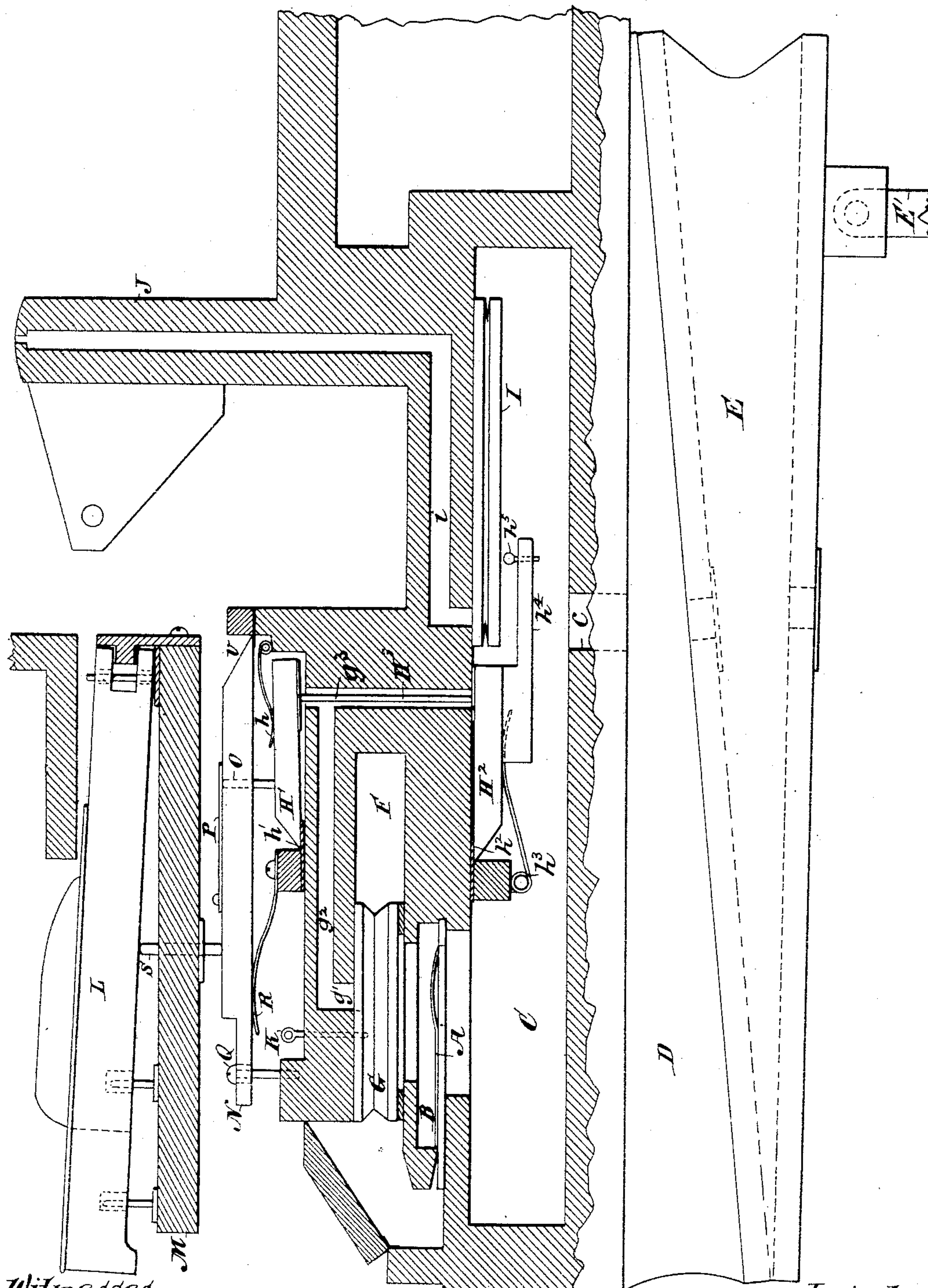


(No Model.)

R. W. PAIN.
MUSICAL INSTRUMENT.

No. 445,075.

Patented Jan. 20, 1891.



Witnesses
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UNITED STATES PATENT OFFICE.

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MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 445,075, dated January 20, 1891.

Application filed January 23, 1889. Serial No. 297,230. (No model.)

To all whom it may concern:

Be it known that I, ROBERT W. PAIN, of New York, in the county and State of New York, have invented a certain new and useful Improvement in Musical Instruments, of which the following is a specification.

The accompanying drawing illustrates a vertical section of a portion of a musical instrument embodying my improvement, the section being taken transversely to the length of the instrument.

A designates one of the sound-producing devices of this instrument. It is shown as consisting of a reed and is located in a cell B, communicating with what is ordinarily termed a "wind-chest" C. This wind-chest communicates through passages *c* with an equalizer D. The equalizer is in communication with bellows E, of which there may be any desirable number. In the present instance these are suction-bellows, and hence when they operate they attenuate the air within the wind-chest. The equalizer and the bellows may be of ordinary construction and can be combined in the usual or any other suitable manner. The bellows may be operated by rods *E'* from a treadle or in any other ordinary way. The cells of the reeds communicate with a chamber F, opening to the atmosphere. With each reed-cell is combined a valve G, which may be aptly described as a "pallet-valve and pneumatic motor combined." The interior of each pallet and pneumatic G is in free communication with a duct consisting, as here shown, of an upright portion *g'*, communicating with said pallet and pneumatic, a horizontal portion *g''*, extending from the portion *g'*, and a vertical portion *g'''*, extending from the portion *g''*. The portion *g'''* is at the upper end open to the atmosphere and at the lower end in communication with the wind-chest C. The vertical portion *g'''* of each duct *g' g'' g'''* has combined with it two valves *H' H''*. The valve *H'* is above the reed-board and controls the communication of the duct with the atmosphere. The valve *H''* is arranged within the wind-chest and controls the communication of the duct with the wind-chest. When the valve *H'* of any duct *g' g'' g'''* is open, the corresponding valve *H''* is closed,

and vice versa. A rod *H'''* extends between each pair of valves *H' H''*, so as to render it impossible for both valves to be closed at the same time.

Each valve *H'* consists of a lever hinged at one end by flexible material *h'* or otherwise to the top of the reed-board and extending over the vertical portion *g'''* of one of the ducts before mentioned. It may be faced on the under side with any suitable material to obviate leakage. A spring *h* impinges upon it and tends to force it to its seat.

Each valve *H''* is made in the form of a lever, hinged at one end to the underside of the reed-board by flexible material *h''* or otherwise and extending under the lower end of the vertical portion *g'''* of one of the said ducts. It may be provided with any suitable facing material opposite the said duct to prevent leakage. A spring *h'''* impinges against the under side of each valve *H''*, tending to force it upwardly to its seat. Each valve *H''* is shown as having an arm *h'''* extending rearwardly from it. Above the arm *h'''* of each valve *H''* a pneumatic motor I is arranged within the wind-chest C, its exterior being exposed to the wind-chest and its interior communicating with a duct *i*, which terminates in a tracker J. The arm *h'''* of each valve *H''* is preferably provided with an adjustable contact-piece *h'''*, which may advantageously be made in the form of a screw. The pneumatic motor I, corresponding to each valve *H''*, operates upon the contact-piece *h'''* of such valve to lower the same in order to open the corresponding duct *g' g'' g'''*.

It must be understood that there will be for each reed a pallet and pneumatic G, a duct *g' g'' g'''*, a pair of valves *H' H''*, with their appurtenances, a pneumatic motor I, and a duct terminating in the tracker J. These parts will be varied in number, according to the number of notes the instrument is to have.

The tracker J has passed over it a perforated music-sheet controlling the ingress of air from the atmosphere through the ducts *i* to the pneumatic motors I. When air in this way is permitted to enter one of the ducts *i*, it will expand the corresponding pneumatic motor I, because the atmospheric pressure

thus admitted to the interior of said motor will be greater than the pressure within the wind-chest C. The lower board of the motor will then move downwardly and force open the corresponding valve H^2 against the resistance of its spring h^3 . The opening of the valve H^2 will permit the corresponding valve H' to close. Communication between the corresponding pallet and pneumatic G through its duct $g'g^2g^3$ with the atmosphere will then be cut off, and communication will be simultaneously established between the pallet and pneumatic G through the duct $g'g^2g^3$ with the wind-chest C. The pallet and pneumatic G will then collapse, its lower movable board rising. Air will then pass into the corresponding reed-cell and sound the reed therein. In considering the operation of the pallet and pneumatic it is important to note that the area of its lower board exposed to the reed-cell is much less than the interior area of that board; hence the action which I have described

Each pallet and pneumatic G has combined with it a stop to prevent its lower board from rising too far. This may advantageously be made of an adjustable pin or screw K, inserted in the reed-board above the pallet and pneumatic and extending down into the interior of the latter.

I have thus far explained the operation of the musical instrument under control of the traveling music-sheet. I will now describe the operation from manual keys L. These keys L are supported and operated in the usual way upon a key-block M.

When one of the keys L is depressed, it will close the corresponding valve H' and open the valve H^2 . It does not operate upon these valves only. Interposed between each key L and the corresponding valves H' H^2 is a lever N, which at one end is pivotally connected by flexible material v or otherwise to the rear portion of the reed-board. It extends forwardly over the valve H' , with which it coacts. It receives within it a pin O, that is affixed to the opposite valve H^2 . A spring P, shown as consisting of a flat strip of metal, is secured to each lever N and extends over the opening that accommodates the pin O. When the lever occupies a certain position, as here shown, the spring P rests upon the top of this pin O. If the lever is swung downwardly beyond this point, it will close the valve H with a yielding pressure, due to the spring P. Each lever N has combined with it a guide Q, which has the function of a stop, and is shown as made in the form of a screw, it being, when so made, adjustable. A spring R is arranged beneath each lever N and tends to press it upwardly. The stop Q limits the upward movement of the lever N under the influence of the spring R. Between each lever N and its corresponding key L is interposed a pin S, which fits loosely in a hole in the key-block. When a key L is depressed, it will act through its pin S to depress the opposite lever N. The depression

of the lever N will cause the valve H' to be closed with a yielding pressure, owing to the presence of the spring P, and cause the simultaneous opening of the valve H^2 . During the closing of the valve H' by the lever N the spring P will be slightly deflected by the time the valve is held seated. The stop Q is to be so adjusted as to preserve a proper initial co-action between the spring P and valve-pin O. It will be seen that the movement of the valve H' is infinitesimal compared with the movement of the key necessary to operate it. The spring P insures an operative connection at all times between the lever N and valve H' , as it compensates for shrinking and swelling of material due to changes of the weather, inasmuch as it may be deflected more or less in the operation of the lever N as such changes occur. The key may nevertheless be fingered with all the ordinary advantages. The spring P of each lever has also the additional function of compensating for changes incident to variations in the weather, inasmuch as it is free to yield or straighten out to compensate for changes between the valve H' and itself, as also changes in the reed-board, while its stop-pin Q remains unadjusted. The alignment of the lever will therefore not be disturbed by changes in the weather.

The adjustable stop K, which is combined with the pallet and pneumatic G, is important, in that it affords a ready means for regulating the amount of movement of each pallet and pneumatic. As the pallet and pneumatic for one note will require less movement than the pallet and pneumatic for another note, this facility for regulating the movement is important, especially when it is remembered that unnecessary movement of the pallet and pneumatic for any note will interfere with its correct action.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a musical instrument, the combination, with a reed-cell, of a combined pallet-valve and pneumatic motor arranged at the outer side thereof and communicating internally through ducts $g'g^2g^3$ with the atmosphere and the wind-chest, substantially as specified.

2. In a musical instrument, the combination, with the pallet-valve or pneumatic G, of the adjustable stop K, substantially as specified.

3. In a musical instrument, the combination, with a valve controlling the speaking of a sound-producing device, of a key, a lever interposed between the key and the valve, and a spring-connection between the lever and the valve, substantially as specified.

4. In a musical instrument, the combination, with a valve controlling the speaking of a sound-producing device, of a key, a lever interposed between the key and the valve, and a spring transmitting motion from the lever to the valve, substantially as specified.

5. In a musical instrument, the combina-

tion, with a valve provided with an upward-
ly-extending pin and controlling the speak-
ing of a sound-producing device, of a key, a
lever interposed between the key and the
5 valve and receiving the pin of the valve, and
a spring attached to the lever and bearing
upon the pin, substantially as specified.

6. In a musical instrument, the combina-
tion, with a valve controlling the speaking of
10 a sound-producing device, of a key, a spring

providing a direct yielding connection be-
tween the valve and key, and an adjustable
stop preserving a proper initial coaction be-
tween the spring and valve, substantially as
specified.

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