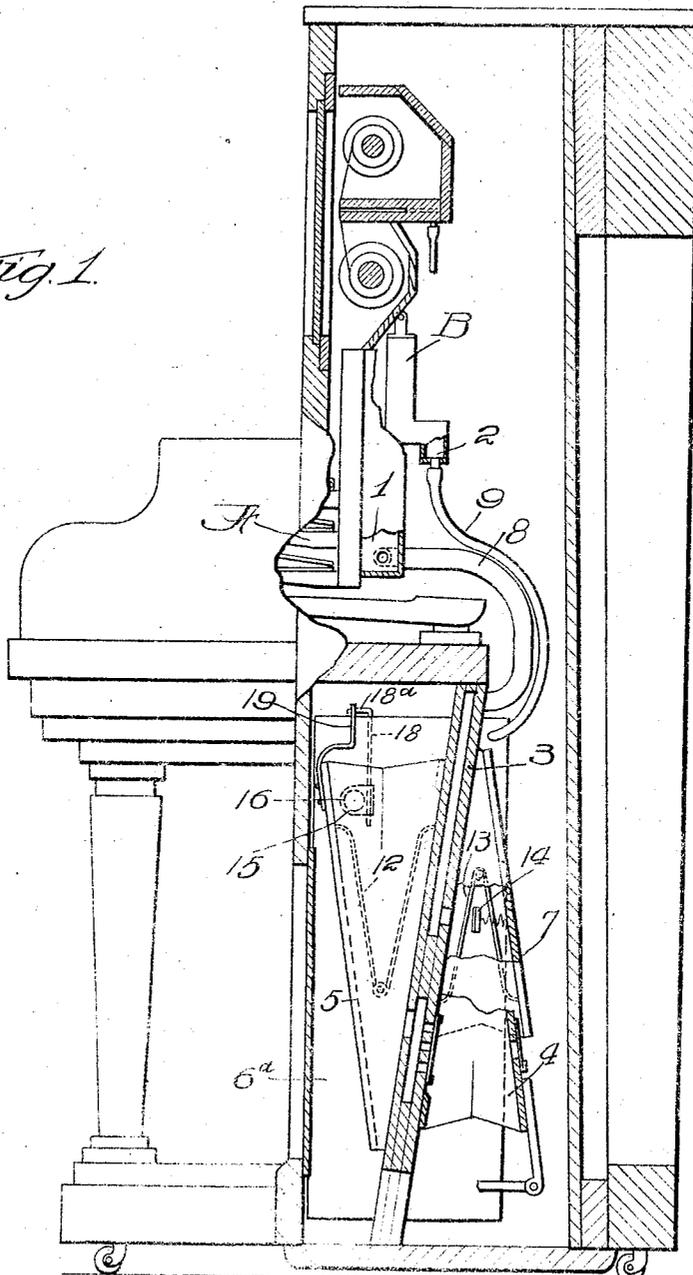


M. CLARK.  
 EXHAUST DEVICE FOR AIR MOTOR OPERATED PLAYER PIANOS.  
 APPLICATION FILED DEC. 26, 1917.

1,298,292.

Patented Mar. 25, 1919.  
 2 SHEETS—SHEET 1.

*Fig. 1.*



*Inventor,  
 Melville Clark*

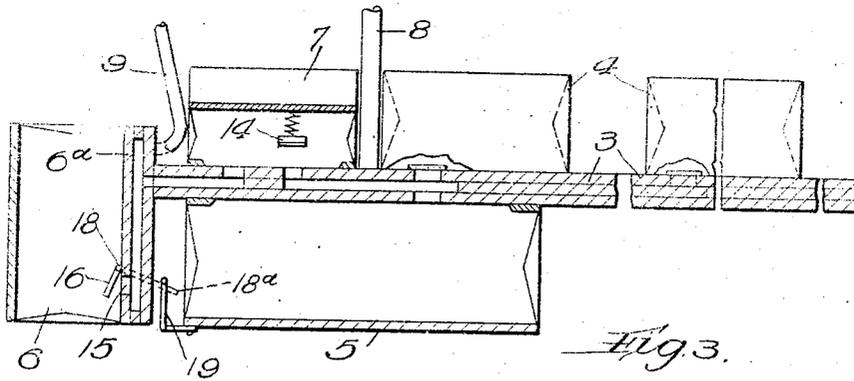
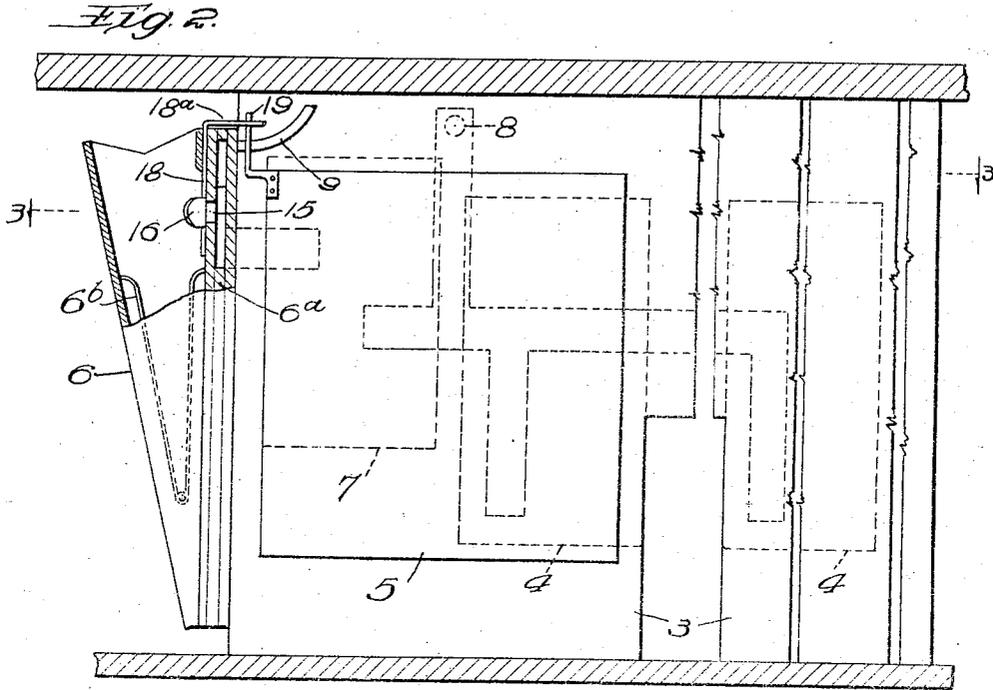
*Witness,  
 C. H. Luntz*

*by Austin M. Austin  
 His Atty.*

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Witness.  
*[Signature]*

Inventor:  
 Melville Clark

by *Burton Burton*  
 his Attys.

# UNITED STATES PATENT OFFICE.

MELVILLE CLARK, OF CHICAGO, ILLINOIS, ASSIGNOR TO MELVILLE CLARK PIANO COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

EXHAUST DEVICE FOR AIR-MOTOR-OPERATED PLAYER-PIANOS.

1,298,292.

Specification of Letters Patent.

Patented Mar. 25, 1919.

Application filed December 26, 1917. Serial No. 208,764.

*To all whom it may concern:*

Be it known that I, MELVILLE CLARK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Exhaust Devices for Air-Motor-Operated Player-Pianos, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved construction of the exhaust devices and connections therefrom for the pneumatic action of an automatic piano player for the air motor which drives the controlling note sheet thereof.

It consists in the elements and features of construction shown and described, as indicated in the claims.

In the drawings:—

Figure 1 is a fore-and-aft sectional view of the exhaust or vacuum-producing devices in conjunction with a side elevation of an automatic player equipped with this invention.

Fig. 2 is a forward side elevation of said exhaust or vacuum-producing devices.

Fig. 3 is a section at the line, 3—3, on Fig. 2.

In the drawings the pneumatic action of an automatic player is conventionally shown at A, and the motor for operating the note sheet thereof is conventionally shown at B. 1 is the vacuum chamber of the pneumatic action; 2 is the vacuum chamber of the air motor. 3 is the duct board on which are mounted the exhaust devices in the form of pumpers, 4—4, which are at the rear of said duct board, the main high tension exhaust chamber or receiver is on the forward side of said duct board, the governing bellows, 7, for limiting the exhaust tension which can be derived from the main exhaust bellows or receiver, 5, for operating the air motor, said governor bellows being mounted on the rear side of said duct board; and an auxiliary low-tension bellows or receiver, 6, of which the base-board, 6<sup>a</sup>, is mounted cross-wise of one end of the duct board, 3. 8 is a conduit leading from the main exhaust bellows or receiver, 5, to the vacuum chamber, 1, of the pneumatic action. 9 is a conduit leading from the main exhaust bellows or receiver, 5, by way of the governor bellows, 6, to the vacuum chamber 2, of the air motor.

As thus far described, except as to the auxiliary low-tension bellows, 6, the construction and operation is familiar in exhaust devices for pneumatic players having an air motor for driving the note sheet. The operation of the pumpers producing partial vacuum in the high tension bellows, or receiver, 5, causing said bellows to be collapsed against the resistance of its high tension spring, 12, maintains a partial vacuum in the vacuum chamber, 1, of the pneumatics, operating the playing devices in a manner requiring no further description here. At the same time, and by the same operation of the pumpers (or any other exhaust devices that may be employed) a certain degree of exhaust tension or a partial vacuum is produced in the governor bellows, 7, which is determined by the tension of its expanding spring, 13, which yields to permit the bellows to collapse and seat the valve, 14, at the port of communication of said governor bellows with the main exhaust bellows or receiver, 5, when a certain degree of exhaust tension or partial vacuum is produced, and thus the degree of exhaust tension or partial vacuum operating upon the air motor is governed in a manner well understood, so as not to exceed that which will thus collapse the governor bellows and seat its valve as stated.

In the operation of an automatic player provided with exhaust devices of the character described and having an air motor for operating the note sheet, it will obviously occur that if the degree of exhaust tension or partial vacuum maintained by the pumpers in the main exhaust bellows or receiver, 5, is for the purpose of playing softly, kept for any length of time below the degree necessary for collapsing the governor bellows to seat its valve, there will be no actual government or control effected by said governor bellows upon the air tension operated upon the air motor, but, on the contrary, the degree of exhaust tension in the main high tension bellows or receiver, 5, varying from said degree less than sufficient to seat the governor bellows valve downward, will operate with similar variation upon the air motor; and it will also be understood, as is observed in experience, that under those circumstances it will be impossible to keep the air moving through the chambers of the air motor adequately to maintain its speed,

because if the operator increases the rate of pumping for the purpose of thus operating the motor, he will immediately produce a higher tension in the main exhaust bellows or receiver, than that needed for the purpose of the soft playing which is being desired. That is to say, it is difficult to maintain the uniform or proper speed of the motor, and particularly to maintain a high speed of the motor for rapid playing, while at the same time playing softly, in a structure equipped in this manner. The purpose of the present invention is to obviate this defect. Upon considering what happens under the conditions above stated, it will be seen that the difficulty mentioned arising from the fact that it is impossible to maintain the movement of an adequate volume of air through the air motor and its connections with the exhaust devices by light pumping, occurs because with the necessary high tension spring for expanding the high tension bellows or receiver, 5, a very short movement of the moving member of said bellows from its most expanded position, puts the spring under tension in excess of that which is permissible for the low exhaust tension requisite for the soft playing, and in consequence the air is drawn out of the vacuum chambers in impulses following the strokes of the pumper, so that both the playing and the motor movement reflect these strokes by pulsations in the playing; instead of being steady, as it is the purpose of the yielding exhaust chamber or receiver to make them, and which it does make them when it can be held collapsed to a sufficient extent so that its range of expansion shall meet the air requirement of the playing devices and the motor in the intervals from stroke to stroke of the pumpers. And it will be observed that this lack of a sustained pull is particularly detrimental to the action of the air motor, because the parts in it which are to be moved, and the parts which it is to move in propelling the note sheet, upon losing their speed cannot be caused to recover it instantly, and thus it steadily drops back while this condition continues; and it is therefore impossible to maintain a high speed for rapid playing when playing very softly, as is often desired.

This defect is obviated in the structure shown in the drawings by the provision of the low tension exhaust bellows or air receiver, 6, that is, one whose expanding spring yields to permit the collapse of the bellows at a lower tension than that which is necessary to collapse the governor bellows 7. Said low tension bellows lever has its communication with the exhausting means through the port, 15, controlled by valve, 16, seating inside said low-tension bellows, and opening inward, said valve being mounted upon a rock shaft, 18, which

extends outside the said low-tension bellows and has on its outer ends a crank arm, 18<sup>a</sup>, which is engaged by a tappet, 19, carried by the moving member of the main high tension bellows, 5, said tappet being positioned so that it encounters said crank arm and opens the valve, 16, in the very last part of the expanding movement of said moving member of the main bellows, that is, when the exhaust tension operating in said main or high tension bellows is approaching the lowest point at which said main high tension bellows is adapted to maintain the tension. When the valve, 16, is thus opened, the exhausting devices operate immediately through the connection of the pumpers with said low tension bellows, and said bellows being collapsed against the resistance of its low tension spring 6<sup>b</sup>, operates thereafter for producing a continuous pull at low tension upon the vacuum chambers, both of the pneumatic action and of the motor, and so continues the operation both of playing and of driving the note sheet, steadily while the tension is such as to produce a soft playing. The capacity of this low tension bellows may easily be made such that the volume of air which is drawn in its expansion is sufficient to give the motor not only a steady speed, but, if desired, a high speed, while light or soft playing is produced by the low tension.

I claim:—

1. In an automatic player having a pneumatic player action and an air motor for actuating the note sheet, in combination with a vacuum chamber of the pneumatic action and the vacuum chamber of the air motor, an exhaust system comprising exhausting means, a high tension exhaust receiver connected with the exhausting means, and a low tension exhaust receiver in communication with the exhausting means; the tensioning means of the high and low tension receivers respectively, being related at the tensioning capacity so that the low tension receiver remains collapsed until the high tension receiver is nearly fully expanded; conduits by which both said receivers communicate at the same time both with the pneumatic action vacuum chamber and with the air motor vacuum chamber; a governing bellows interposed in the air conduit between the two receivers; a valve which said governing bellows operates for governing the air tension operating upon the low tension receiver, and a spring resisting the collapse of said governing bellows adapted to permit it to collapse and seat the governing valve upon tension in said bellows higher than the tensioning means of the low tension receiver.

2. In an automatic player having a pneumatic player action and an air motor for actuating the note sheet, the combination

with a vacuum chamber of the pneumatic action and the vacuum chamber of the air motor, an exhaust system comprising exhausting means, a high tension exhaust receiver connected with the exhausting means; a low tension exhaust receiver in communication with the exhausting means, the tensioning means of the high and low tension receivers respectively, being related as to tensioning capacity so that the low tension receiver remains collapsed until the high tension receiver is nearly fully expanded; conduits from said exhaust system to the vacuum chamber of the pneumatic player action and to the vacuum chamber of the air motor respectively; a valve which controls the communication of the low tension receiver with the exhausting means, and mechanical connections from the moving member of high tension receiver for opening said valve near the limit of the expansion of the high tension receiver.

In testimony whereof, I have hereunto set my hand at Chicago, Illinois, this 22nd day of December, 1917.

MELVILLE CLARK.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."