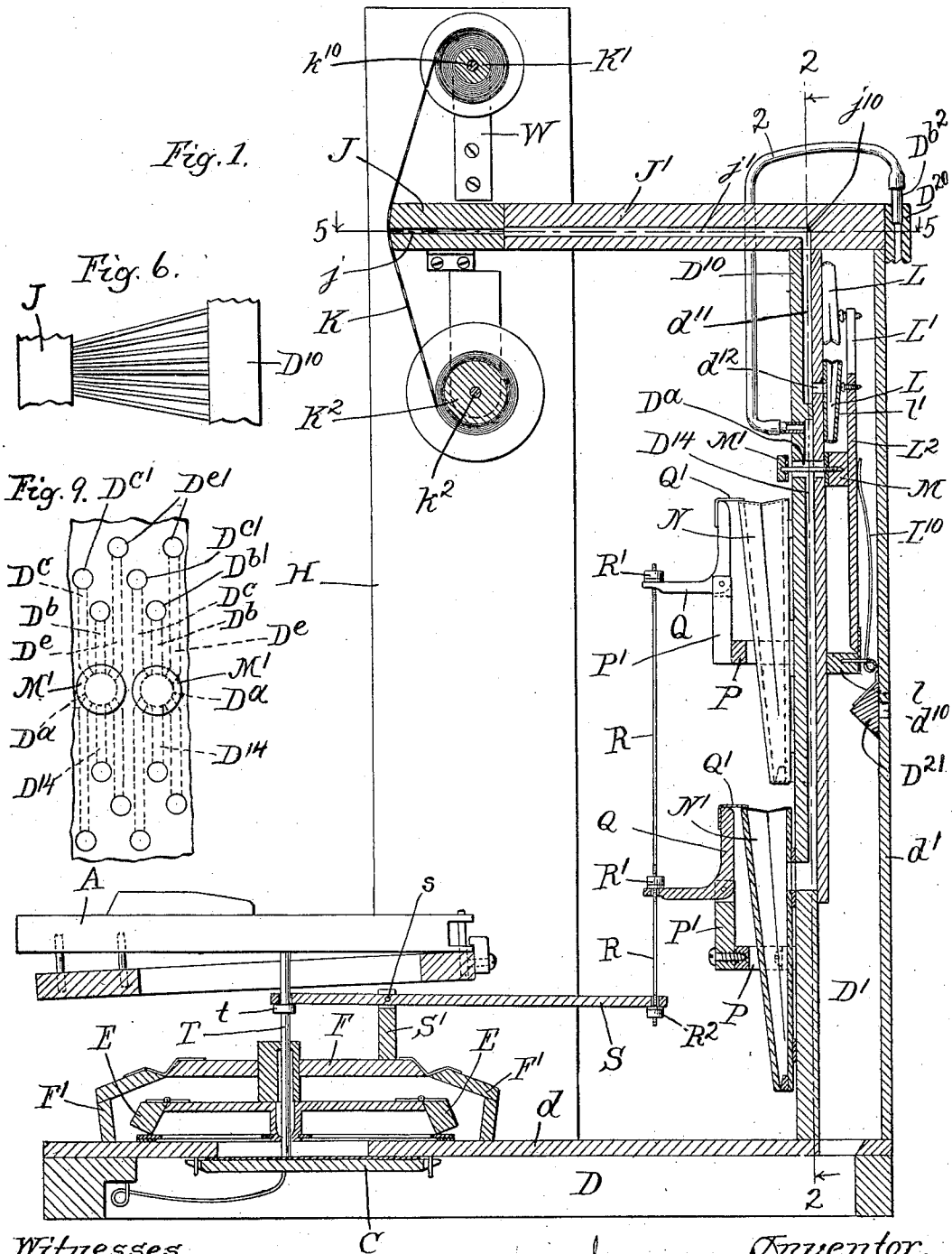


M. CLARK.
PNEUMATIC ORGAN.

No. 576,029.

Patented Jan. 26, 1897.



Witnesses.

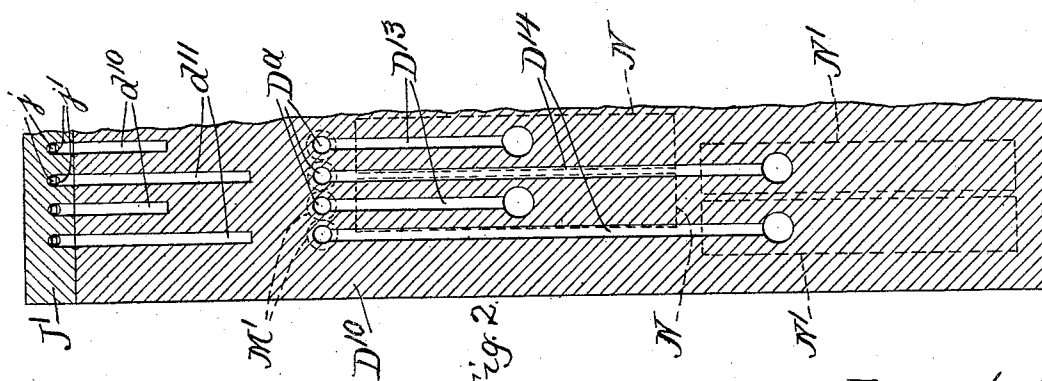
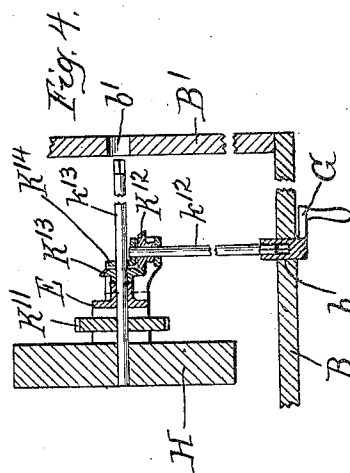
E. T. Wray.
John Elliott.

Inventor.
M. Clark
by R. B. Bunker
his atty.

4 Sheets—Sheet 2.

No. 576,029.

Patented Jan. 26, 1897.



Witnesses.

E. T. Wray
Jean Elliott.

Inventor,

Melville Plank
by Burton & Burton
his attys

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Fig. 7.

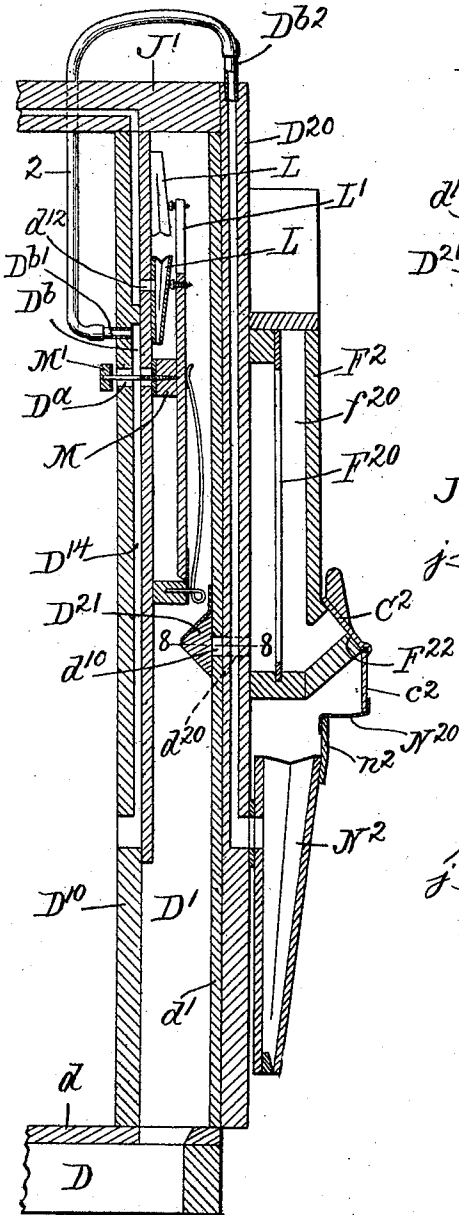


Fig. 8.

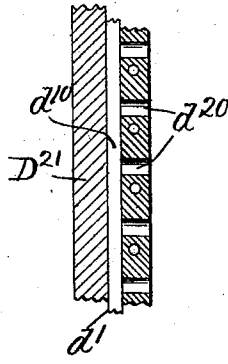
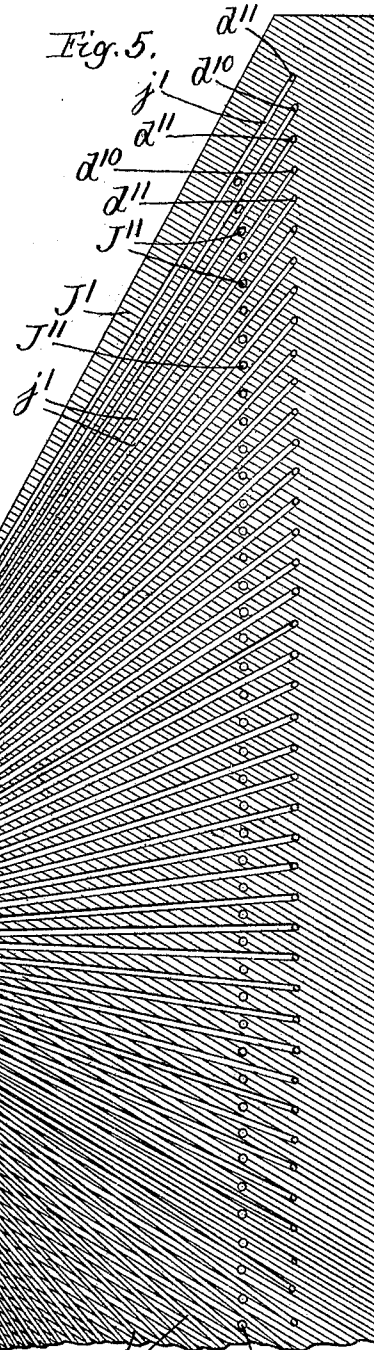


Fig. 5.



Witnesses.
E. T. Wray.
Frank Elliott

Inventor.
Melville Clark
by Burton W. Burton
his atty

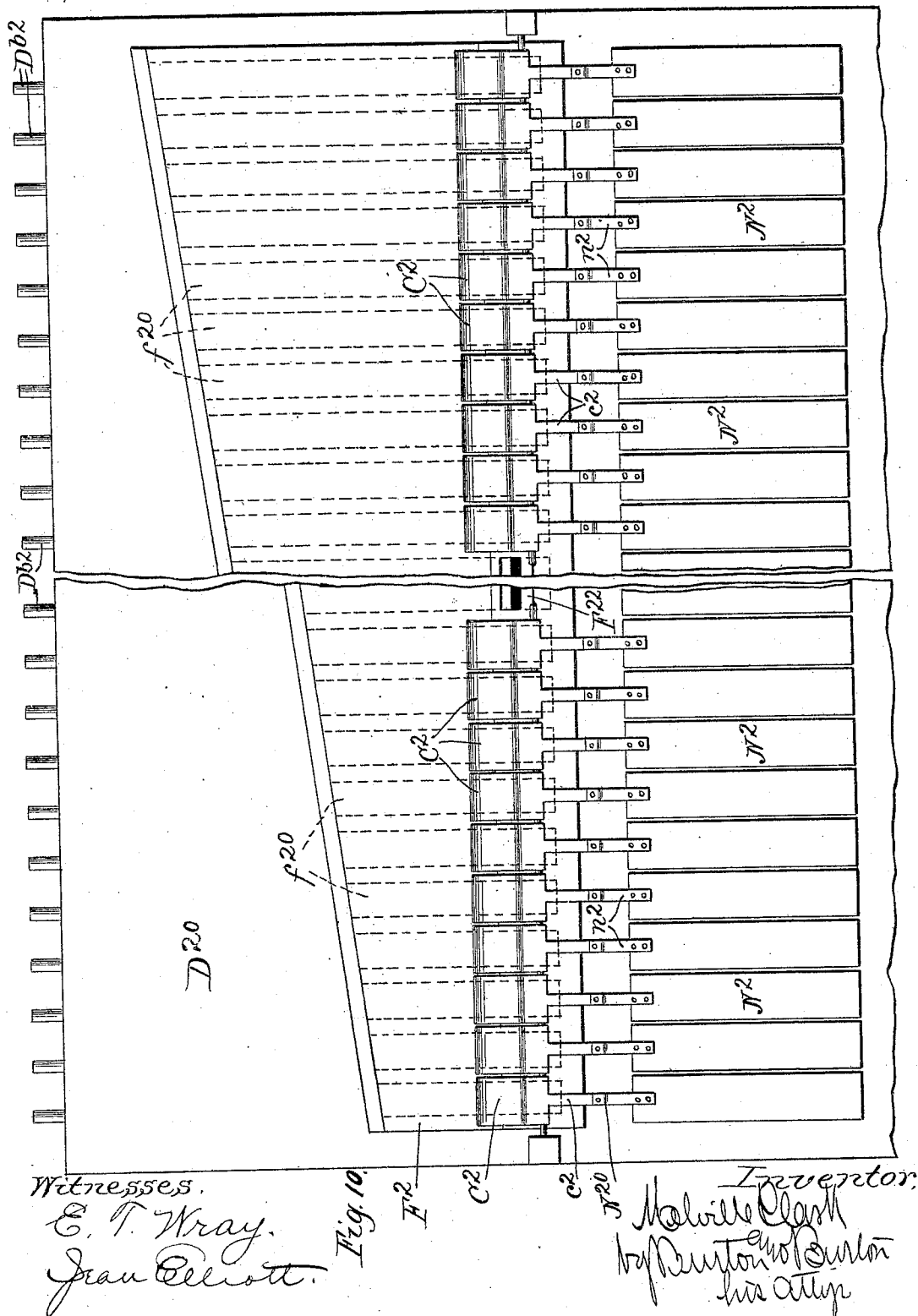
(No Model.)

4 Sheets—Sheet 4.

M. CLARK.
PNEUMATIC ORGAN.

No. 576,029.

Patented Jan. 26, 1897.



UNITED STATES PATENT OFFICE.

MELVILLE CLARK, OF CHICAGO, ILLINOIS.

PNEUMATIC ORGAN.

SPECIFICATION forming part of Letters Patent No. 576,029, dated January 26, 1897.

Application filed December 2, 1895. Serial No. 570,727. (No model.)

To all whom it may concern:

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

10 This invention relates to organs which are adapted to be operated by pneumatic action, such pneumatic action being controlled by appropriate music-strips according to well-known principles and methods.

15 The invention consists in improvements in the pneumatics and connections therefrom to the organ-action proper, by which pneumatic action is adapted to be mounted upon and connected with the ordinary organ-action and acts upon the same pitman or plunger which is acted upon by the depression of the key when the instrument is played by hand.

My invention comprises, further, specific spring-actuated devices for unwinding and 25 rewinding the music-strip.

In the drawings, Figure 1 is a vertical section from front to rear through an ordinary action of common construction having my pneumatic action mounted upon and connected with it, certain supplemental parts being omitted and the connections thereto being broken away. Fig. 2 is a section at the line 2 2 on Fig. 1. Fig. 3 is a front elevation of the music-sheet and winding apparatus. Fig. 4 is a detail section at line 4 4 on Fig. 3. Fig. 5 is a section at the line 5 5 on Fig. 1. Fig. 6 is a detail plan showing a modification of the structure shown in Fig. 5. Fig. 7 is a continuation of Fig. 1, showing the 40 same vertical pneumatic-chamber which is shown in Fig. 1 and the additional parts at the rear thereof which are broken away and omitted from Fig. 1. Fig. 8 is a detail section at the line 8 8 on Fig. 7. Fig. 9 is a detail in the nature of a diagram, showing the method of providing any desired number of principal or secondary pneumatic connections operated by one primary pneumatic. Fig. 10 is a rear elevation.

50 The familiar form of organ-action shown at the left-hand part of Fig. 1 and situated in the ordinary position with respect to the

case comprises, with other parts, the manual-key A, plunger or pitman T, valve C, mounted upon the under side of the top *d* of the vacuum-chamber D, and may comprise any number of sets of reeds, with their appropriate 55 mutes E E, and the customary swell-chamber, of which the fixed top F and the swell-valves F' are shown in the customary relation to the reed-chambers and mutes. At the rear of this customary action there is mounted and extends upright the pneumatic exhaust-chamber D', which communicates at its lower 60 end with the main exhaust-chamber D and is otherwise closed, except as it has communication, as hereinafter explained, with the primary and secondary pneumatics L L, &c., and N N', &c.

J is the tracker-range. It projects horizontally, being mounted by its rear edge on the forward edge of a horizontal board J', which is mounted sidewise on the upper end of the pneumatic vacuum-chamber, which is 70 secured directly to the upper edge of the pneumatic vacuum-chamber D' and projects horizontally forward and at its forward edge is traversed by the music-strip K, which runs from the roll K' onto the roll K², being wound by the spring-actuated train hereinafter described, connected to the latter roll, and adapted to be wound by hand, as hereinafter 75 described, onto the former roll.

From the forward edge of the tracker-range, which is traversed by the music-strip, 85 the ducts *j j*, corresponding to the several keys of the instrument, lead through and communicated directly with ducts *j'*, &c., which extend in the same direction in the board J' to the point *j*¹⁰, where they turn at right angles and emerge from the lower side of the board, communicating, respectively, with the ducts *d*¹⁰ *d*¹¹ in the forward wall D¹⁰ of the pneumatic vacuum-chamber D'. Said ducts *d*¹⁰ and *d*¹¹ communicate inwardly through 95 said wall by the port *d*¹² with the primary pneumatics L L, mounted within the pneumatic vacuum-chamber and actuating the levers L' L², respectively, and each provided with a vent-opening *l* smaller than *d*¹². The 100 levers L' L² are fulcrumed at their lower ends and pressed upon the primary pneumatics, respectively, by the springs L¹⁰. Each of these levers carries the valves M M', mounted

on a common stem, which stem extends through the front wall D^{10} , the valve M seating upon the inner side and the valve M' upon the outer side of the wall, and closing, respectively, the inner and outer ports of the cross-duct D^a , through which the stem of said valves M and M' extends. The cross-ducts D^a communicate through vertical ducts D^{13} and D^{14} , respectively, with the secondary pneumatics N and N' , which are mounted upon the outer or forward side of the wall D^{10} of the pneumatic vacuum-chamber.

$P P$ are bridges extending horizontally across the two rows of secondary pneumatics for the purpose of giving support to the bell-crank levers $Q Q$, which are fulcrumed at their angles, respectively, upon posts $P' P'$, &c., secured to the bridges $P P$ in front of the secondary pneumatics, respectively. Q' are flexible straps or links which connect the vertical arms of the bell-crank levers Q with the vibrating end of the respective pneumatics.

$R R$, &c., are connecting-rods which extend from the forward end of the horizontal arms of the bell-crank levers, respectively, down to the rear ends, respectively, of the levers $S S$, &c., which are fulcrumed at s at the upper edge of a bar S' , which is mounted on top of the swell-chamber underneath the manual. Said levers S , at their forward ends, stand above the buttons $t t$, &c., on the pitmen or plungers T , which constitute the familiar connection from the manual-keys to the reed-valves. The connecting-rods R are provided with adjustable stops R^1 and R^2 , respectively, above and below the bell-crank-lever arms and the lever-arms S , for the purpose of adjusting properly the connection from the bell-crank levers to the levers S to prevent lost motion.

When an aperture in the music-strip K passes the mouth of a duct in the tracker-range, the primary pneumatic corresponding to and communicating with said duct, being exposed to the suction of the organ-bellows by reason of being within the pneumatic vacuum-chamber, tends to fill, and thereby to actuate the lever L^1 or L^2 pertaining to it in a direction to cause the valve M' to seat on the outer side of the wall D^{10} of the pneumatic vacuum-chamber, unseating the valve M from the inner side, and thereby putting the secondary pneumatic in communication with the vacuum-chamber, causing said secondary pneumatic to be collapsed by the suction and to actuate the bell-crank lever Q , and through the connecting-rod R and lever S to operate the pitman pertaining to the key and reed to which the uncovered duct in the tracker-range corresponds, the actuation of the pitman and its valve being, as will be seen, precisely the same as it would receive by the depression of the manual-key by hand.

In order to obtain the necessary power and stroke to give the reed-valve the same extent of opening by this means as it would receive

by a depression of the key in playing an instrument by hand, it is necessary to provide secondary pneumatics of size corresponding to the hardness of the action—that is, strong enough to do the work as promptly and fully as it can be done by hand—that is, to open the valve wide.

It will be evident that if the secondary pneumatics were arranged all side by side in a single row, each in line with the manual-key to which it corresponds, such pneumatics would be limited in width to the space allowed each key on the manual. Thus limited, it is impossible to give the pneumatics sufficient power to operate the valves as they are operated in playing the instrument by hand; but by setting the pneumatic vacuum-chamber upright and arranging them in a plurality of horizontal rows and setting the corresponding individuals of the different rows out of line vertically, that is, offsetting them from each other, the set-off being the amount of the lateral distance which pertains to each key of the manual, I can make the pneumatics as broad as desired and as long as desired, the increase of the breadth only necessitating a greater number of rows and consequent increased height of the pneumatic vacuum-chamber, and the increase of length also necessitating simply the increase in height of the pneumatic vacuum-chamber, and such increased height is not objectionable up to a limit much beyond what is actually necessary for the purpose. No inequality in the action of the pneumatics of the several rows upon the reed-valves respectively to which they pertain results from their different heights, the only difference caused by that difference in height being a difference in the length of the connecting-rods R , and since said connecting-rods operate by a pull and not by a push and are therefore not rendered more liable to spring by their increased length this increased length does not in any respect affect their action.

I have shown both the primary and secondary pneumatics arranged in two rows, offset, therefore, half their width; but it will be understood that the construction does not involve any limitation to two rows, and the pneumatics may be arranged in any number of horizontal rows without departing from the principle involved. The levers L^1 and L^2 , which pertain to the respective rows of primary pneumatics, being of different length and being preferably as a matter of convenience all fulcrumed on the same bridge or rib l , the difference in their leverage upon the respective pneumatics may be compensated by a corresponding difference in the tension of the springs L^{10} , which press them against said primary pneumatics. In practice, however, this difference may be disregarded without affecting the result; that is to say, inequality of pressure of the levers against the pneumatics within the limits to which such inequality is liable to exist in the structure

shown does not produce any perceptible difference in the promptness of action of the pneumatics, and this is the only respect in which a difference could be caused by difference in the pressure of the levers on the pneumatics.

As indicated, the parts constituting the pneumatic action above described are designed and adapted to be applied to organs of customary construction without change in the organ-action itself and, except for appearance, without change in the case, though the pneumatic action will preferably usually be suitably inclosed in an upright extension or appurtenance to the organ-case. Not only for this reason, but because I do not consider it desirable to impose upon the organ-bellows the additional work of winding and rewinding the music-roll, as is sometimes done, I prefer to have this process performed by some simple mechanical means, such as a spring-actuated train, suitably governed for rewinding. I have shown such devices in Figs. 3 and 4. The shaft k^2 of the winding-roll K^2 extends through its bearing in the side post H of the frame which supports both rows and is actuated by a train represented by the wheels V, V', V², and V³, the last of which is on the shaft v^3 , which is suitably connected by familiar ratchet devices (not shown) with a mainspring X in a drum or barrel X', which has also rigid with it a large gear X², which meshes with a pinion X³ on a shaft x^3 , which has also fixed to it a brake-wheel X⁴, which is pressed upon by a brake-shoe having a screw-stem x^5 , which is set through a spring-bar X⁶, suitably supported on the framework. The shaft v^3 extends through the frame Z, which supports the train, and outside said frame-bar has the beveled gear X⁷, which meshes with the beveled gear X⁸, whose shaft, as well as the shaft v^3 , is journaled in a bracket U, secured to the outer side of the frame-bar Z. The shaft of the gear X⁸ extends forwardly, while the shaft v^3 is produced laterally, said shafts terminating before penetrating the front and end walls B and B', respectively, of the cabinet-work. Said walls are provided with eyes b and b' in line with said shafts, respectively, adapted to admit and seat a crank-handle key G, the ends of the shaft being squared to receive such key, so that the driving-spring may be wound either by the operator seated in front of the organ or through the eye b' at the end.

For rewinding the strip onto the roll K', I employ a train consisting of the gears K¹⁰ and K¹¹, inside the frame-bars E, and beveled gears K¹² K¹³, mounted in a bracket K¹⁴ similar to the bracket U. The shafts k^{12} and k^{13} of the gears K¹² and K¹³, respectively, are produced, respectively, toward the front and toward the end walls of the case, which are provided with eyes for the insertion of a key. The details of this structure may be understood from Fig. 4, although that figure rep-

resents, primarily, the corresponding devices in a winding-roll, the arrangements being precisely similar, the same key being used, so that the operator seated at the front of the organ can rewind in order to repeat any portion of the music and the same thing can be done by one standing at the end of the case.

The time of the music, due to the speed of the winding process, it will be understood, is regulated by the screw-stem x^5 of the brake-shoe, whose pressure upon the brake-wheel may be varied at will by screwing it in or out through the spring-bar X⁶.

W is a spring secured to one side of the frame in which the rolls are mounted. At its upper end it affords a bearing for the left-hand end of the roll K', which operates by endwise pressure against the hub or roll, thereby forcing the opposite end k^{10} into engagement with the portion k^{11} of said shaft which is permanently journaled in the opposite side bar key of the frame.

It will be understood that by pressing the roll endwise to the left it may be disengaged at k^{10} for removal.

My invention includes a further feature, which, though especially useful in combination with the upright pneumatic vacuum-chamber, is of a more extended utility. Generally stated, this feature consists in a construction by which a single set of primary pneumatics is made to operate a plurality of sets of secondary or principal pneumatics and connections to such secondary or principal pneumatics of a nature which permits the location of such pneumatics and their corresponding reeds and reed-chambers in any convenient place and at any distance from the primary pneumatics or from the other set or sets of secondary or principal pneumatics, so that, in fact, from one set of primary pneumatics and one music-strip a plurality of organs may be operated; that is, a plurality of entire sets of reeds not necessarily organized within the same case or in any special relation to each other or to the keyboard or music-strip. The principal feature of this part of my invention is represented in the drawings in connection with the features already described, and consists in providing in the board D¹⁰, which forms one side of the pneumatic vacuum-chamber and which has the cross-port D^a, through which the principal or secondary pneumatics are alternately vented and operated by the suction from the vacuum-chamber, a plurality of ducts corresponding to D¹⁴ opening into said cross-port D^a. For the purpose of illustrating such plurality of ducts I have shown in Fig. 1 a second duct D^b, and in detail view, Fig. 9, I have shown additional ducts D^c D^e, &c. These additional ducts extend each a short distance from the cross-port D^a and then turn at right angles and emerge at the outer surface of the board D¹⁰ and are there provided with metal mouthpieces D^{b'} D^{c'}, &c., adapted for connection with small rub-

ber tubes 2 2, &c., which lead up through apertures J^{11} J^{11} , &c., in the board J' , located between the ducts j' , and thence in any direction to any distance desired to similar metal terminals D^{12} , &c., inserted in ducts d^{20} in the board D^{20} , which may be mounted wherever convenient and have mounted upon it a series of principal pneumatics N^2 N^2 , &c., mechanically connected with the valves C^2 C^2 , &c., of a set of reeds F^{20} F^{20} , mounted in reed-chambers in convenient position to have their valves operated by mechanical connection with the pneumatics N^2 , and most conveniently, as illustrated, on the same board D^{20} , their outer walls being shown at F^2 , &c., and having the valves C^2 hinged to them in the customary manner. It will be understood that communication from a vacuum-chamber must be made with the reed-chambers and controlled by proper mute. The vertical position of the pneumatic vacuum-chamber D' makes it very convenient to mount the board D^{20} upon the back of said pneumatic vacuum-chamber and to make communication from such chamber into the reed-chambers for the reeds F^{20} by means of a horizontal slot d^{10} in the back d' of said chamber D' , said slot communicating with the individual ports d^{20} through the board D^{20} into the several reed-chambers f^{20} . A mute D^{21} , located within the pneumatic vacuum-chamber D' and operated in any familiar manner by connections with its stem or rock-shaft, which will protrude beyond said chamber at the end, serves to control the entire set of reeds thus mounted on the board D^{20} . For the purpose of illustrating this method of construction I have shown a set of subbass-reeds mounted on the board D^{20} , and this serves to illustrate the advantage of the form of connection provided from the primary pneumatics, consisting in the flexible tubes, because it is desirable, or at least convenient, to use a much greater portion of the length of the instrument for the set of subbass-reeds than is occupied by the corresponding keys of the manual. Thus, for example, for two and one-half octaves of subbass I may utilize the entire length of the instrument on the rear side of the pneumatic vacuum-chamber D' , thus obtaining space for reeds of any desired timbre or quality of tone, giving them any width necessary for the specific purpose and obtaining also opportunity for pneumatics wide and powerful enough to operate the valves with certainty and promptness.

I have shown a convenient and compact arrangement and mechanism for connecting the pneumatics N^2 with the valves of the subbass set. The work to be done by the pneumatics being the same for all the reeds, since that work consists, mainly, in lifting the valves, which are the same size for all the reeds, the pneumatics may be uniform in size. I locate them at the lower part of the board D^{20} , pivoting their oscillating walls at the lower edge, so that the action is obtained from their up-

per edge, and I locate the valves for the reed-chambers at the lower part; but in order that they may be gravity-valves, requiring no springs to seat them, I form an oblique shoulder F^{22} toward the lower end of the outer or rear wall F^2 of the valve-chamber and make the valve-port lead through such oblique shoulder, to the lower corner of which the valve is hinged, the upper end of the valve being weighted to cause it to seat promptly, notwithstanding that it is not set directly downward, but only obliquely. From the hinged end of the valve I extend a finger c^2 downward, and from the upper forward edge of the oscillating wall of the pneumatic I extend a rigid finger n^2 , so that it terminates substantially directly behind the lower end of the valve-finger c^2 , and by means of the flexible strap N^{20} , I connect the finger c^2 , so that the pneumatic may operate by a substantially direct pull on the lever-arm of the valve which the finger c^2 constitutes.

I claim—

1. In combination with a reed-organ having a manual-action, a vertical pneumatic-chamber at the rear and pneumatics in a plurality of rows mounted on the forward side of such pneumatic-chamber; and lever connections from the pneumatics respectively arranged in parallel vertical fore-and-aft planes extending respectively to the pitmen of the manual action.

2. In combination with a reed-organ having manual-action, a vertical pneumatic-chamber at the rear, the principal pneumatics mounted on the forward side of such chamber, and lever connections from the exterior of such pneumatics extending in parallel vertical planes to the pitmen of the manual-keys respectively.

3. In combination with an organ having manual-action, a pneumatic vacuum-chamber erected vertically at the rear; the primary pneumatics mounted upon the inner side of the forward wall of said chamber, and the secondary or principal pneumatics mounted upon the exterior of said wall, said primary pneumatics being arranged in a plurality of horizontal rows whose corresponding individuals are offset laterally, the ducts to said primary pneumatics being all parallel and formed in said forward wall and opening at the upper end thereof; the horizontal board J' having ducts j' , and cross-ports j^{10} in a single transverse row communicating with said ducts j' , respectively, and adapted to register with the upper mouths of the primary-pneumatic ducts; and the tracker-range abutting and secured at the forward edge of the board J' , and having its ducts registering with the ducts j' : substantially as set forth.

4. In a pneumatic organ, in combination with the vertical pneumatic vacuum-chamber having principal or secondary pneumatics mounted upon the outer side of one wall; additional secondary or principal pneumatics mounted upon the opposite wall; cross-ports

through one wall, and a plurality of ducts leading from said cross-ports, one duct leading to the pneumatics mounted on said wall, and the other leading to the outer side of the wall, and flexible tubes connected at said last-mentioned ducts and extending to the additional pneumatics; the reed-chambers pertaining to said additional pneumatics, and suitable mechanical connections from the latter to the valves of said chambers: substantially as set forth.

5. In a pneumatic organ, in combination with the vertical pneumatic vacuum-chamber having principal or secondary pneumatics mounted upon the outer side of one wall; additional secondary or principal pneumatics mounted upon the opposite wall; cross-ports through one wall and a plurality of ducts leading from said cross-ports; one duct leading to the pneumatics mounted on said wall, and the other leading to the outer side of the wall; and flexible tubes connected at said last-mentioned ducts and extending to the additional pneumatics also mounted on the vertical pneumatic-chamber, and suitable mechanical connections from said additional pneumatics also mounted on the vertical pneumatic-chamber, and suitable mechanical connections from said additional pneumatics to the valves of their respective reed-chambers: substantially as set forth.

6. In a pneumatic organ, in combination with the upright pneumatic vacuum-chamber, the horizontal tracker-range forward of said chamber, and the ducts leading from said tracker-range rearward to the wall of the pneumatic vacuum-chamber; the primary pneumatics within said chamber; the valves which they respectively actuate, and the ports through the forward wall of said chamber controlled by said valves; ducts in said walls from said cross-ports, and secondary or principal pneumatics mounted on said walls to which said ducts respectively lead; additional ducts in said wall leading from said cross-ports respectively, and terminating at their other ends at the outer side of said wall; additional pneumatics mounted upon the rear of said upright pneumatic vacuum-chamber,

and suitable ducts leading into said additional pneumatics respectively, and flexible tubes connected at one end at the outer end of the additional ducts in the forward side of the pneumatic vacuum-chamber, extending thence up between the ducts leading from the tracker-range, and thence over the upper end of the pneumatic vacuum-chamber and connected at the ports leading into said additional pneumatics, respectively: substantially as set forth.

7. In a pneumatic organ, in combination with the pneumatic vacuum-chamber and the ports D^a leading through its wall and the valves which control such ports and means for operating such valves, a plurality of ducts leading into said ports, and plurality of pneumatics connected with such ducts respectively, and reeds corresponding to such pneumatics respectively having their respective valves operated thereby: substantially as set forth.

8. In combination with a manual action of a reed-organ, the upright pneumatic-chamber at the rear, and the horizontal forwardly-projecting tracker-range mounted at the upper end of the pneumatic-chamber; the primary pneumatics within the chamber, and principal or secondary pneumatics mounted on the forward side of the chamber; bell-crank levers having their fulcrums supported in front of the pneumatics respectively; the levers S operating at their forward ends upon the pitmen of the manual-action respectively, and connecting-rods R from the rear ends of said levers to the horizontal arms of the bell-cranks, and links from the vertical arms of the bell-cranks to the oscillating ends of the secondary pneumatics respectively: substantially as set forth.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 21st day of November, 1895.

MELVILLE CLARK.

Witnesses:

CHAS. S. BURTON,
JEAN ELLIOTT.