

UNITED STATES PATENT OFFICE.

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COMPOUND OR DUPLEX WIND-CHEST.

No. 836,907.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, PHILIPP WIRSCHING, a citizen of the United States, residing at Salem, in the county of Columbiana and State of Ohio, have invented certain new and useful Improvements in Compound or Duplex Wind-Chests; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to pipe-organs, and more particularly to that type employing tubular pneumatic action, but has especial reference to the wind-chest.

It has for its object the production of what will be hereinafter termed a "duplex" or "compound" wind-chest embodying certain peculiarities of construction which greatly enhance its usefulness.

It has for a further object the employment of a special form of diaphragm-valves for controlling communication between the stop-channels and their respective musical pipes.

It has for a further object the employment of a combined perforated membrane-packing and check-valve guarding the pipe-ducts and coöperating with said diaphragm-valves to automatically regulate the wind-supply to one or more pipes from either or both stop-channels in my compound wind-chest structure. Said membrane-packing also has for its object a similar automatic sealing of other pressure communications or joints to prevent "running" of the wind, and this last-named feature is to be made the subject-matter of a separate application for Letters Patent.

In general the object of my present invention is the production of means or an organized arrangement of parts whereby any particular stop in the organ may be played not only from the manual to which it properly belongs, but also from any other manual with which it may be connected or coupled, so that any stop may be used on two manuals at the same time alone or in combination with other stops or couplers, thus doubling the capacity of the instrument.

The invention will be hereinafter described, and particularly pointed out in the claims following.

In the accompanying illustrations, which form part of this application, and whereon

the same letters of reference indicate corresponding parts in the several views, Figure 1 is a fragmentary view representing a transverse section through a compound wind-chest and action-box, the former equipped with my improvements, the stop-channels uncharged, and all parts in normal position. Fig. 2 is a corresponding view under reverse conditions, the stop-channels here being charged with pipe-wind and communication established with the musical pipes. Fig. 3 is a similar sectional view, on an enlarged scale, showing a fragment of one pipe-bar and compound valve-throat, bellows-pneumatic, and diaphragm-valves occupying the same relation as that shown by Fig. 1. Fig. 4 is also a fragmentary view corresponding with Fig. 3, except that the valves here occupy the position illustrated by Fig. 2; Fig. 5, a view similar to Figs. 3 and 4, except that the valves here occupy a still different relation. Fig. 6 is a face view of one diaphragm-valve bar, the valves complete being shown at each end, the adjacent valves removed, displaying the compound inlet-ports, and said bar being cut back at its center, showing one communicating tubular valve-duct. Fig. 7 is a modification of the invention and represents a transverse section through two stop-channels, one containing a bellows-pneumatic valve closed and the other a diaphragm-valve open. Fig. 8 is a similar transverse section also representing a modification of the invention wherein diaphragm-valves exclusively are employed all shown closed.

Reference being had to the drawings and letters thereon, A indicates the top board, and B the bottom board, of my improved wind-chest. These are of ordinary construction and require no special description further than the statement that they are both crossed transversely by action-grooves or windways *a a*, normally containing air under comparatively high pressure from a common source of supply (not shown) by way of the usual action-boxes, such as C D, located by preference at sides of the instrument. Within action-boxes C and D are located primary and secondary pneumatics *b c*, respectively, and these in turn are each fitted with valve-stems and valves.

E indicates a valve-stem carried by the movable member of primary pneumatics *b*, and *d e* a double valve affixed thereto alter-

nately guarding opposite ends of a port F, opening out of the action-boxes. Communicating with the interior of said primary pneumatics *b* are wind-tubes *f*, each under control of the manual or pedal keys (not shown) of the organ. Similarly the secondary pneumatics *c* are equipped with valve-stems *G* and double secondary valves *g h*, alternately guarding opposite ends of ports H, also opening through the action-box to the atmosphere and in direct communication with the windways *a* aforesaid. These primary and secondary pneumatics *b c* are arranged in co-acting pairs corresponding in number with manual and pedal keys of the instrument and also with the windways *a*, before mentioned, comprising sixty-one in the manuals and thirty in the pedal-actions as a standard. The interior of each secondary pneumatic *c* is in constant communication with the ports F by way of individual channels *i*, and are thus at times brought into direct communication with the interior of the action-box wherein the particular pneumatic is located.

I J represent stop-channels separated by pipe-bars K, which latter therefore also perform the functions of partitions running longitudinally from end to end of the wind-chest and fitting snugly between its top and bottom boards A B. These pipe-bars K are perforated at proper intervals by inlet-ports L for communicating directly with both adjacent stop-channels I J and are intersected above by vertical wind-outlets *j*, leading to the musical pipes, which are not shown, but ordinarily surmount the top board A. When economy of space is not a matter of importance, an entire set or stop of pipes (ordinarily sixty-one for the manuals) may be placed upon a single pipe-bar K, in which event the stop-channels I and J are arranged in simple pairs, as shown by modified Fig. of the drawings. The preferred construction, however, is that represented by Figs. 1 and 2 and comprises a stop-channel I on each side of an intermediate stop-channel J in triplex arrangement. In this construction all pipes of one set are placed on two pipe-bars alternately—as, for example, pipes C D E F G A#, &c., on one bar and on the other bar pipes C# D# F G A B, &c. As a consequence of this arrangement the total width of the wind-chest is increased slightly, but its length is decreased one-half, channels I, in effect, being formed of two half-sections and the capacity of the intermediate channel J doubled by means of special valve features now to be described.

Within each intermediate stop-channel J is a depending valve-bar M, offset from the top board A a convenient distance by means of block or strip *k*, the latter serving also as an extra closure for the channel at this point. Throughout their length these bars M are provided with depressions or valve-pockets

N, arranged upon both sides of said bars in staggered relation. These are covered loosely by an unbroken flexible membrane or individual membranes *l*, upon which are secured valve-pallets O, as shown by Fig. 6 and elsewhere. The interior of these membrane or inflatable diaphragm-valves is placed in communication with windways *a* of the top board by agency of a direct duct or tubular connection *m*. (Clearly shown at the center of Fig. 6 and by dotted lines throughout the drawings.) Said tubes or jointless pipes *m* also serve to effectually guard against running of the wind at these points of comparatively high pressure, which in other constructions sometimes results in falsifying the pipes. As a consequence of this arrangement it is apparent that the pressure in the action-boxes and windways and said diaphragm-valves is identical, so that the normal condition of the latter is inflated, as shown by Figs. 1, 2, 3, 4, and 8.

The pallet O of each diaphragm-valve aforesaid is in register with its respective compound inlet-port L of the pipe-bars K, over which it is adapted to close; but interposed between said valve and its seat is a perforated flexible self-acting packing-membrane P, which constitutes also a check-valve and has a highly-important function to perform, as will later appear in a statement of operation. This self-packing membrane P may be secured to the pipe-bars in the form of a continuous perforated strip, or it may take the form of individual membranes; but in any event its perforation or windway must be arranged concentrically with relation to the port L, which it guards. It should be of a diameter to slightly obstruct said port, and should be secured to the face of its pipe-bar or an offset-block *n* thereon, when such is employed, in a manner to allow of flexible action, as best shown by Fig. 5.

Within stop-channels I are located bellows-pneumatics Q of ordinary construction in direct communication with windways *a* of the bottom board B through the ducts R, perforating the lower edge of pipe-bars K. The bellows-pneumatics are thus kept normally inflated and carry upon their movable members an arm *o*, bearing pallet *p* for controlling communication between channels I and the compound inlet-ports L of the pipe-bars. Here also is employed a perforated flexible membrane or check-valve P, secured to the pipe-bar, as before stated and for similar purposes, as will later appear.

This being a general statement of my several improvements in their preferred forms of construction and relation of parts, I will now proceed to describe briefly their operation. It should be understood, however, that I do not limit myself to the particular construction and arrangement of parts herein shown, since they can be variously modi-

fied and changed without in the least departing from the spirit of my invention as hereinafter claimed.

The operation is as follows: Presuming
 5 that the normal position of all primary and secondary pneumatics *b c* and their correlative valves is as shown in action-box C, Fig. 1, that the air-pressure in said action-boxes is in excess of that employed in the stop-channels, that the said action-boxes are in communication with the interior of all diaphragm-valves O by way of windways *a* and tubular ducts *m*, and that as a consequence said
 10 boxes, windways, ducts, and valve-pockets N stand normally charged with "high-pressure wind," the valve-membranes *l* thus being inflated the pallets O affixed thereto will each serve to normally close its adjacent end of the compound inlet-port L of pipe-bars
 20 K. Presuming, furthermore, the windways *a* in bottom board B to be similarly charged with air at the same pressure as above, also that they communicate with the interior of bellows-pneumatics Q, located in stop-channels I, by way of ducts R at base of the pipe-bars, and that the compound pipe-ports L are here normally closed by pellets *p*, as
 25 clearly shown, if now pipe-wind from a wind-trunk or other source of supply is first admitted to any particular stop channel or channels of the wind-chest by withdrawal of the appropriate stop-knob at the keyboard of the instrument—for example, stop-channels I I, shown in Fig. 2—and thereupon a
 35 key or keys be depressed corresponding with a musical pipe or pipes located upon said charged stop-channels, the resulting action will be as follows: The air is first exhausted, via wind-tube *f*, from the particular primary
 40 pneumatic *b* corresponding with the key depressed. This pneumatic thereupon collapsing unseats or opens its valve *d* and simultaneously seats its opposite valve *e*, establishing communication with and inflating the secondary pneumatic *c* by pressure of air from
 45 the action-box. As the result of this movement the secondary-pneumatic valve *g* is seated and its opposing valve *h* unseated, all as shown by Fig. 2 of the drawings. As a
 50 further consequence pressure from one groove *a* of the bottom board B is exhausted through port H to the atmosphere, collapsing all bellows-pneumatics Q communicating with this particular groove *a*, withdrawing their
 55 pallets *p* from pipe inlet-ports L and causing those pipes to speak which are located upon the previously-charged stop-channels I, all other pipes in controllable communication with the same groove *a* remaining silent from
 60 lack of pipe-wind in their particular stop-channels at the time. Similarly the grooves *a* of top board A are controlled from the intermediate station or action box C, Fig. 1. In this figure, however, the primary and sec-
 65 ondary pneumatics are shown in their nor-

mal positions, the diaphragm-valves inflated and their pallets O serving to close the adjacent end of pipe inlet-ports L, as shown by Figs. 1, 2, 3, 4, and 8. A reversal of the position occupied by primary and secondary
 70 pneumatics *b c*, however, exhausts the interior of diaphragm-valves O, causing the same to assume the position indicated by Figs. 5 and 7. Where this occurs in stop-channels previously charged with pipe-wind the pipes
 75 guarded by said valves O obviously will speak, all other pipes not in controllable communication with the groove or grooves *a* then in action remaining silent.

In the drawings the action last described
 80 may best be observed by reference to Fig. 7, wherein one stop-channel is presumed to be charged with pipe-wind, the other stop-channel exhausted, and both valves removed from
 85 opposite ends of the compound inlet-port L in the manner heretofore described. Pipe-wind now rushing from the charged stop-channel, as indicated by the arrows, first freely
 90 passes one packing-membrane P to the interior of port L in the direction of the uncharged stop-channel at the opposite side of pipe-bar
 95 K. Here coming in contact with the flexible edge of the second packing-membrane P, partially obstructing the opposite end of port L, this membrane is blown out to contact with
 100 the withdrawn pallet *p* of pneumatic Q, whereby communication between the afore-said charged and uncharged stop-channels is automatically cut off and the pipe-wind finds
 105 its only source of outlet. If, on the other hand, conditions are reversed and pallet *p* of one bellows-pneumatic Q is located in the charged stop-channel, pallet O of a diaphragm-valve in the uncharged channel, and both pal-
 110 lets are removed from opposite ends of the compound inlet-port L, the pipe-wind then following the direction of arrows as indicated by Fig. 5 of the drawings first closes communication with the uncharged channel by
 115 agency of the packing-membrane P, as stated, and then finds vent through vertical outlet *j* to the pipe.

Having thus described my invention in the best form at present known to me, I do not
 120 desire to limit myself to the construction and arrangement of parts or mode of operation hereinbefore set forth, as same may be variously changed and modified without in the least departing from the spirit of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a wind-chest for pipe-organs, the
 125 combination with a pipe-bar having a suitable inlet-port, of a valve for controlling the admission of pipe-wind to said port, and a check-valve for automatically preventing
 130 back pressure through the port aforesaid.

2. In a wind-chest for pipe-organs, the combination with a pipe-bar having a suitable inlet-port, of a valve for controlling the admission of pipe-wind to said port, and a
5 membraneous check-valve for automatically preventing back pressure through the port aforesaid.
3. In a wind-chest for pipe-organs, the combination with a pipe-bar having a suitable inlet-port, of a valve for controlling the
10 admission of pipe-wind to said port, and a perforated check-valve for automatically preventing back pressure through the port aforesaid.
4. In a wind-chest for pipe-organs, the combination with a pipe-bar having a suitable inlet-port, of a valve for controlling the admission of pipe-wind to said port, and a flexible check-valve interposed between the first-named valve and its seat for automatically
15 preventing back pressure through the port aforesaid.
5. In a wind-chest for pipe-organs, the combination with a pipe-bar having a suitable inlet-port, of a valve for controlling the admission of pipe-wind to said port, and a check-valve having a free portion overhanging said
20 port for automatically preventing back pressure therethrough.
6. In a wind-chest for pipe-organs, the combination with a pipe-bar having a double inlet-port opening from both sides thereof, of valves for controlling the admission of pipe-wind to said ports, and check-valves for preventing back pressure through the ports aforesaid.
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7. In a wind-chest for pipe-organs, the combination with a stop-channel, of a pipe-bar having suitable inlet-ports, a valve-bar within said channel, valves carried by said
40 valve-bar for controlling the admission of pipe-wind to said ports, and individual check-valves for automatically preventing back pressure through said ports.
8. In a wind-chest for pipe-organs, the combination with a stop-channel, of a pipe-bar having suitable inlet-ports, air-tight inflatable valves guarding said inlet-ports, a suitable action-box, high-pressure windways
45 connecting the interiors of said box and valves, and means for checking the passage of pipe-wind except in one direction only.
9. In a wind-chest for pipe-organs, the combination with a stop-channel, of a pipe-bar having suitable inlet-ports, air-tight inflatable valves guarding said ports, a suitable action-box, high-pressure windways connecting the interiors of said box and valves, tubular conduits in said windways for breaking
50 pressure-joints, and means for checking the passage of pipe-wind except in one direction only.
10. In a wind-chest for pipe-organs, the combination with a stop-channel, of a pipe-bar broken by inlet-ports, valves guarding
55 said ports, a suitable action-box, a top board provided with high-pressure windways communicating with the interiors of said box and valves, and jointless tubular conduits in said ways for breaking the joints in said top board. 70
11. A compound wind-chest for pipe-organs comprising independent stop-channels, a pipe-bar having inlet-ports adapted to communicate with both of said channels, valves for controlling the admission of pipe-wind to said ports, individual check-valves
75 for automatically preventing back pressure through said ports, and means whereby communication may be established between said inlet-ports and either or both of said stop-channels. 80
12. A compound wind-chest for pipe-organs comprising independent stop-channels, a pipe-bar having inlet-ports adapted to communicate with both of said channels, suitable
85 valves located within said channels whereby communication may be established between said inlet-ports and either or both of said stop-channels, and means for checking the passage of pipe-wind through said ports except in one direction only. 90
13. A wind-chest for pipe-organs comprising high-pressure windways, a stop-channel, pipe-bars having suitable inlet-ports, pneumatic valves for controlling communication
95 between said channels and ports, jointless tubular ducts or pipes for connecting said high-pressure windways with the interior of said pneumatic valves, and means for checking the passage of pipe-wind through said
100 ports except in one direction only.
14. A compound wind-chest for pipe-organs comprising independent stop-channels, pipe-bars serving also as partition-walls for said channels, inlet-ports in each pipe-bar
105 adapted to communicate with both adjacent stop-channels, valves for guarding said inlet-ports upon both sides of the pipe-bars, and means for actuating said valves simultaneously or dissimultaneously from the same or
110 different keyboards.
15. In a wind-chest for pipe-organs, the combination with suitable stop-channels, pipe-bars and valves for controlling the delivery of pipe-wind from said channels
115 through said bars, of top and bottom closures for said channels each provided with independent action-grooves in controllable communication with their respective valves, and means for checking the passage of pipe-wind
120 through said bars except in one direction only.
16. In a wind-chest for pipe-organs, the combination with a duplex stop-channel, of top and bottom closures for said duplex
125 channel, valves in each channel-division for controlling the delivery of pipe-wind therefrom, action-grooves in each of said closures for controlling the valves in their respective channels, and means for checking the pas- 130

sage of pipe-wind from said channels except in one direction only.

17. In a wind-chest for pipe-organs, the combination with a plurality of parallel stop-channels, of pipe-bars constituting also partitions between said channels, top and bottom closures for said channels, compound inlet-ports in each pipe-bar adapted to establish communication between adjacent stop-channels, valves guarding opposite ends of said inlet-ports, and action-grooves in each of said closures for controlling said valves and the delivery of pipe-wind from alternate stop-channels.

18. In a wind-chest for pipe-organs, the combination with a stop-channel, of pipe-bars on each side of said channel, inlet-ports in said pipe-bars, top and bottom closures for said channel, a valve-bar between said pipe-bars, air-tight inflatable diaphragm-valves upon opposite sides of said valve-bar adapted to register with and close the inlet-ports aforesaid, and action-grooves in one of said channel-closures in controllable communication with the valves aforesaid.

19. In a wind-chest for pipe-organs, the combination with independent stop-channels, of an intermediate stop-channel, pipe-bars separating said stop-channels, compound inlet-ports perforating said pipe-bars, valves guarding said ports for controlling the delivery therethrough of pipe-wind from adjacent stop-channels, and means for checking such delivery except in one direction only.

20. In a wind-chest for pipe-organs, the combination with a plurality of independent stop-channels, of a series of wind-outlets for each of said channels, a stop-channel adapted to communicate with either series of said wind-outlets, and means whereby communication between the channels is automatically prevented.

21. In a wind-chest for pipe-organs, the combination with a pair of stop-channels, of

a series of wind-outlets for each of said channels, valved ports for communicating with said outlets, a stop-channel intermediate of the aforesaid channels adapted to communicate with the ports of either series of outlets, and means whereby communication between the channels is automatically prevented.

22. In a wind-chest for pipe-organs, the combination with a stop-channel, of parallel pipe-bars having inlet-ports opening into the common stop-channel, a valve-bar within said channel, valves upon opposite sides of said valve-bar for guarding the inlet-ports aforesaid, and means for actuating said valves simultaneously or dissimultaneously.

23. As an article of manufacture a pipe-bar having suitable inlet-ports, valves and valve-seats, of a packing interposed between said valves and seats having a free portion overhanging said ports.

24. As an article of manufacture a pipe-bar having suitable inlet-ports, valves and valve-seats, of a perforated packing interposed between said valves and seats in concentric relation with and partially overhanging said ports.

25. As an article of manufacture a pipe-bar having suitable inlet-ports, valves and valve-seats, of a packing interposed between said valves and seats having a free portion overhanging said ports constituting also a self-acting check-valve.

26. In a wind-chest for pipe-organs, the combination with a pipe-bar having a suitable inlet-port, of a valve guarding said port, means for sealing the joint between said valve and its seat and automatically checking the flow of air in one direction.

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

PHILIPP WIRSCHING.

Witnesses:

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