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# UNITED STATES PATENT OFFICE.

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## EXPRESSION MECHANISM FOR PLAYER MUSICAL INSTRUMENTS.

Application filed October 6, 1920. Serial No. 414,953.

This invention relates to expression mechanism for player musical instruments, such as player pianos and organs, and more particularly to improvements on the player mechanism for musical instruments shown, described and claimed in the patent to William A. Watson and Warner Eustis, No. 1,430,517, dated Sept. 26, 1922. One of the objects of the present inven-

10 tion is to provide improved and simple means for carrying a theme through a performance by the player action, for carrying a solo or for accenting any given notes or phrases, and for playing softly in either the bass or the treble or both of them. Another 15object of the invention is to provide means for making use of valve units, such, for instance, as those shown in patent to William A. Watson, #1142863, in which patent the 20valve unit is shown as constituting means for controlling the piano action attackingbellows. Another object of the invention is to provide means associated with the expression mechanism in such manner that the 25 expression-valve serves the double function of an expression-valve and a cut-out-valve for shutting off the player-pneumatics durand shutting on the player phenatter stating the rewinding of the perforated sheet of music, or to do so while the player instruand music sheet or web, and for skipping passages of the music cut on the sheet, when desired. Other objects of the invention will appear from the description.

The above being among the specific objects of the present invention, the same consists of certain features of construction and combinations of parts to be hereinafter described and then claimed with reference to
the accompanying drawings illustrating a desirable embodiment of the invention, in which—

Fig. 1 is a perspective view of a portion of a player action sufficient to illustrate the present invention, parts being broken away for clearness of illustration, the controlled parts being in position for playing softly in the treble.

Fig. 2 is a sectional front elevation, partly
diagrammatic, the controlled parts being in accenting position, that is to say, one of the expression-holes in the music sheet admitting atmospheric air into the expression tracker-tube.

Fig. 3 is a view similar to Fig. 2, showing 55 the controlled parts in position for rewinding the perforated music sheet.

Fig. 4 is a vertical sectional view of the valve device, which is controlled directly by the rewind-manual.

Fig. 5 is an elevation of the seat for the said valve.

Fig. 6 is an under side view of the said valve, and

Fig. 7 is a fragmentary front elevation 65 showing the improved expression mechanism associated with means for causing the travel of a note sheet.

Referring to Figs. 1, 2 and 3, a portion only of the player action is illustrated, and 70 comprises a wind-way or wind-chest 10, which, although not necessarily so, is preferably so disposed relative to the remainder of the player action that when the latter is installed in the case of a player musical in- 75 strument, the said wind-way will be positioned under the key-bed, substantially in accordance with aforesaid Patent Ne. 1,430,517. At the right-hand end of windway or wind-chest 10, there is a hollow head 80 11, and the wind-way and the head 11 are preferably constructed of sheet metal associated in any preferred manner. It is not necessary to illustrate the left-hand end head, as that may be similar to the right-hand end 85 head, the left- and right-hand hollow heads being respectively for bass and treble, in which case the wind-ways which support the player-pneumatics are divided between the base and treble in well-known manner. A 90 motor wind-way 12 leads to the right and upwardly, and to the motor, which is not shown in said figures, it preferably being supported from the lower portion of the right-hand head 11. However, the motor 82 95 is partially shown in Fig. 7.

Expression-tubes 13 and 14 lead respectively to the bass and treble sides of the player action, and as the parts which may be associated with the bass side of the player 100 may be the same as those associated with the treble side, this description will be confined only to the parts associated with the treble side. The forward end of expression-tube 14 is provided with a ported head 15, the 105 port of which is controlled by a valve 16, which is operated by the expression-manual or button 17. The said valve automatically .

using the finger to depress the manual 17 and open the valve 16 against the action of its spring. The tracker 18 is connected in 5 any suitable manner with the wind-ways of the player-pneumatics, and at least at the treble end it is provided in well-known manner with a hole, from which expression-tube 19 leads, and with which hole there is adapt-10 ed to register any one of a series of side expression perforations in the music sheet 20.

The tubes 14 and 19 are preferably of metal, and their control means are adapted to control certain valves and mechanism, which 15 may be duplicated at the bass side of the

player action. An expression-valve 21, preferably in the form of a disk, is located in the hollow head 11, and is adapted to open or close 20 the valve opening surrounded by the seat 22 for said valve, and the valve and its seat are preferably in accordance with afore-said application. Valve 21 is provided with a depending upright stem 23, which extends downwardly through the lower end of the  $\mathbf{25}$ head 11, and the lower end of said stem passes through a rigid metallic wall 24, which is secured in the lower end of said head, said wall being located below the 30 wind-way 10. Wall 24 is provided with a hollow neck 25, through which the valvestem 23 passes, and the lower extremity of spectively closed by a primary valve 46 and

- 35 around the neck 25 in any suitable manner. material which will secure the bag against leakage of air. The lower extremity of valve-stem 23 is preferably disconnected
- from the bag 26, so that it will rest loose-40ly therein, and the bottom of the bag is secured to the central button 27 of flexible diaphragm 28. Diaphragm 28 is secured at its edge in an airtight manner to the, pref-
- 45 erably sheet metal, chamber 29, which is localled at the lower extremity of the head 11. Chamber 29 is provided with a central bottom opening 30, for the purpose of admitting atmospheric air, and also for the pur-
- pose of receiving a tension-spring 30<sup>a</sup>, the tendency of which is to pull the diaphragm downwardly with a greater or less pull, as desired; said spring may be carried by any suitable means for adjusting its tension.
- The flexible diaphragm 28 divides the cham-55ber or member 29 into two sub-chambers 31, 31° respectively, the sub-chamber 31 being located above the diaphragm, and the sub-chamber 31ª below it, so as to provide
- 60 a chamber which is constantly open to atmospheric air.

A valve-casing 32, preferably of sheet metal, is positioned upon the wind-way 10, and partly extends thereinto, its outer portion preferably extending forwardly, as

closes the port in head 15, the operator shown in Fig. 1. The inner portion of the valve-casing 32, which is located within the wind-way 10, is provided with openings 33, and the said casing is provided also with valve-seats 34 and 35, respectively, the open- 70 ings in which are respectively adapted to be closed or opened by means of primary valve 36 and secondary valve 37. Said valves are disposed upon a central stem 38, the inner end of which is attached to a 75 flexible diaphragm 39, which constitutes a puff. At the forward end of valve-casing 32, there is a chamber 40, with which the expression-tube 14 is connected. Air-tube 41 leads from the chamber between the 80 valve-sents 34 and 35 to the valve-casing 42, which preferably extends forwardly from the head 11, its inner portion being disposed in said head similarly to the way in which the valve-casing 32 is arranged, and as 85 shown in Fig. 1. In Figs. 2 and 3 the valve-casings 32 and 42 are shown differently disposed, for the sake of clearness of illustration, and although the said valvecasings may be arranged as in said figures 90 in practice, it is preferred to arrange them as shown in Fig. 1. Valve-casing 42 is pro-vided with openings 43 in that portion thereof which is within the head 11, and is furthermore provided with valve-seats 44 and 95 45, the openings within which may be resaid stem is received in a flexible bag 26, a secondary valve 47. Said valves are lo-the mouth of which is secured airtight cated upon a stem 48, which is connected around the neck 25 in any suitable manner. with a puff 49, back of which is a cham- 100 Said bag may be composed of any suitable ber, to which leads the tube 41. For obvious reasons, each of the diaphragms 39 and 40 are preferably provided with bleed-holes, as this is the best practice in this 105 connection.

The air-tube 50 leads downwardly from a port 51 in the side of the outer portion of the valve-casing 42. A tube 52 extends upwardly from the sub-chamber 31 of the chamber 29. In the description of the op- 110 eration of the expression mechanism de-scribed, it will be assumed for the present that the tubes 50 and 52 are directly connected together, or constitute one tube, which connected the sub-chamber 31 with the valve- 115 casing 42.

In normal playing the manually-con-trolled valve 16 will be closed, in which case the expression-valve 21 will be open, and the instrument will play loudly. The 120 action of the parts associated with the valve 21 in normally loud playing will be apparent when the method of accenting is described. If one desires to play the music softly at either the bass or the treble side, the corre- 125 sponding expression-manual is operated. In Fig. 1, the treble manual 17 is shown as depressed by a finger of the operator, so as to open the valve 16. This will admit atmospheric air into tube 14, and the air rushes 130

through said tube into the chamber 40 of which then momentarily acts to depress the the valve-casing 32. It immediately acts upon the valve 37 and opens it, closing the valve 36, which controls the opening to the wind-way 10, so that the air tension in the wind-way 10 will have no effect and is nullified. Valve 37, having been opened automatically, the atmospheric air rushes through the tube 41 to the valve-casing 42, 10 thereby immediately inflating the puff formed by diaphragm 49. This action ac-

tuates the valve-stem 48, thereby closing the valve 47 upon its seat 45, and cutting off atmospheric air through the opening in said 15 seat. This action also moves the valve 46

from its seat 44 and permits the tension air in the hollow head 11 to act through the opening in said seat, and through the tubes 50 and 52, and in the sub-chamber 31 of the

20 chamber 29. The tension air in sub-chamber 31 acts to lift the flexible diaphragm 28 against the tension of the spring 30<sup>a</sup> and to collapse the flexible bag 26, thereby acting upon the lower end of the valve-stem 23 to

25 raise the expression-valve 21 and close the valve opening at 22. Normally, the tension air in the hollow head 11 and in the collapsible bag 26 has no lifting tendency upon

the flexible diaphragm 28, but as soon as tension air acts directly in the sub-chamber 30 31 above the diaphragm 28, the said diaphragm is instantly raised by suction through the tubes 50, 52. Inasmuch as the sub-chamber 31 is a sealed chamber, except 35

for the effect of the tension air therein, the valve 21 will be maintained in closed position for all practical purposes while the valve 16 is kept open, except there will be a slight seepage of atmospheric air into the

player action, which only has the effect upon the valve 21 of imparting a slight flutter 40 thereto, but this does not interfere with the desired effect obtained by closing the valve 21. In other words, the said seepage of air

45 will have a slight tendency to minimize the action of the tension air in the chamber 31, but this is insufficient to prevent the valve 21 from being practically closed. The valve 21, being then closed in the manner de-scribed, and as shown in Fig. 1, the melody 50 will be played softly, whether the same be

carried through the bass or the treble. To understand just how the expression regulating-valve 21 acts it should be kept

55 in mind that the suction bellows is operating, and that the note-sheet is moving forward-With a constant suction in the lower ly. windway 10, and if there occurs the smallest leak of atmospheric air into the upper wind-60 chest structure having the player-pneumatics, as for sounding one note, the expressionvalve 21 moves further, even though slightly, 65

valve-actuating diaphragm 28 and to very slightly lower the valve 21. The suction in the upper windchest structure is immediately regulated to the desired tension at the 70 time of such slight valve movement, with the result that the note is sounded with the desired power when the regulation has thus been produced.

Should more atmospheric air be admitted 75 to the upper windchest structure, due to more player valves being operated, so as to increase the leakage into said upper strueture, expression-valve 21 is in the same manner lowered further, so that the vacuum ten- 80 sion in the lower windway acts to immediately establish a proportional tension in said upper structure, the two or more notes being sounded with practically the same power as before. Hence, it follows that it makes no 85 difference whether one note or any number of notes are sounded, as the expressionvalve 21 acts to automatically maintain a predetermined tension in the upper windchest structure of the player action proper. 90 Consequently, on account of the variable vibratory movement of the valve 21 in playing softly, the same flutters in its regulating action. It thus variably cuts off the suction on its controlling diaphragm 28. 95

So far, it has been assumed that the perforated music sheet 20 has acted as a valve to keep the expression tracker-tube 19 closed. If the music sheet be provided with a series of expression-holes, these holes will register 100 one at a time with the tube 19, and the controlled parts will be set instantly into the position as illustrated in Fig. 2. This is due to the fact that atmospheric air will be momentarily admitted to the tracker-tube 19, 105 and such air will act to press the diaphragm 39 inwardly or inflate the puff, thereby establishing an air tension balance between the wind-way 10 and the tube 41, inasmuch as the pressure air will act instantly to open 110 the primary valve 36, and to close the valve 37 to the atmospheric air which is admitted through the then manually-opened valve 16. It is here assumed that the operator has been constantly acting upon the expression- 115 manual 17 to maintain the valve 16 in open position, as regards the two conditions of the apparatus illustrated in Figs. 1 and 2. Tension air in the tube 41 will instantly act upon diaphragm 49 to deflate the puff 120 formed thereby, and this action will result in closing valve 46 and opening the valve 47 to atmospheric air. Atmospheric air will thereupon be instantly admitted into the valve-casing 42, and will rush through the 125 tubes 50 and 52 into the sub-chamber 31 of the chamber 29. The pressure air will then away from its seat. This slight movement immediately act to depress the flexible dia-is due to the momentary slight decrease of phragm 28, and allow the valve 21 to open vacuum tension in said upper structure, by gravity, if its valve-stem be merely rest-

as the valve 21 practically opens instantly in response to the opening in the note sheet 20, which then registers with the tracker-5 tube 19, the note corresponding with the reg-

istering hole of the note sheet will be accented. If there is no air pressure in tube 19 the

instrument will play loudly when the manu-10 ally-controlled valve 16 is closed. This is link 63 with a crank-arm 64, which is sup- 75 because it does not matter what position the valve 36 may be in, inasmuch as there is a bleed-hole 49° in the chamber of the puff or

- 15 hole is to establish a balanced vacuum tension at both sides of the diaphragm. The result is that if the valve 36 happens to be closed, a vacuum will be produced in the tube 41 and the parts communicating with it.
- 20 If the valve 36 happens to be open at the time of normal playing the effect on the diaphragm at 49 is just the same. Consequently, whether the valve 36 is open or closed at the time of normal playing, the
- 25 valve 47 will be open, and the pressure of the outer atmosphere will cause the expression-valve 21 to move away from its seat, so that the instrument can play loudly. This, of course, assumes that the tubes 50, 52 are
- 30 in communication with each other. There is also a bleed-hole at 39ª back of the diaphragm at 39, so that an equilibrium of vacuum tensions can be established at both sides of said diaphragm.
- Under the present invention it is possible 33 to omit a separate cut-out-valve between the player-pneumatics and the pumping mechanism, although this invention is not necessarily restricted to such omission. Prefer-
- 40 ably, mechanism actuated and set from the rewind-manual is employed, in association with the expression mechanism, and the same will now be described. In Figs. 1 and 2 the rewind-manual is set for playing a piece of 45 music, while in Fig. 3 it is set for rewind-
- 55, with which, respectively, connect the corresponding ends of the tubes 50 and 52. Mounted upon the valve-seat 53 is a slide or disk-valve 56, which is adapted to be
- 55 turned upon a pivot 57 carried by the valveseat 53. The contacting face of the valve 56 and the seat 53 should be ground for the best results, and the pivot 57 is controlled by a small spring 57<sup>a</sup>, which acts to press
- 60 the valve 56 upon its seat. As shown more clearly in Fig. 6, the valve 56 is provided with a semi-circular, or arcuate, channel 58, lines, and the passage 59 to the position and at the opposite side of the diameter of shown in the broken out portion of the figthe valve, with an arcuate channel 59, said ure. The valve 56 now forms a rewind-

ing within the flexible bag 26. Inasmuch grooves in the inner face of the valve. As shown in Figs. 1 and 2. the channel 58 establishes communication between the tubes 50 and 52. Channel 59 registers with a port 60 in valve-seat 53, and said port is connected 70 by a by-pass tube 61 with the wind-way 10 at a point in advance of the head 11. A crank-arm 62, extending edgewise from the disk-valve 56, is connected by means of a ported by a rockshaft 65, at the forward end of which is a control-manual 66, constituting the rewind-manual. A link 67 condiaphragm at 49, the effect of which bleed- nects another crank-arm 68 on shaft 65 with a vertical rock-shaft 69, which at its upper 80 end is adapted to actuate a rod 70. The rod 70 serves for conditioning the gear shift pinion of the power mechanism of the motor, and the rewind-valve associated with the tempo-governor, for moving the perforated \$5 music sheet at greater than playing speed in rewinding, and in skipping or going ahead silently. Mechanism which may be employed to co-ordinate with the rod 70 for bringing about these results may be such as 90 is shown, described and claimed in co-pending application of myself and William  $\Lambda$ . Watson, Serial No. 414,954, for rewind mechanism for player musical instruments. Before describing the position of the parts 95 operated by the rewind-manual in co-ordination with the expression mechanism as illustrated, it is well to say that the playing position of the rewind-manual is preferably to the right, as shown in Figs. 1 and 2, that is, 100 to the right of a line passing vertically through the rock-shaft 65. The skipping position of the same mechanism, or the "silent go-ahead" position, is preferably at the vertical, that is to say, the rewind- <sup>105</sup> manual is set vertically. This position is not illustrated in the drawings. but the action of the rewind mechanism herein involved is the same in that position as when the rewind-manual is moved to the left, 110 ing. A plate or disk forming a valve-seat which is the preferred rewind position, as 53 is suitably supported in front of the shown in Fig. 3. It should be remarked lower end of the hollow head 11, and this is that the tracker-bar is shown in Figs. 2 and shown in Figs. 4 and 5 in detail. Valve- 3 diagrammatically, that is, it is not shown 50 sent 53 is provided with two ports, 54 and in the position which it takes in the prac- 115 tical apparatus, and, that the rewind-manual is shown in Figs. 2 and 3, for clearness of illustration, in a different position than shown in Fig. 1, which is the practical posi-120 tion for said manual.

As before stated, Fig. 3 shows the position of the parts in rewinding. In this position, the valve 56 will be shifted so that the connection between the tubes 50 and 52will be broken, the passage 58 in the valve 125 being moved to the position shown in broken 65 channels being preferably formed as half conditioning valve and the passage 59 will 130

now connect the tubes 52 and 61, thereby rod 70 for either of the directions of travel forming a shunt connection between the wind-way 10 and the chamber 31. Tension air will now exert its action on the flexible diaphragm 28, thereby raising the value 21 and closing its opening, thus shutting off

- the player-pneumatics, and strictly speaking, shutting off all channels or windways directly above the valve 21. Full tension 10 will now be exerted upon the air in the motor wind-way 12, as the player-pneumatics are cut out by the valve 21 which now forms a rewind cut-out-valve.
- With a view to clarity it is stated at this 15 convenient point that although suction is established on the diaphragm 28, which controls the expression-valve 21, when either of the branch tubes 50, 61 is connected with the diaphragm chamber 31, the pull on the diaphragm is not the same in each case. The suction through the connecting branch 20
- 50, 52 which connects with the head 11 at a point between the valve 21 and the player-25
- the short connecting branch 61, 52. For, as before described, the expression-valve 21 having a controllable orifice therefor which
- 30 therethrough for soft playing-the vacuum tension above the said valve is weaker than chamber, one wall of which is formed by in the windway 10, and the tension in the said diaphragm, and means adapted to ad-35
- 10 in advance of the position of the expression-valve 21, are connected with the dia- 2. In expression mechanism for player phragm-chamber 31 there is a pull on the musical instruments, the combination of a sion-valve 21, are connected with the diadiaphragm 28 which corresponds with the
- 40 degree of tension in the windway 10, as that tension is not affected by any of the connections between the said valve and the player-pneumatics. Hence, at this time the expression-valve 21 is held firmly shut and
- 45 there is little, if any, flutter thereof. The valve is shut so tightly at this time that it is converted into a rewind-cut-out valve, and at this time the motor can be speeded up for rewinding the note sheet. 50
- In skipping, or in "silent go-ahead," the rewind-manual, as before stated, preferably assumes a vertical position intermediate of its right- and left-hand positions. In that
- position, the crank 62 on the valve 56 will be set in a position intermediate of the po-55 sitions shown in Figs. 2 and 3. However. there will still be a break in the connection musical instruments, the combination of a between the tubes 50 and 52, although the 60 up, as is the case in rewinding.

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of the note sheet. A rock-shaft 71 has bearings in brackets 72, 73, and an arm 74 on the lower end of said shaft is pivotally connected with the rod 70. The upper end of the 70 shaft 71 carries an arm 75 which is adapted to shift the intermediate driving pinion 76 in one direction or the other. When the pinion 76 is shifted to mesh with the gear 77 the note sheet roll 80 will carry the note 75 sheet forwardly over the tracker 18 and the instrument will play. When the pinion 76 is shifted to clutch with one of the gears of sprocket-chain 78 the note sheet will be rewound on the roll 79. 80

Obviously, the invention is susceptible of more or less modification, as parts may be omitted, parts added, and parts substituted for others without departing from the spirit and scope of the invention as defined in the 85 claims.

What I claim as new is:

1. In expression mechanism for player pneumatics, is of less tension than through musical instruments, the combination of a windway, player-pneumatics, the winding 90 flutters during soft playing. At this time, establishes communication between the play-as the valve 21 is closed, or practically er-pneumatics and said windway, an ex-closed—except for the restricted flow of air pression-valve for controlling said orifice, er-pneumatics and said windway, an ex-pression-valve for controlling said orifice, a flexible diaphragm, a member having a 95 diaphragm-chamber 31 is equal to that in mit air under different pressures to said the windway 10. But, when the branch chamber from two different points of said tubes 61, 52, which lead from the windway windway, for opening and closing said 100 valve.

> wind-way, a hollow head at the end of said windway, an expression-valve, located in 105 said head, a flexible diaphragm, a member having two chambers formed by said diaphragm, and means adapted to admit air under different pressures to one chamber, for opening and closing said valve.

3. In expression mechanism for player musical instruments, the combination of a wind-way, a hollow head at the end of said wind-way, an expression-valve located in said head, an open transverse valve-seat in 115 said head, a flexible diaphragm, a member having two chambers formed by said diaphragm, and means adapted to admit air under different pressures to one chamber, for opening and closing said valve. 120

4. In expression mechanism for player wind-way, a hollow head at the end of length of the passage or channel 59 is such said windway, an expression-valve located that the ports 55 and 60 will communicate. in said head, a flexible diaphragm, a mem-Consequently, the motor will also be sped ber having two chambers formed by said in said head, a flexible diaphragm, a mem- 125 diaphragm and located at the lower end of In Fig. 7 is illustrated the relation of the said head, and means adapted to admit air expression mechanism and rewind-manual under different pressures to one chamber, to suitable power mechanism controlled by for opening and closing said valve.

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musical instruments, the combination of a and open said wind-way, and a passage conmain windway, the player-pneumatic wind- necting the other of said valve units with way, an expression-valve between the playerpneumatic and the main windway and hav-

- ing a full-open position and a near-closed position, and which is always biased toward one of said positions in normal playing, a chamber separate from said windway and 10 having a flexible diaphragm supporting said
- valve, and control-valve means for admitting air under different pressures to said chamber, to act on said diaphragm and cause said valve to move toward one position for ob-15 taining one effect, and toward the other posi-
- tion to obtain another effect, whereby said valve is caused to flutter when near-closed. 6. In mechanism of the class described, a wind-way, a valve therein having a stem, a
- 20 chamber having a flexible wall connected to said valve through its stem, a flexibly walled enclosure located in said chamber and communicating with said wind-way, and surrounding the end of said stem adjacent said
- 25 flexible wall, and means adapted to admit air at the pressure in said wind-way to said chamber, and for admitting air at a different pressure to said chamber, for opening and closing said valve.
- 7. In mechanism of the class described, a 30 wind-way, a hollow head at the end of said wind-way, a valve in said head having a stem, a chamber at the lower end of said head having a flexible wall connected to said
- 35 valve through its stem, a flexibly walled enclosure located in said chamber and communicating with said wind-way, and surrounding the end of said stem adjacent said flexible wall, and means adapted to admit air
- 40 at the pressure in said wind-way to said chamber, and for admitting air at a different pressure to said chamber, for opening and closing said valve.
- 8. In an expression mechanism for player 45 musical instruments, a horizontal wind-way, a hollow head at one end of said wind-way, a transverse, open, valve-seat in said head between the player-pneumatics and said wind-way, an expression-valve and its stem
- 50 below said seat, said stem extending to the lower end of said head, a chamber at the lower end of said head having a flexible wall adapted to operate said valve through its stem, and manually-controlled, pneumatic
- 55 means adapted to admit air under different pressures but at different times to said chamber, for moving said valve to and from its seat.

9. In mechanism of the class described, the 60 combination of a wind-way, two valve units, each having a plurality of valves for controlling said wind-way, means for controlling the valves in one of said units, a passage connecting said units, a chamber hav-65 ing a flexible diaphragm, a valve operable in said head, said valve having a depend- 120

5. In expression mechanism for player from said diaphragm and adapted to close said chamber, whereby said diaphragm is adapted to be operated.

10. In mechanism of the class described, the combination of a wind-way, two valve units, each having a plurality of valves for controlling said wind-way, means for controlling the valves in one of said units, a 75 passage connecting said units, a chamber having a flexible diaphragm, a valve operable from said diaphragm and adapted to close and open said wind-way, a passage connecting the other of said valve units with 80 said chamber, whereby said diaphragm is adapted to be operated, said controlling means comprising a manually-operable valve for admitting atmospheric air thereinto.

11. In expression mechanism for player 85 musical instruments, the combination of a wind-way, two valve devices, each having a plurality of valves for controlling said windway, a hollow head transverse of said windway, means for controlling the valves in one 90 of said valve devices, a passage connecting said valve devices, a chamber having a flexible diaphragm, an expression-valve operable from said diaphragm and adapted to open and close communication between said 95 wind-way and the player-pneumatics, and a passage connecting the other of said valve devices with said chamber, whereby said diaphragm is adapted to be operated.

12. In expression mechanism for player 100 musical instruments, the combination of a wind-way, two valve devices, each having a plurality of valves for controlling said windway, a hollow head transverse of said windway, means for controlling the values in one 105of said valve devices, a passage connecting said valve devices, a chamber having a flexible diaphragm, an expression-valve operable from said diaphragm and adapted to open and close communication between said 110 wind-way and the player-pneumatics, a passage connecting the other of said valve devices with said chamber, whereby said diaphragm is adapted to be operated, and said controlling means comprising a manually- 115 operable valve for admitting pressure air thereto, and also an expression tracker-tube.

13. In a player mechanism for musical instruments, a wind-way having an upright hollow head, in combination with an ex- 120 pression-valve located in said head, and means for operating said valve and comprising a control-valve device positioned in said head.

14. In a player mechanism, a wind-way 125 having an upright hollow head, said head being provided with a transverse orificed valve-seat, in combination with an expression-valve to control the orifice and located

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ing stem, atmospherically-operated means for cutting out the expression mechanism, adapted to act on said stem for opening said valve, and suction-operated means for closing the valve.

15. In a player mechanism, a wind-way having an upright hollow head, in combination with a chamber at the lower end of said head, a flexible diaphragm in said chamber, a transverse orificed valve-seat in said head,

- <sup>10</sup> an expression-valve located in said head and having a depending stem resting on said diaphragm through the gravity thereof and said valve, means adapted to act on said diaphragm for operating said valve through said
- <sup>15</sup> stem, atmospheric means for acting on said diaphragm to open said valve, and suction means acting on said diaphragm to close the valve.
- 16. In mechanism of the class described, <sup>20</sup> the combination of a rewind-manual having a playing and a rewind position, means actuated by said rewind-manual and adapted to operate on the power mechanism for either of the two directions of travel of the perfo-
- 25 rated music-sheet, expression means, a rewind conditioning-valve associated with said expression means, and means for actuating said valve from said manual to cut out said expression means when rewinding.
- 20 17. In mechanism of the class described, the combination of a rewind-manual, having three positions, namely,-for a forward travel, a skipping, and a rewinding,-means
- under the control of said manual for conditioning the apparatus for a playing speed and a faster speed in skipping and rewind-ing, expression means, a rewind conditioning-valve associated with said expression means, and means for actuating said valve 40 from said manual to cut out said expression

means when skipping or rewinding.

18. In a player musical instrument, the combination of a windway to the playerpneumatics, an expression mechanism asso-45 ciated therewith, with a rewind mechanism having a control part which is independent of said windway and constitutes one of the elements of the expression mechanism.

19. In a player musical instrument, a com-50 bined expression and rewind cut-out-valve, means for operating said valve for expression, and separate means for operating said valve for rewinding the perforated music sheet with accelerated speed. 55

20. In a player musical instrument, a combined expression and rewind cut-out-valve, means for operating said valve for expression, a control valve, and a manual for operating the control valve for conditioning the 60 instrument for expression and for rewinding a perforated music sheet.

21. In a player musical instrument, the combination of an expression mechanism having an expression-valve, a rewind-man-65

and means associated with said control-valve for enabling said expression-valve to act as a rewind cut-out-valve, when said expression mechanism is cut out.

22. In a player musical instrument, the combination of expression mechanism having an expression-valve, rewind mechanism, and means for enabling said expressionvalve to act as a rewind, cut-out-valve.

23. In a player musical instrument, the combination of a wind-way, a hollow head thereon, expression mechanism, a part of which is mounted on said head, having an expression-valve located in said head, re- 80 wind mechanism, and means for enabling said expression-valve to act as a rewind, cutout-valve.

24. In a player musical instrument, the combination of a wind-way, a hollow head 85 thereon, expression mechanism, a part of which is mounted on said head, having an expression-valve located in said head, rewind mechanism, and means for enabling said expression-valve to act as a rewind, cut-out- 90 valve, said means comprising a control-valve mounted on said head.

25. In a player musical instrument, the combination of expression mechanism, a rewind mechanism and a manual operable at 95 will on both of said mechanisms for conditioning the instrument for expression or for rewinding a perforated music sheet.

26. In a player musical instrument, the combination of expression mechanism, a re- 100 wind mechanism, a manual operable at will on both of said mechanisms for conditioning the instrument for expression and for rewinding a perforated music sheet, and a single valve operable by said manual for ac- 105 complishing that purpose.

27. In a player musical instrument, the combination of expression mechanism comprising a passage, and a valve controlled from said passage, with a rewind mechanism 110 comprising a passage for independently controlling said valve, and valve means operable by said rewind mechanism for cutting either of said passages in or out.

28. In expression means for musical in- 115 struments, a wind-way, a diaphragm, a branch air connection to said diaphragm from said wind-way, a valve in said wind-way actuated by said diaphragm, and located between the ends of said branch con- 120 nection, and means to cut off the connection from the said wind-way and to admit atmospheric air to said connection.

29. In a player musical instrument, a vertical hollow head having a wind-way, a dia- 125 phragm, a branch connection between said wind-way and said diaphragm, and a vertically actuated valve resting upon said diaphragm and controlling the passage of air ual, a control-valve operable by said manual between said wind-way and said diaphragm, 130

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way except for said branch connection.

30. In a player musical instrument, the combination of a wind-way, a hollow head

5 connected therewith, a rewind-valve in said head, and mechanism for operating said

valve for rewinding. 31. In a player musical instrument, the combination of a wind-way, a hollow head

10 connected therewith, a vertically operable, gravity return, rewind-valve in said head, and mechanism for operating said valve for rewinding.

32. In a player musical instrument, the 15 combination of a wind-way, a hollow head connected therewith, a rewind-valve in said head, mechanism for operating said valve for rewinding, a separate control-valve operable by said rewind mechanism, and a con-20 nection from said wind-way controlled by

said control-valve for admitting tension air to operate said rewind-valve.

33. In a player musical instrument, a valve-chamber, an expression-valve for con-

25 trolling the same, and means for causing the flutter of said valve when it is in position for soft playing.

34. In expression mechanism for player musical instruments, the combination of the

80 main windway for establishing suction on the player-pneumatics, an expression-valve in said windway and controlling the degree of suction on said pneumatics, a chamber

said diaphragm being sealed from said wind- having a flexible diaphragm controlling said valve, and means of communication leading 35 from between the said valve and playerpneumatics to said chamber and functioning with said valve for maintaining an even vacuum tension upon said player-pneu-40 matics.

35. In expression mechanism for player musical instruments, the combination of the main windway for establishing suction on the player-pneumatics, an expression-valve in said windway and controlling the degree 45 of suction on said pneumatics, a chamber having a flexible diaphragm mechanically controlling said valve, and means connecting with the windway at a point between the said valve and player-pneumatics for ad- 50 mitting air at will under suction or atmospheric pressure to said chamber, whereby said valve serves for both soft and loud playing.

36. In expression mechanism for player 55 musical instruments, the combination of the main windway for establishing suction on the player-pneumatics, an expression-valve in said windway and controlling the degree of suction on said pneumatics, a chamber 60 having a flexible diaphragm supporting the weight of said valve, and means for admit-ting air at will under suction or atmospheric pressure to said chamber, whereby said valve serves for both soft and loud playing.

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