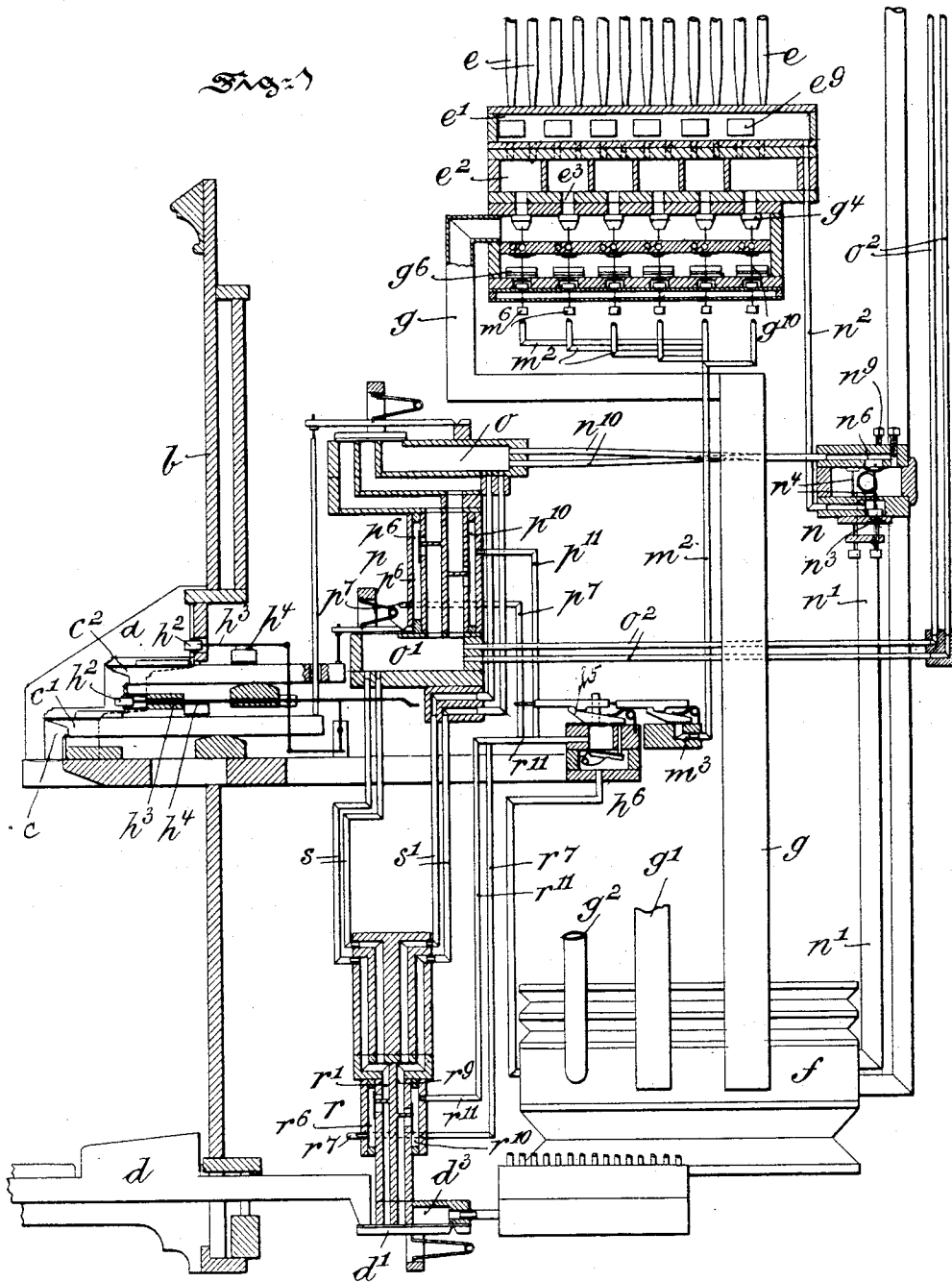


J. NEEF.
PNEUMATIC ORGAN.

No. 539,757.

Patented May 21, 1895.



Witnesses:
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Richard C. Maxwell.

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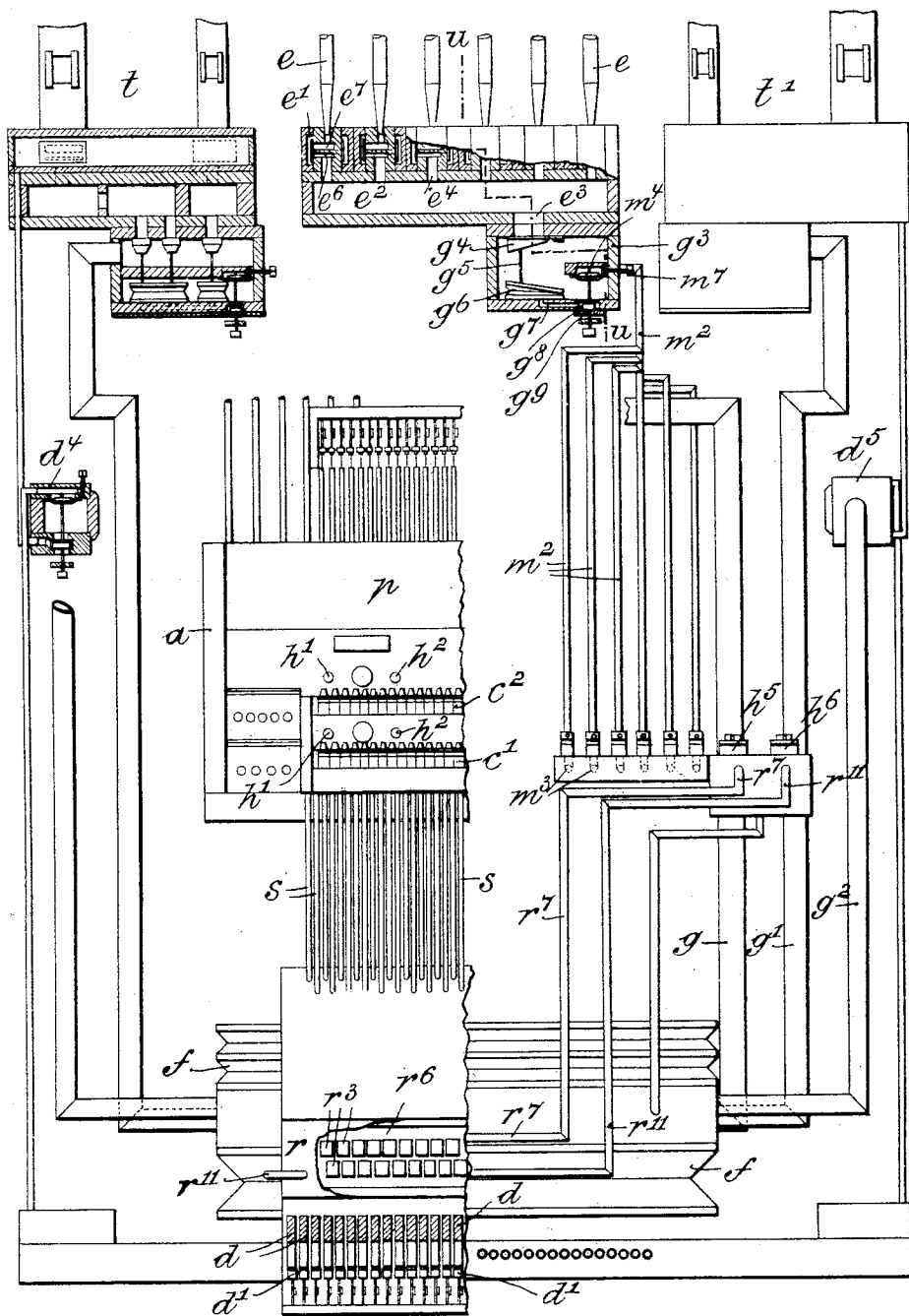


Fig. 2

Witnesses:
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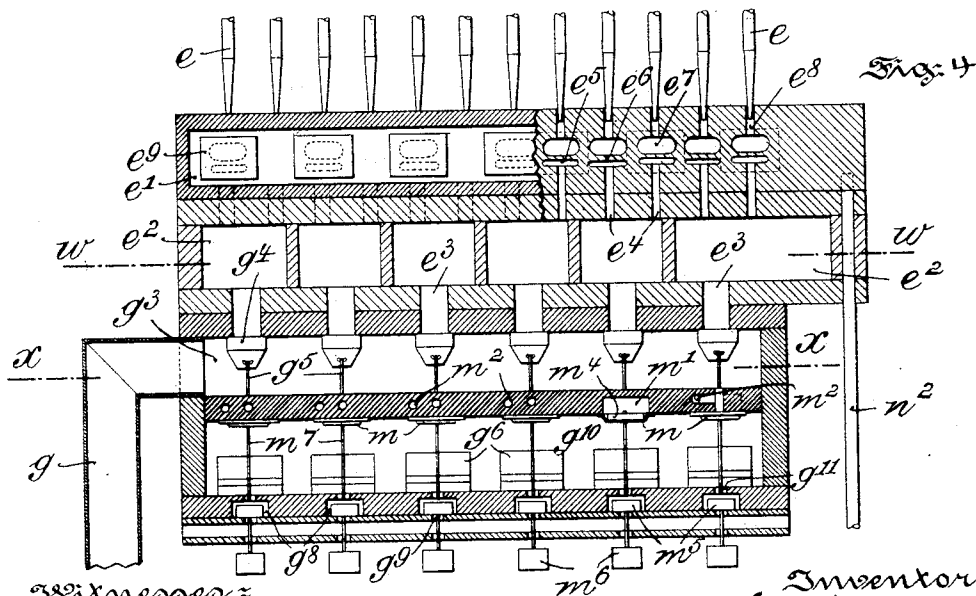
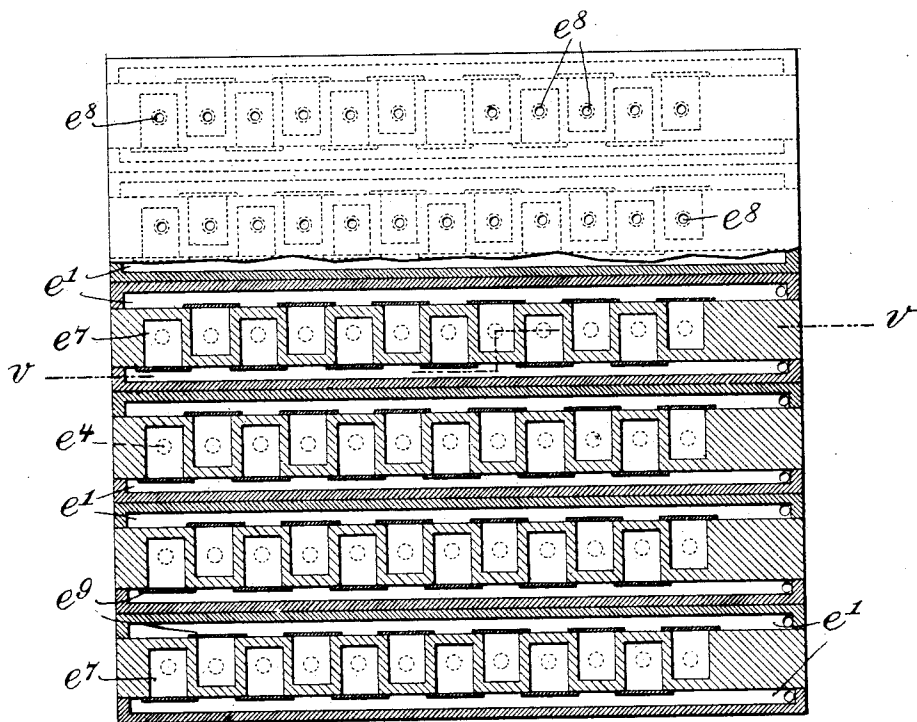
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Fig. 3



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Fig. 5

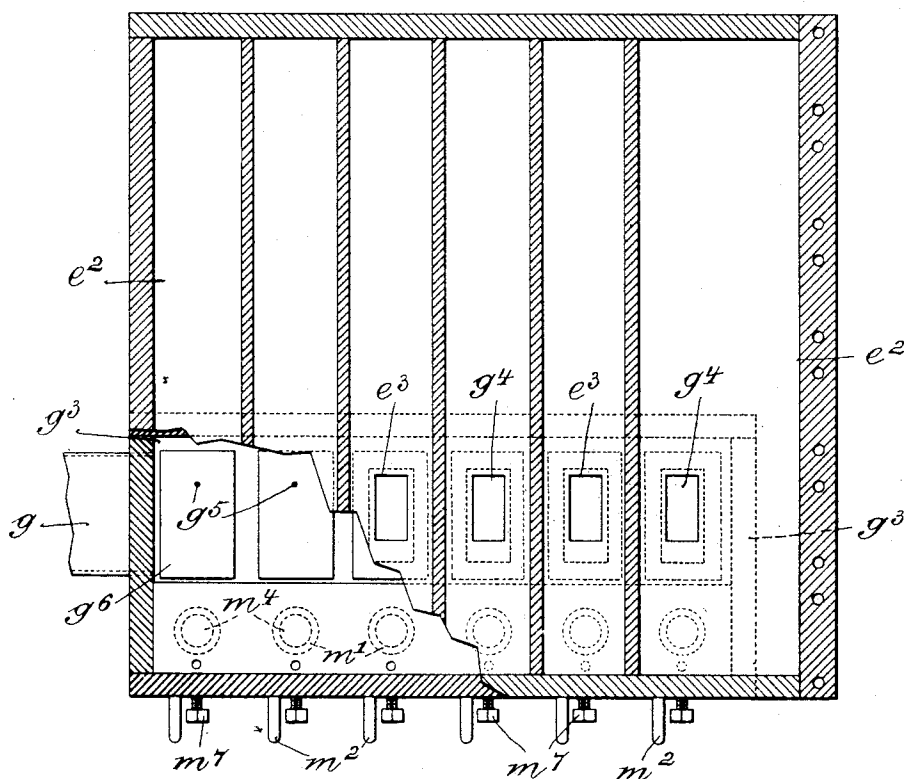
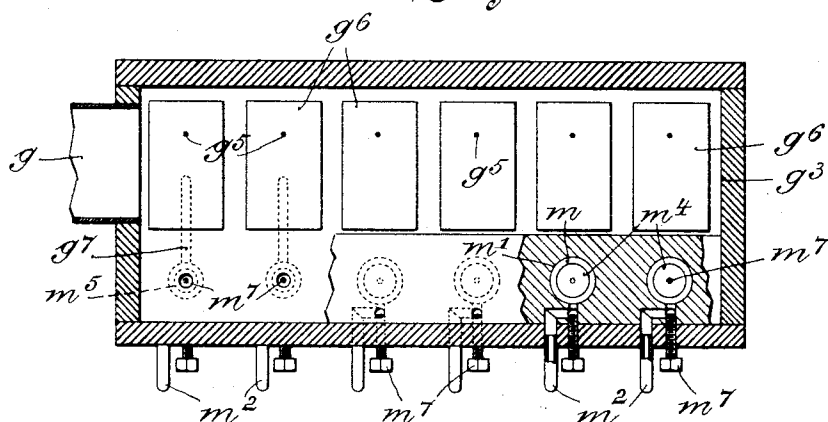


Fig. 6



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Fig: 7

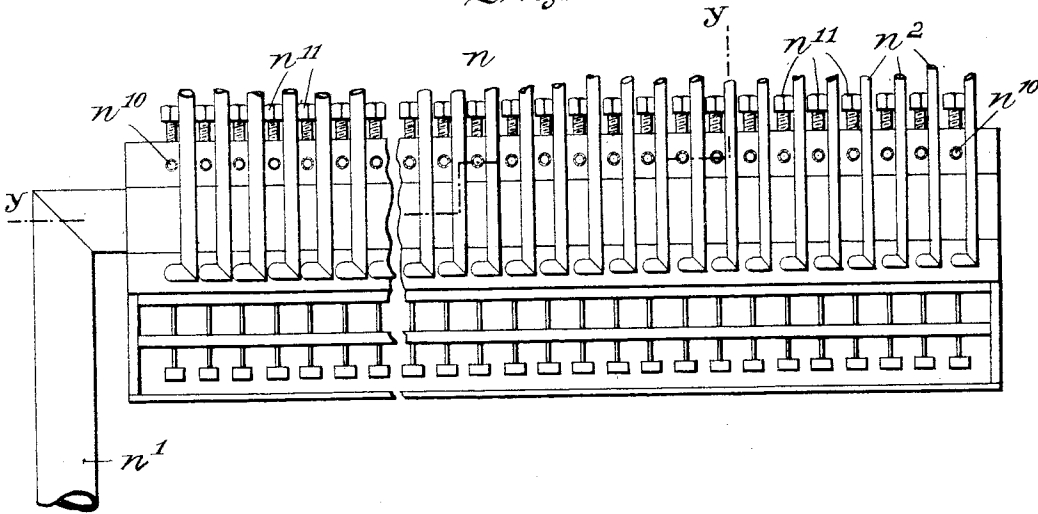


Fig: 8

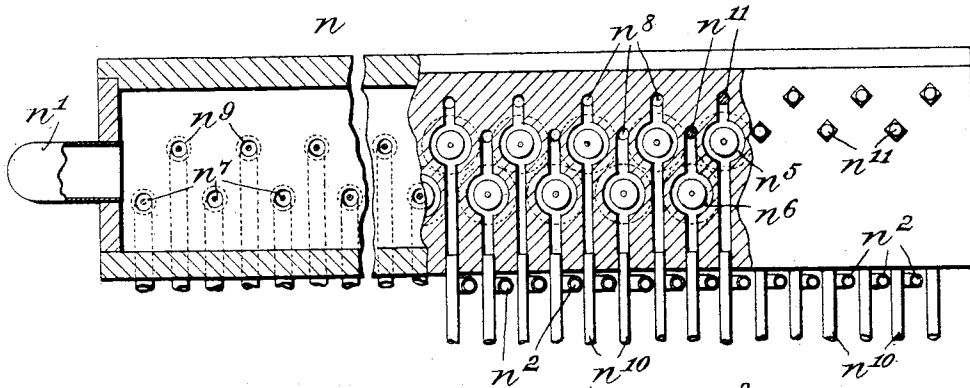
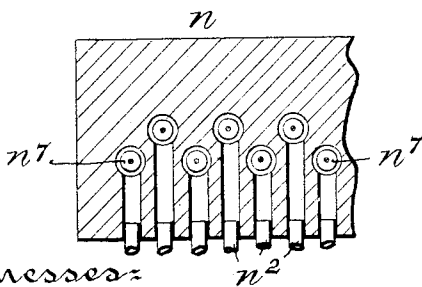
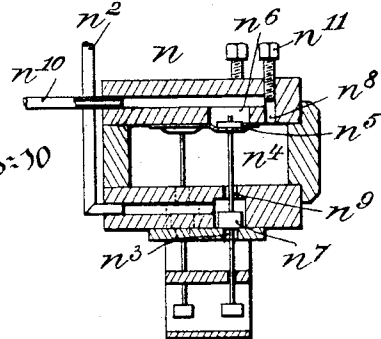


Fig: 9



Witnesses:
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Richard C. Maxwell.

Fig: 10

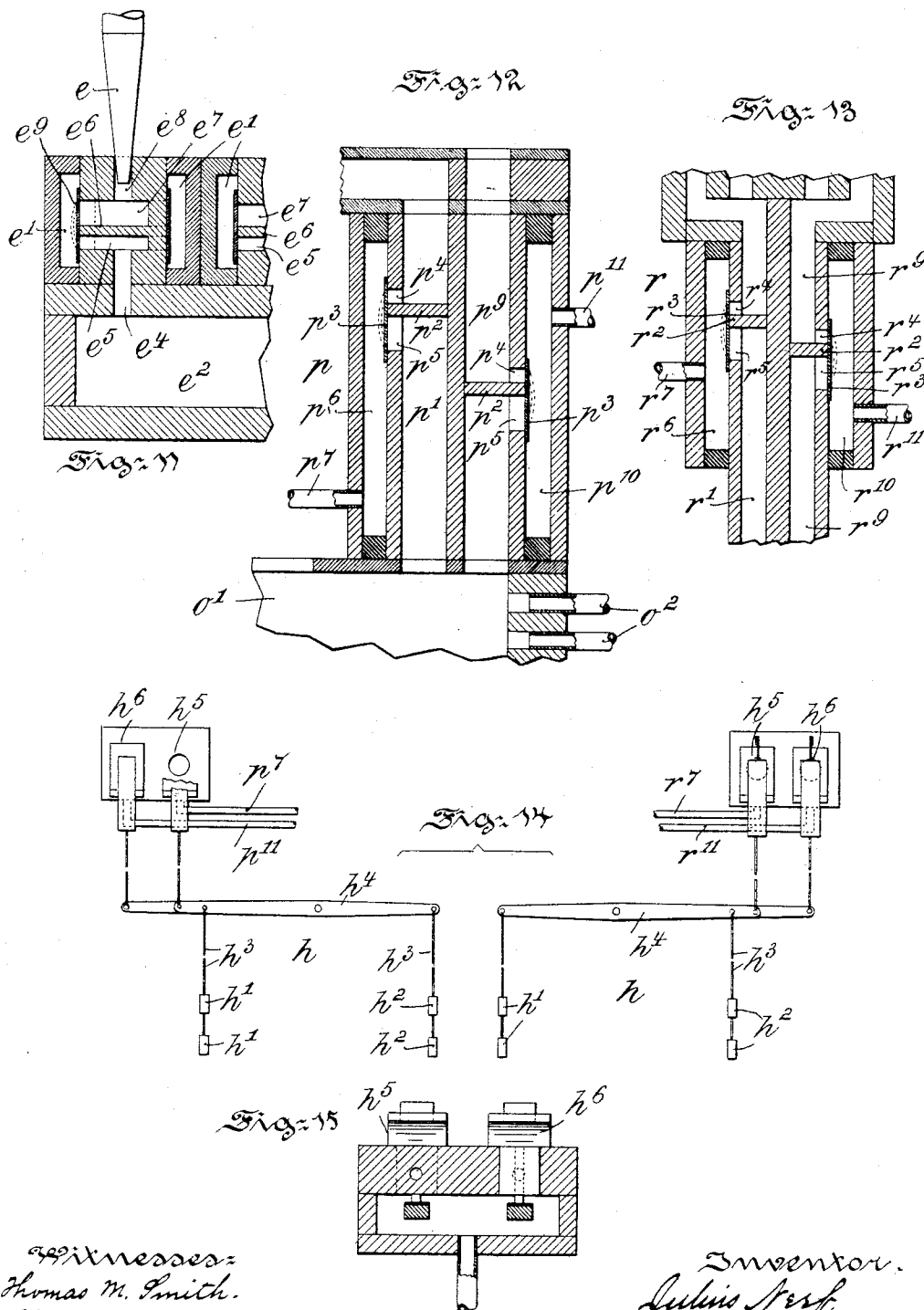


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UNITED STATES PATENT OFFICE.

JULIUS NEEF, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF
AND JOHN B. DIDINGER, OF SAME PLACE.

PNEUMATIC ORGAN.

SPECIFICATION forming part of Letters Patent No. 539,757, dated May 21, 1895.

Application filed January 7, 1895. Serial No. 534,015. (No model.)

To all whom it may concern:

Be it known that I, JULIUS NEEF, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Pneumatic Organs, of which the following is a specification.

My invention has relation to organs and particularly to that class known as pneumatic organs.

The principal object of my invention is to provide for the utilization of one source of wind supply and that of a constant nature for the purpose of actuating the couplers and other pneumatic parts and also the organ pipes, the keys, when operating the necessary valves, liberating exhaust wind therefrom to cause the pipes to speak.

My invention consists of a pneumatic organ constructed and arranged in substantially the manner hereinafter described and claimed.

The nature and general scope of my invention will be more fully understood from the following description taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a view, partly in side elevation and partly in section, of the desk of an organ, showing the arrangement and construction of the main parts of the organ and their connection with the pneumatic parts embodying features of my invention. Fig. 2 is a front elevation showing parts of the organ in broken section. Fig. 3 is an enlarged top plan view of a part of the great organ, partly in section, with the pipes removed. Fig. 4 is an enlarged sectional view taken on the line *u u* of Fig. 2 or *v v* of Fig. 3. Fig. 5 is a transverse sectional view on the line *w w* of Fig. 4. Fig. 6 is a similar view taken on the line *x x* of Fig. 4. Fig. 7 is an enlarged side elevation of the great station and its connections. Fig. 8 is a sectional view of the said great station taken on the line *y y* of Fig. 7. Fig. 9 is a horizontal section on a plane taken through the channels just above the valves *n*⁷. Fig. 10 is an enlarged cross sectional view of said station. Fig. 11 is an enlarged detail sectional view of the inlet chambers to one of the pipes and of the diaphragm or membrane valves control-

ling said inlet. Fig. 12 is an enlarged detail sectional view of the manual coupler and of the diaphragm or membrane valves controlling the chambers therein. Fig. 13 is an enlarged detail sectional view of the pedal-coupler and of the valves controlling the same. Fig. 14 is a diagrammatic view of the coupler mechanism, and Fig. 15 is an enlarged sectional view of one set of the valves of said 60 coupler mechanism.

Referring to the drawings *a*, is the desk of the organ. *b*, is the housing therefor; and *c*, the manual keyboard consisting as shown, of the great organ register *c'*, and swell organ 65 register *c*². However, it is obvious that the said key-board may include other registers, if desired.

The pedal key-board is designated by *d*, the great organ pipes by *e*, the bellows or wind 70 supply by *f*, and the wind trunks leading to the great and pedal organs respectively by *g*, *g'* and *g*².

The parts heretofore described are of the usual well known construction, as is the coupler mechanism *h*, consisting of the buttons *h'*, *h'*, and *h*², *h*², the rods *h*³, levers *h*⁴, &c., operating the valves *h*⁵, *h*⁵, and *h*⁶, *h*⁶, as clearly illustrated in Fig. 14.

The keys of the key-board *c'* and *c*², control 80 through their respective stickers and wires the upper and lower pallet-boxes *o* and *o'*, in the usual manner.

Before proceeding further with the description of my invention it should be understood 85 that in the drawings for the sake of clearness, certain parts of the organ have been eliminated. As for instance, the pipes and the wind-chest of the swell organ, while connections between the same and the other parts 90 of the organ are shown in part only, it may be here remarked that the great organ and its connections have been clearly illustrated, and the following description thereof, with such modifications as will be suggestive to the 95 practical organ builder, can be equally well applied to the construction and arrangement of the pedal and swell organs and their connections, without further explanation or detail description or illustration thereof.

Referring now to the great organ, each one 100 of the pipes *e*, is placed upon the wind box

e' , which in turn is placed upon a wind-chest e^2 , having valve controlled inlets e^3 . The wind-chest e^2 , and the wind-box e' , communicate by means of ports e^4 , which lead into lower
 5 air chambers e^5 , separated by a partition e^6 , from the upper air chambers e^7 , which communicate through ports e^8 , with the mouth of the pipe e . Communication is had from the lower air chamber e^5 , to the upper chamber
 10 e^7 , around one end of the partition e^6 , which communication is regulated by a membrane e^9 , as clearly illustrated in Figs. 1, 3, 4 and 11. The inlet e^3 , leads from the wind trunk-box g^3 , and is controlled by the valve g^4 , one end
 15 of which is secured by a rod g^5 , to a "pneumatic" or small bellows g^6 , having an outlet g^7 , leading by a port g^8 , to a valve controlled exit port g^9 , into the atmosphere, as clearly illustrated in Figs. 2 and 4. The exit port g^9 ,
 20 is controlled by a valve g^{10} , which is supported from a leather or other flexible disk m , forming one of the walls of an air passage m' which leads through a tube m^2 , to the appropriate draw-stop outlet m^3 , as clearly illustrated in Figs. 2, 4 and 6. The valve g^{10} , consists of two seats m^4 and m^5 , and a weight m^6 ,
 25 united by a spindle or rod m^7 . The upper seat m^4 , rests upon the membrane m . The lower seat m^5 , controls the outlet from the bellows g^6 , through the port g^9 , to the atmosphere, and also controls an inlet g^{11} , from the wind trunk-box g^3 , to the bellows g^6 . The volume of air escaping through the tube m^2 , is regulated by an adjustable or thumb screw m^7 .
 30 Preferably at the back and the sides of the organ are ranged three or more stations or wind boxes, known respectively as the great, swell, pedal, sharp and natural stations, &c., only one of which, the great station, has been
 35 fully illustrated and will be described in the present application, as the others are similar thereto. The pedal station is illustrated in Fig. 2.

The great organ station n , is a long wind-box having direct communication through the trunk n' , with the bellows or air reservoir f . It also communicates by exhaust tubes n^2 , with the wind-box e' . These exhaust tubes n^2 , are arranged in three series, and by preference the tubes of each series vary in diameter from those of the other series. Thus, for instance, in Fig. 7, the tubes on the right hand are the smallest, while those in the middle are of a medium size, and those on the left are the
 45 largest. This arrangement is advantageous for the following reasons: The pipes to which these tubes lead vary in diameter and require varying volumes of air for intoning. Again where the air supply is either insufficient or
 50 too great, as is the case where the tubes leading to the pipes are of one size, the tone produced would be irregular, that is, uncontrollable or ciphering. The outlet ports n^3 , of these tubes are controlled by valves n^4 , similar in construction to the valves g^{10} , hereinbefore explained and suspended from a disk or membrane n^5 , forming one wall of the air passage

n^6 , leading by a tube n^{10} , from the great station to the pallet-box o . The lower seat n^7 , of the valve n^4 , controls the outlet from the
 70 port n^3 , to the atmosphere and the inlet n^8 , from the station n , to the tubes n^2 , and then to the wind-box e' , of the great organ. Leading from the air passage n^6 , into the great station is a port n^8 , controlled by the adjusting screw n^{11} , as clearly illustrated in Figs. 1,
 75 7, 8, and 10.

The pallet-boxes o and o' , are of the usual construction and arrangement, and therefore a detailed description of the same, is deemed
 80 unnecessary. Situated between the pallet-boxes o and o' , is the improved pneumatic manual coupling device p . Leading from an appropriate compartment of the pallet-box o , to a corresponding compartment of the box
 85 o' , is a trunk or air passage p' , normally obstructed by a partition p^2 , extending from one wall transversely across the passage to an opening in the other wall covered by a membrane p^3 , as clearly illustrated in Figs. 1 and
 90 12. The arrangement of this membrane and the partitioned opening covered thereby is similar to that of the chambers e^5 and e^7 , leading to the pipes e , partition e^6 , and the membrane e^9 , therefor. The partition divides into
 95 two openings, one of which is approximately two and one-half times the area of the other. In the instance shown, in the organ pipe inlets the lower opening or air chamber e^5 , is the smaller, that is to say, the opening communicating through the port e^4 , to the wind-box e' ,
 100 while the opening above is greater and leads to a channel e^8 , of approximately the same area as the smaller opening e^5 , and in direct communication with the organ-pipes.

In the coupler mechanism the upper opening p^4 , is the smaller and lower opening p^5 , the larger. On the outside of the passage p' , that is to say, outside the membrane is an air passage or channel p^6 , communicating through
 105 the tube p^7 , with the "on" coupler valves h^5 , of the usual well known character. On the opposite side of the air passage p' , is a corresponding passage p^8 , which being a duplicate of the passage p' , a repeated description thereof, is needless. Outside this passage p^8 , is a channel p^{10} , leading through a tube p^{11} , to another "on" valve h^6 , of the coupling mechanism. This passage p' , and its membrane p^3 ,
 110 couples the swell organ to the great organ key c' and the passage p^8 , and its membrane p^3 , couples the great organ key c' and the swell organ by octaves. The manual and pedal registers are coupled together when the manual coupler p , is connected with the pedal
 115 coupler r . The general construction of the pedal coupler r , and the manual coupler p , is similar. The membrane r^3 , and partition r^2 , in the passages r' and r^8 , correspond in detail with the membranes p^3 , partition p^2 , and
 120 passages p' and p^8 , of the manual coupler. The outside channels r^6 and r^{10} , communicate respectively through tubes r^7 and r^{11} , with the pedal coupler valves. The natural pedal

chest t , and the sharp pedal chest t' , are of the usual construction and arrangement, as indicated in part in Fig. 2. These pedal chests are provided with the improved valves and membranes hereinbefore described in connection with the great organ.

The passage r' , is connected by the tube s , with the lower pallet box o' , and the passage r'' , is connected by the tube s' , with the upper pallet box o , for respectively coupling the pedal to the swell organ and the great organ *ad libitum*. The lower ends of the passages r' and r'' , are closed by a valve d' , controlled by a key d , of the pedal. It is of course to be understood that the lower pallet-box o' , is connected by means of the tube o^2 , with the swell station of a character similar to the great station, but not illustrated, and that the pedal pallet-box is likewise connected with appropriate pedal-stations d^4 and d^5 , illustrated in Fig. 2, of the drawings, and similar in construction and arrangement to the great station.

The operation of a pneumatic organ of my invention is as follows: All of the parts of the organ being under a uniform wind pressure from the bellows f , and all the valves and membranes being closed, as illustrated in the drawings, the organ is mute. If now, for instance, one of the keys of the great organ be depressed, the corresponding valve in the pallet box o , is opened through the sticker and its tapped wire provided with a leather or nut. Immediately air escapes through the tube n^{10} , from the air passage n^6 , in the station n , which air passage n^6 , is situated above the diaphragm or membrane n^5 , controlling the valve n^4 . The excess of pressure within the station n , beneath the diaphragm n^5 , immediately raises said diaphragm and with it the valve n^4 , the lower seat n^7 , of which is lifted until the outlet n^3 , of the tube n^2 , is opened to the atmosphere. Air now escapes through said tube n^2 , being exhausted from the wind-box e' . The wind pressure heretofore in said wind-box e' , was sufficient to press the membrane e^9 , closely down upon the mouths of the chambers e^5 and e^7 , but when the air is exhausted from said box e' , the excess of wind in the smaller chamber e^5 , expands or bellies out the membrane into the shape indicated by the dotted lines in Fig. 11, in which position the air from the chamber e^5 , passes into the chamber e^7 , around the partition e^6 , and then through the inlet e^8 , into the required pipe e , which then speaks or intones. When now the key is released, the valve in the pallet-box is closed, the pressure in the tube n^{10} , is again normal, and the wind passes again thereinto through the controlled port n^8 , of the station n , pressing equally above and below the membrane n^5 , and restoring thereby the valve n^4 , to its normal position, in which position the outlet from the tube n^3 , to the air is closed and an inlet from the station to the tube n^2 , is opened. The normal pressure of wind now ascends the tube n^2 , enters the wind-box e' ,

and operates by reason of its pressure against a larger surface of the membrane e^9 , to close said membrane against the pressure from the smaller chamber e^5 , down upon the mouths of the chambers e^5 and e^7 , and the supply of air to the pipe is thus cut off, and sound ceases instantly.

The above description is equally applicable to one or all of the pipes of the great, swell, pedal or other organ with such modifications as will be obvious to those skilled in the art to which my present invention appertains.

The draw stop mechanism is set in operation as follows: The required stop is pulled and opens the outlet m^3 , to one of the draw-stop tubes m^2 . Air escaping through said tube is exhausted from the air channel m' , above the flexible disk or membrane m . The excess of pressure of wind in the wind trunk box g^3 , serves to press the membrane inward, thus elevating the valve g^{10} , the lower seat m^5 , of which being raised, a communication is opened between the outlet g^7 , of the bellows g^6 , and the atmosphere. The excess of pressure in the wind box g^3 , and the weight of the valve g^4 , are then sufficient to collapse said bellows and the valve g^4 , drops into an open position, opening thereby the inlet e^3 , into the wind-chest e^2 , and thus bringing the required set or sets of pipes under pressure direct from the bellows and into action, when required by the performer. When the draw-stop is returned to its "off" position the outlet tube m^2 , is closed, the pressure above and below the membrane m , is equalized, the valve g^{10} , is lowered, closing the exit from the bellows g^6 , into the atmosphere and opening the inlet g^{11} , from the box g^3 , to said bellows the bellows is expanded and the valve g^4 , elevated thereby and the inlet e^3 , closed.

The coupling mechanism between the upper and lower pallet-boxes is operated, as follows:—When the necessary button is pushed in or pulled out as the case may be, one of the valves h^5 or h^6 , is opened and a communication thereby established between either tube p^7 or p^{11} , and the atmosphere. The pressure within the outside channel p^6 or p^{10} , is lessened and the wind pressure within the passage p' or p^9 , bulges the membrane p^3 , sufficiently to allow the air to pass from the lower pallet-box through the passage p' or p^9 , around the partition p^2 , into the upper pallet-box, when the valve controlled by the corresponding key is opened and said key thereby depressed. This key then sets in operation the pipe or pipes required in the same manner, as if it had been specially depressed by the performer.

When the coupler mechanism is manipulated to an "off" position, the valves h^5 and h^6 , are closed, the outlet from the tube p^7 or p^{11} , to the air is closed, the pressure on each side of the membrane p^3 , is equalized, and the opening closed by the membrane.

In the pedal coupler the same description as above is applicable, there being membranes adapted to be operated by exhaust as above

described, which control the communication between the upper and lower pallet-boxes and the pedal pallet-box by means of the tube r^7 or r^{11} , controlled by the pedal coupler valves.

5 In addition thereto the lower end of the passage r' or r^3 , is closed by a valve d' , which is controlled by a pedal key d . When this valve d' , is opened the passage below the partition is under lower pressure than above the partition and this difference in pressure is sufficient to allow the air in the upper passage to bulge out the membrane and thus allow the air to pass around the partition.

15 It is manifest that other pneumatic parts of an organ may be equipped with my present invention, the main advantages of which are, first, that but one constant wind pressure is required to operate both pipes and pneumatic parts; second, that in the coupling arrangement shown the keys themselves are not so coupled as to be both depressed manually, but one is depressed manually and the other operated pneumatically by the wind being allowed to pass from the lower pallet box o' , into the open air, and, third, that under my present system the pneumatic organ responds as quickly, easily and readily to the touch of the performer, as if the organ was actuated electrically.

30 Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A pneumatic organ provided with a draw-stop pallet-box having an adjusting screw regulating the exhaust therefrom, valves having pipe connections with said box, membranes in said box and draw-stop valves in connection therewith, substantially as and for the purposes described.

40 2. A pneumatic organ provided with a station having membrane supported valves, exhaust ports leading to the pallet-boxes, regulating screws controlling the exhaust from said ports, pipe-connections with a wind-chest and said station and manual and pedal keys, the construction being such that said membrane supported valves and the regulating

device control the exhaust from said wind-chest said keys controlling said station, substantially as and for the purposes described. 50

3. A pneumatic organ provided with pallet-boxes, wind-boxes for the registers or stops of the organ pipes, a wind-station, a single wind supply or bellows, wind-trunks leading from the bellows to the said register or stop, wind-boxes, and wind-station, exhaust-tubes leading from the pallet-boxes to the wind-station and controlled by the key-valves for exhausting into said pallet-boxes, regulating screws controlling the exhaust from said tubes, 60 valves in the wind-station controlled by the exhaust-tubes to the pallet-boxes, tubes leading from the wind-station to a wind-box in the path of membranes controlling the pipe wind inlets, and said membranes controlled by the wind-station valves, substantially as and for the purposes described. 65

4. A pneumatic organ provided with great, swell and pedal pallet boxes, an air passage leading from each compartment of one of said boxes to a corresponding compartment of another of said boxes, a partition extending transversely from one wall of said passage to an opening in the other wall forming two inlets at said opening of which one is larger than the other, a membrane covering said inlets and with the partition closing the air passage, a channel arranged on the outside of the membrane and normally under pipe wind pressure closing said membrane down upon the inlets, a coupler valve adapted when operated to exhaust wind from said channel to thereby open communication in the air passage and to couple the pallet-box compartments connected thereby, substantially as 85 and for the purposes described.

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

JULIUS NEEF.

Witnesses:

J. WALTER DOUGLASS,
THOMAS M. SMITH.