(No Model.)

G. W. INGALLS & A. E. PHELPS.

BELLOWS.

No. 263,788. Patented Sept. 5, 1882.

Fig. 1.

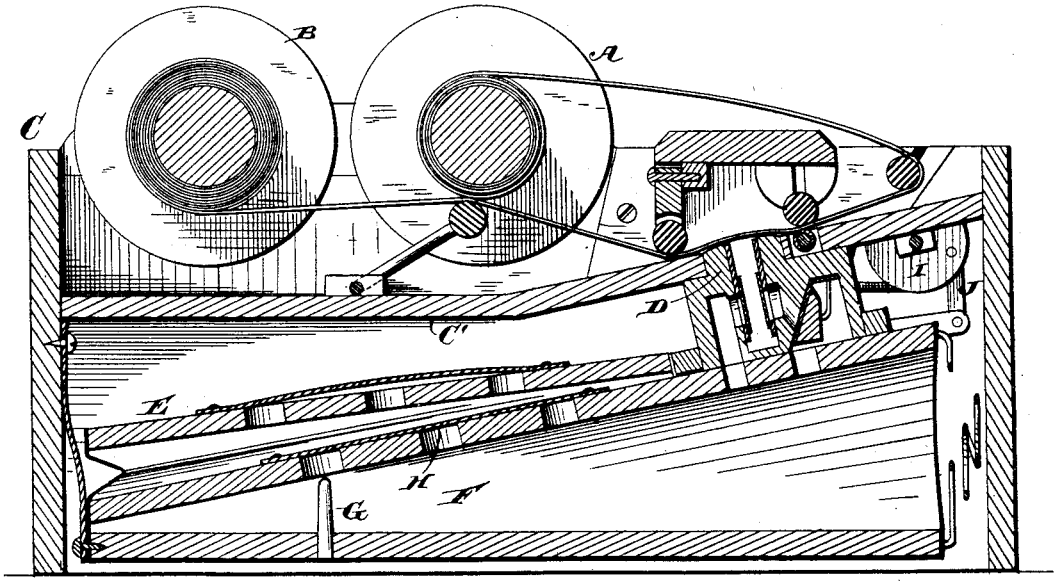


Fig. 2.

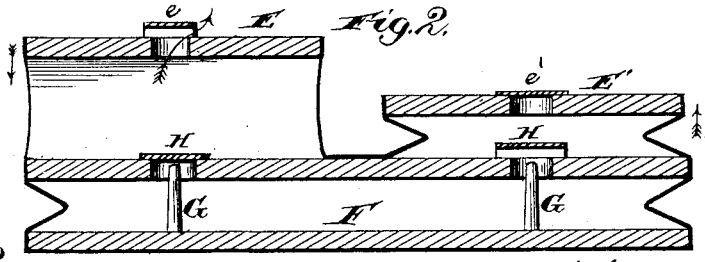


Fig. 3.

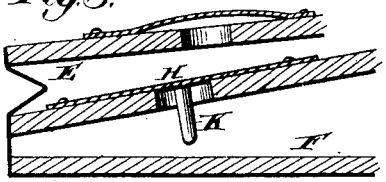


Fig. 4.

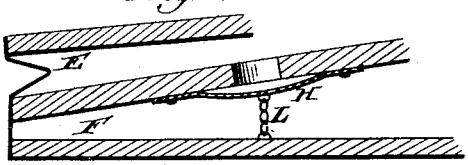
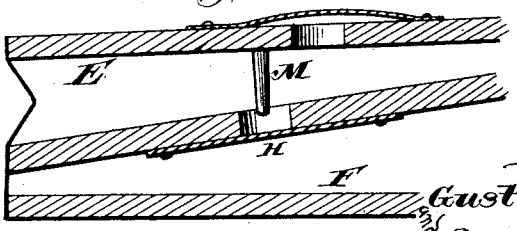


Fig. 5.



Witnesses.
Robt Everett.
Edward G. Siggers.

Inventors
Gustavus W. Ingalls.
and Amial E. Phelps.
By Wm H Babcock
Atty.

UNITED STATES PATENT OFFICE.

GUSTAVUS W. INGALLS AND AMIAL E. PHELPS, OF WORCESTER, MASSACHUSETTS, ASSIGNORS TO SAID INGALLS.

BELLOWS.

SPECIFICATION forming part of Letters Patent No. 263,788, dated September 5, 1882.

Application filed June 17, 1882. (No model.)

To all whom it may concern:

Be it known that we, GUSTAVUS W. INGALLS and AMIAL E. PHELPS, citizens of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Bellows for Automatic and other Musical Instruments; and we 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, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to safety-valves for the bellows of musical instruments, and has for its object to provide a new arrangement and combination of the same and means for operating them, whereby divers objections to the common construction and method of operation will be avoided.

Hitherto the safety-valve for the ordinary suction-bellows has usually been placed upon the outside of it at the large end and on the bottom, a spring being employed to hold it. When these bellows are used (a reservoir and two pumps) this safety-valve is in the bottom of the reservoir-bellows. When the pump-bellows, by their alternate action, have exhausted the reservoir-bellows beyond a certain point, the collapsing of said reservoir-bellows will cause said safety-valve to come in contact with a fixed external pin, which will force said valve open against the resistance of said spring, and thereby allow external air to rush in and relieve the bellows. The objection to this method are chiefly as follows: First, the increased exhaust force necessary to overcome said spring and open said valve tends to make the reeds unsteady in their action; secondly, the inward rush of air through the safety-valve produces an audible sound, which may interfere more or less with the music; thirdly, dust and dirt are frequently drawn into the bellows, to the detriment of the same; fourthly, the external spring is specially liable to accidental injury, which would be fatal for the time being to the efficiency of the bellows. To avoid these objections we employ, in combination with a main or reservoir bellows and its pump-bellows, intervening valves and rods or lugs within said reservoir-bellows, one rod or lug being arranged to open each valve when the contraction of the main bellows passes a certain point for the purpose of allowing the air to rush back from the suction-bellows. Of course when the operation is by forcing instead of by suction the lug or rod is arranged to operate in the reverse direction, and the valve itself is in each case reversed in position. We also locate the valves and the opening-rods in the thin part of the bellows, in order that the action may be gradual. This prevents a sudden rush of air, which always has a tendency to make needless noise and unsteady action.

In the accompanying drawings, Figure 1 represents a longitudinal vertical section taken through an automatic musical instrument embodying my invention. Fig. 2 represents a transverse vertical section taken through the bellows in the neighborhood of the rods which actuate the valves. Fig. 3 represents a detail view of a valve having a stud or lug on its under side as a substitute for the rod raised from the bottom of the bellows, which is shown in the figures before mentioned. Fig. 4 represents a detail view of part of the reservoir-bellows, the bottom of one feeder-bellows, a downwardly-opening valve between the two, and a pair of loose links connecting said valve to the bottom of the reservoir-bellows, this construction and arrangement being adapted for use when the operation is by forcing instead of by suction; and Fig. 5 represents a similar detail view, in which, for the same purpose, a rod or stud extends downward from the under side of the top of the feeder-bellows above said valve.

A designates the winding-roll, B the rewinding-roll, C the case, C′ the partition between the upper and lower parts of said case, D the reed-board, E E′ the two upper or pump bellows, arranged side by side, and F the lower or reservoir bellows, of an automatic musical instrument, the air passing down through the reed-ducts in said reed-board to said main or reservoir bellows, thence up through the communicating valves H to the two pump-bellows E E′, and finally out of the

latter through the ordinary outlet-valves, *e e'*, in the top boards of said pump-bellows. On the bottom of the thin part of the reservoir or main bellows F we erect two rods or posts, G, repectively, under the two valves H, which allow the passage of air from the reservoir-bellows to the two pump-bellows E E'. These pump-bellows are operated alternately by driving-shaft I and pitman J. Consequently one draws itself full from the reservoir or main bellows F while the other is discharging into the air above. The valve H in the bottom of the former is under such circumstances, open and cannot come into contact with the post or rod G below it; but the valve H of the discharging-bellows is closed, and remains so until the contraction of the reservoir-bellows becomes sufficient to draw this latter valve against the post or rod G below it. The valve is thereby forced open and the air flows back from the pump-bellows to the reservoir-bellows, so as to prevent the latter from being utterly emptied. As these valves H are wholly within the set of bellows, they do not admit any foreign substances thereto, and the sound of the passing air is unheard. One valve is adapted to do the work of two in each instance, for the ordinary valve of communcation between the bellows answers also as a safety-valve. The location of these valves H in the thin part of the main bellows insures their gradual opening, for the space traveled over by any point of the thin part of the bellows when the latter opens and closes will of course be much less than the space traveled over by any point in the thicker part of the bellow during the same period, the motion of one side of a closing or opening bellows being like that of a pendulum-rod, the arcs simultaneously described by the several points increasing progressively with the distance from the pivotal point.

In Fig. 3 the rod G is supplanted by a stud or lug, K, formed on the under side of the valve H, or attached thereto, and operating against the floor of the main reservoir F when the latter contracts too far, so as to open said valve H, as before.

In Fig. 4 a modification is shown which is adapted to be used when pressure-bellows are employed. The valve H opens downward into reservoir F and links L connect it with the bottom thereof. When this reservoir contracts in the act of forcing air through the reeds the links exert no influence either way, but merely fold toward each other. When, however, the reservoir-bellows expands too far these links are straightened and draw on the valve H, so as to open it and allow the air to escape from said reservoir into the feeder-bellows.

In Fig. 5 another modification is shown, for the same purpose as the last. A stud, M, extends downward from the under side of feeder-bellows E, and is arranged to bear against and open the valve H, when the reservoir-bellows expands far enough to bring said stud and valve in contact with each other.

In all these forms of our invention the operating parts are internal, and the advantages hereinbefore stated are secured.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A reservoir-bellows and a pump or feeder bellows, in combination with a valve between them and a device for opening said valve in order that it may act also as a safety-valve for said reservoir-bellows.

2. In combination with a main bellows, a pump-bellows, and the intervening valve, a rod interposed between said valve and the bottom of the main bellows and arranged to open said valve as the latter approaches said bottom, substantially as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

GUSTAVUS W. INGALLS.
AMIAL E. PHELPS.

Witnesses:
FRANK A. BEANE,
WALTER G. INGALLS.