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S. R. WARREN.

Improvement in the Construction of Organs.

No. 131,984. Patented Oct. 8, 1872.

FIG. 1.

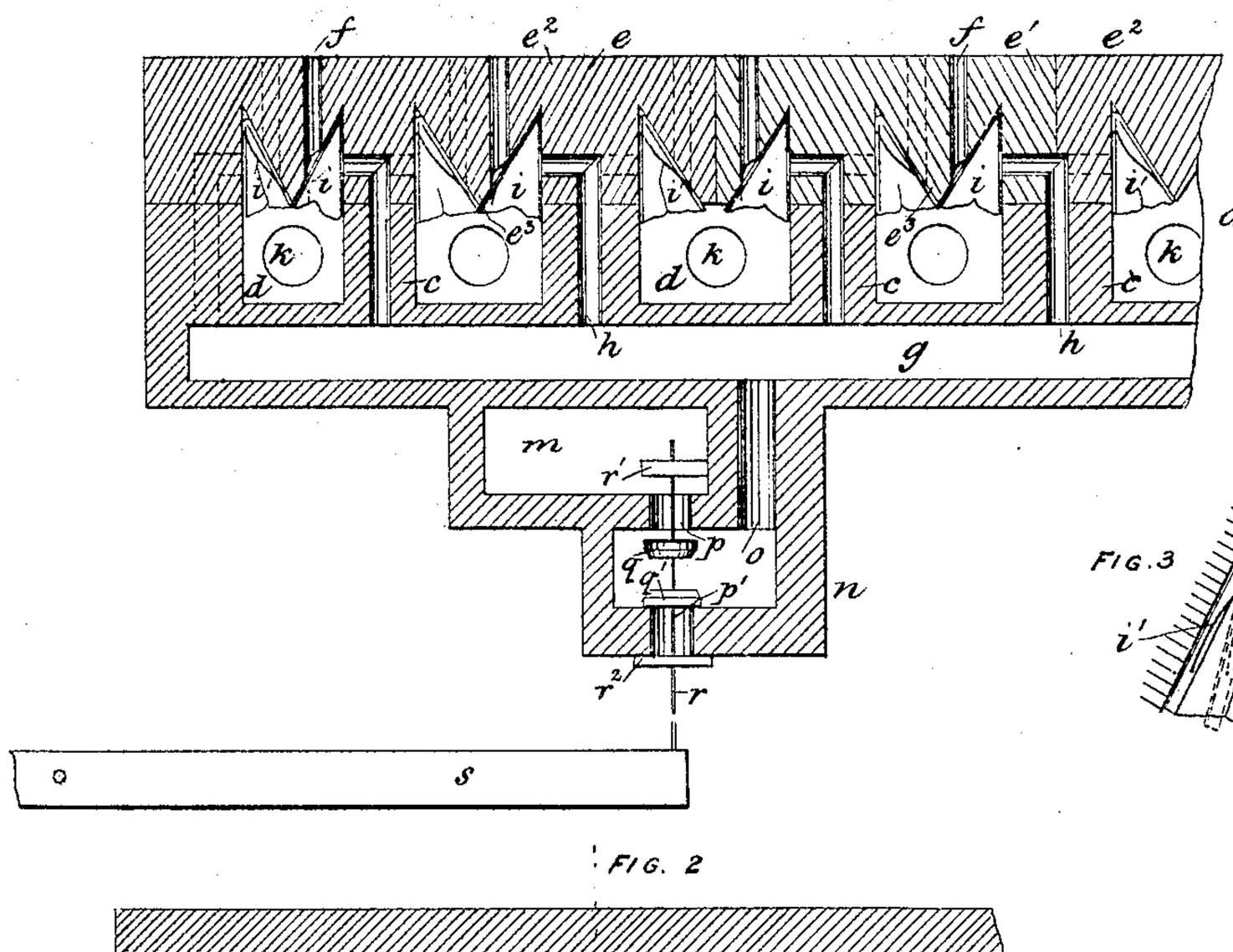

FIG. 2

FIG. 3

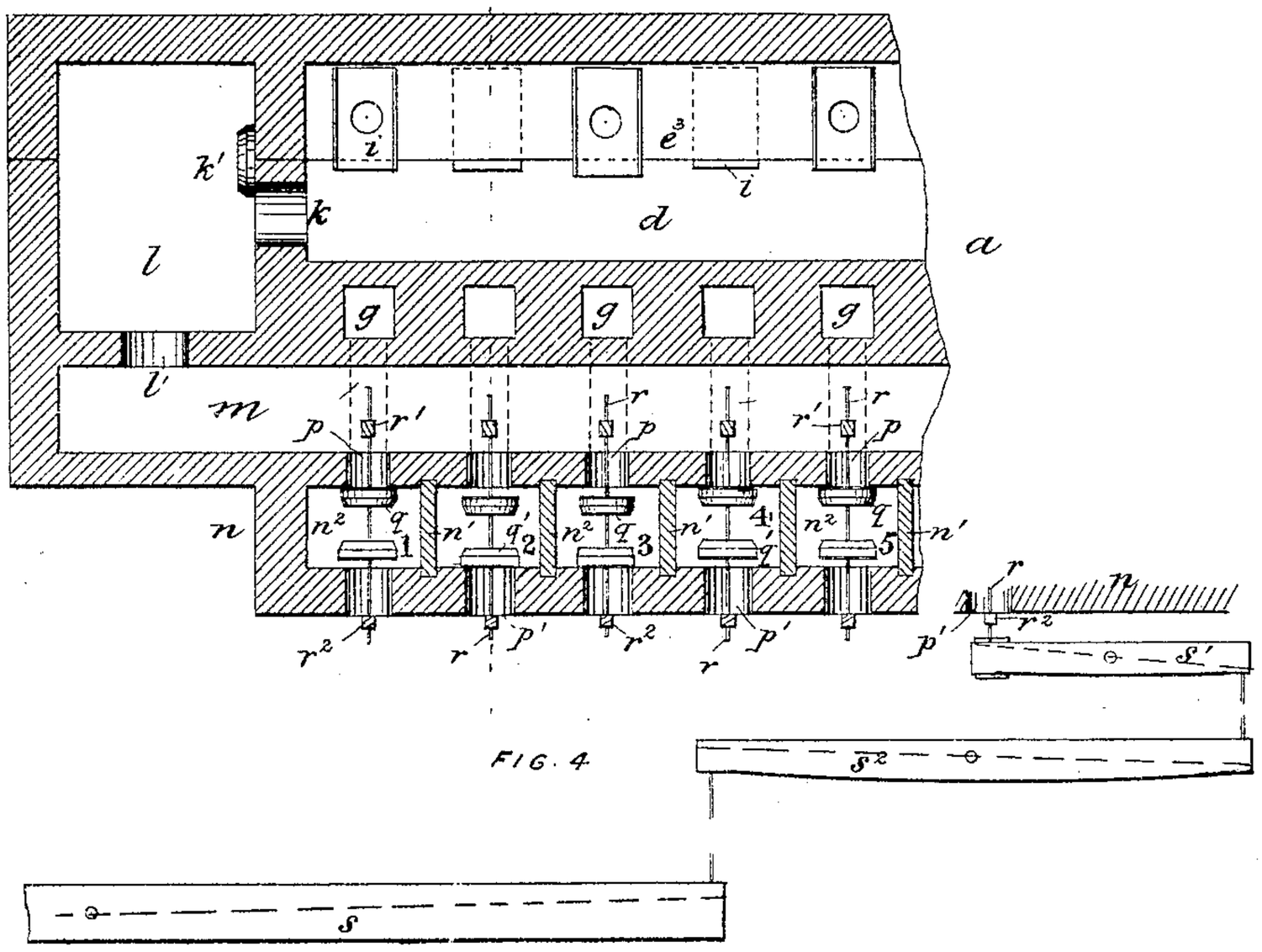

FIG. 4

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FIG. 5

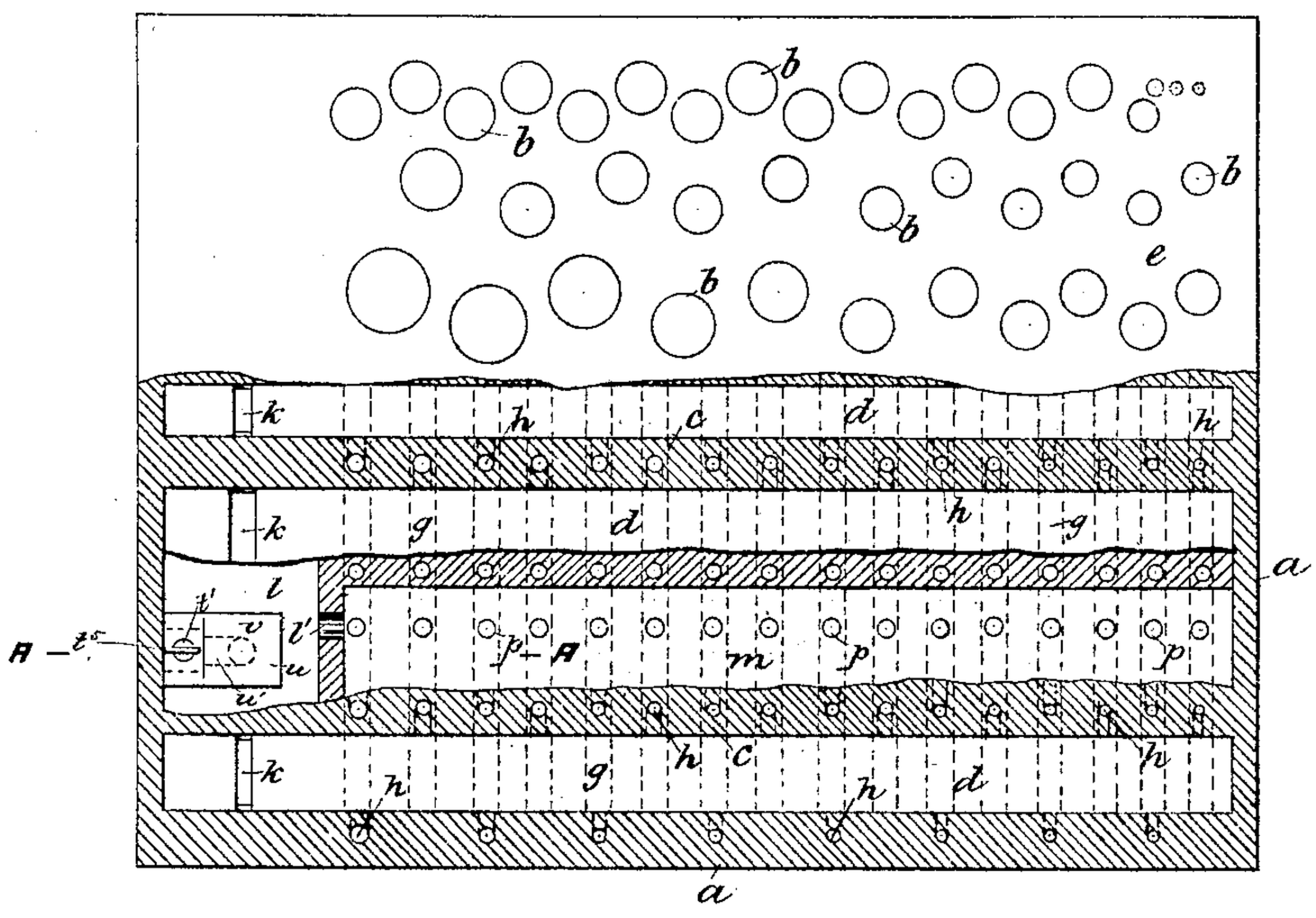
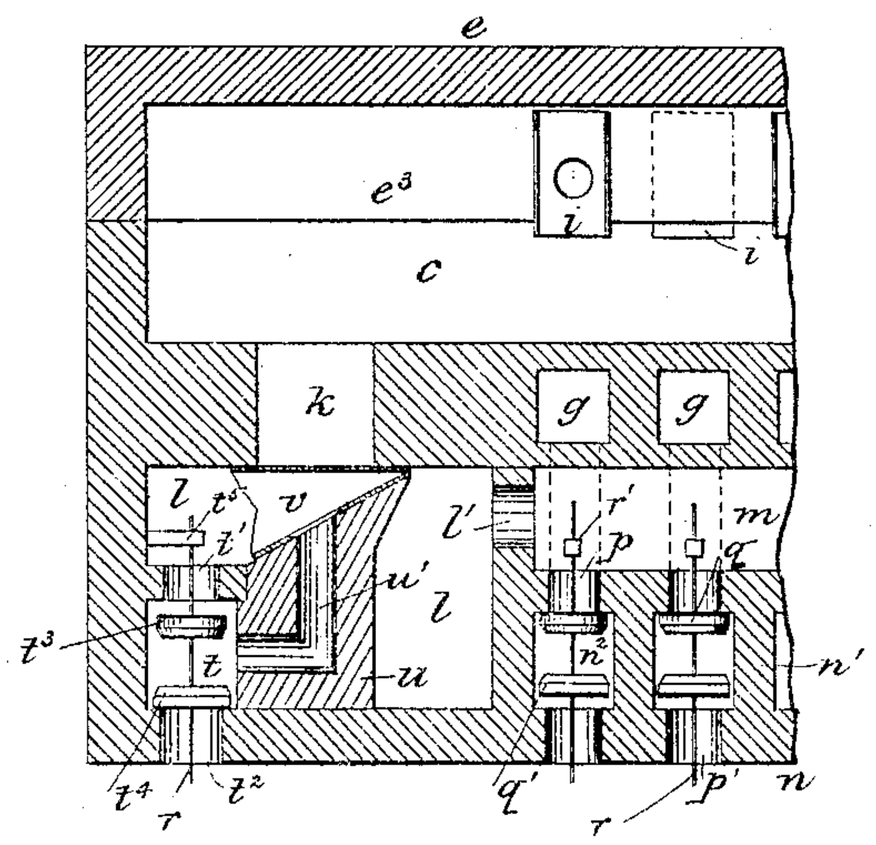


FIG. 6.



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UNITED STATES PATENT OFFICE.

SAMUEL RUSSELL WARREN, OF MONTREAL, CANADA.

IMPROVEMENT IN THE CONSTRUCTION OF ORGANS.

Specification forming part of Letters Patent No. **131,984**, dated October 8, 1872.

To all whom it may concern:

Be it known that I, SAMUEL RUSSELL WARREN, of the city of Montreal, in the district of Montreal, in the Province of Quebec, Canada, organ-builder, have invented certain new and useful Improvements on the Construction of Organs; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawing, where—

Figure 1 represents a transverse section of the wind-chest across the cells; Fig. 2 represents a section of wind-chest and wind-trunk; Fig. 3 represents a detail of the bellows; Fig. 4 represents a detail of the action of the keys; Fig. 5 represents a plan, showing partly the upper surface of the wind-chest, part with the top-board removed to show the cells, and also showing the arrangement of the wind-chamber; and Fig. 6 represents a section on line A A, Fig. 5, enlarged. Nos. 1, 2, 4, and 6 of these figures are drawn to a scale of about one-quarter full size; No. 3, full size; and No. 5, one-eighth full size.

It has long been a desideratum with organists and organ-builders to find some means of lessening the amount of force required to play an organ of even moderate power against the pressure of the wind in the chest when any number of the stops are down, the amount of pressure for each key amounting to as high as half a pound, which renders the performance of any piece of music where the full power of the organ is at all required most fatiguing to the player. Within the last fifty years many plans have been devised to in some way obviate this difficulty: pneumatic levers, which are, however, very complicated in construction and require a large amount of wind in addition to that for the pipes; touch-lighteners, which but imperfectly fulfil their purposes; and many other devices; but I claim in this invention to have reduced the pressure required to force down the keys to an almost nominal amount, even with all the stops of the organ drawn, and against the whole force of the wind therefrom. Another advantage which I claim is that there is no delay whatever in the transmission of the action, the pipes speaking almost simultaneously with the pressure on the keys. By this invention, also, the force required to draw the stops (a serious item with organs as at present constructed) is reduced to a minimum, and they may even be arranged to be worked by keys, if desired, instead of by the present system. I claim, also, that by my invention a far less amount of wind is required, (at least twenty-five per cent.,) the escape through the slides, which work the stops at present, being entirely avoided.

With these preliminary observations I will now proceed to describe the construction of my invention in such manner as to enable any skilled person to manufacture the same.

In the drawing, similar letters of reference indicate like parts.

Letter *a* is the wind-chest, of any length and breadth necessary to receive the requisite number of pipes *b*, shown in Fig. 5, and divided up by partitions *c* running longitudinally into cells *d*, one for each stop or register to the chest. The top board *e* is formed, as shown in Fig. 1, in sections e^1 e^2, screwed down or otherwise fastened to the partitions *c*, made wide enough for that purpose. It is, as also shown in Fig. 1, formed with a number of angles, e^3, of more or less acuteness on its lower side, one of these angles fitting and projecting downward into each cell *d*. In this are bored, alternately on each side of the angle, the holes *f* to receive the feet of the pipes. In the bottom of the wind-chest are formed main channels *g*, one preferably to each key or note in the key-board, running transversely to the cells *d* and varying in size, if required. Communicating with these main channels are bored, first vertically and then horizontally, as shown in Fig. 1, in the thickness of the partitions *c*, smaller channels *h*, arranged so as to communicate alternately with the cells on either side, and having the openings in the cells *d* exactly opposite to those at the lower ends of the holes *f*. In the space between the angle e^3 and the partition *c*, and firmly secured to the latter, are placed small bellows *i*, exactly covering, when full, the apertures of *f* and *h*, the hole in the bellows being over the aperture *h*. These bellows are, as shown in Fig. 3, provided on either side with a spring, i', for the purpose of making sure that the bellows are pressed close up against the side of the angle e^3 when the wind is first introduced. Should greater strength be required, a bow-spring

may be placed within the bellows, but it will be found that in most cases the spring as shown will be amply sufficient. At the end of each cell *d* is placed an opening, *k*, opened or closed by a valve, *k'*, (which may be worked by a draw or slide, as now in use, or by any ordinary pallet,) and communicating with the wind-trunk *l*, to which wind is brought from the bellows by any ordinary vertical trunk. This wind-chest also opens, by means of an aperture *l'*, into a wind-chamber, *m*, placed underneath the wind-chest and running its whole length. Under this is placed again a valve-chamber, *n*, divided up by partitions n^1 into a series of smaller chambers, n^2, one to each main channel *g*, with which it is connected by a channel, *o*. In the upper and lower sides of these valve-chambers n^2 are formed apertures *p p'*, communicating, one with the wind-chamber *m*, and the other with the external air. These openings may be closed by means of "poppet"-valves *q q'*, connected together by wire *r*, of the usual pattern employed by organ-builders; this wire passes up into the wind-chamber *m* through a guide, r^1, placed there for it, and downward through the aperture *p'* and another guide, r^2, placed across it, and is attached directly to the pivoted key or lever *s*, pressed down by the organist in playing. If it be possible, it is preferable to connect the wire *r* directly to the key *s*, as in Fig. 1, but should this be impossible, in Fig. 4 is shown a system of pivoted levers, s^1 s^2, in combination with the key *s*, by which the same effect may be produced, a bow-spring, if desired, being placed on the under side of the chamber *n*, so as to press on the key s^1, and give the requisite degree of friction. It will be noticed that the poppet-valves *q q'* are so arranged that when the opening *p* is closed by the valve *q* the valve *q'* leaves open the aperture *p'*. In Fig. 2 the valve-chambers, numbered 1, 4, and 5, show the wire *r* pressed upward by the action of the lever in playing, thus closing the aperture *p* and leaving *p'* open, and giving a communication from the valve-chamber n^2 to the external air. When, however, the levers, acting upon these respective sets of valves, are not touched the valve *q* falls, thus opening communication by the aperture *p* between the wind and valve chambers, the external air being shut off by the valve *q'* closing the aperture *p'*, as in the chambers marked 2 and 3, Fig. 2. By preference, the valve *q* is circular in shape, and *q'* rectangular; this is for the purpose of being able to adjust more accurately the distance between them, and thus the amount of opening which one valve will leave when the other is closed; for this reason I prefer to have the valve-chambers n^2, as shown in Fig. 6, of just sufficient size to admit the valve *q'* easily and without fear of jamming, rather than as in Fig. 2, where they are shown of a larger size. This action, as above described, applies only to the key-board of an organ, the apertures *k*, from the wind-trunk *l* into the cells *d*, being opened or closed by means of a draw, as at present practiced. It is found, however, in practice, that the handles of the stops, especially when there is a large pressure of wind, and under certain conditions of the atmosphere, are extremely difficult to draw. To obviate this I have applied the principle of my key-action, as above described, to the stops, as shown in Figs. 5 and 6. In these it will be seen that the cells *d* are carried back to the extreme rear of the chest, and the wind-trunk *l* placed below on the same level as the wind and valve chambers *m* and *n*, the opening *k* being preferably rectangular in shape, and air being admitted to it, as described. In the wind-trunk *l* is formed a valve-chamber, *t*, with apertures t^1 and t^2, communicating, the one with the wind-trunk and the other with the external air. These are closed, as before described, by valves t^3 t^4, arranged as above, the wire *r* connecting them passing through guides t^5, as may be required, and connected below, either with levers and elbows, so as to be actuated by a draw, or even connected with a key-board placed conveniently for that purpose, springs being used to give the requisite amount of friction to keep the stop out. In the block *u*, forming one side of the chamber *t*, is bored the passage *u'*, opening at its upper end into the bellows *v*, which may be provided with a spring, as before mentioned, and which, when full, close the aperture *k*. This contrivance may be applied only to one or two of the large stops in an organ, the other stops being worked by an ordinary valve, or it may be applied to the whole of the register. The bellows are formed as shown in Fig. 3, the front and back being preferably made of mill-board, or its equivalent, and the front and sides covered with soft leather or other approved substance, in the mill-board of the front being formed a hole exactly opposite the one in the back, through which the air is admitted, and arranged so that when the bellows are inflated the lower end of the channel *f* will only be covered by the leather or the covering of the bellows.

The operation of my invention is as follows: The parts having been arranged substantially as described, and the exact distance between the valves *q* and *q'* having been adjusted on the wire *r*, wind is, in the usual manner, forced from the bellows, and, by any ordinary means, into the wind-trunk *l*. The organist having drawn as many of the valves *k'* as he may require, the corresponding cells *d*, thus placed in communication with the wind-trunk *l*, are filled with wind from it. The wind also passes through the opening *l'* into the wind-chamber *m*, and thence by the apertures *p* into the valve-chambers n^2, whence it is conveyed by the channels *o* into the main channels *g*, passing through the small channels *h* into the bellows *i*, which are thereby fully inflated, as shown in Fig. 1, the leather or other covering of the bellows being pressed onto the openings. It will be seen that the pressure of air within and without the bellows is equal. The organ-

ist now, in beginning to play, presses down the keys *s*, as many of them as he may wish, and thus, either by direct action, as in Fig. 1, or by means of pivoted levers, of which one arrangement is shown in Fig. 4, presses up the wire *r* and with it the poppet-valves *q q'*, the upper one, *q*, closing the aperture *p* between the wind-chamber *m* and each valve-chamber n^2, of which the corresponding lever is touched and the lower one, *q'*, leaving open the aperture *p'* in that chamber. The result of this may be easily seen. The supply of wind being cut off from that particular bellows, the internal pressure is no longer maintained and a way of egress for the wind being provided by the opening of the aperture *p'*, that in the bellows is forced by the external pressure of the air in the cell *d* down through the passage *h* into the main channel *g*, and thence by the channel *o* into the valve-chamber n^2 and out at the aperture *p*. The pressure of the wind in the bellows *i* being thus removed, they are forced open into the position shown by the dotted line in Fig. 3, and the wind passing through the holes *f* enters the pipes, making them "speak." As soon as the pressure is removed, from each lever the parts resume their original position, the valves *q* and *q'* dropping and by so doing closing the apertures *p'* and opening *p*. It must be recollected that the opening of the bellows and the admission of air to the pipe are almost instantaneous upon the lever being pressed down.

In this operation I have, however, described the action of the organ with stops arranged to be drawn in the ordinary style. The working of the modification shown in Figs. 5 and 6, and which would be preferable, would be as nearly as possible that already described for the keys, the air from the wind-trunk *l* entering the valve-chamber *t*, through the aperture t^1, passes through the channel *u'* into the bellows *v*, inflating them and keeping the aperture *k* closed. Directly, however, that, either by means of pressing a key in a key-board specially for the stops, or by drawing a handle as at present, the valves t^3 t^4 are pressed up, thus closing the influx of air to the bellows and providing a means of egress for it, the air in the bellows rushes out through the channel *u* and aperture t^2, the bellows collapsing and opening the aperture *k*, through which the air is admitted to the cell *d*.

It will be seen by the foregoing description that the only resistance which has to be overcome in pressing down each key is the suction of the wind upon the upper surface of the valve *q'*.

The parts of the chest being so simple are very unlikely to get out of order, but should any damage occur to any of the bellows the section of the wind-chest in which the damage exists may easily be removed without disturbing at all the general arrangement of the organ.

It has been shown that, by the above-described invention, the construction of the wind-chest is simplified, organ-playing is rendered non-fatiguing, both as regards the key-board and pedals; and the stops, no longer affected by dampness or heat, do not require any exertion to work them.

The arrangement of the wind-chest, valve-chambers, valves, &c., both for stops and keys, is peculiarly adapted for the application thereto of electricity, no alteration of construction being needed and nothing being required but the application of the magnets.

Having thus described my invention, what I claim is as follows:

1. The art of removing the difficulty of working the stops of an organ, by establishing for each stop a counter-balancing pressure of wind in a bellows arranged to act directly and without the slide-valves, inclosing the opening into the register, the counter-balance being removed and the air admitted to the register by the collapse of the bellows.

2. The wind-chest *a*, with divisions *c* and cells *d*, in combination with the wind-trunk *l* placed either on the same level or below, substantially as and for the purpose described.

3. The top *e* of the wind-chest, constructed in sections e^1 e^2, substantially as set forth.

4. The wind-chamber *m*, in combination with the wind-trunk *l*, valve-chambers n^2, arranged with openings *p p'* and poppet-valves *q q'*, channels *o* or their equivalents, main channels *g*, small channels *h*, and bellows *i* or their equivalents, working in combination with keys *s*, passages *f*, and pipes *b*, substantially as and for the purposes set forth.

5. The bellows *i*, arranged in combination with the division *c* and angle e^3, substantially as and for the purposes set forth.

6. The valve-chamber *t*, arranged with openings t^1 t^2 and valves t^3 t^4, channel *u'* and bellows *v*, in combination with the wind-trunk *l* and opening *k*, substantially as and for the purposes set forth.

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