

No. 768,414.

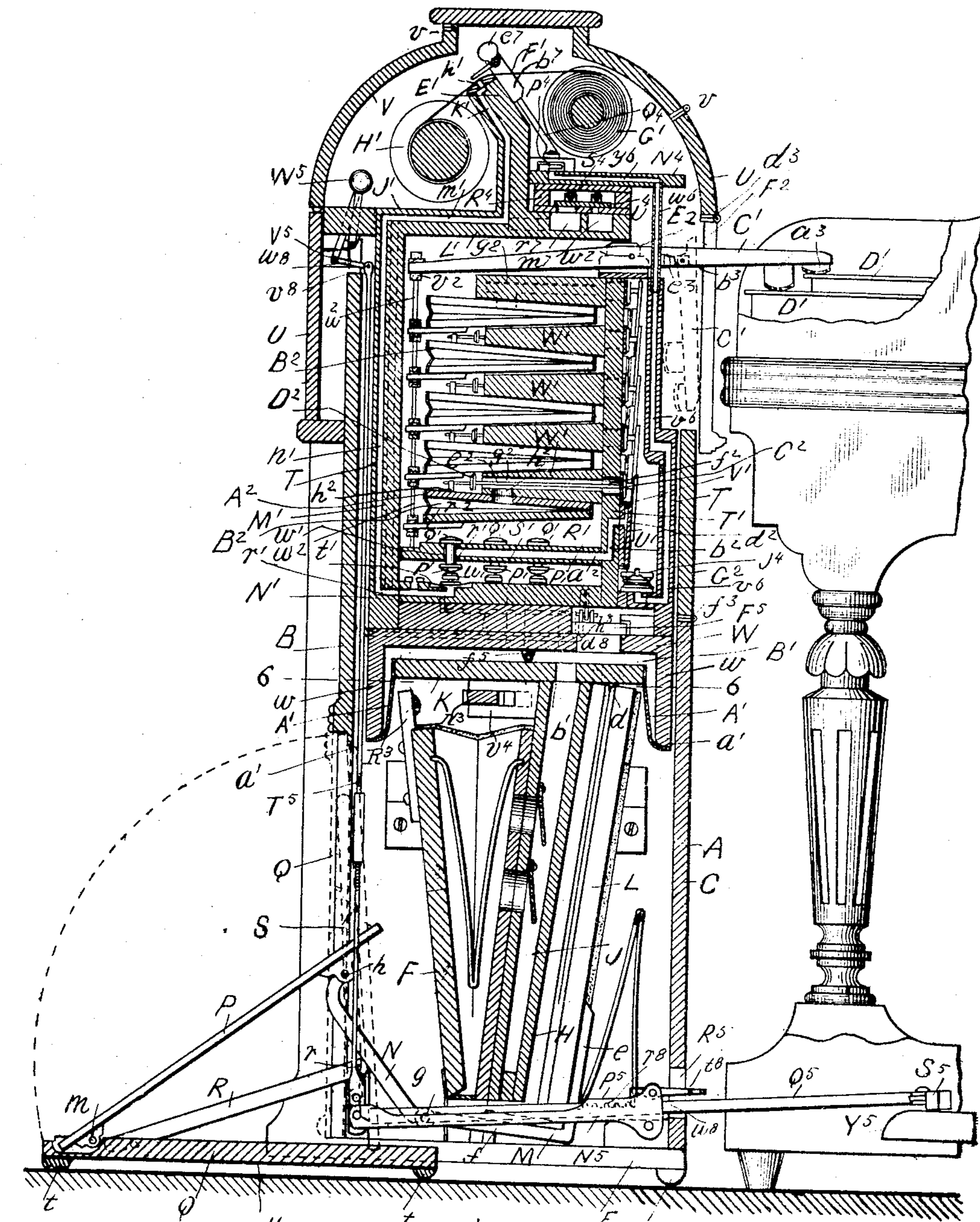
PATENTED AUG. 23, 1904.

P. WELIN.
AUTOMATIC MUSICAL INSTRUMENT.

APPLICATION FILED AUG. 3, 1899.

NO MODEL.

7 SHEETS—SHEET 1.



WITNESSES

Flournoy J. Garrett
John H. Roche

FIG. 1

INVENTOR

Peter Welin
Per Edwin M. Brown
Attorney

No. 768,414.

PATENTED AUG. 23, 1904.

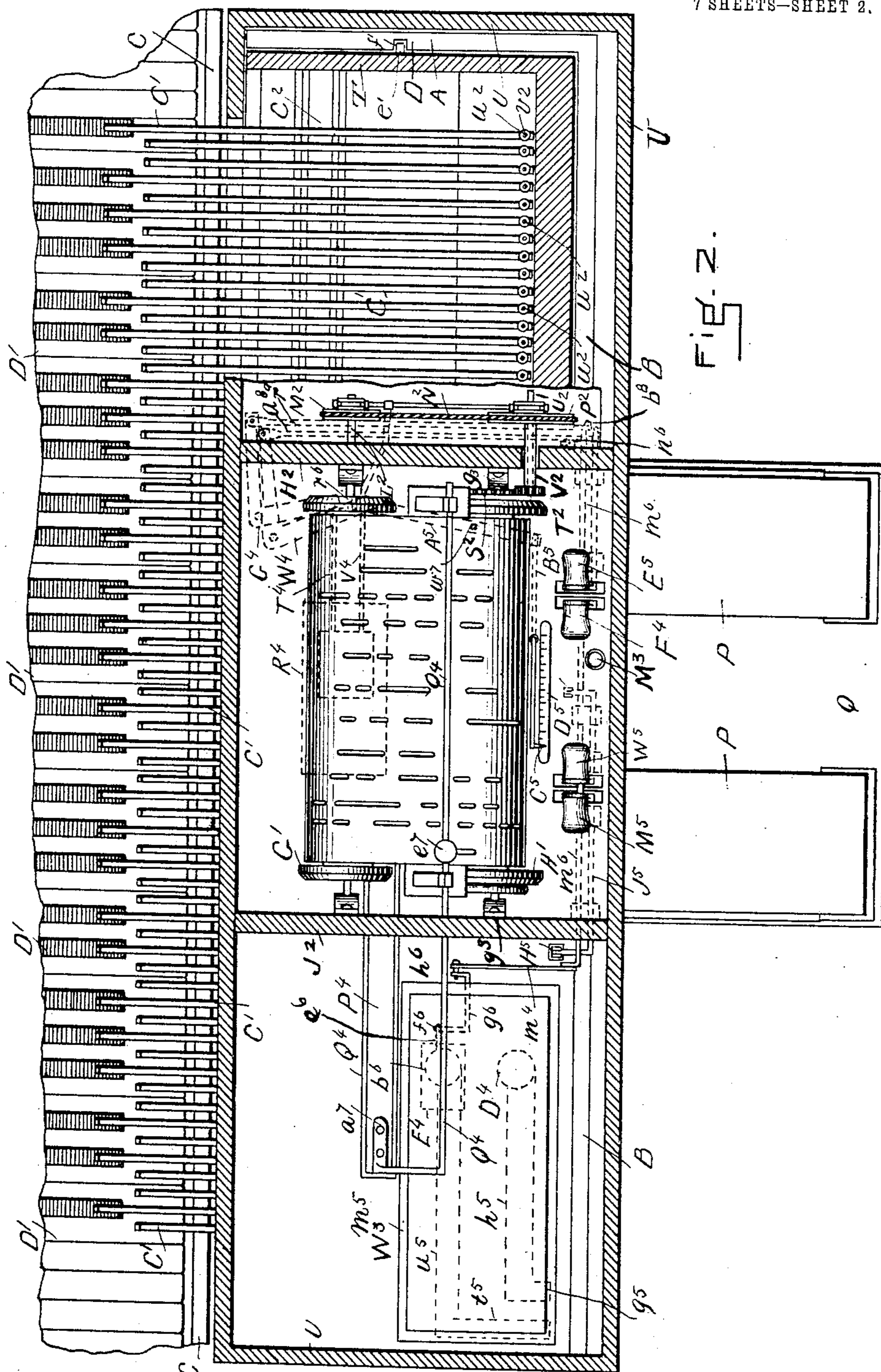
P. WELIN.

AUTOMATIC MUSICAL INSTRUMENT.

APPLICATION FILED AUG. 3, 1899.

NO MODEL.

7 SHEETS—SHEET 2.



WITNESSES

Flourence I. Garrett.
John A Roche

INVENTOR

INVENTOR
LeRoy Holm
 By *Edwin H. Barron,*
Attorney

No. 768,414.

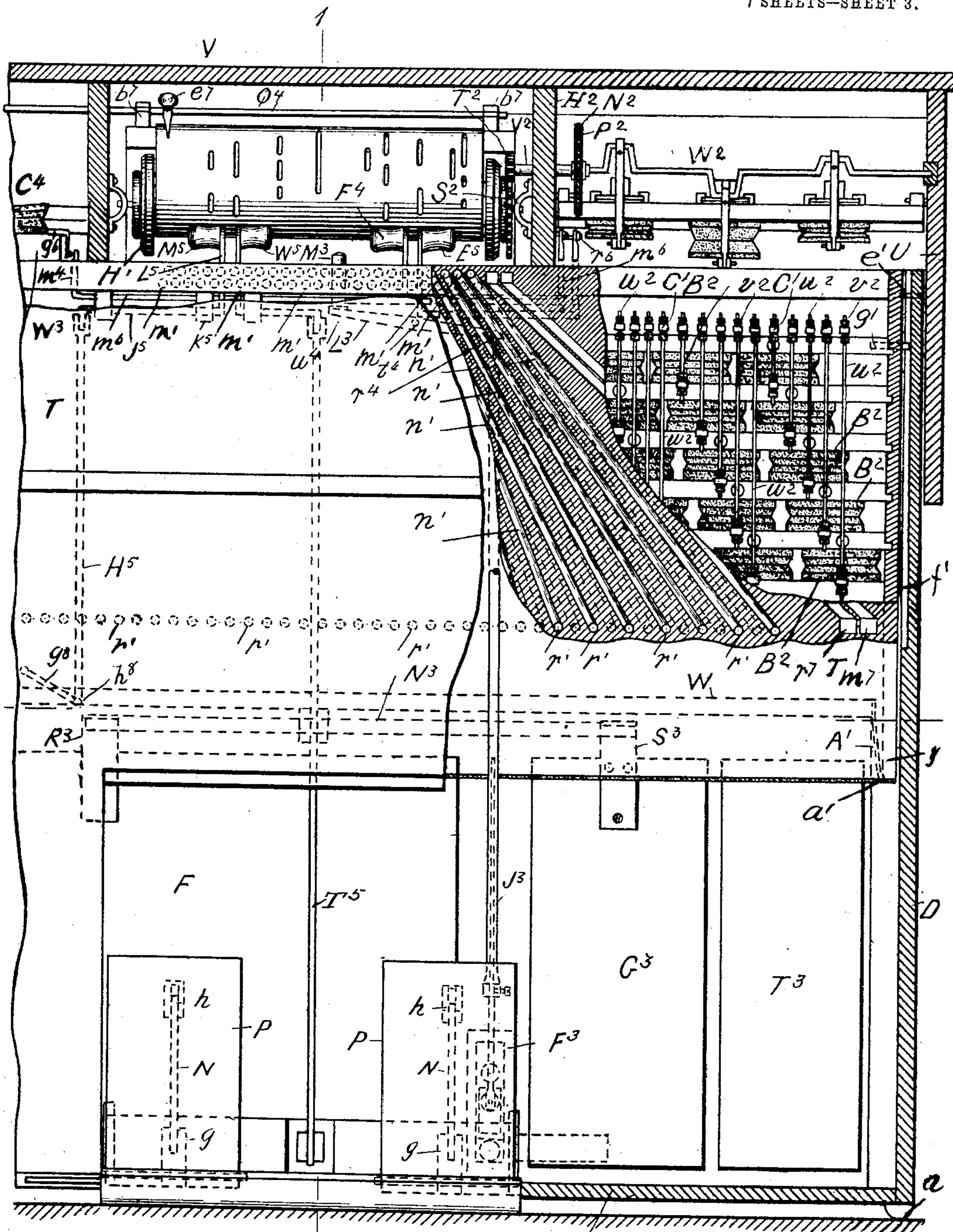
PATENTED AUG. 23, 1904.

P. WELIN.
AUTOMATIC MUSICAL INSTRUMENT.

APPLICATION FILED AUG. 3, 1899.

NO MODEL.

7 SHEETS—SHEET 3.



WITNESSES

Florence I. Garrett.
John A. Roche.

INVENTOR

Peter Welin,
Per Edwin H. Brown,
Attorney.

No. 768,414.

PATENTED AUG. 23, 1904.

P. WELIN.
AUTOMATIC MUSICAL INSTRUMENT

APPLICATION FILED AUG. 3, 1899.

NO MODEL.

7 SHEETS—SHEET 4.

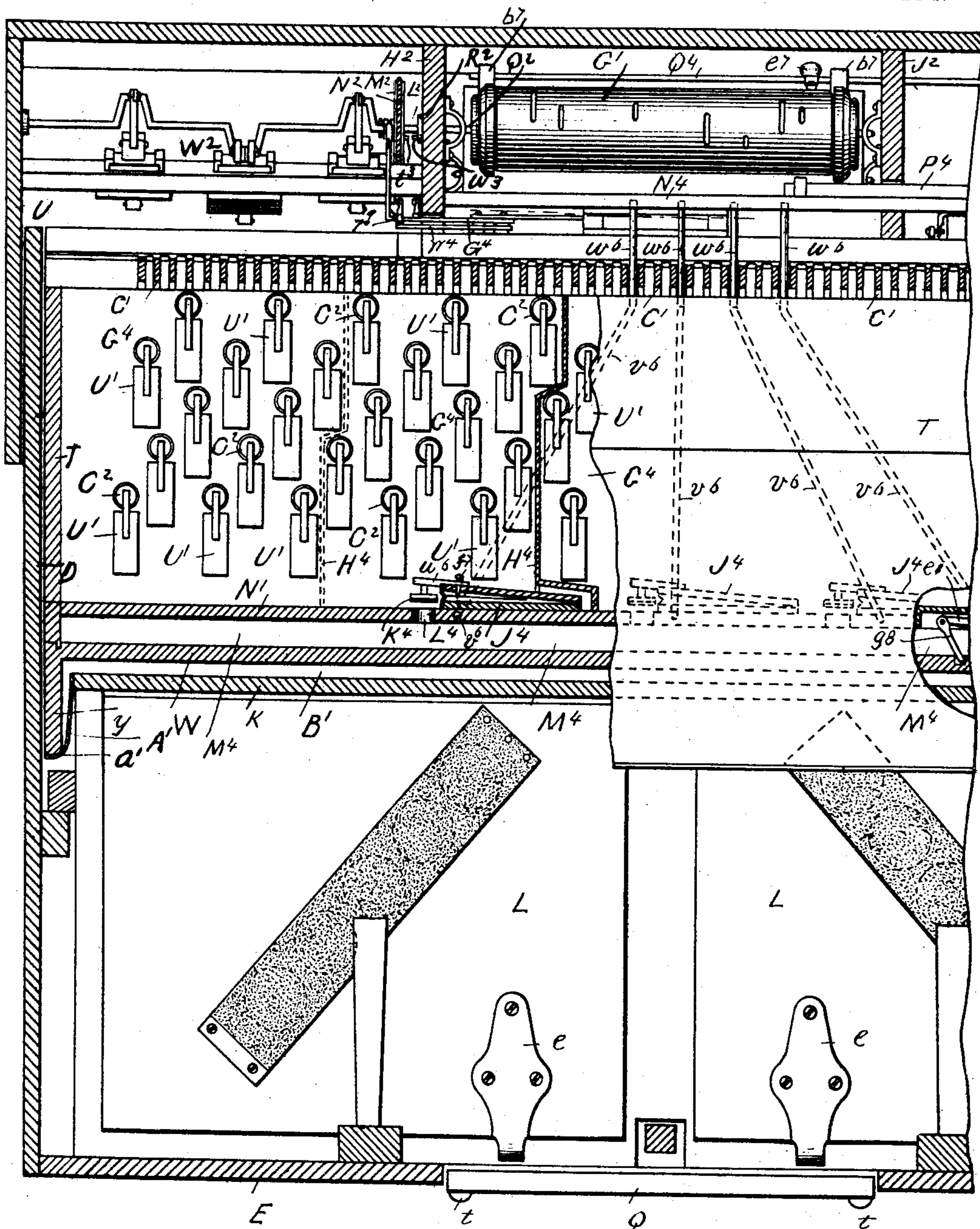


Fig. 4.

WITNESSES

Flourence J. Garrett.
John A. Roche

INVENTOR

Peter Welin,
By Edwin H. Brown,
Attorney.

No. 768,414.

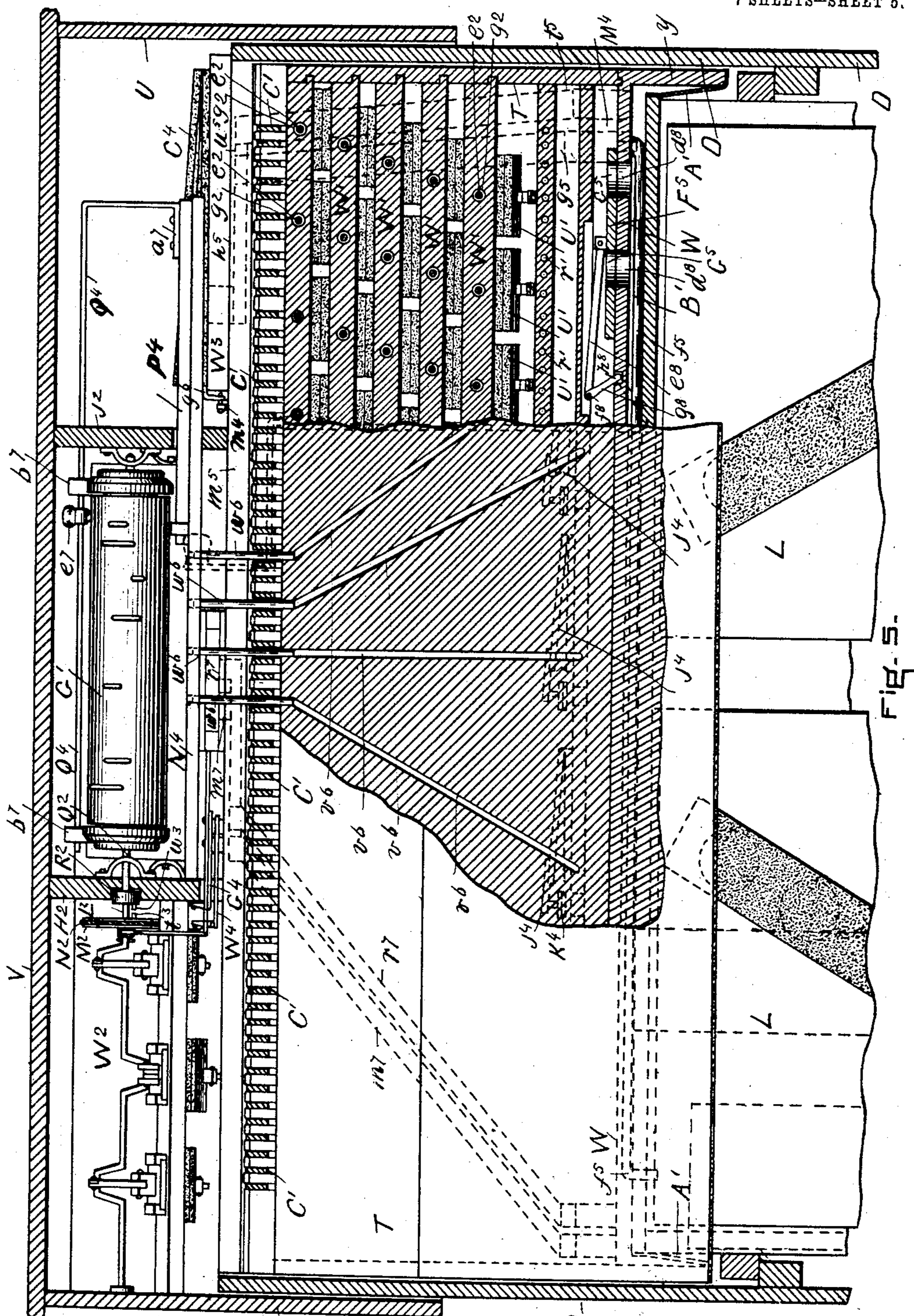
PATENTED AUG. 23, 1904.

P. WELIN.
AUTOMATIC MUSICAL INSTRUMENT.

APPLICATION FILED AUG. 3, 1899.

NO MODEL.

7 SHEETS--SHEET 5.



WITNESSES

Florence I. Garrett.
John A. Roche

INVENTOR

Peter Welles,
Per Edwin H. Brown,
Attorneys

No. 768,414.

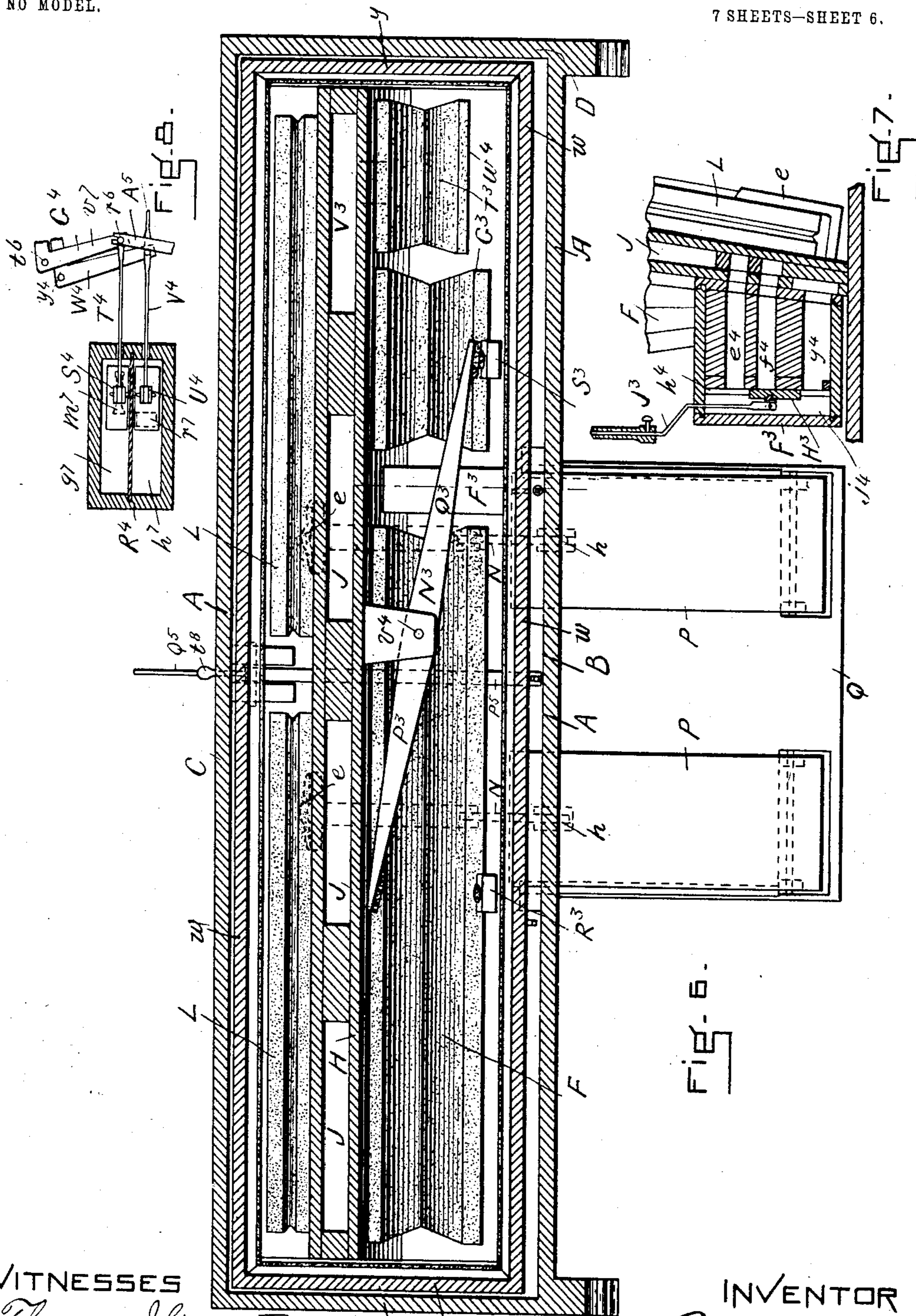
PATENTED AUG. 23, 1904.

P. WELIN.
AUTOMATIC MUSICAL INSTRUMENT.

APPLICATION FILED AUG. 3, 1899.

NO MODEL.

7 SHEETS—SHEET 6.



WITNESSES

Florence I. Garrett.
John A. Roche

INVENTOR

Peter Welin,
Per Edwin W. Benson,
Attorney.

No. 768,414.

PATENTED AUG. 23, 1904.

P. WELIN.
AUTOMATIC MUSICAL INSTRUMENT.

APPLICATION FILED AUG. 3, 1899.

NO MODEL.

7 SHEETS—SHEET 7.

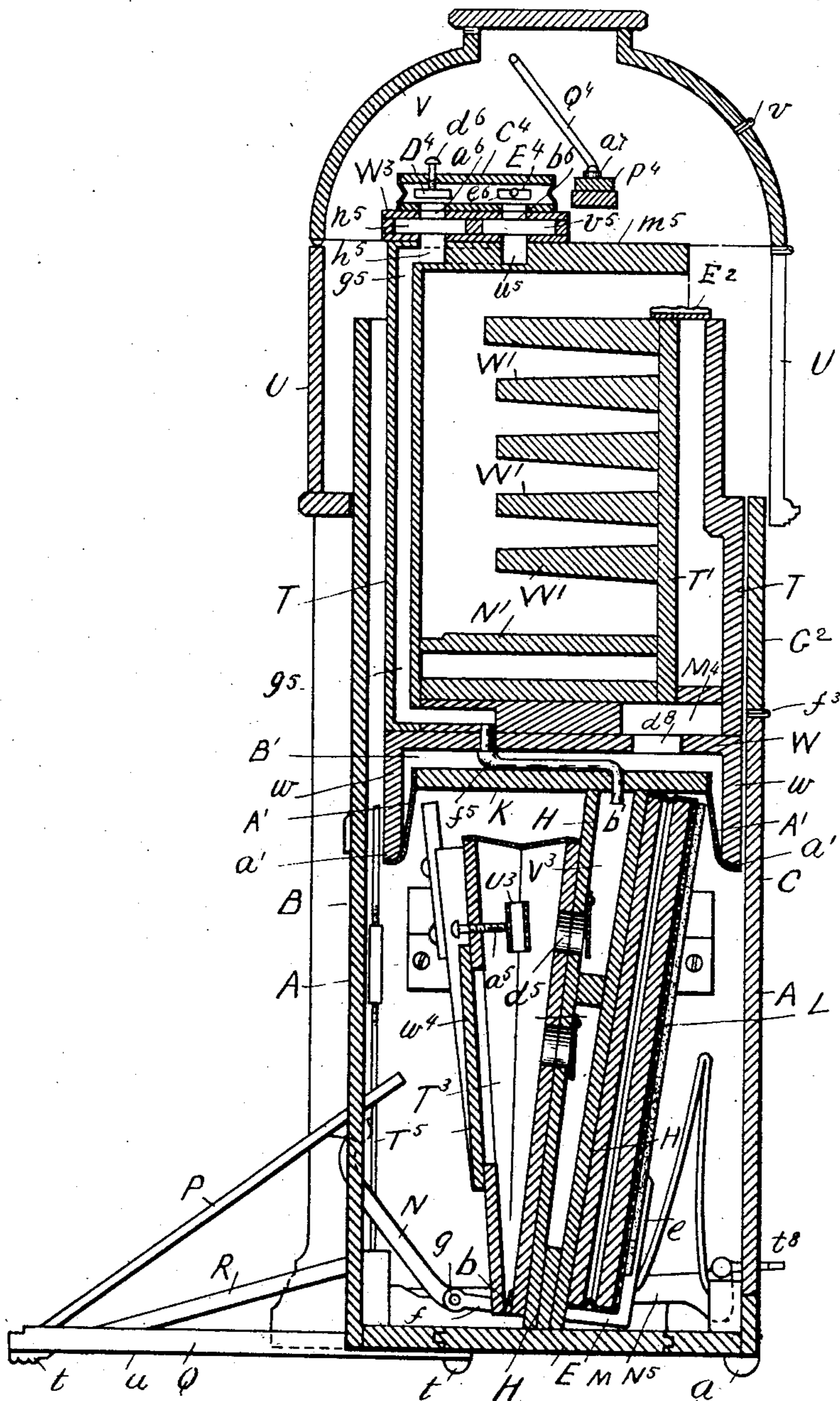


Fig. 9.

WITNESSES

Flourance J. Garrett.
John A. Roche.

INVENTOR

Peter Welin,
Per Edwin H. Brown,
Attorney.

UNITED STATES PATENT OFFICE.

PETER WELIN, OF WORCESTER, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE AEOLIAN COMPANY, OF NEW YORK, N. Y., A CORPORATION OF CONNECTICUT.

AUTOMATIC MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 768,414, dated August 23, 1904.

Application filed August 3, 1899. Serial No. 726,043. (No model.)

To all whom it may concern:

Be it known that I, PETER WELIN, of Worcester, in the county of Worcester and State of Massachusetts, have invented certain
5 new and useful Improvements in Automatic Musical Instruments such as Pianolas, &c., of which the following is a full, clear, and exact description.

This invention relates to improvements in
10 automatic or self-playing instruments commonly called "pianolas," "piano-players," and the like, which are arranged to be operated by a perforated music-sheet controlling
15 suitable fingers or levers actuated by pneumatics to operate the keys of the pianoforte or other similar keyboard musical instrument, by which means a musical composition can be played in accordance with the perforations in the music-sheet.

20 The novel features of the invention relate mainly to improved means for providing different wind-pressures for use at will, also means for applying different wind-pressures to different parts of the keyboard so that some
25 notes may be sounded more loudly than others, also certain improved means of effecting and controlling the differences in expression, also means for retracting the projecting ends of the striking-levers when the instrument is not
30 in use, all of which will hereinafter be described in connection with the preferred form of the apparatus, and thereafter the novel features which I desire to claim will be enumerated in the claims.

35 In the drawings, Figure 1 is a central vertical section on the plane 1 1 of Fig. 3, showing a portion of piano in full in its operative relation to the apparatus. Fig. 2 is a horizontal section through the casing of the instrument in the plane above the striking-levers, some portions of the casing being broken
40 away to show details beneath. Fig. 3 is a partial front elevation, partly broken away, and partly in section to show details. Fig. 4 is a rear elevation of part of the instrument, the casing being shown in vertical section with some of the parts broken out or in section to show details. Fig. 5 is a rear view of the up-
45

per portion of the instrument with the casing in vertical section and some of the parts
50 broken out or in section to show details. Fig. 6 is a horizontal cross-section on the plane 6 6 of Fig. 1. Figs. 7 and 8 show details as will be hereafter understood. Fig. 9 is a front to rear vertical section on two planes, the upper
55 part of the instrument being sectioned near the left-hand end of the instrument and the lower parts being sectioned on the plane near the right-hand end of the instrument through the equalizer T³.
60

In the drawings, A represents a lower casing having a front B, a back C, ends or sides D, and bottom E, which have feet or knobs *a* for it to rest on the floor and to which casing is permanently secured the main bellows, reservoir, or equalizer F, its movable board being hinged to the lower end or edge of the wind-chest H, having a wind-chest chamber J, which chest is also secured to the casing.
65 To the top of the wind-chest is secured a horizontal board K. L L are the two exhausters for the bellows, and they are hung at *d* to the wind-chest to be moved back and forth for the exhaustion of air from the bellows and wind-chest chamber J, as usual in exhausters.
70 At the lower end of each exhauster near its middle portion is secured one arm, *e*, of a right-angular bar M, its other arm, *f*, extending under the bellows toward the front of the instrument and having pivoted to it at *g* one
80 end of a bar or rod N, which at its other end is pivoted at *h* to the under side of a pedal P near its inner end, the outer end of the pedal being pivoted at *m* to a board Q, pivoted at
85 *n* to a rod or link R, pivoted to the front of the casing at *r* in an opening S and the board having knobs *t* for it to rest on the floor, and, as shown in Fig. 1, it is swung down and extending out in front of the instrument in proper position for operation of the pedals by
90 a person's feet, there being one pedal and its connections to each exhauster. These parts are well known.

The board Q with the pedals P pivoted to it and other operating parts connecting the
95 pedals with the exhausters are so pivoted and

connected together that the board can be swung up and down with the pedals and operating parts, and when down, as shown in Fig. 1, the pedals are in position for operating the
 5 exhausters, and when swung up, as shown in dotted lines in Fig. 1, the pedals and operating parts will be inside of the casing out of the way and sight, and the board Q will close the opening S in front of the casing, it hav-
 10 ing its outer side *u* finished to correspond to the finish of the casing around and about the opening and making a complete finish of the casing.

The bellows, wind-chest, and exhausters and
 15 parts connected thereto for operation thereof are constructed and arranged for the exhaustion of the bellows, as usual in such bellows, and as is well known in reed-organs and similar musical instruments and needing no more particular description herein.

T is the action-case, which contains and supports the action-work of the instrument, and this case is smaller in cross-section than the lower casing, so it can freely fit and be moved
 25 up and down therein within certain limits, and U is another outer casing having a cover or top V, which is hinged at two places *v* to the casing U to swing back and over in order to expose the upper parts of the mechanism.
 30 This casing U extends down over the action-case and a short distance below the upper edge of the lower casing, as shown in cross-section in Figs. 1 and 9 more particularly. From the bottom board W of the action-case
 35 T the sides *w* and ends *y* are made to extend downward freely over the edges of the top board K of the wind-chest around and about the bellows, as shown in Figs. 1, 4, 5, 6, and 9, leaving a space or chamber B' between the
 40 two, and the edges of the wind-chest board and the lower edges *a'* of the downward extension of the action-case are connected together all around by a sheet A' of flexible material, such as leather, which makes a close
 45 and a flexible and extensible joint between the wind-chest board K and action-case T, so that the action-case can be moved up and down, as desired, and yet maintain a close and air-tight connection between the two to make
 50 an air-tight chamber B' between them. This chamber B' is an air or wind chamber or passage in connection with the wind-chest chamber J, and it has communication therewith by a passage *b'* through the board K. The
 55 action-case T is guided in its movements by a tongue *e'* on its end uprights running, respectively, in a groove *f'* in the lower casing, (see Figs. 2 and 3 more particularly,) and when at the desired height it is secured in po-
 60 sition by screws *g'*. This flexible-sheet connection A' between the lower casing and the action-case is for the purpose of allowing the action-case to be moved up and down within the lower or outer casing and yet maintain
 65 an air-tight connection between the two and

so that the fingers C' of the action-case which act upon the keys D' of the pianoforte can be adapted to varying heights of the keyboards of pianofortes of different manufacturers, which vary considerably for their proper ac-
 70 tion thereon, the bellows and its connecting parts being stationary for the pedals to always maintain the same relation to the floor for their proper operation by the person's feet.

E' is the tracker or raceway board, over the upper surface *h'* of which travels the perforated music-sheet F' from the music-roll G' to the take-up roll H' in the operation of the instrument. The tracker-board is secured to
 80 a horizontal tracker duct-board J' of the action-case, and it has a row of air ducts or passages K' in its length opening to its upper surface *h'*, each of which extends down through
 85 the tracker-board into a horizontal passage *m'* in the horizontal tracker duct-board and then down through the front board M', as at *n'*, and horizontally backward a short distance in a bottom board N', as at *n'*, and turning
 90 upward open to the upper surface of the board N', as shown more particularly in Fig. 1 in cross-section.

The opening of the passage *n'* in the board N' is enlarged at its upper surface, and to the board over this enlarged opening is secured a
 95 flexible sheet or diaphragm *t'* of leather, which closes the opening and passage *n'* to air passing therethrough. The usual leak-hole or bleed-hole should of course be provided, as seen in
 100 Fig. 1. Resting on the knob *u'* of this diaphragm are two valves P' Q', secured together by a central stem or rod, one valve, P', being in the wind chest or chamber R' between the board N' and another board or partition, S', above
 105 it, the stem of the valve extending through a hole or passage *w'* in the board S', the other valve, Q', being above the board S', the two valves acting to alternately close and open communication between the duct *a'* and either
 110 the atmosphere above or the chamber R' below the board S', the stem also serving as a guide to the movements of the valves. The hole *w'* is of a diameter large enough to allow the free passage of air through the hole
 115 around and about the stem and yet of small enough diameter to serve as a guide for the stem.

In the board S' is horizontal air-passage *a''*, leading from the side of the hole *w'*, which extends back, then up a short distance, as at
 120 *b''*, in a back board T' of the action-case, then out at its rear side and communicating by an air-passage *d''* in the stationary board of an upright secondary pneumatic U', secured to
 125 the back board T' with the chamber of the pneumatic. The movable board of this pneumatic has an upwardly-extending arm V', to which is attached one end of a horizontal rod *e''*, which extends rearward through an opening or air-passage *f''* in the upright board T' 130

and through a passage g^2 , making a continuation of the same in a horizontal partition W' , secured to the back board T' , the rod extending beyond the board W' and through an ear piece or guide h^2 , secured on the upper side of the stationary board A^2 of a larger or striking pneumatic B^2 , secured by such board to the under side of the horizontal board W' . Attached to this rod e^2 are two valves $C^2 D^2$, one, C^2 , on the outside of the back board T' and arranged to close the opening or passage f^2 in the back-board, and the other, D^2 , on the inner end of the rod e^2 , arranged to open and close the inner end of the passage g^2 in the board W' . A passage h^2 through the lower side of the board W' and board A^2 of the pneumatic B^2 forms communication between the air-passage g^2 and chamber of pneumatic B^2 .

The movable board of the pneumatic B^2 has an extension-arm v^2 , to which is secured by buttons the lower end of an upright rod w^2 , which at its upper end is connected by buttons v^2 to one end of a horizontal key-striking lever or finger C' , pivoted at w^2 to cross-bar E^2 on the upper side of the action-case, its other end or arm projecting outward through an opening F^2 in the rear wall of the action-case in position to be just over one of the keys D' of the pianoforte when the instrument is placed in front thereof and adjusted by the means already described to the proper height for the key, as shown in Figs. 1 and 2 more particularly.

The fingers C' which are over and operate the white keys of the pianoforte have their fulcrums in one line in the bar E^2 , and the fingers which are over and operate the black keys being longer, because the black keys are farther back, have their fulcrums in the bar E^2 farther forward. On the under side of the outer end of each finger is secured a block a^3 , having its outer side curved, as shown, and covered with a thickness of leather or other suitable soft material to prevent noise when striking or pushing down the pianoforte-keys. The black keys being higher than the white keys, with the fingers all in the same horizontal plane, the blocks for such fingers are thinner, as shown in Fig. 1 more particularly. Each finger or lever C' is made in two parts and pivoted together at b^3 , so when not in use the outer arm can be swung down or folded so as to retract it into the casing out of the way. The outer arm has a shoulder e^3 to abut against the other arm when in its proper position for action on the pianoforte-keys to prevent further upward movement of the finger and to make the finger practically rigid, all as shown in Fig. 1 more particularly. There is also a lid or cover G^2 at the back below the opening F^2 , pivoted at f^3 to the casing A , which can be swung down when desirous of getting at some of the works.

The take-up roll H' is in front of the tracker or raceway and is arranged to turn in bear-

ings g^3 , secured to the cross upright boards or partitions $H^2 J^2$, and the music-roll G' is arranged to be put in place and removed therefrom and to engage with a shaft L^2 . On this shaft L^2 is a loose pulley M^2 , which connects by a belt N^2 with a pulley P^2 , secured to the shaft U^2 , and projecting from the side of this loose pulley M^2 is a pin t^3 , which is at the same radial distance from the shaft L^2 as a side projecting pin u^3 of a disk R^2 on the rod-shaft L^2 , so that if the pulley is moved along its shaft toward and up to the disk and the pulley is turned it will by its pin t^3 engaging with the pin u^3 of the shaft-disk R^2 turn its shaft and the music-roll; but when moved away into the position shown in Figs. 4 and 5 it will have no effect upon the music-roll shaft. This pulley and shaft and clutch connection is for the purpose of rewinding the music-sheet upon the music-roll after it has been unwound therefrom and wound upon the take-up roll in playing the instrument.

On the shaft of the take-up roll at one end is secured a gear S^2 , which is arranged to engage with the small gear T^2 , slidably secured on the end of the shaft U^2 , and arranged to rotate with a sleeve V^2 in a bearing in the framework, which shaft U^2 is the driving-shaft of the motor W^2 for operation of the music-rolls, as is well understood in this art without further detail, the motor being constructed and arranged for operation substantially as usual in air-motors constructed of bellows, as is well known in many mechanical musical instruments operated by a perforated music-sheet and needing no more particular description herein.

Each air-duct in the vertical tracker-board E' communicates with a separate primary-pneumatic valve P' , separate pneumatic U' , and pneumatic B^2 , with accompanying valves and air-passages as herein described for one air-duct; but as the air-ducts are quite small and close together in one line and as the pneumatics are necessarily much wider in order to get them all in proper position for operation the series of pneumatics are arranged in series of five horizontal rows, as shown in Figs. 1, 3, 4, and 5, one above the other, on the back of the board, each in vertical line with its respective valves and pneumatics, the air-passages m' in the front board M' , leading from the horizontal passages m' , diverge from the central vertical line of the raceway each side in order to communicate with their proper air-passage r' in the lower board N' , as shown more particularly in Fig. 3.

So far described the instrument can operate the keys of a pianoforte to play any composition arranged in the perforated music-sheet. This is accomplished as follows: The instrument having been first adjusted as to the height of the fingers from the floor to correspond to the height of the keys of the pianoforte which it is to operate by moving the

action-case up or down correspondingly, and then securing it in such position by the screw g' , is placed in front of the pianoforte with its fingers in proper position over the pianoforte-keys so that the finger-blocks just rest on or touch the keys, as shown in Figs. 1 and 2, and the bellows being then operated by the pedals air will be exhausted from the wind-chest and the chambers of the action.

While the unperforated portion of the music-sheet passes over the tracker-board or race-way the action of the instrument is not in operation, although the take-up roll will be turned to draw the music-sheet over the race-way: but as a perforation comes over any one of the air-ducts K' in the tracker-board E' immediately air will pass down through it into the passage K' , down it through the passages m' , n' , and r' , and against the under side of the valve-diaphragm t' , and from its pressure thereon will raise it and the primary valves $P' Q'$, connected thereto, the space or chamber above the board being open to the outside air, the valve P' closing the opening w' into passage a^2 in the board, which passage is then open to the air from the outside through the upper part of the opening w' by the raising of the primary valve Q' . Immediately air passes into the passage a^2 and from it into the vertical pneumatic U' on the upright or rear board, inflating the same, which pulls the rod e^2 and its two valves C^2 and D^2 , which, respectively, open the passage f^2 and close the end of air-passages g^2 , when air from the pneumatic B^2 will pass through its opening h^3 out through the passages g^2 and f^2 to the chamber to the exhaust-bellows, which closes the pneumatic B^2 , raising its movable board and through its rod w^2 , connected to its finger C' , causes the finger to strike the key of the pianoforte under it and sound the note to such key, and as soon as the unperforated portion of the music-sheet is over the air-duct air is prevented from entering the same, when all the pneumatics, valves, &c., in connection therewith return, as usual, in well-known manner to their normal positions, ready for operation as before when another perforation comes over the air-duct.

In order to give expression to music played by the pianoforte with this instrument—such as soft and loud, retards and accelerations, crescendos and diminuendos, &c.—means are employed in connection with the instrument so far described for such purpose as will now be described.

Secured to the main wind-chest at its forward side and beside the main bellows, Figs. 3, 6, and 7, is a valve-box F^3 , having air-passages e^4 , f^4 , and g^4 , one, e^4 , opening to the outside air, the other, f^4 , communicating with the wind-chest, and the third, g^4 , communicating with the small bellows G^3 , secured to the wind-chest at the side of the main bellows. (See Figs. 6 and 7.) In the chamber

j^4 in this box, communicating with each of these air-passages, is a valve H^3 over the ends of the same and which is of a width or length to fully cover one of these air-passages, but not to cover any two at the same time, and it is arranged to slide up and down in suitable grooves h^4 in the sides of the box, its position as shown in Fig. 7 being its normal position, and for the operation of the same a rod J^3 , pivoted to the valve, extends upward and connects at r^4 to one end of a lever L^3 , pivoted at t^4 to a support beneath the horizontal tracker duct-board J' , its other end, w^4 , being under a push-button M^3 in an opening in the horizontal board and projecting up through the board a short distance, as shown in Fig. 3, in front of the take-up roll convenient for operation thereof by hand.

N^3 is a horizontal lever pivoted between two lugs at v^4 , secured to the front of the wind-chest above the main bellows, its two arms $P^3 Q^3$ extending, respectively, over the main bellows and the small bellows G^3 , the end of arm P^3 being in the line of travel of a vertical arm R^3 of the main bellows and the end of the other arm, Q^3 , being in line of travel of a vertical arm S^3 of the small bellows G^3 . The operation of this small bellows and lever is substantially as follows: If desirous of striking a key forcibly and suddenly at any time, push the button M^3 down, which will through its lever L^3 and rod J^3 move the valve H^3 up and close the air-passage e^4 , leading to the outside, and open the air-passage g^4 to the bellows G^3 , and air will pass from the bellows through passage g^4 , through chamber f^4 , into the wind-chest, quickly closing the bellows G^3 , by which its arm Q^3 will quickly and forcibly strike and move the lever N^3 on its pivot and cause its end P^3 to operate upon the main bellows to open it and increase the air-tension to give a stronger blow on the pianoforte-keys. The push-button being allowed to rise, the valve H^3 is moved down, and the bellows G^3 is opened by a supply of air through the passage e^4 from the outside.

T^3 is a bellows secured to the wind-chest at the side of the bellows G^3 , which serves as a regulator for the passage of air. Its movable board w^4 has in the bellows-chamber a valve U^3 , secured to a screw a^5 , which screws through the board w^4 for the valve to be over an opening d^5 from the bellows to wind-chest chamber V^3 , (see Figs. 6 and 9,) which is in free communication with the main chamber of the wind-chest, and from this chamber an india-rubber tube f^5 extends and connects with a passage g^5 , (see Figs. 5 and 9,) which communicates with a passage h^5 in the top board m^5 of the action-case and then opens into a chamber n^5 in a box W^3 , secured to the board m^5 .

The india-rubber tube f^5 passes through the chamber B' and is to maintain at all times a close and air-tight connection between the passage g^5 and chamber V^3 , so that as the ac-

tion-case is moved up and down in setting the instrument to a pianoforte the passage for air therethrough will be continuous and constant from the chamber through the india-rubber tube to the chamber n^5 above. Another tube t^5 extends from the primary-pneumatic chamber, in which are located the diaphragms t' , up to and connects with a horizontal passage w^5 , opening into another chamber v^5 in the box W^3 . On top of this box is a pneumatic C^4 , which has two openings a^6 b^6 into chambers n^5 and v^5 , respectively, of box W^3 . Over the openings a^6 is a valve D^4 , secured to a screw d^6 , screwing through the movable board of the pneumatic, and E^4 is a valve over the opening b^6 to the chamber v^5 .

An arm e^6 is connected to the valve E^4 inside the pneumatic, and against it bears an arm f^6 , pivoted at g^6 on the box W^3 , and extending outside is connected at h^6 to an arm of a rod m^4 , extending downward, then sidewise to and is connected with a handle F^4 . The rod m^6 continues beyond the handle F^4 and is pivoted at n^6 to the board, then extending upward, Figs. 2, 3, a short distance, and pivoted to a link r^9 , connected to one arm of a bell-crank lever G^4 , pivoted at t^6 to a support.

The function of the pneumatic C^4 is to restrict the opening a^6 by means of the valve D^4 , so that the pressure for operating the primary pneumatics will never exceed that which causes the closing of the valve D^4 by the collapse of the regulating-pneumatic C^3 . The purpose of this is to prevent the whistling noise made by the wind passing through the perforated sheet when too great pressure is used in the primary-pneumatic chamber. Closing of the valve E^4 by entirely shutting off the suction from the primary-pneumatic chamber prevents the operation of the pneumatics during the rewinding of the music.

The regulator-bellows T^3 is for the purpose of controlling the speed of the motor, so that it will not vary with the variations of pressure in the main wind-chest, as is well understood in the art, the chamber V^6 being connected with the passage m^7 , (shown in dotted lines in Fig. 5,) so that the air is exhausted from the passage m^7 directly to the regulator-bellows T^3 and thence under the control of the valve U^3 into the wind-chest.

The chamber in which are located the vertical or secondary pneumatics U' is divided vertically into four or five compartments by partitions H^4 , having in each compartment twelve pneumatics representing an octave, and in each of these compartments, secured to the bottom board N' , is a horizontal pneumatic J^4 , having an extension u^6 to its movable board, to which is attached valve K^4 , disposed over and adapted to close as nearly as desired a hole L^4 through the board N' , communicating with the chamber M^4 below it, which communicates with the wind-chest chamber. In Fig. 4 there is indicated a partition H^4 in dotted

lines which is only needed when it is desired to separate the lowest two octaves, which is not usually the case. As shown and disregarding this lowest partition H^4 , there are four of the compartments with a pneumatic J^4 in each, and each pneumatic has a separate air-passage v^6 leading therefrom through the backboard of the action-case into a vertical metal tube w^6 , connected therewith into a passage y^6 , Fig. 1, in a horizontal board N^4 , Figs. 1 and 5, which passage y^6 then turns upward and is open to the air on the upper surface of the board. These air-passages v^6 converge toward each other, as shown in Fig. 5, in order to have their metal tubes and other passages near to each other. P^4 is a slide-valve on top of the board N^4 , which is adapted to slide back and forth over the open ends of the tubes w^6 to open and close one or more of them, as desired, to vary at will the point of division between the sections to be actuated by the different wind-pressures. To one end of this valve is connected at a^7 a rod Q^4 , which extends upward and then sidewise over the tracker-board and guided in supports b^7 and centrally has secured to it a knob e^7 in position for convenient operation of the valve by hand. As the valve P^4 is moved over one or more of the air-passages w^6 the corresponding pneumatic, J^4 , communicating with it is operated to close the hole L^4 more or less and accordingly to regulate the passage of air therethrough. To prevent the full closing of the hole, a regulating-screw f^7 , screwing through the movable board of the pneumatic, is arranged to abut against its bottom board to limit the movement of the valve K^4 to close the hole L^4 more or less accordingly to the adjustment of the screw. The object of these compartments each having a desired number of pneumatics U' with an air-passage L^4 communicating with the wind-chest, each compartment having a pneumatic J^4 and a valve K^4 to its air-passage L^4 , is for the purpose of changing the force or power of the fingers on the piano-keys to produce a light or soft or a heavy or loud tone, which is accomplished as follows: With the valve P^4 not over the tubes w^3 , as shown in Fig. 5, the pneumatics J^4 are open to the outside air, and in such positions the valve K^4 is fully open, by which the pneumatics U' will receive the full force of the bellows, consequently giving a heavy or loud tone to the piano; but if the valve P^4 is moved to cover one or more of the tubes y^6 air is prevented from entering therein, which allows the bellows-pneumatics J^4 to collapse under the combined action of gravity and the suction on valve K^4 . The valve K^4 , according to the adjustment of the screw f^7 , by which the flow of air passing through the passage L^4 is obstructed, consequently makes the tone of the piano lighter or softer because of a lighter blow upon the piano-key, and if the valve P^4 is moved over all the tubes all the tones will

be softened, or any of the series of compartments can be acted upon as desired to shift the point of division between the loud section and the soft section.

5 Any number of pneumatics U' can be in one compartment, as desired, although I have shown an entire octave in each compartment.

R⁴ is a gate-box for controlling the speed of the motor. This is connected to the motor in any usual manner and is divided into longitudinal chambers g⁷ and h⁷ by a partition, with one, g⁷, of which an air-passage m⁷ communicates, and with the other chamber, h⁷, an air-passage r⁷ communicates, which latter passage communicates with the flexible chamber B', wind-chest chamber, and bellows. Over the passage m⁷ is a valve S⁴, which is connected to the bell-crank G⁴ by a rod T⁴. Passage m⁷ is connected below to the compartment V⁶ of the wind-chest, leading to the regulating-bellows T³. To the pivot v⁶ of arm v⁷ of the lever G⁴ is connected a lever A⁵ by an open slot in the end of the lever pivoted at w⁷ and connected by its other end to an arm B⁵, arranged to slide in suitable guides in front and having an index or pointer C⁵ on its end, disposed above and over a scale D⁵, fixed to the horizontal tracker-board. A valve U⁴ on the passage r⁷ is connected by a rod V⁴ to one arm of a bell-crank lever W⁴, pivoted at Y⁴, its other arm being connected by a rod a⁸ to a crank at b⁸ to a rod m⁶, thence to the handle F⁴ for operation of the same. When the handle F⁴ is drawn forward to cause the rewinding of the sheet and the shifting of the driving-clutches, as well understood in the art, it also, through its connection with the crank-lever W⁴ and valve U⁴, opens wide the passage r⁷, admitting high suction to the motor to rewind at maximum speed, as is well understood in the art.

The music-sheet will be marked by a figure indicating the speed with which the piece of music is to be played, and by sliding the rod B⁵ along until its pointer C⁵ is opposite the figure on the scale the music in the music-sheet will be played accordingly. Sliding the pointer along the scale by means of handle E⁵ will, through the lever connection with the valve S⁴, open or close it accordingly as a faster or slower time is desired for the instrument by opening or closing the air-passages m⁷.

In Figs. 1 and 5 is shown a valve F⁵ in the chamber M⁴, which is for a soft stop, and it is arranged over two openings d⁸ in the board W above the chamber B', making communication between the two chambers B' and M⁴. This valve has two openings G⁵ through it, which, with the valve in the position shown in Fig. 5, are just over or coincident with the openings d⁸, which allows air to freely pass through the openings from the chamber B' to the chamber above, M⁴; but if the valve is moved to the right in this figure the passage

of air is cut off more or less as the solid part of the valve comes over the openings, closing the same accordingly. For operating this valve F⁵ a rod e⁸ is pivoted by one end to the top of the valve, its other end being pivoted at f⁸ to one arm, g⁸, of a crank-lever h⁸, swinging in a socket in the board W, its other arm pivoted to one end of the rod H⁵, Fig. 3, which extends up and is pivotally connected to one end of an arm of a rod J⁵, turning in a bearing K⁵ in the under side of the tracker-board and having an arm L⁵, which projects up freely through the tracker-board in front of the music-roll, having a handle M⁵ for operation of the same.

N⁵, Fig. 1, is a lever formed of two parts P⁵ and Q⁵, one part, Q⁵, extending into a longitudinal socket in the other, P⁵, in order to change the length of the combined lever, a rack r⁸ being on the upper edge of the part Q⁵, in which is arranged to engage a pawl t⁸, pivoted at u⁸ to the part P⁵, so that with the part Q⁵ out the desired distance the proper length of the lever is obtained, and when in place it is held by the pawl engaging with the rack of the arm. This lever extends out through an opening R⁵ in the back of the case and has pivoted to its outer end an arm S⁵, arranged to bear upon the loud pedal Y⁵ of the pianoforte, the arm by its pivot being adjustable at one side or the other to bear upon the loud pedal if it should be at one side or the other of the lever.

At the end of the lever is pivoted an upright rod T⁵, which extends up through an opening between the two casings at the front, its upper end being pivoted at v⁸ to one end, W⁸, of a crank-lever V⁵, pivoted to a support, its other end extending freely up through the board and having a handle W⁵ for operation of the same. Pulling forward the handle W⁵ raises the small lever-arm w⁸ and rod T⁵, and lever N⁵ is operated to press down the loud pedal of the pianoforte when desirous of using such pedal.

It will be well understood that the details of construction may be greatly varied without departing from the principles of operation of the device and that some of the improvements may be used independently of the other improvements.

What I claim, and desire to secure by Letters Patent, is the following:

1. In combination with a main bellows and a wind-chest connected thereto, a bellows provided with connections for operating it and with a lever and actuating connections for exerting pressure on the said main bellows to modify the effect of the latter.

2. The combination with means for accentuating notes in mechanical musical apparatus, of a movable indicator having mechanical connection therewith for indicating the accentuation to be produced, and a tracker and means for operating a perforated music-sheet

over the said tracker, the said indicator being mounted to move transversely to the sheet to indicate directly upon the said sheet.

3. The combination with a plurality of pneumatics for playing a keyboard instrument and a plurality of valves therefor, of a plurality of separate wind chambers or passages each leading severally to separate divisions of the said valves, and a plurality of valves for throttling the wind in said chambers or passages, and connections for controlling the said throttling-valves one after another in succession at will.

4. The combination with pneumatically-actuated apparatus for playing keyboard instruments and with the pneumatics thereof for the respective notes, of devices for accentuating some of the notes more than the others, and means for adjustably controlling the said devices to shift the point in the musical scale where the accentuation begins.

5. In combination with pneumatically-actuated apparatus for playing keyboard instruments, and with means for accentuating some of the notes above the others, means for shifting the point of accentuation in the musical scale.

6. In combination with a wind-chest, a series of chambers, a plurality of pneumatics in each chamber, connections for operating thereby the keys of the musical instrument, a passage from each said chamber to the said wind-chest, a valve for restricting each said passage and a pneumatic and controlling connections for operating each said valve for substantially the purposes set forth.

7. In a self-playing attachment for musical instruments, the combination with a wind-chest having a series of passages leading therefrom to the key-actuating pneumatics, of a series of valves respectively controlling the said passages, a series of primary pneumatics for actuating said valves located within said chest, two or more partitions dividing the said chest into compartments, and means for producing a different pressure on any number of the said compartments as compared with the others.

8. In a mechanical playing attachment for keyboard musical instruments, the combination with a casing inclosing the operating mechanism, of a series of key-striking levers projecting without the casing in their playing position and provided with a joint for folding the projecting portion of the lever, and a common actuating means for retracting the same within the casing.

9. In a mechanical playing attachment for keyboard musical instruments, the combination with a series of key-operating pneumatics, of connections and exhausting devices for producing two different pneumatic pressures for operating on different sections of the said pneumatics, and means for varying at will the point of division between the portions

having higher and those having lower pressure.

10. In a self-playing attachment for musical instruments, the combination with a series of key-actuating pneumatic motors, of means for producing differential-working pneumatic pressure for two sections of said series of motors, and means for varying the point of division between the portions having higher pressure and those having lower pressure.

11. In combination, a wind-chest, a chamber, a series of pneumatics for operation of levers or fingers upon the keys of a pianoforte &c., a hole or passage between the chamber and wind-chest, a valve to the passage, a pneumatic to which the valve is attached, an adjustable stop to the pneumatic to regulate the flow of air through the passage, a passage or channel communicating with the pneumatic and a valve to the air-passage.

12. In combination, a wind-chest, a chamber, a series of pneumatics in the chamber for operation of levers or fingers upon the keys of a pianoforte &c., a hole or passage between the chamber and wind-chest, a valve to the passage, a pneumatic to which the valve is attached, an air passage or channel communicating with this pneumatic and a valve to the last air-passage.

13. In combination, a wind-chest, a series of chambers, a series of pneumatics in each chamber and connections for controlling the operation of levers or fingers upon the keys of a pianoforte &c., a hole or passage between each chamber and the wind-chest, a valve to each passage, a pneumatic to each valve, a separate air passage or channel communicating with each latter pneumatic, and a valve to each passage.

14. In combination, a wind-chest, a chamber, a series of pneumatics in the chamber for operation of levers or fingers upon the keys of a pianoforte, &c., a hole or passage between the chamber and wind-chest, a valve to the passage, a pneumatic to which the valve is attached, an air passage or channel communicating with this pneumatic, a valve to the last air-passage, and an adjustable stop to said pneumatic to regulate the flow of air through the air-passage.

15. In combination with pneumatically-actuated apparatus for playing keyboard instruments and with means for accentuating some of the notes above the others, means for shifting the point of accentuation in the musical scale, comprising a valve, a series of ducts, and a plurality of wind-controlling means connected and controlled thereby.

16. In combination with pneumatically-actuated apparatus for playing keyboard instruments and with means comprising a plurality of pneumatically-controlled wind-controlling valves, and connections for accentuating some of the notes above the others, means, compris-

ing a valve and connections for successively controlling the action of said wind-controlling valves, for shifting the point of accentuation in the musical scale.

5 17. In combination with pneumatically-actuated apparatus for playing keyboard instruments and means for accentuating some of the notes above the others, means for shifting the point of accentuation in the musical scale,
10 comprising a slide-valve and connections for controlling the accentuation, and a visible indicator and connections thereto movable with said valve.

18. In combination with pneumatically-ac-

tuated apparatus for playing keyboard instru- 15
ments and means for accentuating some of the notes above the others, means for shifting the point of accentuation in the musical scale, and means for visually indicating the location of such point of accentuation. 20

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

PETER WELIN.

Witnesses:

HJALMAR UTTERBERG,
JOHN LARSON.