each controller sheet having for that purpose perforations adapted to register with corresponding ducts of the tracker for controlling pneumatic devices which move the slides, P and P³, respectively, to the positions corresponding to the character of the controlling sheet. For this purpose, a pneumatic motor is connected to each of the slides. These two motors are substantially alike, the slides only having slightly different provision for being engaged by them, and the description of one of the motors will suffice for both. Fig. 4 shows a section of said motor associated with a portion of the slide, P³, which is provided with means for actuation by the motor, which will now be described. The device is located at one end of the instrument substantially in line with the slide which is to be operated. It comprises a bracket or supporting bar, T, upon which there is mounted two primary pneumatic chambers, S and s, each containing a primary pneumatic, S¹ and s¹, controlling by the usual valve means motor pneumatics, S² and s². The moving members of the motor pneumatics are connected with feed dogs, S³ and s³, respectively, which are arranged to thrust in opposite directions toward each other by the collapse of the respective motor pneumatics, and in such thrust engage abutments on the slide bar to be operated, such slide bar being extended at the end to proper position to carry such abutments. In Fig. 4, the slide bar illustrated is P³, which has for engagement of the dog, S³, a single toothed abutment, T¹, and for engagement of the dog, s³, a triple toothed abutment, T².

In Fig. 9, there is shown in connection with the pneumatic device, identical with that already described and shown in Fig. 4, a portion of the slide bar, P, having a single tooth abutment, T⁴, for engagement by both of the dogs, S³ and s³, for thrusting the bar in opposite directions, according to which pneumatic, S² or s², is energized. Flexible tubes, S⁵ and s⁵, connect the primary pneumatic chambers, S and s, of the pneumatic devices for operating both the slides, with the exhaust chamber to which the said tubes run by any convenient course not shown. Tubes, S⁶ and s⁶, lead from tracker ducts, o⁶ and o⁷, respectively, to the primary pneumatics, S¹ and s¹, of the device for operating the slide, P³, and similar flexible tubes, S⁶⁰ and s⁶⁰, connect similarly with the primary pneumatics of the other device for operating the slide, P, being extended from tracker ducts, o⁸ and o⁹. The controller-sheet, W, is provided at its marginal portions at the initial end with apertures in two longitudinal

lines corresponding to the position of the tracker ducts, o⁶ and o⁸, for controlling the said two pneumatic devices, for operating the slides, P and P³. It being understood that normally and in the absence of any actuation, the slide, P, stands at position for bringing into service the tracker ducts of the wider scale and for cutting off those of the narrower scale, if the controller sheet introduced has its perforations cut according to the narrower scale, such sheet is provided at the proper position at the initial end with an aperture, w¹, for registering with the tracker duct, o⁸, which, when such registration occurs causes the motor pneumatic, S², of the pneumatic device pertaining to the slide, P, to be collapsed, so that its dog which normally stands engaged with the abutment, T⁴, operating against said abutment, thrusts the slide, P, in direction for reversing the registration; that is, for bringing its ducts into registration with the tracker ducts of the narrower scale. When the controller sheet runs off the tracker, it uncovers the duct, O⁹, which causes the opposite motor pneumatic, s², of the same device to be collapsed, and to cause its dog, s³, which stands in engagement with the opposite side of the abutment tooth, T⁴, from that at which the dog, S³, was originally engaged to operate the slide, P, in the opposite direction from that at which it was thrust by the dog, S³, restoring the registration of the slide with the ducts of the larger scale. If the controller sheet introduced is designed for utilizing the entire range of tracker ducts of the narrower scale, the controller sheet is provided at its initial portion with one aperture, w², in the upper longitudinal line for registering with the tracker duct, o⁷, which causes the motor pneumatic, s², of the device shown in Fig. 4 to be collapsed, and the dog S³, to be thrust forward into engagement with the innermost tooth of the abutment, T², on the slide bar, P³, and thrust that slide bar one step away from the position shown in Fig. 4, which is the normal position, bringing all the ducts of the slide bar, except the ducts p³¹, into registration with the corresponding ducts of the rib, O⁸, for the result desired. If the controller sheet is cut on the narrower scale for playing 88 notes by means of the principal action, it will be provided with two apertures, W³, which will cause the motor pneumatic, s², to be collapsed and extended twice, so as to thrust and retract the dog, s³, twice, engaging successively the first and second teeth of the abutment, T², and actuating the bar, P³, two steps, effecting the registration desired. If the controller sheet is cut on the narrower scale for playing 65 notes only, it will be provided with three perforations, w⁴, in immediate succession, which will cause the dog, S³, to actuate the bar, P³, three

steps, producing the desired registration.

If the controller sheet is cut on the wider scale for playing 88 notes in the principal action, it will be without any aperture, w^1 , at

- 5 the line for registering with the tracker duct, o^8 , so that the bar, P , will be left standing in its normal or original position registered with the tracker ducts of the wider scale, and the controller sheet will be provided at the initial portion with two apertures, w^3 , in line for registering with the tracker duct, o^7 , which will cause the bar, P^3 , to be moved two steps from initial position, giving the desired registration. If such controller sheet is cut on the wider scale for playing 65 notes, it will be provided with three apertures, w^4 , for registering with the tracker duct, o^7 , causing the bar, P^3 , to be actuated three steps for the desired registration. In every case when the paper runs off the bar, all the tracker ducts being uncovered, all the motor pneumatics, S^2 and s^2 , may be collapsed; but to prevent the collapse in that case of the motor pneumatic, s^2 , and cause only the motor pneumatics, S^2 , to experience the action, the motor pneumatic, s^2 , has a vent aperture, s^{20} , controlled by a valve, V , carried on a lever arm, V^1 , fulcrumed between its ends on the fixed wall of the motor pneumatic, s^2 , and connected from the end opposite the valve by a link, V^2 , with the moving wall of the pneumatic, S^2 . From this connection, it results that whenever the pneumatic, S^2 , is collapsed, its initial movement lifts the valve, V , and vents the motor pneumatic, S^2 , so that it does not collapse.

- The principal and supplemental actions respectively, mounted on their primary pneumatic chambers respectively above and below the table A, have their corresponding motor pneumatics B and C in substantially vertical alinement so that pitmen R extending through guide eyes, a , on the table A, and reaching at their upper ends the hammer action X of the piano, extends through operating fingers b and c of the corresponding motor pneumatics of the principal and supplemental actions respectively, said pitmen being provided with stops r above the respective fingers b and c so that whichever pneumatic,—of the principal action or of the supplemental action,—is collapsed will actuate the pitmen for operating the hammer action.

I claim:—

1. In an automatic piano, in combination with the hammer action, two pneumatic actions each comprising motor pneumatics for operating on the hammer mechanism; a table upon which both said pneumatic actions are supported one above and the other below the table; a pitman guide on the table for operating on the hammer action, positioned and connected for action thereon of

the moving members of the corresponding motor pneumatics of both actions; a tracker having ducts connecting with the two pneumatic actions respectively, and means for producing different degrees of air tension in the chambers of said actions respectively.

2. In an automatic piano, in combination with the hammer action, two pneumatic actions, each comprising motor pneumatics for operating on the hammer action, said pneumatic actions being mounted one above the other with their corresponding motor pneumatics vertically alined; a table fixed with respect to the hammer action between the two pneumatic actions and affording support to both of the latter; a pitman for operating upon the hammer action carried and guided by the alined moving members of the motor pneumatics, said pitmen being free to move upwardly with respect to both the alined moving members; a tracker having different sets of ducts connecting with the two pneumatic actions respectively, and means for producing different degrees of air tension in the chambers of said two pneumatic actions.

3. An automatic piano, in combination with a hammer action, two pneumatic actions; a tracker having separate sets of ducts communicating with said actions respectively; and means for producing different degrees of air tension in the chambers of said pneumatic actions respectively, said two pneumatic actions being positioned for operating upon the hammer action, having the moving members of their corresponding motor pneumatics vertically alined with each other; and pitmen carried by said alined moving members for operating upon the hammer action and free to move upwardly with respect to both said moving members.

4. In an automatic piano, in combination with the hammer action, two pneumatic actions for operating upon the hammer action; a tracker device and a controller sheet co-operating therewith, the ducts of the tracker and flexible tubes extending therefrom comprising three groups, one group connected with one of said pneumatic actions, a second group connected with the other of said pneumatic actions, and a third group having connections with both of said actions; valve bars interposed in the tube connections from the tracker to the pneumatic actions respectively for controlling the communication through the tubes of the second and third groups, and pneumatic devices for moving such valve bars, the tracker device having ducts connecting with said pneumatic devices, and the controller sheet having apertures for registering with said ducts.

5. In an automatic piano, in combination with the hammer action, two pneumatic actions for operating upon the hammer action;

a tracker device having its ducts and the tubes leading therefrom consisting of three groups, the first group for connection with one of the pneumatic actions, the second group for connection with the other pneumatic action, and the third group branched for connection with both said pneumatic actions; a valve bar interposed in the tube connections from the tracker bar to said actions, having extending from it the entire number of tubes of the second and third groups, and mounted on the tracker duct board with range of movement for registration at one position of all the ducts of the second group and one branch of the third group, and non-registration of the other branches of the third group, and at a second position for registration of the last mentioned branches and non-registration of all the other tubes of the second and third groups, and at a third position for non-registration of all the tubes connected with it; a step-by-step feed device for actuating the valve bar; a pneumatic device for operating the step-by-step feed, and duct connections from said pneumatic device to the tracker bar, the controller sheet having perforations for registration with said duct connections of the tracker bar for giving step-by-step action to the feed device.

6. In an automatic piano, in combination with the hammer action, two pneumatic actions for operating upon it; a tracker device comprising a tracker bar having two sets of ducts differently spaced at the tracker mouth; a duct board to which the ducts of both sets lead and at which they are equally spaced; a valve bar seated on such duct board having ports for registration at one portion with one of said sets and at another portion with the other set; a pneumatic device for shifting the valve bar to change its registration, the tracker bar having a duct and connections therefrom for operating such pneumatic, and a controller sheet having apertures positioned at the ini-

tial part of the sheet for registration with such duct.

7. In an automatic piano, in combination with a hammer action, two pneumatic actions for operating upon the hammer action; a tracker device having its ducts and the tube leading therefrom consisting of three groups, the first group for connection with one of the pneumatic actions, the second group for connection with the other pneumatic action, and the third group branched for connection with both of said pneumatic actions; a valve bar interposed in the tube connections from the tracker bar to said actions having extending from it the entire number of tubes of all said groups, and mounted on the tracker board with a range of movement for registration at one position of all of the ducts of the second group and one branch of the third group and non-registration of the other branch of the third group, and at a second position for registration of the last-mentioned branch and non-registration of all the other tubes of the second and third groups, and at a third position for non-registration of all the tubes connected with it, the mouths of the ducts of the first group in the tracker duct board being elongated in the direction of movement of the bar to maintain registration with the ducts of the third group on the bar at said second position; a step-by-step feed device for actuating the valve bar; a pneumatic device for operating the step-by-step feed, and duct connections from said pneumatic device to the tracker bar, the controlling sheet having perforations for registration with said duct connections with the tracker bar for giving step-by-step action to the feed device.

In testimony whereof, I have hereunto set my hand this 8th day of May, 1909, at Chicago, Illinois.

MELVILLE CLARK.

Witnesses:

J. S. ABBOTT,

M. GERTRUDE ADY.