H. PIERCE.

VALVE SYSTEM AND TRACKER BOARD.

APPLICATION FILED SEPT. 6, 1907.

899,469.

Patented Sept. 22, 1908.

2 SHEETS—SHEET 1.

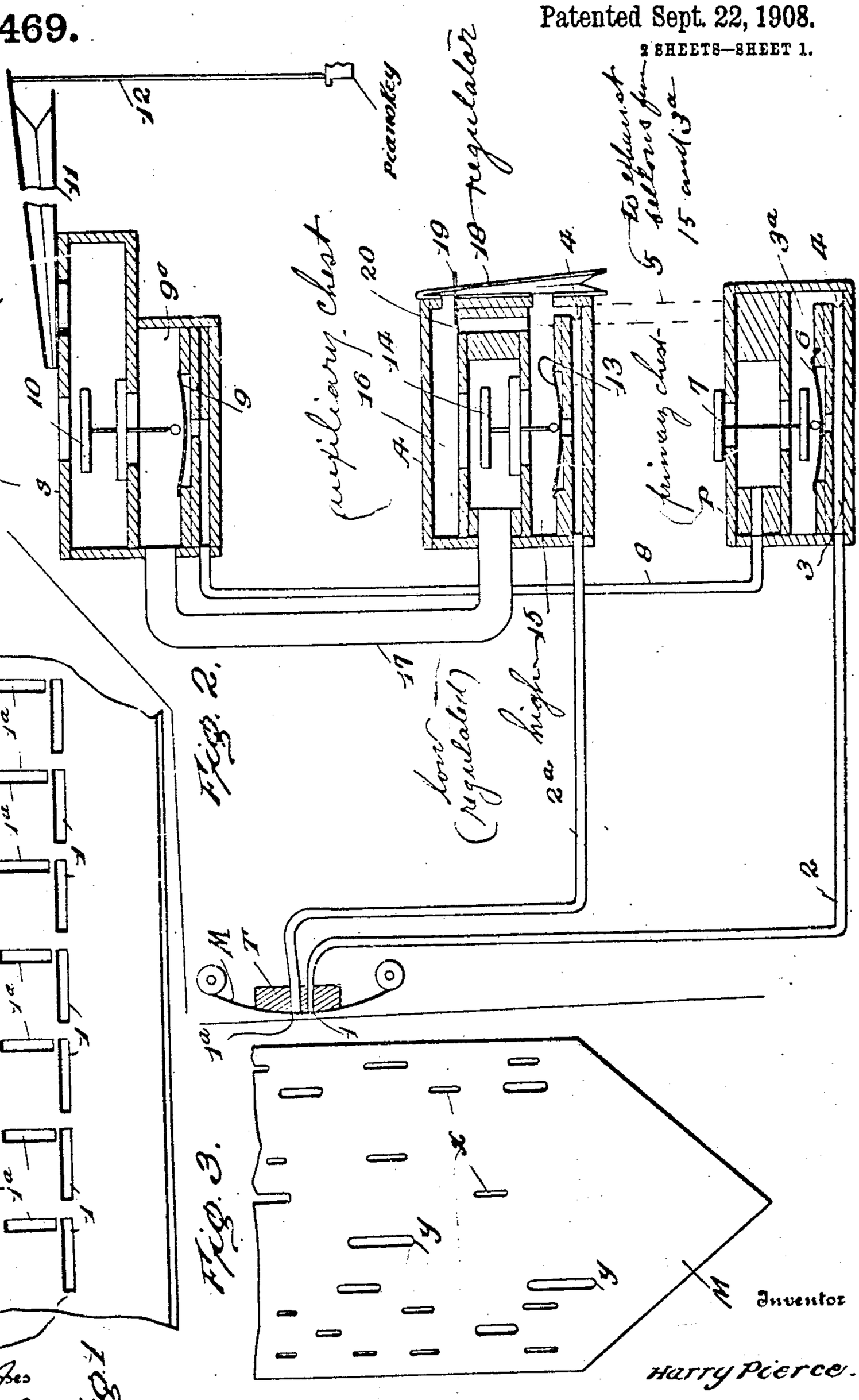


Fig. 2.

Fig. 3.

Witnesses

Inventor

Harry Pierce.

By R. H. A. Macey. Attorneys

895-392 (165) for this tracker board,
x (168)
899470 (162) for note sheet.

y secondary
x ordinary

THE NORRIS PETERS CO., WASHINGTON, D. C.

H. PIERCE.

VALVE SYSTEM AND TRACKER BOARD.

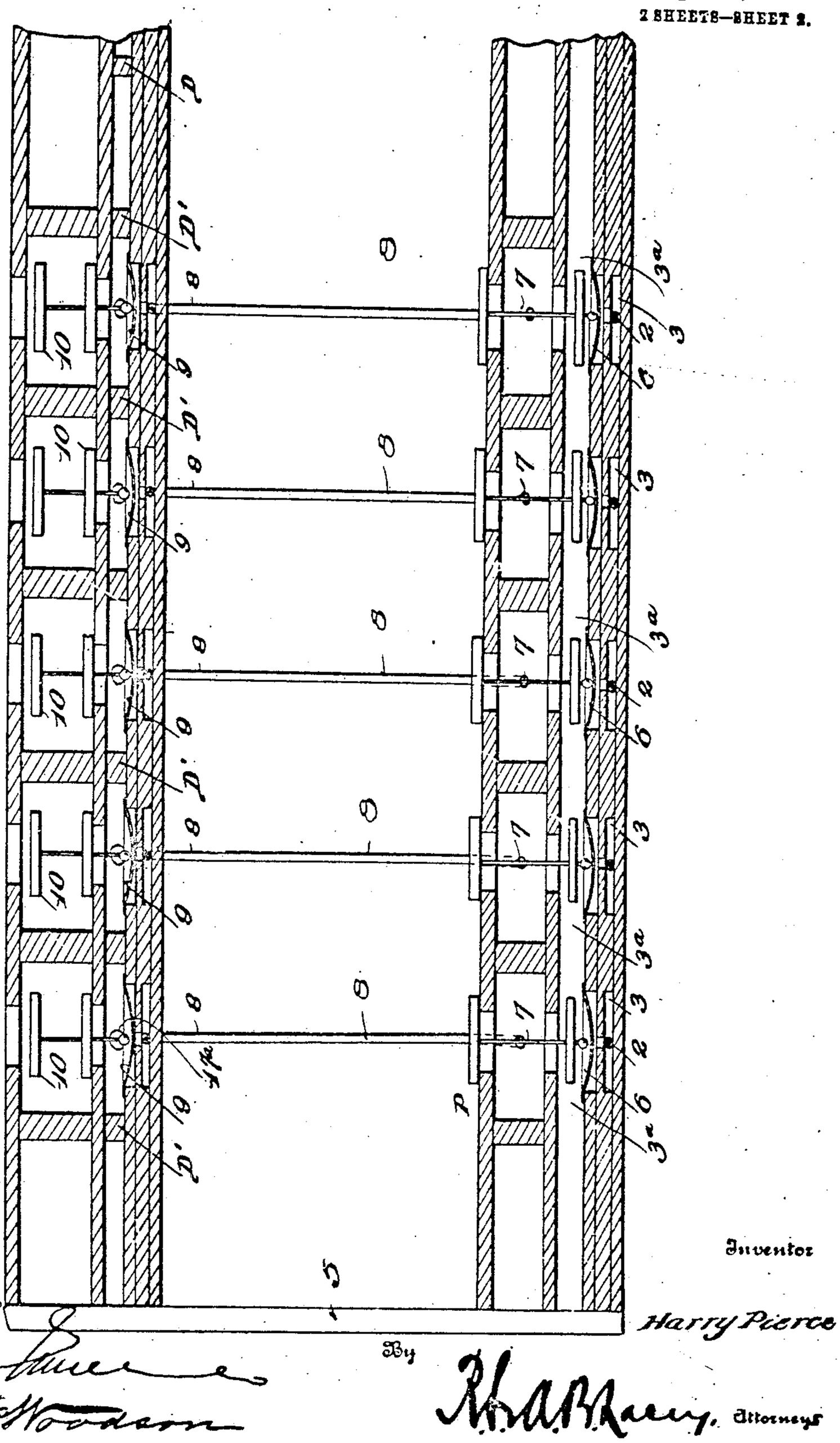
APPLICATION FILED SEPT. 6, 1907.

899,469.

Patented Sept. 22, 1908.

2 SHEETS—SHEET 2.

Fig. 4.



Witnesses

W. C. Woodward

Inventor

Harry Pierce

By

R. H. A. Bailey, Attorneys

THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HARRY PIERCE, OF KANSAS CITY, KANSAS, ASSIGNOR OF ONE-HALF TO FRANK A. BRIGGS, OF KANSAS CITY, MISSOURI.

VALVE SYSTEM AND TRACKER-BOARD.

No. 899,469. Specification of Letters Patent. Patented Sept. 22, 1908.

Application filed September 6, 1907. Serial No. 391,658. REISSUED

To all whom it may concern:

Be it known that I, HARRY PIERCE, citizen of the United States, residing at Kansas City, in the county of Wyandotte and State of Kansas, have invented certain new and useful Improvements in Valve Systems and Tracker-Boards, of which the following is a specification.

This invention relates to pneumatically actuated musical instruments, particularly of the keyboard playing type that are designed to be attached to a piano and automatically play the same under the control of specially devised music sheets mounted to pass over a tracker range, although it is to be understood that the invention is applicable also to mechanically controlled instruments of this character in which the entire mechanism is incorporated within the case of the instrument and embodies auxiliary wippens or equivalent accessories arranged to swing the hammers against the strings. These piano players as first constructed were mechanical in tone as well as in name, for the reason that no means were provided for properly bringing out the theme or melody of the composition being rendered, and consequently they could be readily distinguished, even by those who were not trained or cultured musicians, from a manually operated instrument, by their lack of tone color or capability of accenting any one or more notes at the desired or predetermined intervals to properly emphasize the theme; and this was a fault that hindered the more universal recognition of the musical value of the automatic piano players, notwithstanding the expression appliances that were employed and the high degree of technique that the mechanical elements made possible. To overcome this deficiency, it has heretofore been proposed to divide the vacuum chest into two grand divisions, controlling the treble and bass clefs respectively, and by cutting in either edge of the perforated music sheet allow air to enter a small hole in either side of the tracker range or board governed by such cuttings, and thereby create a greater suction upon that particular side of the instrument so as to accent the particular "note" which happens to register with the tracker board at that instant. It was thus possible to emphasize two notes at the same time, there being two compartments in each row of pneumatics in the vacuum chest; but it was not possible, by this construction, to single out one note above others on the same side of the center division line on the tracker board, should two or more perforations strike the tracker board at the same time on the same side of the division point. In other words, if two or more holes were to register with the tracker board at the same time on the same side, these two or more notes would be accented. In order to overcome this, but at the risk of endangering the rythmic effect, it has been proposed to cut the theme or accented notes in the roll or sheet a very small fraction behind the accompaniment cuttings.

In contradistinction to the foregoing and to obtain an artistic emphasis of the theme, my invention comprehends means for accenting any one or more notes, regardless as to how many strike the tracker board at the same time, and the invention, more specifically considered, comprises a specially constructed vacuum chest with each diaphragm pneumatic separated from the rest, a system of valves in addition to those heretofore ordinarily used and peculiarly correlated to the same, a specially constructed tracker-board and peculiarly cut or perforated music rolls or sheets, the tracker-board and music sheet forming the subject matter of separate applications for Letters Patent.

The invention also consists in certain constructions, arrangements, and combinations of the parts that I shall hereinafter fully describe, and then point out the novel features and combinations thereof in the appended claims.

For a full understanding of the invention, reference is to be had to the following description and accompanying drawings, in which:

Figure 1 is a face view of a portion of a tracker board constructed in accordance with my invention; Fig. 2 is a transverse sectional view, in the nature of a diagram, illustrating my improved valve system in the simplest embodiment thereof, it being understood that in practice, as is customary, the valves of each vacuum chest or chamber will be "banked" in transverse rows of two or three to a row for the sake of compactness; Fig. 3 is a view of a portion of the perforated music sheet employed; and, Fig. 4 is a front view, partaking of the nature of a longitudinal section, of the primary and secondary valve chests or vacuum chests of the ordinary

double action automatic players, but arranged according to the principles of my invention.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

Referring to the drawings, and now more particularly to Fig. 2, the letter "T" designates my improved tracker board or range, across which the perforated music roll or sheet "M" is arranged to pass; "P" designates the primary vacuum chest of the ordinary double action pneumatic player, and "S" the secondary vacuum chest thereof, arranged in accordance with the principles of this invention; and "A" designates the additional or auxiliary vacuum chest which renders the theme emphasizing effects possible.

The tracker board T is provided with the usual longitudinally extending or elongated ports 1, each of which is connected by a flexible tracker or tube 2 with the respective vacuum chambers 3 in the primary vacuum chest P, the latter being provided with a vent 4 and connected to the pipe or tube 5 leading to the suction bellows (not shown). The chamber 3 is in communication with a diaphragm pneumatic 6 underneath the double action valve 7. A tube 8 leads from above the lower head of said valve to the secondary vacuum chest S underneath and in communication with its diaphragm 9, adapted to actuate its valve 10.

11 designates the ordinary secondary or power pneumatic of the bellows type, designed to actuate the suspended finger or rod 12 so as to depress the key.

The foregoing parts are, as thus far described, of the usual formation. In their practical operation, whenever a port or passage 1 of the tracker board is closed by a perforated music sheet, a partial vacuum exists in the tube 2 created through the vent 4, and the suction is transmitted through the chamber 3^a, and tube or tracker 8 to the diaphragm 9. A partial vacuum also exists in the chamber 9^a above the diaphragm pneumatic 9. This creates equalization of air pressure above and below the respective pneumatics 9 and 6 and causes the valve 10 to be so held as to admit atmospheric air into the secondary or power pneumatic 11, the valve 7 closing the chest P against the admission of atmospheric air.

Whenever the perforated music sheet M opens the passage 1, it destroys the equalization, causing the valve 7 to rise and admit atmospheric air into the chest P and to the tube 8. Air rushing into said tube will manifestly raise the valve 10, closing the upper valve and opening the lower valve, thereby causing the secondary or power pneumatic 11 to close, air being emptied through the chamber 9^a, the pipe 17 connected at one end thereto, the chamber 16 and exhaust or suction pipe 5 that is connected to the pumping bellows, this exhaust being controlled by the regulator 18. Hence a soft or unaccented tone will be produced, it being understood that the valve 14 is lowered during this operation, the tube 2^a being closed.

Referring now to Fig. 1, wherein is illustrated my improved tracker board, it will be seen that the same is provided, in addition to the usual passages 1, with a correlated series of transversely extending passages 1^a extending back of and in line with one end of the said openings 1, respectively. A tracker or tube 2^a leads from each one of these passages 1^a, to the auxiliary vacuum chest A and communicates with the diaphragm 13 underneath the double valve 14, governing chambers 15 and 16 that are designed for communication with chamber 9^a by means of the pipe 17. 18 designates a regulator of the well known type designed to control the tension by means of the valve 19.

In describing the operation of the additional vacuum chest of my invention in connection with the other parts, it is to be understood that the music sheet to be employed is especially formed with a set of accenting openings *y* (see Fig. 3) in addition to the ordinary cuttings *x*. So long as the passages 1 and 1^a in the tracker board are closed by the perforated music sheet, there is the same partial vacuum in the channels of the chest P, as before stated, to the diaphragm 9 in chest S; but the vacuum in the chamber 9^a is created through pipe 17 to chest A, through chamber or channel 16, through the regulator 18 and the passage 20, and through the pipe 5 to the pumping bellows. The vacuum between the regulator 18 and chamber 9^a is subdued and controlled by the slide valve 19. This gives weak suction or expression between chamber 9^a through pipe 17 and chamber 16 through the regulator. There is strong suction or high tension through the channels of the chest P from the diaphragm 9 and through the pipe 5 from the chamber 15. The strong exhaust in channel 3^a in the chest P causes the air under the diaphragm 6 from the tube 2 to hold the valve in the chamber 3^a firmly to its seat, to cause the air under the diaphragm 9 to lift the valve 10 for soft expression by low tension, when the secondary or power pneumatic 11 and valve 10 are on soft expression.

Whenever the perforation in the music sheet opens a passage 1^a in the tracker board, atmospheric pressure rushes through the tube 2^a, destroying the equalization under the diaphragm 13, lifting the valve 14, closing the chamber 16, and opening chamber 15, thereby creating a strong suction through the pipe 17 to the chamber 9^a.

EXAMINER'S ROOM

This gives said chamber 9ª the same suction as under the diaphragm 9. Whenever, however, this same perforation in the music sheet extends over a passage 1 in the tracker board, as well as a passage 1ª atmospheric pressure will rush through the tube 2 into the chest P, destroying equalization under the diaphragm 6, raising the valve 7, and thereby admitting atmospheric pressure through the tube 8 so as to destroy the exhaust under the diaphragm 9. The latter being then raised, lifts the valve 10, and effects the closing of the pneumatic 11 with added force, the note thereby being accented.

Fig. 4 illustrates a longitudinal sectional view of the ordinary primary and secondary vacuum or valve chests of an ordinary double action player. It is to be understood that the vacuum is ordinarily created in the pipe or channel 5 from the pumping bellows through each end of the sections or grand divisions of the valve chest for the bass and treble portions, to the middle division D ordinarily employed. In order to separate each individual diaphragm 9 for action in connection with my improved auxiliary vacuum chest A above described, the said diaphragms 9 are separated from each other by the divisions D', the pipes 17 leading into the valve chest S above the respective diaphragms 9, as indicated at 17ª.

Having thus described the invention, what is claimed as new is:

1. In combination, a tracker board formed with two sets of air passages; a primary valve chest connected to one set of passages, power pneumatics, a secondary valve chest operatively connected to said pneumatics and having connection with the primary valve chest, an auxiliary valve chest having air passage connection with the secondary valve chest, means for exhausting air from the auxiliary valve chest and from the connection between the same and the secondary valve chest, tension regulators included in the air exhausting means, the auxiliary valve chest being provided with air passages leading directly from its connection with the secondary valve chest to the air exhausting means around the tension regulators, valves in said auxiliary valve chest, said valves normally closing said last named passages and opening the passage from the connection between said valve chest and the secondary valve chest to the tension regulators, and a connection between said auxiliary valve chest and the other set of passages in the tracker board, arranged upon the opening of any passage of said set to shift the valve so as to admit the air directly from the secondary valve chest to the air exhausting means.

2. The combination of a tracker formed with two air passages for each note, of power pneumatics, primary and secondary valve mechanisms connected to each other and the latter to the power pneumatics, the primary valve mechanism being connected to one set of said passages, an auxiliary valve chest connected to said other set of passages and to the secondary valve mechanism, means for normally exhausting the air from the secondary valve mechanism under regulated tension through the auxiliary valve chest, and means for exhausting the air from said secondary valve chest through the auxiliary valve chest unregulated and direct upon the opening of the passages of both sets simultaneously.

3. The combination with a tracker board formed with two sets of air passages, the passages of one set being elongated transversely to the travel of the sheet and the passages of the other set being elongated longitudinally of the travel of the sheet and in alinement with the ends of the corresponding passages of the first mentioned set, of power pneumatics, primary and secondary valve mechanism connected to the set of transversely elongated passages, an auxiliary valve chest connected to said other set of passages and to the secondary valve mechanism under regulated tension through the auxiliary valve chest, and means for exhausting air from said secondary valve chest through the auxiliary valve chest unregulated and direct upon the opening of the passages of both sets simultaneously.

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

HARRY PIERCE. [L. S.]

Witnesses:
J. P. DENNY,
E. L. FISCHER.