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PNEUMATIC ACTION FOR PIPE ORGANS.

APPLICATION FILED APR. 11, 1911.

1,043,593.

Patented Nov. 5, 1912.

3 SHEETS—SHEET 1.

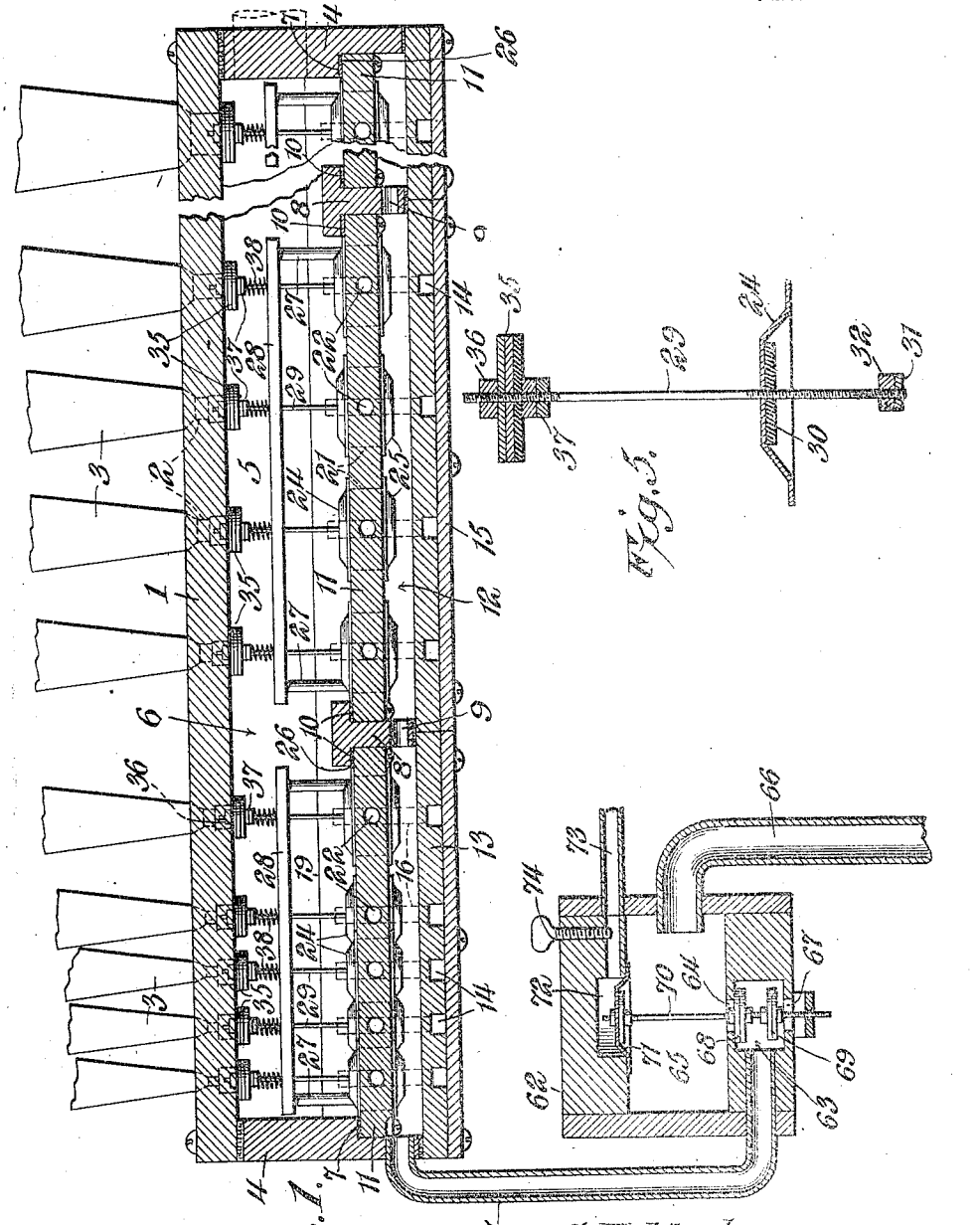

FIG. 1.

FIG. 3.

Witnesses

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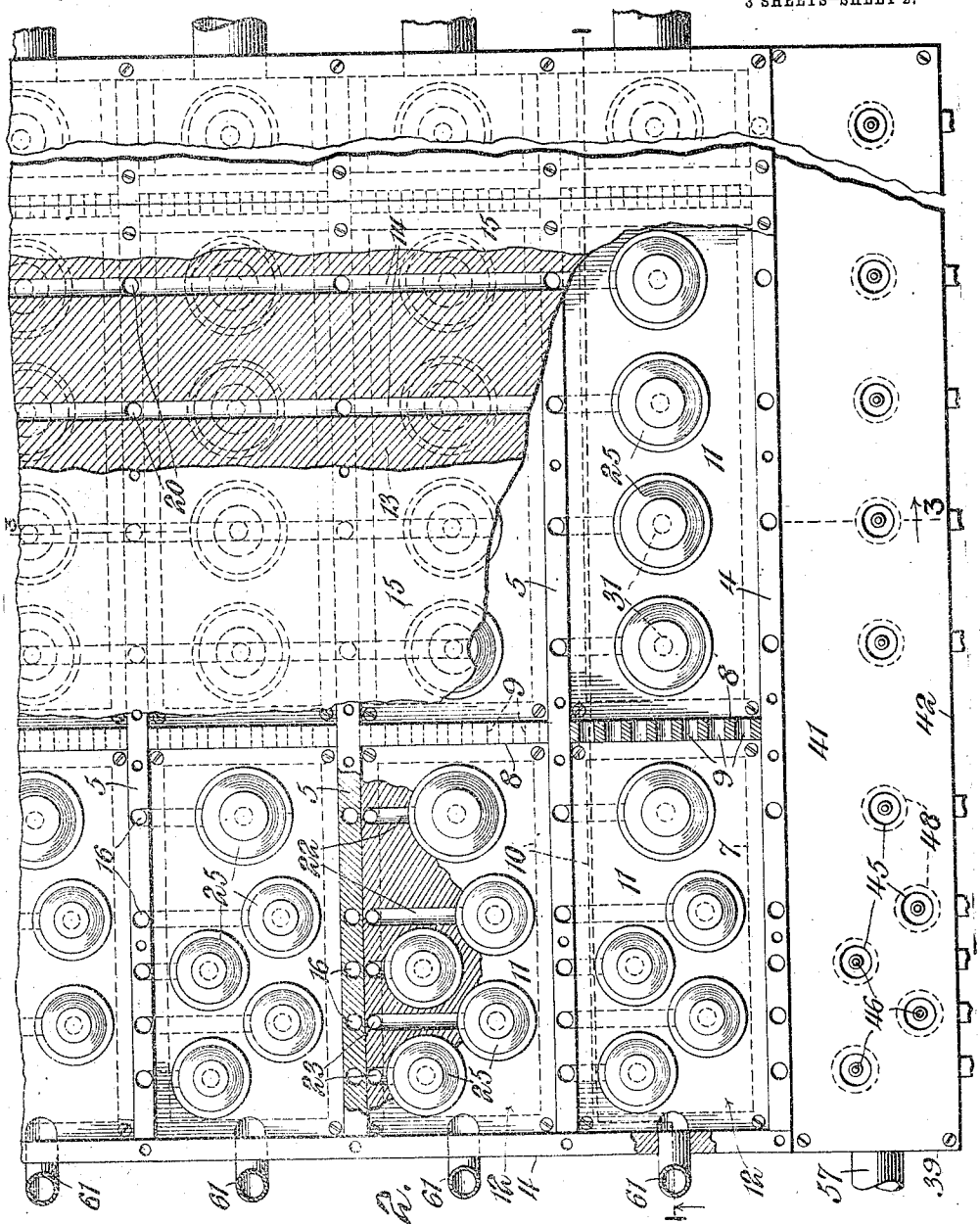

Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

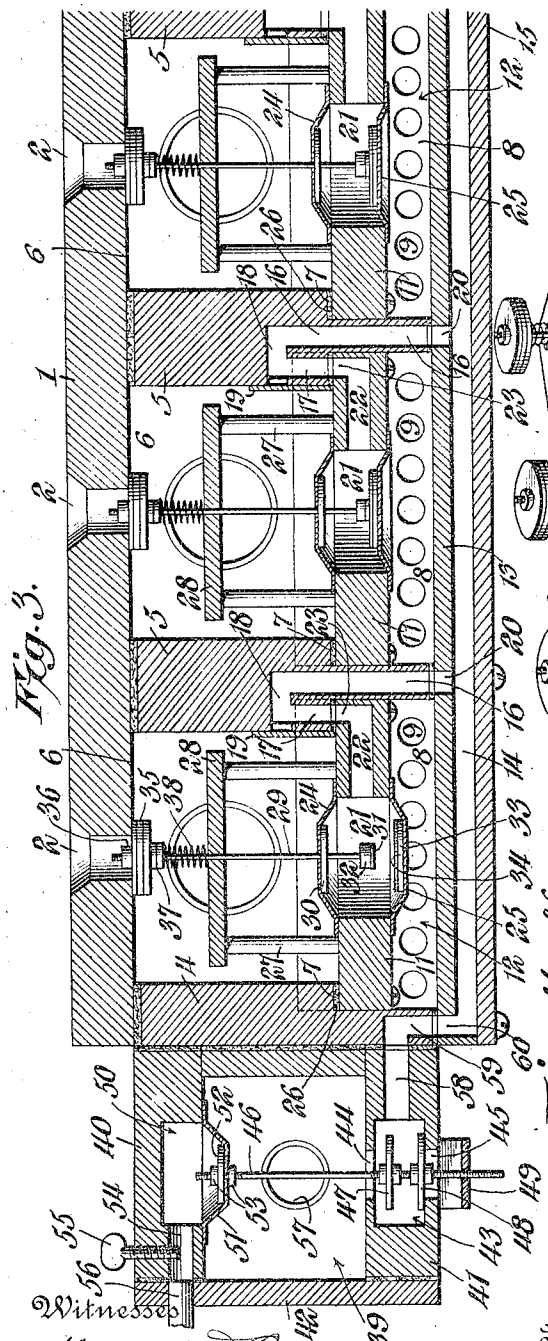
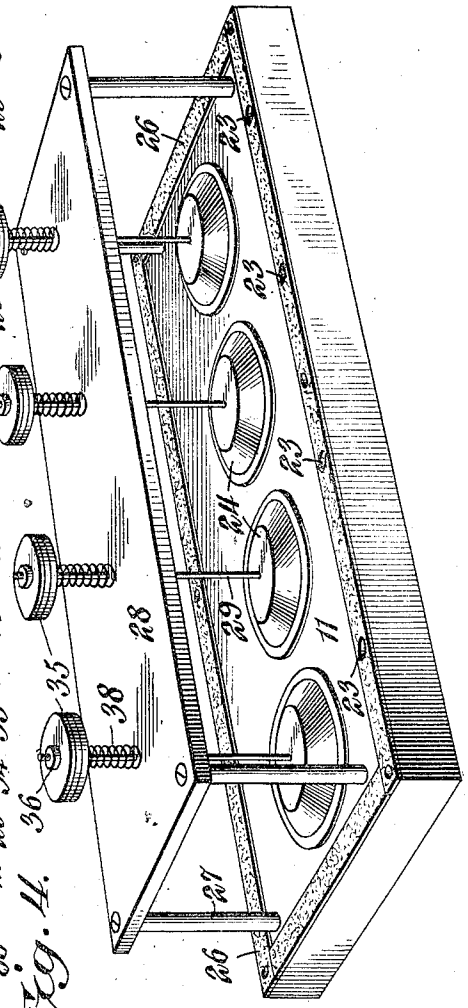


Fig. 4.



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UNITED STATES PATENT OFFICE.

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PNEUMATIC ACTION FOR PIPE-ORGANS.

1,043,593. Specification of Letters Patent. Patented Nov. 5, 1912.

Application filed April 11, 1911. Serial No. 620,436.

To all whom it may concern:

Be it known that I, CLARENCE K. HECKMAN, a citizen of the United States, residing at Hagerstown, in the county of Washington and State of Maryland, have invented certain new and useful Improvements in Pneumatic Actions for Pipe-Organs, of which the following is a specification.

This invention has reference to improvements in pneumatic actions for pipe organs, and its object is to provide an action held inactive by air pressure and rendered active by the release of air pressure, that is, the establishment of atmospheric pressure on one side of the parts to be actuated which then respond to the pressure already established on the other side thereof, and furthermore the invention contemplates the making of the puff rails in short sections, so that in the case of repairs being needed to the valves directly controlling the organ pipes, only a small portion of the puff rail need be removed in order to gain access to the parts needing repairs and the necessity of removing the whole puff rail belonging to a stop chest is avoided.

In accordance with the present invention the general arrangement of the action may conform to the common practice wherein a wind chest carries a number of sets of pipes, each set belonging to some one stop, and controlling the organ pipe valves is a wind chest individual to each stop and extending lengthwise of the set of pipes, while extending across the stop chests which are usually arranged in parallel relation one to the other are groove boards through which are formed conduits leading to the individual organ pipe valves at one end and at the other to a valve chest controlled by the keys of the organ.

In the present invention each pipe valve is under the control of a double puff, one puff being exposed to the pressure of the wind in the wind chest carrying the air designed to enter the pipes on the opening of the pipe valves, while the other puff is subjected to pressure within the particular stop pressure chamber, and this last named puff serves to maintain the pipe valve in the closed position, so long as the stop pressure is maintained and irrespective of the pressure in the space between the puffs, this latter pressure being controllable by the keys of the organ. Furthermore, by making the puff rail in sections of comparatively short length the making of repairs becomes greatly facilitated, since any one of the short sections of puff rail may be bodily removed with the valves carried thereby without disturbing any other parts of the action, and repairs may be easily made under the most favorable conditions, and not as in organ actions as usually installed under the most unfavorable conditions, where the workman generally has to make repairs in cramped quarters and while in an awkward position without sufficient light and where the use of proper tools is difficult. In organs as usually constructed the only way of avoiding the awkward conditions in making repairs is to dismantle the whole organ action, which is an expensive and time consuming job.

With the present invention should it transpire that extensive repairs to the valve structures are necessary only those sections of the puff rails that require repairs need be removed after removing such ones of the groove boards as may be necessary, while all other parts of the organ action need not be disturbed, whereby extensive repairs may be made with a minimum of dismantling, with a consequent saving of expense.

The invention will be best understood from a consideration of the following detailed description, taken in connection with the accompanying drawings forming a part of this specification, with the understanding, however, that while the drawings show in part a practical organ action involving the present invention, such embodiment of the invention is not in itself mandatory, but is susceptible of various modifications and changes without, however, any change in the principle of the invention or its mode of operation, and consequently the invention is not limited to the exact disclosure of the drawings.

In the drawings:—Figure 1 is a longitudinal vertical section through a portion of a pipe organ action, the section being taken lengthwise of a stop pressure chamber on the line 1—1 of Fig. 2. Fig. 2 is a bottom view, partly in elevation and partly in section, and partly broken away of a portion of an organ action constructed in accordance with the present invention. Fig. 3 is a section on the line 3—3 of Fig. 2. Fig. 4 is a perspective view of one of the valve units included in one section of a puff rail. Fig. 5 is a sectional view of one of the pipe valves,

but which may be taken as typical of the construction of any of the valves in so far as such view applies.

The present invention applies to the type of pneumatic organ actions where two air pressures are employed, one being of a somewhat higher pressure than the other, so that for convenience of description these pressures may be considered as high pressure and low pressure air, and such air pressures are supplied by pumping apparatus delivering air in sufficient volume for the purpose, but which pumping apparatus need not be herein considered since in itself it does not form any part of the present invention.

In the drawings there is shown a pipe board 1 provided with pipe holes 2 in which are seated pipes 3, which, when air under suitable pressure and volume is admitted to them, speak with the tone to which they are tuned, the pipe board with the pipes being of common and well known construction, and so needs no particular description herein. Since it is customary to install organ actions with the pipes 3 standing upright, the pipe board 1 becomes the top of a wind chest inclosed at the sides by side members 4, this wind chest being divided into extended channels by division boards or rails 5. It is immaterial for the operation of the pipes whether the chest supplying them with air under pressure be a single chest, or whether it be divided into a number of parallel channels, for in the latter case each of the channels has common communication with the air supply, so that the pressure is maintained substantially constant. For this reason the air chamber into which air is directed to supply the pipes is referred to generally as the air chamber 6, whether it be made as a single chamber or divided into a series of chambers by the rails or partition boards 5, the latter being necessary for the support of other members to be described.

Considering the pipe board 1 as the top of the structure, the bottom edges of the side members 4 and of the partition rails 5 are rabbeted to form shoulders 7 extending lengthwise of the sides 4 and rails 5 and at suitable intervals in the space or channels between the sides 4 and adjacent rails 5 or between intermediate rails 5 there are set cross blocks or partitions 8, which near their lower edges are provided with numerous perforations 9, or these blocks or strips may be otherwise formed to permit free passage of air through them. The top edges of these blocks are formed with oppositely directed flanges or ledges 10, with those faces presented toward the body of the block 8 flush with the shoulders 7, the ledges 10 projecting into the chamber 6.

Each space defined by the shoulders 7 and ledges 10 constitutes a peripheral seat for a puff rail section 11, which in practice is usually made from six to fourteen inches long, but, of course, these figures are not mandatory and are to be taken as indicative only. The puff rail sections 11 divide the wind chamber 6 for the pipes from another chamber 12 of such extent in one direction as to include the pipes belonging to a stop, and it may, therefore, be called a stop chamber, and while the separate channels defining the chambers 12 may equal in number the channels defining the chamber 6, the channels 12 are pneumatically separate, while the channels 6 may be at all times pneumatically coupled. The sections of each chamber 12 are pneumatically connected end to end through the passages 9 throughout the length of the chamber designed to be included in a single stop, wherefore the united sections may be termed a stop chamber. The bottoms of the chambers 12 comprise groove boards 13, in which are formed grooves or channels 14, after which the boards 13 are completed by a cover member 15 inclosing the grooves 14, so that the latter constitute conduits which may extend practically the full length of the boards 13, this being a common arrangement in pneumatic organ actions.

Each rail 5 has formed in it at suitable intervals passages 16 extending from the bottom edge of the rail into the body thereof, past the shoulders 7 for an appropriate distance, and extending parallel to the passage 16 each rail 5 has corresponding passages 17 extending from one of the shoulders 7, while the ends of these passages are joined by a branch passage 18 bored into the rail from one side thereof and closed in the particular showing of the drawings by a cover 19, but, of course, the end of the passage 18 may be plugged after the customary practice.

Each groove or channel 14 is in constant communication through holes 20 with a corresponding set of passages 16 entirely across all the stop chambers 12 belonging to the same note by name of the sets of organ pipes controlled by the stops in turn controlling the chambers 12, this also being common in pneumatic organ actions.

Each puff rail 11 is formed with a suitable number of passages 21 extending from one face of the rail through the other face, and each of these passages 21 is in communication with a passage 22 opening into a branch passage 23, in turn opening through one face of the puff rail 11 where matching a shoulder 7, and such passage 23 is in matching relation to a passage 17, whereby a groove 14 is in constant communication through the hole 20 with a corresponding passage 16, and this latter through the branch passage 18, and passage 17 communicating therewith is in communication with the passage 23 and from the latter through

the passage 22 into the interior of the passage 21 formed in the puff rail. However, passage 21 is closed at the ends by puffs 24, 25, respectively, these puffs being made out of suitable material of a flexible nature impervious to the air pressure used and are sufficiently mobile to move either into the passage 21 or beyond the plane of the corresponding face of the puff rail. The passage 21 becomes, because of the coverings or puffs 24 and 25, a chamber, and, therefore, for convenience of description the passage 21 will hereinafter be referred to as the chamber 21 or the puff chamber. The puff 24 separates the chamber 21 from the wind chamber supplying the pipes with air, while the puff 25 separates the chamber 21 from the corresponding channel or chamber 12, and the puff rail constitutes the bottom of the wind chamber 6 and the top of the stop chamber or channel 12, leakage of air through the several parts being prevented by suitable packing strips 26 usually of kid in ordinary pipe organ practice, and without further explanation it will be understood that such packing is provided wherever needed to prevent leakage.

Carried by posts 27 fast to the corresponding face of the puff rail is a guide rail 28 through which extends an appropriate number of valve stems 29, these stems being commonly made of wire or small rods and pass through the puff 24 to the chamber 21, the puff carrying on the inner face a disk 30 of suitably stiff material, such as vulcanized fiber, while the end of the stem 29 within the chamber 21 has thereon a pad 31 of some soft material, such as felt, held adjustably in place by a nut 32 which may be formed of leather after the common practice. Each puff 25 has fast thereto at about its center a disk 33, which may, also, be made of vulcanized fiber, and this disk is faced with a layer 34 of a felt or other soft material, so that when engaged, as will hereinafter appear, by the felt buffer 31, the noise of the impact will be reduced to a negligible minimum.

The valve stem 29 on the side of the guide rail 28 remote from the puffs carries a valve 35 which may be formed of a disk of suitable resisting material, such as vulcanized fiber, with a facing of felt and leather as is customary, the valve 35 being held in place by nuts 36, 37, respectively, the nut 37 confining a spring 38 about the valve stem between the said nut 37 and the guide rail 28. The valve 35 normally closes a corresponding pipe hole 2 being held to such position by the spring 38 when no other forces are acting upon the valve, so that should any conditions arise whereby the valve would tend to drop away from the hole 2 by gravity were the spring 38 not present, such spring will maintain the valve in the closed position thus preventing ciphering.

At one end of the casing of the wind chamber 6 there is provided a chamber 39 formed with a top wall 40, a bottom wall 41 and a side wall 42. The bottom 41 is formed with a series of valve chambers 43, each communicating through a passage 44 with the chamber 39 and by way of another passage 45 with the atmosphere, and extending through the passages 44 and 45 is a valve stem 46 carrying spaced valves 47, 48, respectively, within the chamber 43, and the relation of the valves 47 and 48 to the chamber 43 is such that when the valve 47 is in closing relation to the passage 44 the valve 48 opens the passage 45 and vice versa. The valve stem 46 extends through a guide rail 49 carried by the bottom member 41 and also extends into a chamber 50 formed in the top member 40, there being a chamber 50 for each valve stem 46. The chamber 50 where it would otherwise open into the chamber 39 is closed by a puff 51, through which the stem 46 extends, this stem also extending through a disk 52 of suitably stiff material, such as vulcanized fiber, made fast to the inner face of the puff, and the puff and valve stem are held together by nuts 53. Leading from the chamber 50 is a passage 54, the area of which is controllable by a throttling screw 55, and from this passage there leads a pipe or tube 56 to the keys on the console or to an intermediate valve structure, which, however, forms no part of the present invention and need not be described. The chamber 38 is supplied with air under pressure by a conduit 57 and the chamber 43 communicates with an appropriate one of the grooves 14 by way of a conduit or passage 58 formed in the bottom member 41, this passage 58 connecting the groove 14 through a passage 59 formed in the corresponding end member 2 and another passage 60 in the groove board 13.

Each stop channel 12 has communicating therewith a pipe 61 leading to a stop box 62 by way of a valve chamber 63, from which there is a passage 64 to an interior chamber 65 in the stop box receiving air from the bellows through a conduit 66, while the chamber 63 is provided with another passage 67 leading to the atmosphere. Within the chamber 63 are two spaced valves 68, 69, respectively, on a valve stem 70, and this stem is fast at the end remote from the valves 68 and 69 to a puff 71, all in the manner described with relation to the valve stem 46. The puff 71 forms one wall of a chamber 72 with which communicates a pipe 73 leading to a stop pull of the organ, this pipe containing a throttle screw 74.

It has been proposed to operate certain of the parts controlling the pneumatic valves, which in turn control the admission

of air to the pipes, by electric means having conductors leading to the console and keys on the manual and to the draw knobs, and while no attempt has been made to show such electric means, it will be understood that the present invention is as well adapted to such form of organ action as the one shown in the drawings.

Let it be supposed that the organ is in condition for playing, then the chamber 6 is filled with air under pressure, all the chambers 12 are filled with air under pressure, and all the chambers 21 are filled with air under pressure. The chamber 6 is connected with the bellows or other source of air pressure at all times, this being usually low pressure air, but the air cannot reach the pipes 3 because of the valves 35 urged not only by the springs 38, but by superatmosphere pressure on the faces of the valves away from the openings 2. However, there is established an air pressure in each chamber 12 superior to the air pressure within the chamber 6, and consequently the puffs 25 are forced into the chambers 21 and against the buffers 31 at the ends of the valves stems 29, thus seating the valves 35 firmly against the ends of the openings 2 coincident with the chamber 6 irrespective of any pressure of air within the chamber 6 upon the puffs 24. The pressure within the stop chambers 12 is brought about by air coming through the conduit 66 into the chamber 65 and at the same time air under like pressure coming through the conduit 73 into the chamber 72, so that the puff 71 has like pressure on both sides, whereby the weight of the valves 68 and 69 tend to carry the valve 69 into closing relation to the passage 67, where it is held by the superatmospheric pressure within the chamber 65. Moreover, air coming into the chamber 39 through the conduit 57 and also into the chamber 50 through the conduit 56 brings equal pressure to bear on opposite sides of the puff 51, wherefore the valve 48 moves into closing relation to the opening 45 because of the superatmospheric pressure within the chamber 39 and the groove or channel 14 becomes filled with air under pressure, which air is freely conveyed to all the chambers 21 communicating with such groove 14. In the organ action there are as many grooves 14 as are necessary to control all the pipes of all the stops and a like number of valves 47, 48 are provided, and the same is true of the stop box and stop channels 12, as well as the valves 68 and 69.

Under the conditions assumed the organ is silent, even though the keys be depressed. Should a key be depressed under these conditions such action of the key causes the opening of the particular conduit 56 belonging to it to the atmosphere, the conduit 56 thereby becoming an exhaust tube relieving the pressure within the particular chamber 50 belonging to it, so that the superatmospheric pressure within the chamber 59 acting on the particular puff 51 will force the latter into the chamber 50 in which atmospheric pressure has been established and as the area of this puff is considerably larger than the area of the valve 48 the two valves 47 and 48 are moved so that the passage 44 is closed and the passage 45 is opened, whereby the particular groove 14 controlled by the valves under consideration is open to the atmosphere and consequently pressure within all the chambers 21 communicating with the particular groove 14 is reduced to atmospheric pressure, but the pressure within the stop chambers 12 being superior to the pressure within the chamber 6 maintains all the pipe valves in the closed position. When it is desirable to play the organ, certain of the stop knobs are pulled and this causes the opening of the corresponding conduits 73 to the atmosphere, thus exhausting the pressure from the corresponding chambers 72, or if but one stop be pulled when one chamber 72 is exhausted, whence the valves 68 and 69 controlled by such chamber 72 are moved to a position to open the conduit 61 to the atmosphere through the passage 67, thus exhausting the particular stop chamber 12 to atmospheric pressure. Now the pressure within the chambers 21 will force the puffs 25 along the particular chamber 12 under consideration into said chamber away from the buffers 31 at the end of the respective valve rods 29, but pressure being maintained within both the chambers 21 and the chamber 6 the puff 24 remains inert and the several valves 35 are held by the springs 38 and the air pressure within the chamber 6 in closing relation to the pipe holes 2.

Suppose, now, that a key of the manual be depressed, then the corresponding exhaust tube 56 is open to the atmosphere, resulting, as before explained, in the opening of the particular groove or channel 14 controlled by the exhaust tube 56 to the atmosphere, whereby all the chambers 21 controlled by the said chamber 14 have the air pressure within them reduced to atmospheric pressure. Now, the pressure upon the puffs 24 of the chambers 21 controlled by the groove or channel 14, due to the air pressure within the chamber 6, is greater than the same air pressure exerted upon the valve 35, so that no other force preventing the air pressure within the chamber 6 forces the puff 24 into the chamber 21, thereby moving the valve 35 from the particular pipe hole 2 against the action of the spring 38 and admitting air to the pipe to cause the latter to sound. This only occurs in connection with the particular chamber 21 adjacent the stop chamber 12 from which the

high pressure air has been exhausted, for while the same tendency to open the pipe valves is present in all those chambers 21 controlled by the groove 14 under consideration, the superior pressure within the stop chambers, acting on the puffs 25, maintains such valves in closing relation to the pipe holes 2, wherefore only the note corresponding to the key and to the pulled stop will be sounded, all other pipes remaining silent. If more than one stop be pulled, then all those notes corresponding to the manipulated key and agreeable to the pulled stops will sound, all other notes remaining silent.

It is to be observed that the organ action of the present invention depends for its active operation solely upon the exhausting of established air pressures to atmospheric pressure, while all parts are maintained in the inactive position by superatmospheric pressure.

The valves of pipe organ actions are quite liable to deterioration, and this either results in certain pipes failing to sound because the valve are not opened to admit wind thereto, or the valves remain open whereby the pipe or pipes will cipher. When such a condition arises it becomes necessary in pneumatic actions as ordinarily constructed to remove the groove board to gain access to the valves, and then unless the entire section of the organ containing the defective valve or valves be dismantled it is necessary to work in an awkward, cramped position where tools cannot be conveniently used, and in a poor light, the work being principally overhead. Should a like breakdown occur with an organ constructed in accordance with the present invention, the groove board must be removed, but this groove board may be made in small sections, so that but a small area of the groove board need be disturbed, and this area need not be larger than the section of the puff rail containing the defective valve, when this puff rail section is readily removed by removing the few retaining screws and may then be taken bodily from the organ structure to a convenient place where the repairs may be made with comfort under the best working conditions, thus insuring a thoroughness of repairing not usually possible in pipe organ structure, unless the entire organ or a large portion thereof be dismantled, and at far less expense than is necessary for the making of like repairs in organs as ordinarily constructed. It is to be noted that the puff rail, guide rail and valve rods 29 with the valves carried thereby, and, also, the puffs 24 and 25 are all removable together, the puff rail section carrying all the parts named with it.

The blocks or partitions 8 serve as seats for the corresponding ends of the puff rail sections, thus making it possible to produce air tight joints at these points, whereby leakage between the chambers 6 and 12 is prevented.

What is claimed is:—

1. In a pneumatic pipe organ action, the combination with a wind chest and a stop chamber, the latter having one wall in the form of a groove board, of a puff rail separating the stop chamber from the wind chest and comprising a plurality of sections each carrying a fractional portion of the pipe valves belonging to the puff rail as a whole, and means for securing the puff rail sections and valves carried thereby independently of the groove board and for the ready removal of any chosen section and its valves in a direction away from the wind chest without disturbing any other installed section of the puff rail and the valves carried thereby.

2. In a pneumatic pipe organ action, a puff rail composed of a plurality of sections of a combined length less than that of a single rail of the same capacity and each section carrying a plurality of valves constituting a fractional portion of the valves belonging to the puff rail as a whole, and seat blocks constituting supports for adjacent ends of the sections, the thickness of the seat blocks being such as to separate the sections to an extent whereby said sections collectively occupy a space of the same length as that of a single rail of the same capacity, each puff rail section of an installed puff rail being readily removable with its valves independently of the other sections and valves.

3. In a pneumatic pipe organ action, a puff rail composed of a plurality of sections, a groove board in spaced relation to the puff rail and defining a stop chamber between it and said puff rail, means for directing air from the grooves of the groove board to the puffs of the puff rail sections, and seat blocks supporting the puff rail sections and located between adjacent ends thereof, and extending to the groove board to define the depth of the stop chamber, said blocks having passages therethrough within the stop chamber.

4. In a pneumatic pipe organ action having a pipe filling wind chamber and stop chambers, a puff rail in normal interposing relation with respect to the pipe filling wind chamber and a stop chamber, said puff rail having chambers therein each with puffs between a puff board chamber and a pipe wind chamber and stop wind chamber, respectively, the puff board chambers being of approximately the area of the puffs for the movement of the puffs into and out of the respective chambers, pipe valves controlled by said puffs, and air conduits communicating with the chambers in the puff rail.

5. In a pneumatic pipe organ action, a puff rail section constituting a fractional

part of a complete puff rail, said section having chambers formed therein with puffs on opposite faces of the rail section defining end walls for said chambers, one puff carrying a valve stem terminating in a pipe valve, said stem extending into the path of the other puff and said other puff being movable into and out of active engagement with said valve stem.

6. In a pneumatic pipe organ action, a puff board having chambers therein each extending from one face of the puff board to the other, puffs on opposite faces of the puff board defining end walls for said chambers, a comparatively rigid washer carried by each puff, a valve stem carried by one puff and extending through the washer thereof, said stem terminating within the chamber in the puff board in a buffer head adapted to be engaged by the washer of the other puff, and a valve carried by the other end of the valve stem.

7. In a pneumatic pipe organ action, a puff board having chambers therein each extending from one face of the puff board to the other, puffs on opposite faces of the puff board defining end walls for said chambers, a comparatively rigid washer carried by each puff, a valve stem carried by one puff and extending through the washer thereof, said stem terminating within the chamber in the puff board in a buffer head adapted to be engaged by the washer of the other puff, and a valve carried by the other end of the valve stem, the puff board also carrying a guide rail for the valve stems with a spring about each valve stem between the guide rail and the respective valve.

8. In a pneumatic pipe organ action, a puff rail made up of sections each carrying valves and pneumatic operating means for said valves, and intermediate blocks for receiving adjacent ends of the puff rail sections, said blocks having passages therethrough adjacent one edge and at the opposite edge provided with ledges forming abutments for the corresponding portions of the puff rail sections.

9. In a pneumatic pipe organ action, a readily detachable unit constituting a fractional portion of a puff rail, said unit comprising a body member with chambers therein having walls at opposite faces of said body member defined by puffs, said body member also being provided with conduits or passages leading to the chambers and adapted to be placed in communication with air conduits of the pneumatic system, a guide rail carried by the body member, and valves adapted to open and close corresponding pipes of the organ, said valves being provided with stems traversing the guide rail and entering corresponding chambers in the body member through the puffs on the face of the body member carrying the guide rail, said stems being secured to the puffs they traverse and terminating in operative relation to but unconnected to the other puffs.

10. In a pneumatic pipe organ action, a readily detachable unit constituting a fractional portion of a puff rail, said unit comprising a body member with chambers therein having walls at opposite faces of said body member defined by puffs, said body member also being provided with conduits or passages leading to the chambers and adapted to be placed in communication with air conduits of the pneumatic system, a guide rail carried by the body member, and valves adapted to open and close corresponding pipes of the organ, said valves being provided with stems traversing the guide rail, and entering corresponding chambers in the body member through the puffs on the face of the body member carrying the guide rail, said stems being secured to the puffs they traverse and terminating in operative relation to but unconnected from the other puffs, both puffs being provided with centralized comparatively rigid members on the chamber side of said puffs and the comparatively rigid member carried by the second named puff and also the corresponding end of the valve stem being provided with contacting members of non-resonant material.

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

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Witnesses:

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