J. LEISCH.

PLAYER PIANO.

APPLICATION FILED SEPT. 20, 1911.

1,066,632.

Patented July 8, 1913.

3 SHEETS—SHEET 1.

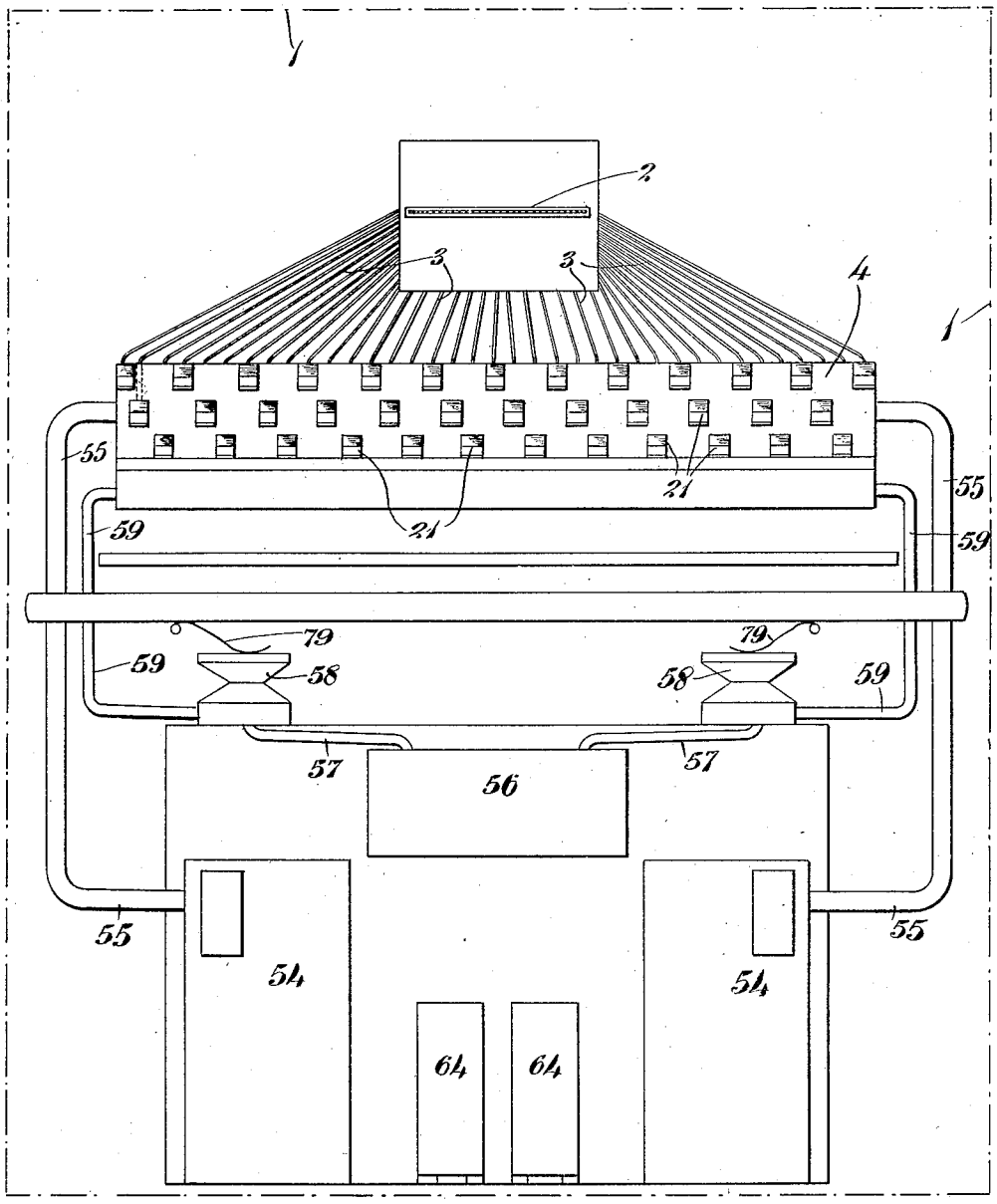

Fig. 1

Witnesses
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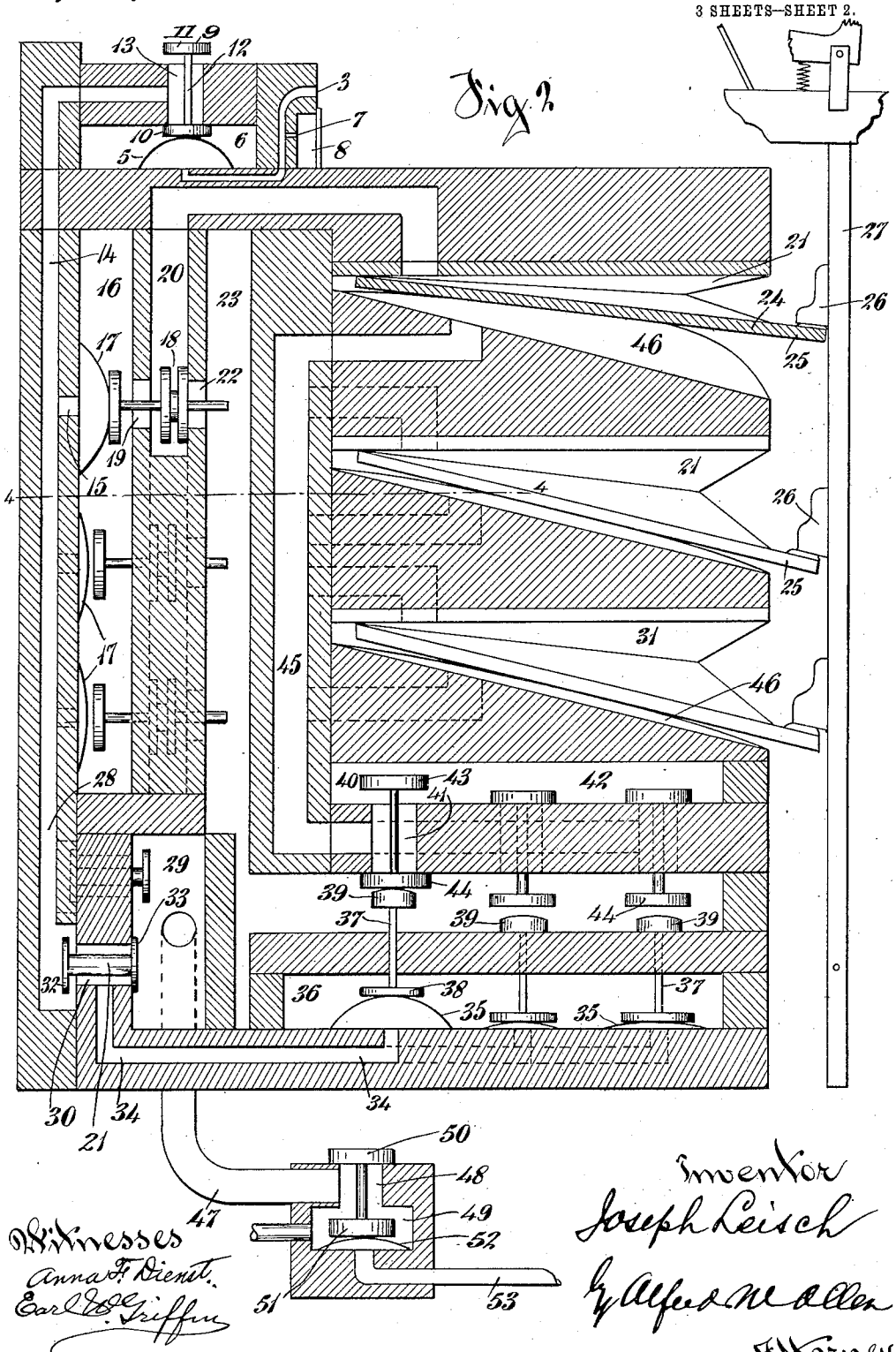
3 SHEETS—SHEET 2.

Fig. 2.



Witnesses

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3 SHEETS—SHEET 3.

Fig. 4

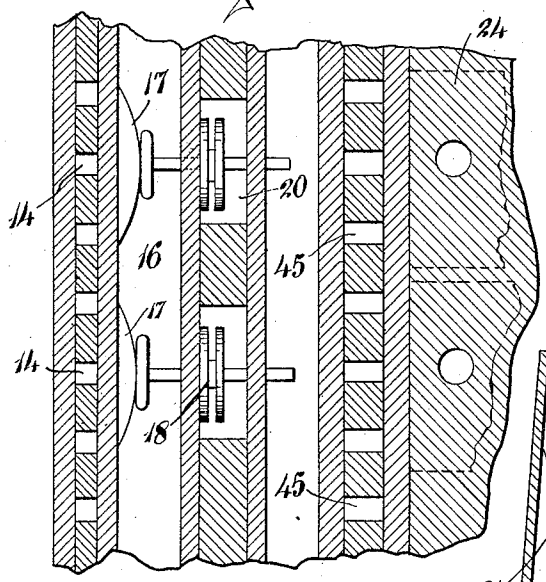

Fig. 3

Witnesses

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UNITED STATES PATENT OFFICE.

JOSEPH LEISCH, OF TRYON, NORTH CAROLINA, ASSIGNOR TO THE JOHN CHURCH COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

PLAYER-PIANO.

1,066,632. Specification of Letters Patent. Patented July 8, 1913.

Application filed September 20, 1911. Serial No. 650,390.

To all whom it may concern:

Be it known that I, JOSEPH LEISCH, a citizen of the United States, and a resident of Tryon, in the county of Polk and State of North Carolina, have invented certain new and useful Improvements in Player-Pianos, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to player pianos in which the piano keys are connected with a series of power pneumatics, which are operated mechanically by pneumatic power, released by the exposure of openings in a tracker board by the movement of specially prepared slotted or perforated sheets of music, which are propelled over the tracker board to actuate the pneumatic devices.

In player pianos as heretofore constructed, the individual piano action is effected by the operation of its respective bellows or diaphragm power pneumatic, in which the bellows or diaphragm is actuated by a single variation of the pneumatic pressure on the movable member thereof, and as a result, a uniform stroke of the piano strings only can be obtained without accentuation, and the tones are only capable of control by a variation of pressure created in the air chest, or by a duplication of pneumatics, or by the ordinary piano pedals.

It is the object of my invention to produce a mechanism in which the uniformity of stroke on the strings may be effected by a duplex action of the bellows or diaphragm power pneumatic, without the necessity of increasing the pressure above or below atmospheric in the air chest of the player piano, or a duplication of the pneumatics, whereby the tones may be accentuated in the same way that they are accented by the human operator in striking the piano keys in the ordinary use of the instrument.

The invention consists of that certain novel construction and arrangement of parts to be hereinafter particularly pointed out and claimed, whereby a duplex action is effected on the movable member of the pneumatic under uniform conditions of pneumatic pressure by the application of suction on one side and compression simultaneously on the other side of the movable member of the pneumatic, either pressure to be governed by regulators of a well known construction, to produce either loud or soft effects, the regulators being so arranged that the operator of the player piano can produce any desired strength of tone or regulate the same to any desired degree, while at the same time accentuating such tones as may be desired.

In the drawings, Figure 1 represents a diagrammatic view of the assembled player piano equipped with my invention. Fig. 2 is a cross sectional view through the pneumatic chest, taken in a vertical plane. Fig. 3 is a cross sectional view, taken through the bellows of the player piano. Fig. 4 is a partial cross sectional view taken on the line 4, 4, of Fig. 2.

Referring more particularly to the drawings, 1 represents the outlines of a piano player, and 2 the tracker board of the same. The tracker board is provided, as usual, with the necessary passages over which the perforated music sheet passes, to which tracker tubes 3 are connected leading from the tracker board to one of the vacuum chambers in the pneumatic player chest, which as a whole is designated by the numeral 4.

Each tracker tube 3 is connected to a primary pouch 5 located along the bottom of the primary vacuum chamber 6, which is common to all of the pouches. The tracker tubes are also each provided with the bleed opening 7 into a vacuum chamber 8, so that the vacuum of the chest is maintained in the tracker tubes. Directly over each pouch 5 is located a primary valve 9, comprising a bottom disk 10, an upper disk 11 connected by the stem 12, the two disks opening and closing the ports 13 from the vacuum chamber 6 to the outer air. In their normal positions, the disks 10 of these valves rest on the deflated pouches 5, and the upper disks 11 close the ports 13. Connected to each port 13 is a passageway 14 which extends to the ports 15, opening into a secondary vacuum chamber 16, in which are located the secondary pouches 17, which operate the valves 18 opening and closing the ports 19 between the secondary vacuum chamber 16 and the passageways 20 which lead to and open into the pneumatics 21. In their normal position, the valves 18 are seated against the wall of the vacuum chamber 16, closing the ports 19, and with the ports 22 between

the passageways 20 and the air chamber 23 open, and thus the pneumatics 21 are in inactive position.

The construction so far described involves one of the ordinary constructions for the double valve player piano action, and to a construction of this kind I prefer to apply my invention, although, as will be seen, the invention is equally applicable to other arrangements of the double valve construction, and is also equally applicable to the single valve construction in which only tracker tubes and primary valves are employed and the action of the primary valves controls the pneumatics.

As is well known, the operation of the construction above described is as follows: When any of the tracker tubes are open to the atmosphere by reason of the perforations in the music sheet passing over the openings in the tracker board, atmospheric pressure takes the place of the vacuum, in the particular tube and the pouches 5 covered by said tubes are at once inflated, the valves 9 raised, and atmospheric pressure admitted to the passages 14 which actuates the pouches 17 to open the ports 19 and close the ports 22, so that the passages 20 thus open to the vacuum chamber 16 are subjected to the suction of the vacuum, and the movable members 24 of the pneumatics 21 are raised and the extensions 25 from the movable members of the pneumatics contact with their respective lugs 26 on the abstract of the wippen 27 of the piano action to actuate the selected piano strings. This connection between the pneumatics and the piano action is frequently accomplished by connecting links, but I have so arranged my series of pneumatics that I am enabled to apply the movement of the pneumatics directly to the piano action, as illustrated in Fig. 2. In this figure, I have shown the upper pneumatic in action with the two other pneumatics illustrated in inoperative position, and it will be understood that, owing to lack of space in the pneumatic chest, the pneumatics are not placed in a straight line side by side, but are staggered in groups of three, as indicated in Fig. 1 of the drawings.

In order to apply my invention, which consists as heretofore stated in constructing the apparatus so that, when desired, the movable member of the pneumatics may be actuated simultaneously both by pressure below atmosphere on one side and pressure above atmosphere on the other, whereby duplex action of the pneumatics is obtained for the purpose of accentuation, I proceed as follows: The passages 14 are extended by continuations or branches 28 to make connection with a supplemental vacuum chamber 29 through ports 30 which are each controlled by a float valve 31, provided with the valve disks 32, 33, so that the valve disks shall be free to move in either direction, and one or the other end of the port shall be open when atmospheric pressure is admitted to the vacuum chamber 29 at the same time that it is admitted to the passages 14; but so that when the atmospheric pressure is not admitted to the chamber 29, and my improvements are out of operation, each disk 32 will close each port 30.

Connected to each port 30 intermediate the opening into the vacuum chamber 29 and the passages 28, is a passage 34, which leads to a pouch 35 in a second supplemental vacuum chamber 36 common to all the pouches. A series of pistons 37 are mounted in the top of this vacuum chamber, which are provided with a lower disk 38, which rests on the pouch and is adapted to be raised by the raising of the pouch. The heads 39 of these pistons engage the valves 40 which are located in the ports 41 opening into the compressed air chamber 42. These valves 40 are provided with the disks 43, 44, the upper one of which closes the port into the compression chamber, while the lower disk 44 normally opens to the outer air chamber or port 41, with which passages 45 are connected leading to the pouches 46, which are located under the movable member 24 of each pneumatic 21. Normally these passages 45 being open, the pouches 46 are deflated.

Atmospheric pressure is admitted to the vacuum chamber 29 for the purpose of accentuation, preferably by means of a slot in the music sheet passing over a vent in the tracker board connected by a supplemental tube 53 to the vacuum chamber 29 through a vacuum chamber 49 and a pouch 52 which controls the valve 50 for port 48 in the same way that the primary valves are controlled. The lower disk 51 of this valve rests on the pouch 52 and thus operates the valve to open the passage 47 to the outer air when the tracker board slot is reached, which connects with the vacuum chamber 29. Instead of operating the construction through the tracker board, a valve operated by hand may also be employed.

Since both air and vacuum pressure are employed, a specially constructed bellows, particularly illustrated in Fig. 3, is provided for creating a vacuum in the vacuum reservoirs 54, from which it is conveyed by tubes 55 to the vacuum chambers in the player chest, the compressed air being delivered by the same bellows into a compressed air reservoir 56, and thence into regulators 58, illustrated diagrammatically by passages 57 in Fig. 1, and from said regulators through air trunks 59 into the pressure chest of the player chest. This specially constructed bellows, as illustrated in Fig. 3, comprises a centrally movable member 60

and the fixed members 61 and 62, the centrally movable member 60 being operated by the connecting links 63 connecting same with the foot pedals 64. The bellows members are inclosed with the usual bellows folds 65. In the movable member a series of openings 66 are provided, closed by the valve 67. In the fixed member 62, openings 68 are provided, closed by the valve 69, and in the opposite member 61 a series of openings 70, closed by the valve 71. The openings 68 open into the outer air, while the openings 70 open into the bellows reservoir 54, which has connection, as heretofore stated, with the vacuum chambers of the player piano chest. In the frame 61 and 62, connected recesses 72 and 73 are provided, the recess 72 having openings 74 into the bellows compartment closed by the valve 75, while the other recess or channel 73 has openings into the reservoir 56. The pressure on this reservoir is controlled by a spring 76, while from the joint passageway 72, 73, a port 77 is provided into the controller box 58, with a valve 78 controlling this port and regulated by the spring 79, and from the controller 58 the air trunks 59 lead to the compression chambers of the chest. A spring 80 normally holds the movable plate 60 of the bellows against the fixed plate 61. By actuating the foot pedals, this plate is actuated to draw air from the reservoir 54 and to deliver the compressed air through the passages 72, 73, to the compression bellows 56, and thence regulated by the tension of the spring 79 into the regulator 58. A spring 81 is located in the vacuum reservoir 54 to regulate the amount of the vacuum pressure. In this way, the movement of the foot pedals supplies both vacuum and compressed air.

It will be obvious from the foregoing description, that the player piano can be operated for ordinary playing without bringing into action my invention; but if the performer should desire to accent a particular note or chord, he could do so by bringing into use the extra pressure in the pouches 46 which are situated immediately underneath the movable members of the pneumatics, and into which air pressure is admitted from the compressed air chamber 42 as heretofore described. This action of the pouches 46 is simultaneous with the suction through the passages 20, and a stronger stroke is given to the hammer of the piano action.

As heretofore suggested, it is very evident that many modifications of my invention may be made without departing from its spirit and scope, and I do not, of course, wish to be confined to the details shown, the essential features of my device being the independent control of, and the application to the opposite side of the power pneumatic movable member of pneumatic power of the opposite sign to that used for direct working of said power pneumatic, and this for purposes of accentuations, and I do not wish to be limited to any specific system of vacuum chambers, pressure chambers and valves. It is my purpose to set forth in the claims that follow, those essential features as stated.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a pneumatic action for player pianos, a series of pneumatics, adapted when operated to operate the piano action, movable members for said pneumatics, and means whereby the movable members may be operated simultaneously by suction and air pressure on opposing sides of said members and independent means of controlling the suction and the pressure.

2. In a pneumatic player piano, a series of pneumatics adapted when operated to operate the keys of the piano, movable members for said pneumatics, means whereby the movable members are operated simultaneously by suction and air pressure forces on opposing sides of said members and means for cutting off one of said forces.

3. In a pneumatic player piano, a series of pneumatics adapted when operated to operate the keys of the piano, movable members for said pneumatics, means whereby the movable members are operated simultaneously by suction and air pressure forces on opposing sides of said members, and means for cutting off one of said forces, with means for controlling said cut off.

4. In a player piano, a series of pneumatics, with vacuum chambers and pouches and valves for controlling the suction in the pneumatics, with a supplemental vacuum chamber and a series of pouches and valves, and a compressed air chamber, with means for actuating parts of the supplemental series at will to apply the compressed air to pneumatics under suction, to increase the strength of the stroke thereof.

5. A player piano, comprising a tracker board, tracker tubes piano action, a pneumatic player chest, vacuum chambers in said player chest, an air pressure chamber in said chest, a series of pneumatics adapted when operated to operate the action of the piano, a series of pouches located under the movable member of the pneumatics, with passages therefrom to said air pressure chamber, an auxiliary vacuum chamber, connections therefor with the tracker tubes and means for admitting compressed air into the pneumatic pouches, upon release of the vacuum in the auxiliary vacuum chamber.

6. In combination with a player piano, having a series of pneumatics to operate the keys of the piano, of a series of pouches

situated under said pneumatics and adapted to raise same when said pouches are inflated, an air pressure chamber connected to said pouches and controlling means whereby the pouches may be inflated or not according as it is wished to reinforce the action of the player piano in the pneumatics actuated by vacuum pressure.

7. The combination with a player piano, the action of which is operated by a series of pneumatics, of means whereby said pneumatics may be operated with both suction and air pressure applied simultaneously, tracker tubes, connections therefor with the suction and pressure means, and means whereby said connections may be cut off from said pressure means and released at will.

8. In a player piano, a series of movable members operating the piano action, a duplex system of pneumatics applied to the series of movable members sources of supply of rarefied and compressed air to said system, each system with an independent operating means, said duplex systems operated by the application of suction and air pressure to said series of movable members simultaneously.

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