(No Model.) 2 Sheets—Sheet 1.

J. W. TRAINER.

REED ORGAN.

No. 472,201. Patented Apr. 5, 1892.

Fig. 1.

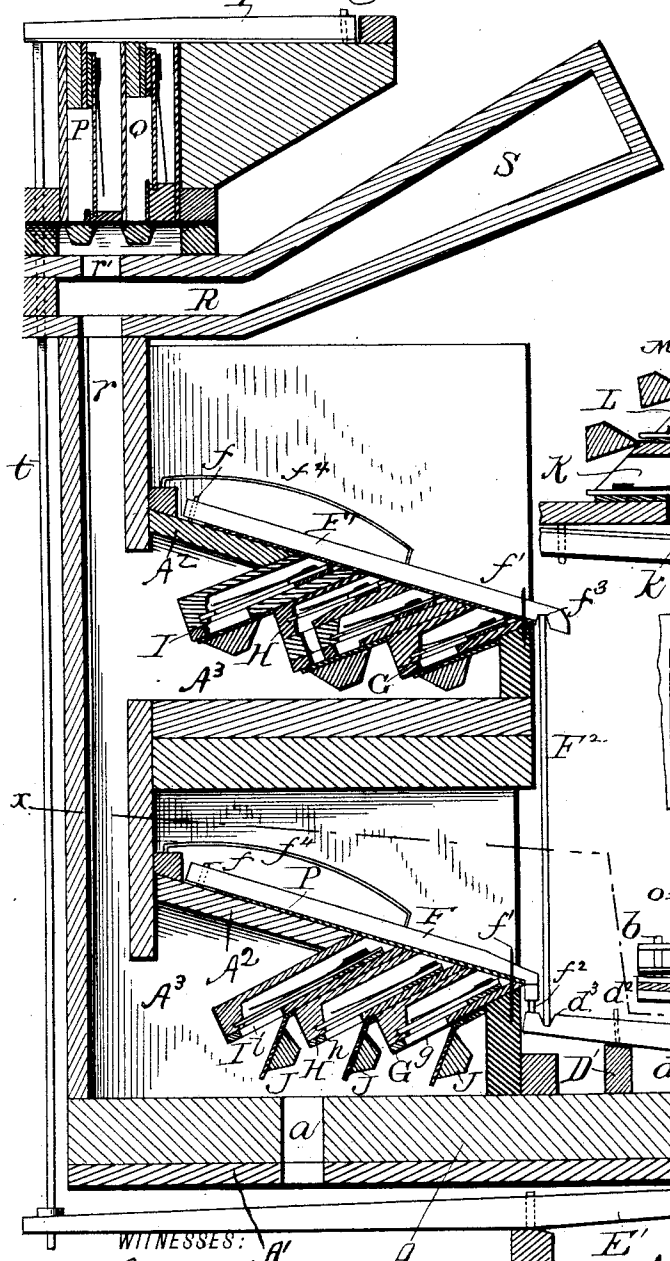


Fig. 3.

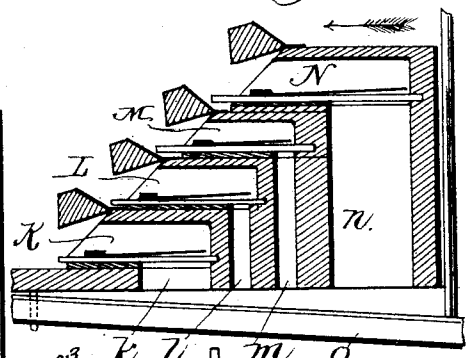
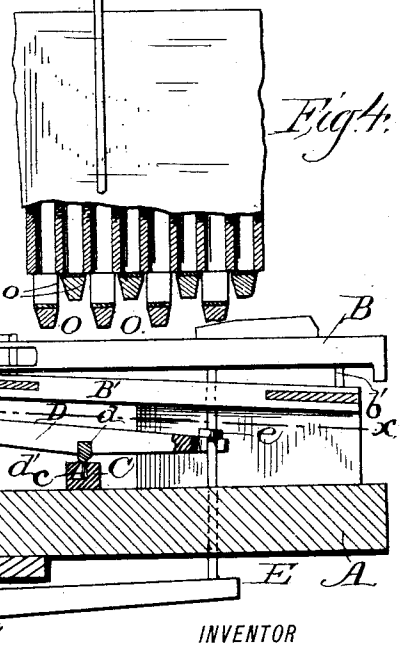


Fig. 4.



WITNESSES:

L. H. Orleman

B. A. Naylor

INVENTOR

John W. Trainer

BY

Doubleday & Blin

ATTORNEYS.

(No Model.) 2 Sheets—Sheet 2.

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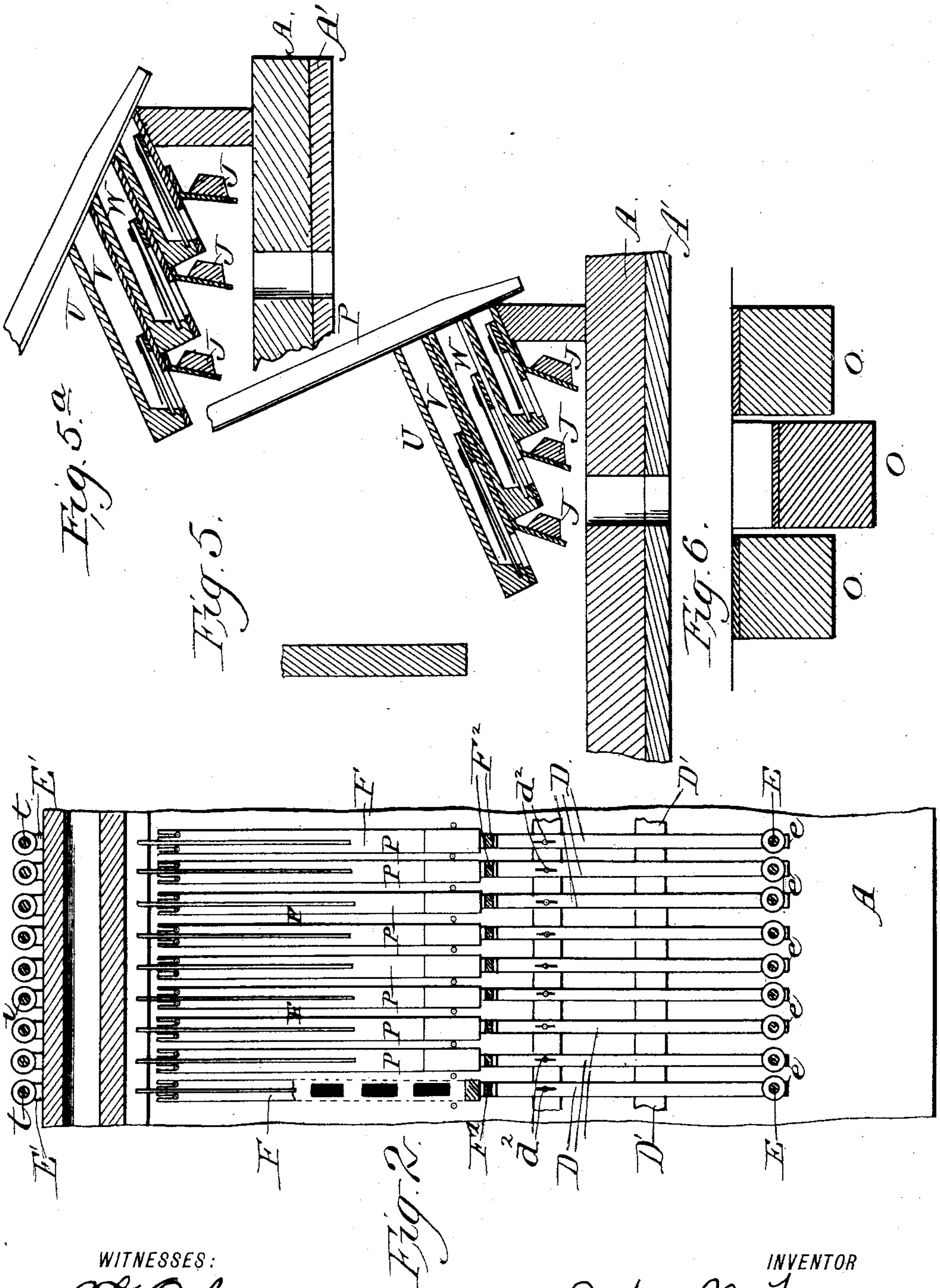

WITNESSES:

L. H. Orleman

D. W. Naylor

INVENTOR

John W. Trainer

BY

Doubleday & Bliss

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN W. TRAINER, OF FORT WAYNE, INDIANA, ASSIGNOR TO THE FORT WAYNE ORGAN COMPANY, OF SAME PLACE.

REED-ORGAN.

SPECIFICATION forming part of Letters Patent No. 472,201, dated April 5, 1892.

Application filed October 3, 1891. Serial No. 407,635. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. TRAINER, a citizen of the United States, residing at Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvements in Reed-Organs, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a central vertical transverse section of so much of a reed-organ as is requisite to illustrate my invention. Fig. 2 is a horizontal section taken on line *x x* of Fig. 1, looking downward. Fig. 3 is a transverse vertical section of a reed-board; and Fig. 4 is an elevation of Fig. 3 looking in the direction of the arrow, part of the front wall being broken away, Figs. 3 and 4 being intended to assist in illustrating my invention, although not exact representations of any organ as actually built. Fig. 5 is a partial transverse vertical section showing a modification illustrating part of my invention. Fig. 6 is a transverse vertical section of three ordinary reed-organ valves.

One part of my invention relates to a new construction and arrangement of the action for operating the valves for the admission of air to the reeds.

Another part relates to the structure of the individual cells, whereby the volume and quality of tones is greatly improved.

Another part of my invention relates to the arrangement or grouping of a series of reed-boards in what is sometimes termed a "bank," and the combination therewith of mutes and valves for regulating the passage of air through the reeds.

Other parts of the invention will be referred to in the claims.

Similar reference-letters indicate like parts in all the figures.

Referring particularly to Figs. 1 and 2, A is the base-board, upon which the action and reed-boards are mounted. The bellows and exhaust-chamber are omitted, the upper board thereof being indicated at A′ with an air-passage *a* through it, and also through the bottom board or base A.

B B are the keys, each pivoted at its inner end upon a pin *b*, with a guide-pin *b′* near its outer end, as is customary in organs.

C is a fulcrum-rail secured to the base A and provided with a longitudinal recess *c*, opening upward. This recess is preferably dovetail-shaped in cross-section.

D D are levers, each provided at its under side with a fulcrum *d*, and a fulcrum-pin *d′* projecting downward therefrom. These fulcrum-pins enter the recess *c*, fitting quite closely the throat thereof, so that while these fulcrum-pins and the levers D can move sidewise—that is to say, longitudinally—within the recess the engagement of the pins with the walls of the throat of the recess restrict the endwise movement of the levers, as will be readily understood without further explanation. In order to facilitate the vibration of these levers, I prefer to bevel off the front lower corners of the fulcrums *d*, so that while the portion of the fulcrum which lies behind or inside of the fulcrum-pin shall furnish a good support for the levers upon the fulcrum-rail, yet when the forward ends of said levers are depressed it will not be raised bodily, as would be the case if the front edge had been left square instead of being beveled off.

D′ is a stop-rail having a series of upwardly-projecting guide-pins d^2, each of which enters a slot in one of the levers to prevent lateral movement of the lever at that point.

By an examination of Figs. 1 and 2 it will be seen that the employment of the longitudinally-recessed fulcrum-rail is advantageous in many ways. For instance, if from any cause the levers D should spring a little, so that instead of being perfectly straight they become slightly bowed, such change in form will not produce any clamping or disturbance in working relation, because, while the ends of the levers are confined or supported against lateral movement by the guide-pins and pusher-pins, their centers are free to move sidewise in the recess. Furthermore, it is easier to form a long recess in that fulcrum-rail than it would be to make a series of pivot-seats, one for each fulcrum-pin *d′*.

E E is a series of pusher-pins, each connecting one of the keys B with one of the levers D, and also preferably with a lever E′. Each

pin E passes through a pole in the base A and a board B′, whereby the pin is prevented from undue lateral movement, but is free to rise and fall. The front end of each lever D is forked to straddle a pin E, which latter carries a collar or nut *e*, engaging with the upper surface of the lever D. Thus by means of the pins d^2 E levers D are supported against undue lateral movement; but by reason of their fulcrum-pins being seated in the recess *c* no cramping of the levers can occur, even though from any cause there be slight differences in their sizes and shapes, produced either in their manufacture or by subsequent warping or springing under differing atmospheric conditions.

F F′ are valves. Each valve is provided at its inner end with two slots to receive pins *f f*, which pins effectually prevent any twisting movement of the valves about their axes.

f′ f′ are pins between the valves, these pins fitting somewhat closely upon opposite sides of each valve. There is a lifting-pin f^2 for each lever D and a tracker F^2 connecting each lever D with one of the upper valves. The lower end of each tracker is seated in a recess d^3, made for its reception near the inner end of a lever B, the upper end of this tracker being seated in a similar recess f^3 in the valve. Each valve is pressed down against the open end of the reed-cells by a spring, preferably a tongue-spring f^4, in substantially the usual way.

G H I represent a series of reed-boards having the reed-cells of the usual shape, except that each cell is beveled off at its front end for the purpose of enlarging the opening, through which air passes when the valve is opened.

In carrying out my invention I propose to arrange these reed-boards or cell-boards in groups or series of two or more, with the beveled-off ends of the reed-cells in such position that a single flat valve may be made to cover one cell in each board of which the series or group is composed.

In the illustration of my invention which I have shown in the drawings there are two groups, the lower one having three reed-boards and the upper group having four reed-boards. In each group the reed-boards project through the sounding-board A^2, so that in fact they constitute a part of the wall of the air-chamber A^3, and as the sounding-board is inclined upward toward the rear the space between it and the base-board and the upper board of the exhaust-chamber is wider at the rear than it is at the front, so that although the upper and rearward reed-board of the group is wider than the front lower board of the same group there is plenty of room for the mutes to swing open without coming into contact with the board A. Each cell has at its inner end an air-opening through its lower wall, as indicated at *g h i*. By reason of the upper walls of the cells in each reed-board being shorter than the lower walls of the same cells I am enabled to so arrange the boards that the lower face of each of them shall at its inner edge project beyond the inner edge of the board below it. The result of this arrangement is that when the mutes J are open there is a practically unobstructed space below the air-passage at the vibrating end of each reed, so that the air-current, after leaving the reed, passes directly into the open space between the reed and the adjacent wall of the air-chamber.

One advantage growing out of arranging the reed-boards to project into the air-chamber is this: It permits the use of a single long valve to close the open ends of a series of reed-tubes, the valve being of such length that when it is opened it admits air freely to each and every of the reed-tubes below it, the adjacent face of the sounding-board providing a suitable pivotal point or fulcrum for a valve of the desired length and without the interposition of any sort of a valve-seat between the valves and the tube ends, thus facilitating the insertion and removal of the reeds. So, also, the sound-wave generated or created by the vibration of the reed as it is propagated in a downward direction passes directly into the air-chamber through a throat which is of constantly-increasing size in transverse area and is exceedingly short on a line perpendicular, or nearly so, to the under surface of the reed. The result of this construction and arrangement of parts is the production of a tone of a much greater volume with a given pitch and character of reed than can be produced by any other construction of which I have knowledge, and at the same time the quality of tone is greatly improved.

In order to further facilitate the application of the mutes to the group of reed boards, I prefer to arrange them as shown in the drawings—that is to say, by placing the lower walls of the series of longer reeds in contact with the upper walls of the board having a shorter series of reeds. For instance, in the lower group the reed-board I is an eight-foot reed or scale, the reed-board H is a four-foot reed or scale, while the reed G is a two-foot scale, so that the increase in the width of the reed-board in the ascending series further increases the width of the projecting step, whereby there is ample room provided for the hinging of the mutes.

Some of the advantages of my invention may be derived from a reverse arrangement of the reed-boards—that is to say, as indicated in Fig. 5ª, where the two-foot scale is at the top of the group, the four-foot scale next below, and the eight-foot scale below that, although the lengths of the reed-cells do not correspond exactly to the lengths of the reeds in each scale respectively, the shorter reeds having the longer cells. Hence I wish to include both methods of grouping under the claims hereof.

In Figs. 3 and 4 I have illustrated reed-

boards arranged in groups with the cells beveled off by cutting away their upper and side walls.

K L M N represent the reed-boards drawn upon a scale a little larger than that of Fig. 1, but fairly representing such construction of parts as would be ordinarily adopted in grouping a series of reeds corresponding to the scales or lengths of reeds shown in the upper part of Fig. 1—that is to say, an eight-foot scale, two two and one-half foot scales, and two foot. Still referring to Figs. 3 and 4, it will be seen that the air-passages *l m*, leading from the reed-cells L M, are very small in cross-section, while the air-passage *n*, although quite wide in one direction, is very narrow in the opposite direction in horizontal section. It will also be seen that although the air-passage *k* from cell K is quite short, yet the air-current and sound-waves which pass downward through that air-passage have their progress seriously impeded because they are obliged to travel in a zigzag path of greatly-reduced size in getting down between the adjacent surfaces of the valves, their movement being still further impeded by the fact that the upper surface of the valve is covered with felt or other soft and rough material, the opposite edges of which form one side of each throat, through which the air-current and sound-wave have to travel in their passage down between the valves into the chamber below, as will be clearly understood by considering Fig. 6 in connection with Figs. 3 and 4, because it will be seen that the spaces between the valves are very narrow.

Two objectionable results are due to the construction of passage through which the air-current and sound-waves travel: First, the volume of tone is less than that which is produced by the use of my invention because the rate of flow of air is restricted, whereby the freedom of vibration of the reed is interfered with, and, further, it is well known that the sound-waves are very sensitive to disturbances arising from interruptions in the path of their travel or propagation. Again, the quality of the tone is much less desirable as regards its purity and timbre than it is in an organ having my invention because, among other things, irregularities in the form of the passage-way or throat through which the air-current and sound-waves pass on their way from the reed to the air-chamber into which the mutes open materially impair the character of the sound-waves in accordance with well-settled laws of acoustics.

P Q are reed-boards in the upper part of the organ.

R S is a modifying resonant chamber, of which the part R is interposed between the reed-boards P Q and those below, there being an air-passage or trunk *r* connecting this resonant chamber with the chambers and the bellows below, and there is an air-passage *r'*, also, connecting the resonant chamber with the reed-boards P Q. By preference I make the part S of the resonant chamber wider at one end than at the other, (in cross-section,) the narrower end communicating with the part R, these two sections being preferably arranged at an angle to each other. Thus the sound-waves emitted by all of the reeds enter this modifying resonant chamber and have their character somewhat changed thereby. There is a series of valves T above the reed-boards P Q, with suitable tracker-rods *t* connecting them with the inner ends of the levers E'. Of course there may be a series of mutes applied to the lower ends of the cells in the reed-boards P Q; but as the stop-action for opening these mutes, together with the mutes of the lower groups or series of reed-boards, form no part of the invention for which protection is sought herein I have omitted them from the drawings.

For convenience in description I prefer to call the ends of the reed-cells which are open at the edge of the reed-board and through which the reeds are inserted into their seats in the board the "open" ends of the reed-cells, and I propose to refer to the opposite ends of the reed-cells as the "closed" ends thereof, although of course each cell has at its inner end an opening through which the air-current passes from the reed downward into the chamber below the reed-board.

From an examination of the drawings it will be seen that in each of the groups of reed-boards the upper board of the series is arranged to have the closed ends of its reed-cells project rearward beyond the closed ends of the reed-cells of the board below, and by preference I make such projection wide enough to provide a suitable surface for the hinging of the mute of the upper board to its under surface in front of the openings through which the air-current and sound-waves pass from its reeds, and although in the arrangement of parts shown in the drawings the part of the reed-board to which the mute is thus hinged is actually in front of those openings—that is to say, between those openings and the keyboard at the front of the organ—I do not wish to be limited to such organization of the parts, but prefer to have the words "in front of the openings" understood as meaning between those openings and the front edge of the reed-board through which the reeds are inserted, without reference to whether that edge be turned toward the keyboard of the organ or in an opposite direction.

Of course that part of my invention which relates to beveling off the upper sides of the open ends of the reed-cells, the combination therewith of valves to close the cells, and a mute to close the openings through which the current of air and sound-waves pass after leaving the reed is applicable to a single reed-board, irrespective of the grouping of the reed-boards. It is obvious that by beveling the open ends of the reed-cells I obtain throats of much greater area and capacity when used

with an ordinary valve than would be possible under such construction of parts as should include the interposition between the reed-cell and the valve of a valve-seat having an opening through it of less area than the area of the beveled end of the cell, this being especially the case if the opening through the valve-seat be circular. So, also, that part of my invention which relates to combining a series of reed-boards in a group with the closed ends of the reed-cells of the upper board projecting beyond the closed ends of the cells of the reed-board below is adapted for use in an organ in which the open ends of the reed-cells are not beveled, although in practice I prefer the construction shown as securing the best results.

It will of course be understood that wherever herein I have referred to the reeds of one reed-board being longer than those of an adjacent board I mean that the tone of the lowest F in such scale corresponds in pitch to the pitch of an open organ-pipe corresponding in length to the number of feet indicated for that particular scale.

I am aware that qualifying tubes and chambers of various shapes and sizes have been used in reed-organs, and therefore do not claim such tube, broadly; but I believe I am the first to combine with an air-trunk or passage-way leading from the exhaust-chamber of one set of reeds to the exhaust-chamber of another set of reeds an interposed qualifying-chamber which projects practically at right angles from the path of the air-current as it passes through the above-referred-to tube-chamber; and I have found by experiment that I can produce better effects as regards quality of tone by making the chamber somewhat V-shaped in cross-section and admitting the sound-waves at the narrower end thereof. I have also found that I can accomplish more satisfactory results by arranging the parts R and S of the resonant chamber at an angle to each other, substantially as indicated in Fig. 1.

It will of course be understood that this organ is to be provided with the usual springs for closing the mutes, in addition to the springs f^4, as shown, for closing the valves.

It is well known that it is desirable to arrange the reeds in an inclined position, about as shown in Fig. 1, to facilitate their being vibrated freely with an air-current of moderate strength; but I do not wish to be limited to any particular arrangement of reeds in respect to position; nor do I wish to be limited to the precise construction or arrangement of parts in which I have embodied my invention, because many modifications thereof will readily suggest themselves to any one skilled in the art of organ-building without going outside of my invention. While both for durability and accuracy of movement I prefer to provide the levers D with separate fulcrums d and to make such fulcrums of firmer-grain wood or other suitable material, yet I do not wish to be confined to such structure because these fulcrums may be omitted, the levers resting directly upon the fulcrum rails or bars, which latter should, by preference, be made of some firm and durable wood or other suitable material.

What I claim is—

1. A reed-board having the open ends of the reed-cells beveled, in combination with valves applied thereto to close the beveled open ends, and a mute to close the openings below the cells through which the air and sound-waves pass, substantially as described.

2. A reed-board having the open ends of the reed-cells beveled, in combination with valves applied to close the beveled open ends, and a mute engaging with the lower surface of the reed-board to close the openings below the cells through which the air and sound-waves pass, substantially as set forth.

3. The combination of two or more reed-boards, the closed ends of the reed-cells of the upper board projecting beyond the closed ends of the reed-cells of the lower board, the reeds of the upper board being of a longer scale than the reeds of the lower board, whereby there is provided an increased width of step, and mutes for closing the openings below the cells, the open ends of the cells of adjacent boards being in a common plane and thereby adapted to be closed by a single valve, substantially as described.

4. The combination of two or more reed-boards, the closed ends of the reed-cells of the upper board projecting beyond the closed ends of the reed-cells of the board below, a series of valves each of which closes a reed-cell of the upper board and the adjacent reed-cell of the lower board, and mutes for closing the openings through which the air and sound-waves pass after leaving the reeds, substantially as described.

5. The combination of two or more reed-boards, each having the open ends of the reed-cells beveled, the lower longer wall of the upper board being arranged on a line with the upper shorter wall of the lower board, and the open ends of all of the reed-cells arranged in a plane to receive the valve, substantially as set forth.

6. In a reed-organ, the combination, with an air-chamber, of a reed-board projecting through one wall of the air-chamber and having the open ends of its reed-cells beveled, in combination with a series of valves overlapping the reed-cells and the wall of the air-chamber, substantially as set forth.

7. In a reed-organ, the combination, with an air-chamber, of a series of reed-boards projecting through one wall of the air-chamber, a series of valves overlapping the open ends of the reed-cells and the wall of the air-chamber, and a mute within the air-chamber to close the openings below the cells through which

the air and sound-waves pass, substantially as set forth.

8. In a reed-organ, the combination, with an air-chamber, of a series of reed-boards projecting through one wall of the air-chamber, the reed-boards being of different widths, whereby there is provided a series of steps, mutes within the air-chamber engaging with the steps, and a series of valves to close the open ends of the cells, substantially as set forth.

9. In a reed-organ, an air-chamber having converging walls, in combination with a series of reed-boards projecting through one of the walls, valves to close the open ends of the reed-cells, and a mute to close the openings through which the air and sound-waves pass, substantially as set forth.

10. In a reed-organ, an air-chamber having converging walls, in combination with a series of reed-boards of different widths projecting through one of the walls, the wider reed-board projecting into a part of the air-chamber which is wider than that into which the narrower reed-board projects, and valves and mutes applied to the reed-board, substantially as set forth.

11. In a reed-organ, the combination, with an air-chamber, of a series of reed-boards projecting through one wall of the air-chamber and having the open ends of the reed-cells beveled, in combination with valves overlapping the beveled ends of the cells and the wall of the air-chamber, substantially as set forth.

12. The combination, with the levers D, provided with the fulcrumed pivots, of the fulcrum-rail having a longitudinal dovetail-shaped recess to receive the pivots, substantially as set forth.

13. The combination, with the levers provided with laterally movable fulcrums, of guiding-pins on opposite sides of the fulcrum and engaging with the levers, substantially as described.

14. The combination, with the levers D and their laterally-movable fulcrum, of the stop-bars provided with pins engaging with the levers, the keys, and the thrust-pins connecting the levers with the keys, substantially as described.

15. The combination, with the series of reed-boards arranged one above the other, of an air-passage connecting all the reed-boards of both series with the exhaust-chamber, and a qualifying tube or chamber interposed between the series of reed-chambers and provided at one side with openings to receive the sound-waves from both series of reeds, substantially as set forth.

16. The combination, with a qualifying-chamber, which is substantially V-shaped in cross-section, of a series of reeds above the qualifying-chamber, a series of reeds below the qualifying-chamber, and a narrow passage through one side of the chamber adapted for the passage of an air-current from a series of reeds, substantially as described.

17. A qualifying-chamber, a portion of which is V-shaped in cross-section and another portion of which is arranged at an angle to both opposing sides of the V-shaped portion, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN W. TRAINER.

Witnesses:
H. H. DOUBLEDAY,
M. P. CALLAN.