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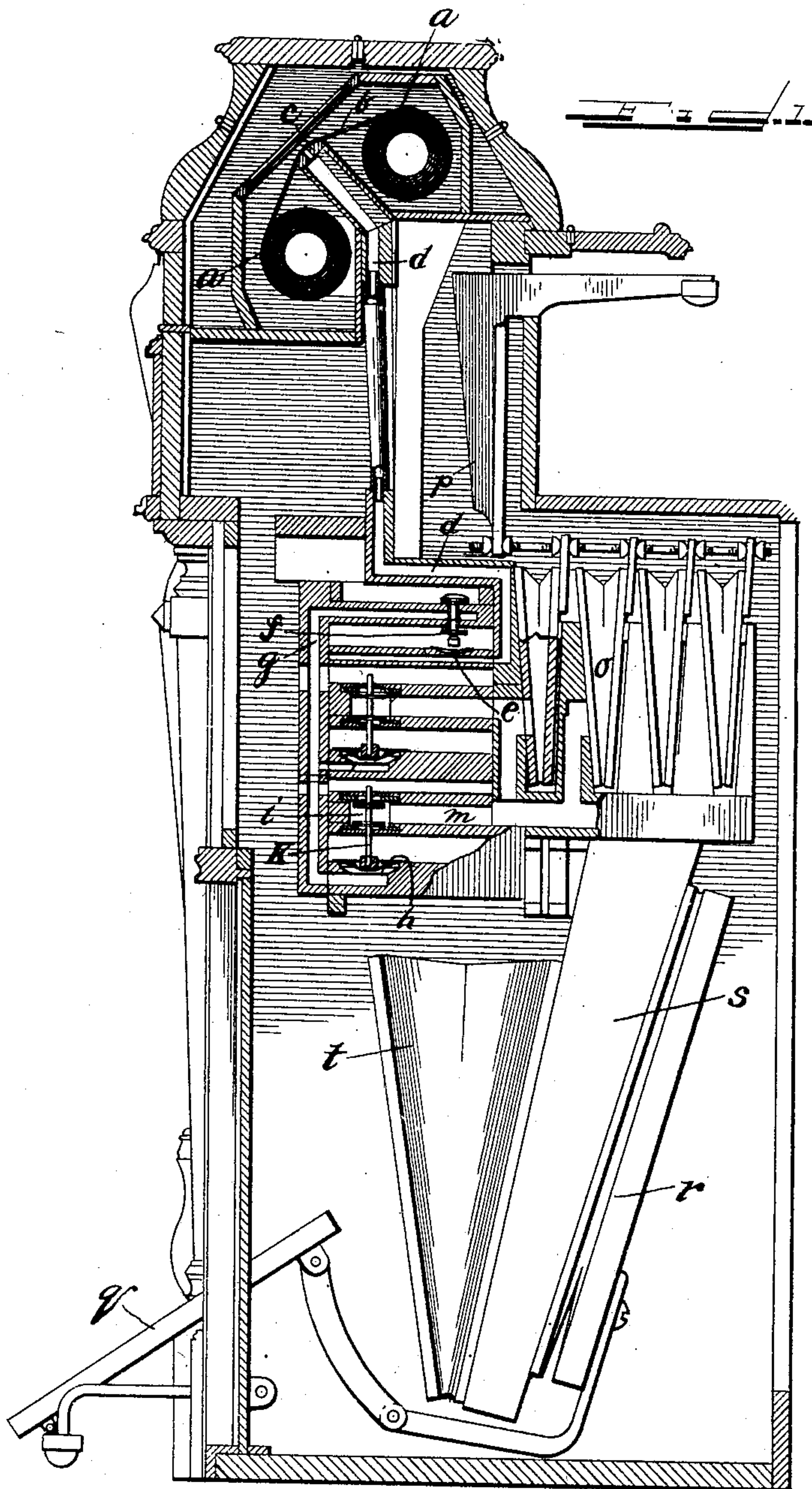
Patented Sept. 30, 1902.

J. H. CHASE.
VALVE FOR PIANO PLAYERS.

(Application filed Oct. 2, 1901.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES
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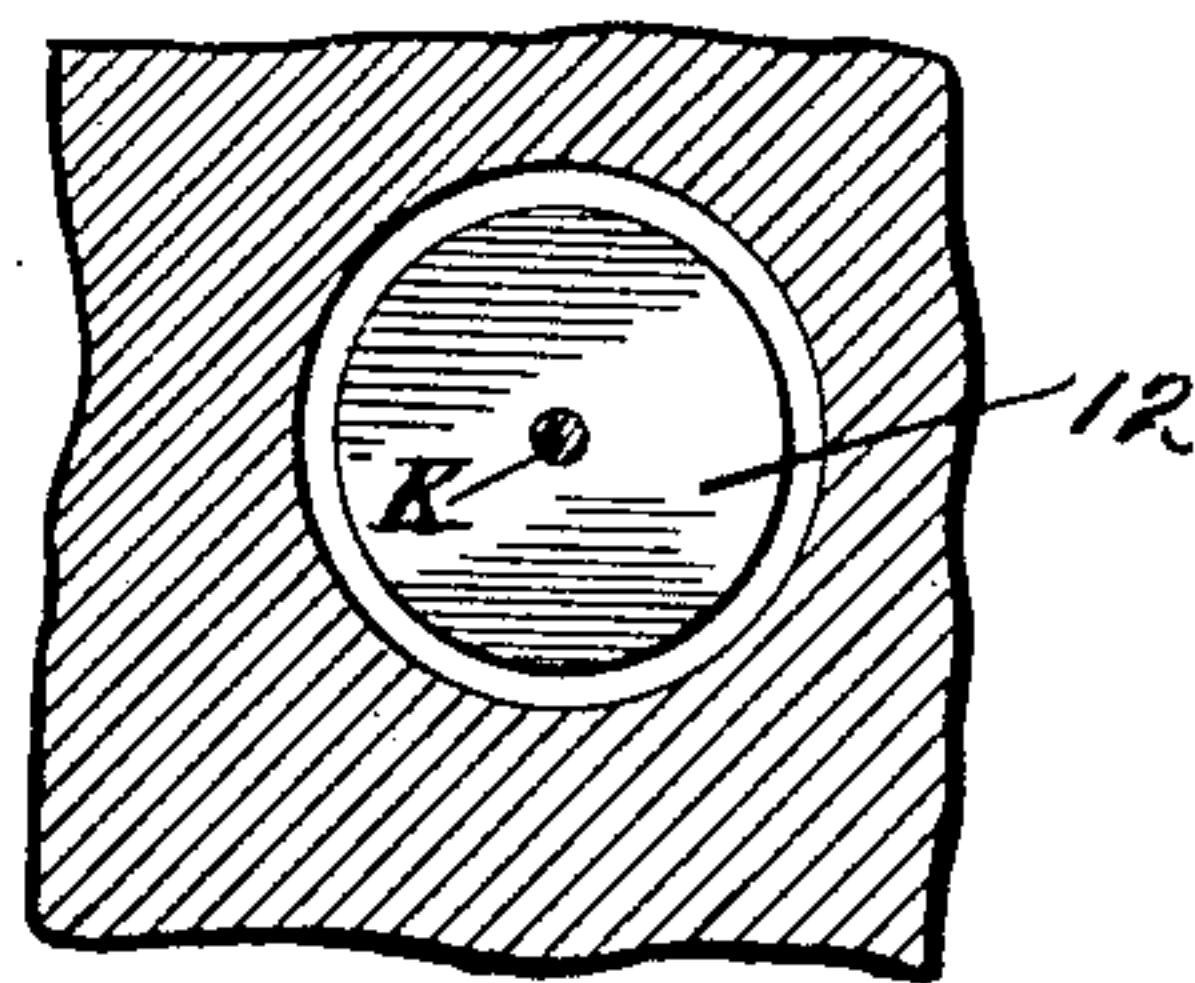
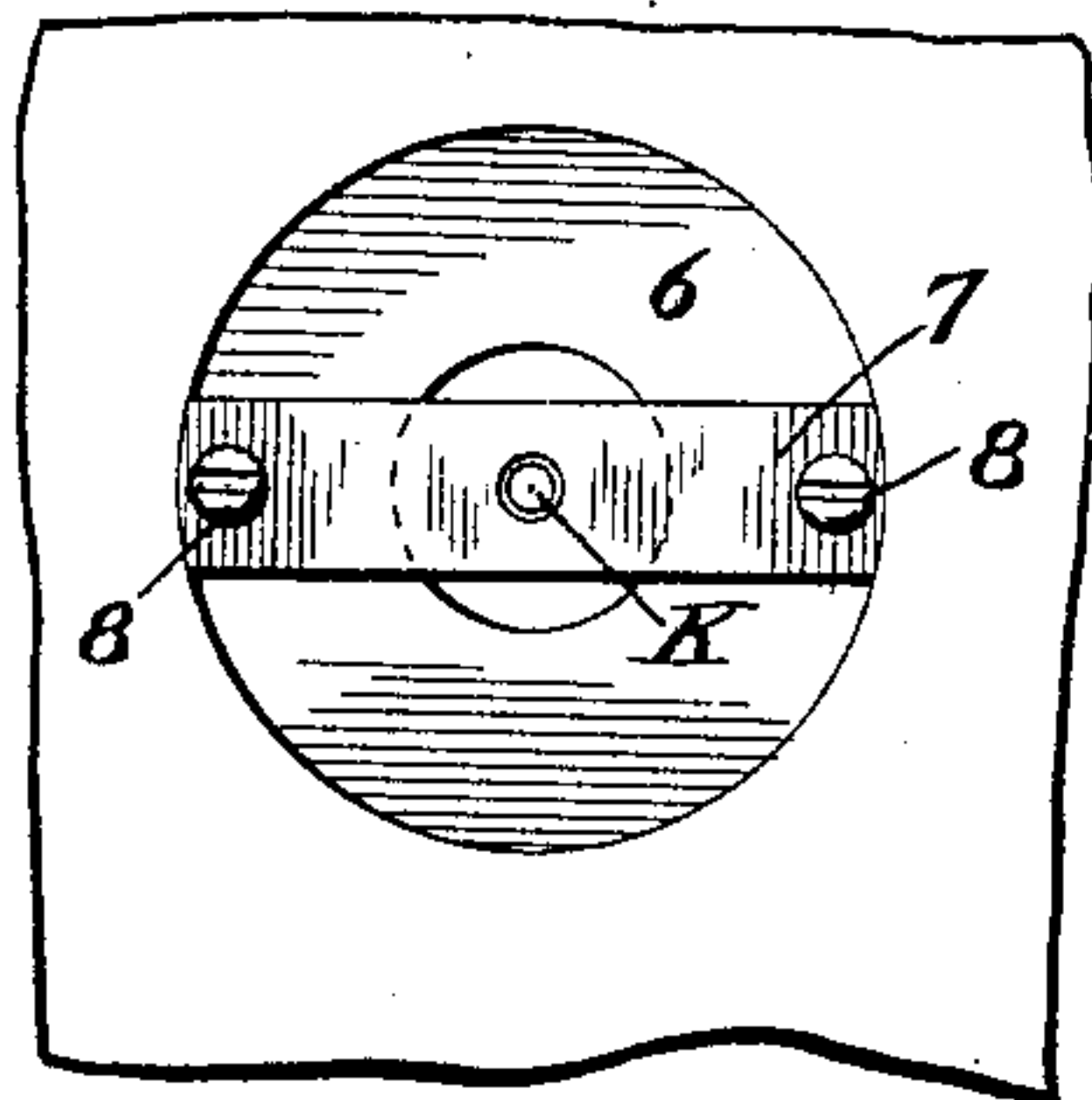
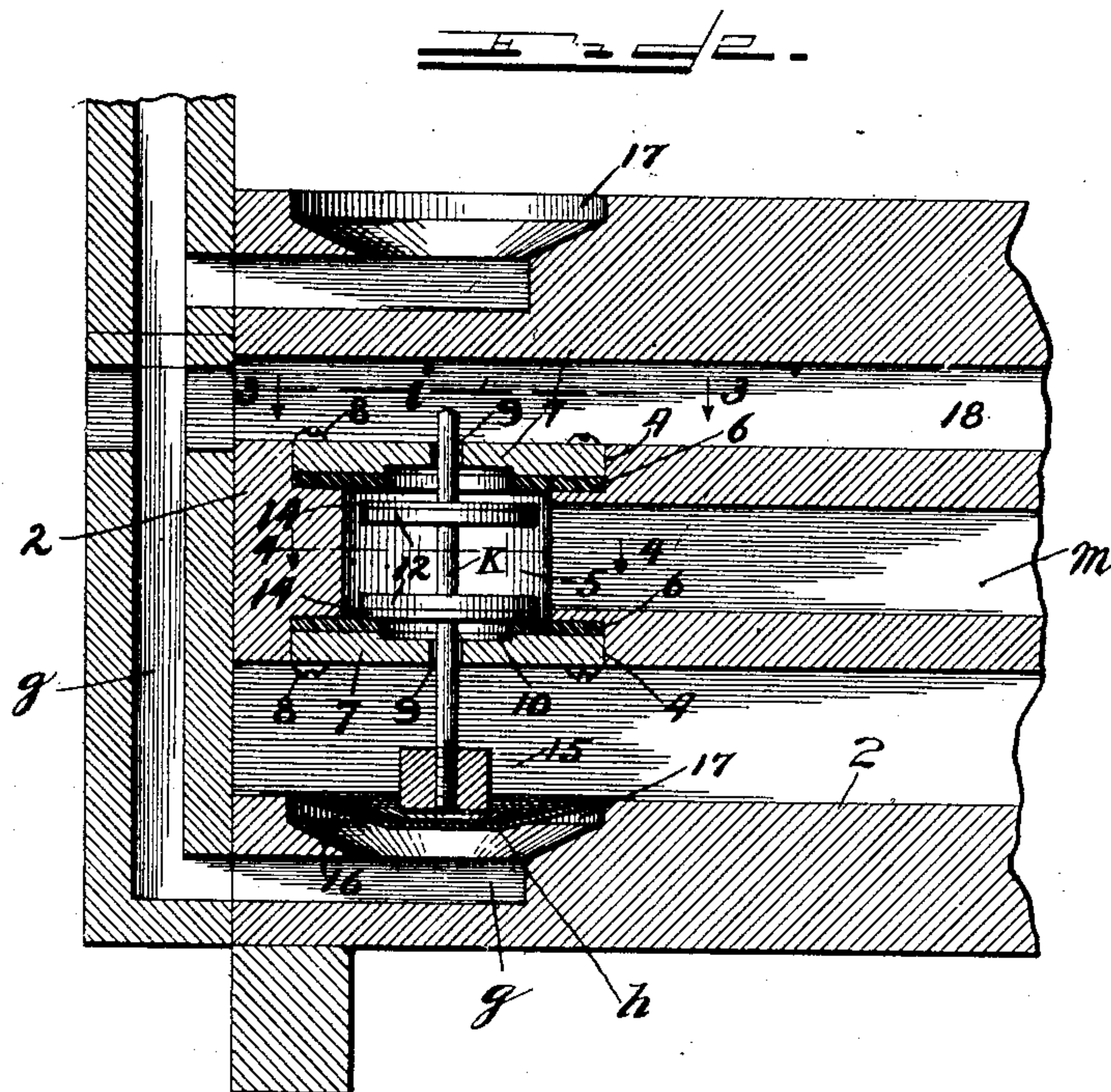
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WITNESSES

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UNITED STATES PATENT OFFICE.

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VALVE FOR PIANO-PLAYERS.

SPECIFICATION forming part of Letters Patent No. 710,097, dated September 30, 1902.

Application filed October 2, 1901. Serial No. 77,337. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH H. CHASE, a citizen of the United States of America, and a resident of Buffalo, Erie county, New York, have invented a certain new and useful Improvement in Valves for Piano-Players, of which the following is a specification.

In the automatic playing of musical instruments, such as the mechanically-played organ or piano, an apparatus is provided consisting generally of coöperating rollers carrying what is known as the "music-sheet," which is a roll of paper in a continuous length perforated at intervals to correspond with the notes of the music to be played. The continuous length of perforated paper or music-sheet is normally wound upon one roll, which is mounted in suitable bearings, and the free end of the roll of paper or music-sheet is connected with another roll that is adapted to be driven by means of a suitable air-motor. Thus in the operation of the mechanical player the music-sheet is unwound from one roll and wound upon the other. As it travels between the two rolls the sheet passes over what is known as the "tracker-board," consisting of a support for several air-ducts respectively leading to pneumatic devices controlling what are known as "primary valves." These valves serve to open and close other air ducts or passages leading to similar devices governing secondary valves, and these valves in turn control what are termed "pneumatics," which are small collapsible chambers or bellows connected mechanically with levers for either operating the valves of an organ or hammers for striking the keys of a piano. Generally speaking, therefore, in the operation of the instrument the performer operates the main feeder-bellows to create an air-pressure or vacuum which serves to actuate the air-motor, and this motor in turn drives the said rolls, thus causing the music-sheet to travel over the tracker-board and alternately, successively, or simultaneously, according to the perforations in the music-sheet, open and close communication with said pneumatic devices to cause them to operate the said pneumatics and their connected mechanism to open the valves of the organ or strike the keys of the piano. This invention relates to improvements in these sec-

ondary valves intended for use in such mechanical musical instruments, though in some of its features it may be of more general application, and has for its object the provision of a valve which shall be efficient and durable in operation and economical in the cost of manufacture. The kind of valve which I prefer to use for this purpose is of the double-acting type or one having two active outer valve-faces which are adapted to open and close upper and lower valve-ports in seats coöperating with said faces. In valves of this class it is of greatest importance that the distance between the valve-seats be maintained without variation, or, in other words, that the variations caused by the shrinking and swelling of the valve-board is reduced to a minimum. It is also a desideratum to have a positive adjustment for the seats and coöperating faces and a valve that is handily placed in position and easily removed.

To the accomplishment of all these objects and results and such others as may hereinafter appear the invention comprises a secondary valve of the double-acting type adapted to be placed in a wind way or channel of a musical instrument and to control the passage of air therethrough from certain other passages of the system. In the particular construction shown the valve-stem carries two disks, which are preferably faced with leather on their outer faces and operate between two valve-seats, each composed of a ring or air-annulus of metal or other material seated in a corresponding recess in the face of the valve-board, the said annulus or ring being secured in place by means of a suitable cross-strip. These seats are opposite each other and their inner faces coöperate with the respective valve-disks, the stem of which is guided by the said cross-strips. Means are also provided for a free passage of the air through the parts in the said seats by grooving or recessing the said strips.

The invention further consists in the novel details of construction and combinations of parts hereinafter described, and particularly pointed out in the appended claims, reference being had to the accompanying drawings, forming a part hereof, in which the same reference characters designate like parts throughout the several views, and in which—

Figure 1 is a vertical cross-sectional view through the instrument, showing the relative locations of the music-sheet, tracker-board, and air-ducts as well as the primary and secondary valves which control the pneumatics for the operation of the key-strikers or valve-operating levers. Fig. 2 is an enlarged detail sectional view through one of the secondary valve-seats and showing the valve in place. Fig. 3 is a fragmentary plan view of the seat looking down from the plane indicated by the line 3 3 in Fig. 2, and Fig. 4 is a horizontal section on line 4 4 in Fig. 2.

Referring to Fig. 1, the rolls upon which the music-sheet is wound are designated by the letters *a a* and the sheet itself by the letter *b*. It is to be understood that the rolls are driven by a suitable motor (not shown) and that the sheet *b* is drawn from one roll to the other during the operation of the instrument. The perforations in this sheet *b* thus drawn forward register with suitable openings in the tracker-board *c*, which openings communicate with passages *d*, leading through such board to pneumatic devices *e*, preferably diaphragm-pallets adapted to control in their operation the primary valves *f*, which valves serve to open and close the wind way or passage *g* to the open-air passage above or the exhaust-passage below, said passage *g* or duct leading to the pneumatic device *h*, similar to the device *e* and controlling the valve *i* by means of the stem *k*. This valve governs the passage *m* in its relation to the open-air passage above or the exhaust-passage below. The passage or duct *m* communicates with the pneumatic device *o*, which is connected by suitable mechanism with the striker *p*, adapted to operate the keys of a piano or to open the valves of an organ.

The pedals *q*, of which only one is shown, are utilized to operate exhausters *r* in the lower part of the instrument, which create the vacuum for the operation of the several devices. A main exhaust chest or chamber *s* is provided, with which the exhausters *r* communicate, and an equalizing-bellows *t* is also connected with such chest or chamber to maintain an even vacuum within the same. This chest *s* is connected by suitable passages and windways with the other parts of the apparatus wherever necessary, notably with the exhaust-passages mentioned above.

The secondary valve *i*, to which this invention relates, is shown clearly in Fig. 2. Here the valve-board 2 is provided with a passage or channel *m*, leading to one of the pneumatics *o*. Recesses 4 are provided in the upper and lower faces of this valve-board 2, and an aperture 5 is formed entirely through the same, with which the said passage or duct *m* communicates. Within each recess a metallic ring or annulus 6 is placed and is firmly secured in position by means of the cross-piece 7, (shown in Figs. 2 and 3,) the same being secured in place by means of screws 8. A central aperture 9 is provided in each cross-piece,

and the inner face thereof is recessed or grooved, as at 10, the said recess being of the same length as the inner diameter of the ring or annulus 6. The inner faces of these metallic rings 6 form the seats of the valves, and as they are let into the surface of the valve-board their seat-faces are close together and the amount of wood between them is slight, and therefore the variation of the distance between them, due to the shrinkage and swelling of the wood, is not appreciable. Moreover, the operating-faces are placed close together, and at the same time thicker disks than ordinary may be used and a firmer and better seat obtained.

The coöperating valve comprises the upper and lower disks 12, secured rigidly to the stem *K* of the valve at a slightly less distance apart than the said rings 6, the outer face of such disks being covered with a layer 14 of leather or other suitable substance. When these disks or faces are in contact with the metallic rings 6, an air-tight closure of the valve is obtained. The stem *K* of the valve passes through the openings 9 in the cross-pieces 7 and is guided thereby. The lower end of the stem *K* is extended, as shown, and is adapted to be operated or raised and lowered by any suitable pneumatic pallet or apparatus *h*, connected with the windway *g*. As one means of handily accomplishing this I provide the button 15, screw-threaded on the lower end of the extended stem *K* and arranged immediately above a flexible diaphragm 16, extending across the expanding opening 17 of the channel or windway *g* into the exhaust-passage above, the said diaphragm being secured at its edges in any desired way to the walls of the opening 17, but not tightly stretched thereacross. When a greater pressure is established below the diaphragm than above, it is obvious that in such case the diaphragm will rise, and in so doing it will engage the adjustable button 15. This upward movement on the part of the diaphragm will in this way operate to lift the valve-stem *K*, thereby closing the upper valve and opening the lower. It will be apparent that the leather covering of the disks 12 may be replaced by leather rings upon the inner faces of the rings 6.

The operation is substantially as follows: The passage of the perforated sheet over the tracker-board opens and closes communication with the passages of such board. It will be understood that each passage in the tracker-board controls a primary valve and that for every such valve there is a corresponding passage *g*, secondary valve *i*, passage *m*, and pneumatic *o*. When the passage in the tracker-board is opened to the air, the pneumatic controlling valve *e* is operated and lifts the said valve to open the passage or channel *g* to the open-air passage above the said valve. The passage *g* being open to air causes pallet *h* to lift the valve *i*, since its upper side is open to the exhaust-passage just above. The

raising of valve *i* opens the passage *m* to the exhaust-passage beneath and closes the same to the open-air passage above. This permits the air to be drawn from the pneumatic *o*, with which the duct *m* communicates, causing the same to deflate or collapse and to operate the striker *p*, connected therewith. When the tracker-board passage or duct is closed as the sheet travels along, the reverse operations take place—that is, the passage *g* is closed to the open air and opened to the exhaust-passage beneath the valve *e*. The pallet *h* now drops owing to the exhaust acting upon its lower face and mechanically closes the valve *i* upon its lower seat to the exhaust-passage beneath and opens it to the passage above, which communicates with the open air. This allows the pneumatic *o* to expand and restores the striker *p* to normal position. The same operation is repeated every time the key-striker *p* is operated, and for every striker in the instrument there is a similar set of pneumatics, passages, valves, and ducts adapted to operate in the same way as above outlined.

It will thus be apparent that I have provided a valve of simple mechanical construction in which there is small liability for the same to get out of order or out of adjustment by shrinkage or swelling of the valve-board and which is readily removed for inspection and repairs and is easily replaced. Moreover, thicker and flatter seats can be used and a tighter chamber obtained than in the ordinary valve construction. Besides, a free outlet for air is obtained through the medium of the recesses in the inner sides of the guide-strips.

It will also be seen that the construction and arrangement permit the two valve-seats to be brought comparatively close together, thereby reducing to a minimum the thickness of the wood between the two valve-seats. In this way the distance between the two valve-seats is reduced without in any way contracting the passage through the valve-board, and by so doing it is obvious that the distance between the two valve-seats will be practically the same under all conditions, the thickness of the wood between the two plates 6 being reduced to such an extent as to prevent a swelling or shrinking of the wood from having any material effect on the relative positions of the two valve-seats. In other words, the small amount of wood between the two valve-seats cannot possibly swell or contract to an extent sufficient to interfere with the operation of the valve. It is obvious, however, that the construction and arrangement of my valve device can be modified or changed without departing from the spirit of my invention. For this reason I do not limit myself to the exact form and arrangement shown and described.

While I have described the invention with particular reference to the details of construction, I would have it understood that it is not to

be limited thereto, as various changes, alterations, and modifications may be made therein and still come within its scope and principle.

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

1. In a mechanical piano or organ player, the combination of a valve-board having a longitudinal passage, recesses on opposite sides of said board, rings secured in said recesses and providing inwardly-facing valve-seats, guide-bars extending across the said rings, a valve-stem extending through openings in said guide-bars, and a pair of disks mounted upon said stem between said valve-seats.

2. In a mechanical piano or organ player, the combination of the exhaust apparatus and power-pneumatics, the tracker-board, perforated music and music-rolls, the fingers actuated by the said power-pneumatics, a valve-board provided with a longitudinally-extending passage, said valve-board being also provided on opposite sides with recesses, flat rings seated in said recesses, guide-bars flush with the opposite surfaces of said valve-board and extending across said rings, a valve-stem arranged to reciprocate in central openings in said guide-bars, and a pair of valve-disks mounted upon said stem between said valve-seats.

3. In a mechanical piano or organ player, the combination of a valve-board made in one piece and having a longitudinally-extending channel or passage, a transversely-extending passage in said valve-board communicating with said longitudinally-extending passage, recesses or offsets formed around the opposite ends of said transverse opening or passage, flat rings seated in said recesses and providing inwardly-facing valve-seats, guide-bars extending across said rings, a valve-stem extending through openings in said guide-bars, and a plurality of valve-disks mounted upon said stem and arranged to play between said valve-seats.

4. In a mechanical piano or organ player, the combination of a valve-board formed with a longitudinally-extending passage, a transverse opening through one end of the board communicating with said longitudinal passage, annular recesses or offsets formed around the opposite ends of said transverse opening, metal rings seated in said annular recesses or offsets, guide-bars extending across the rings and flush with the outer surface of said valve-board, a valve-stem arranged to reciprocate in openings in said guide-bars, a pair of valve-disks mounted upon said stem between said rings, and a pneumatically-actuated diaphragm arranged to engage an adjustable head on the end of said valve-stem.

5. In a mechanical piano or organ player, the combination of a longitudinally and internally channeled valve-board, a transverse opening or passage extending through the end of said board and communicating with said

longitudinal channel, annular recesses or offsets formed around the opposite ends of said transverse opening, flat rings seated in said recesses and providing inwardly-facing seats, 5 guide-bars extending across the said rings and having their inner sides recessed, a valve-stem extending through central openings in the recessed portions of said guide-bars, and a pair of valve-disks mounted upon said stem 10 between said valve-seats.

6. In a mechanical piano or organ player, the combination of the tracker-board and perforated music, the fingers actuated by power-pneumatics, the exhaust apparatus, a horizontally-disposed valve-board provided with a 15 longitudinally-extending passage, a transverse vertical passage extending through said board and communicating with said longitudinal passage, annular recesses or offsets 20 formed around the upper and lower ends of said transverse opening, flat metal rings seated in said recesses or offsets, guide-bars extending across the transverse opening outside the said rings, said guide-bars having their 25 central portions reduced or cut away on their inner surfaces, a vertically-disposed valve-stem arranged for reciprocation in said reduced central portion of said guide-bars, a pair of valve-disks mounted upon said stem 30 between said rings, and a pneumatically-actuated diaphragm arranged to engage the lower end of said valve-stem.

7. In a mechanical piano or organ player, the combination of a valve-board having a 35 transverse opening or passage, annular seats or recesses formed around the ends of said transverse opening, flat metal rings seated in

said annular recesses and providing inwardly-facing valve-seats, guide-bars extending across the outer surfaces of said rings, screws 40 extending through the said guide-bars and rings and into the valve-board, a valve-stem arranged for reciprocation in openings in said guide-bars, and a pair of separated valve-disks mounted upon said stem and arranged 45 to play between said valve-seats.

8. In a mechanical piano or organ player, the combination of a valve-board provided with oppositely-arranged recesses or seats, rings seated in said recesses or seats and providing 50 inwardly-facing valve-seats, and an internally-arranged valve arranged to play between said valve-seats.

9. In a mechanical piano or organ player, the combination of a valve-board provided 55 with annular recesses or seats, valve-seats seated in said annular recesses, and a pair of rigidly-connected valve-disks arranged to engage said valve-seats.

10. In a mechanical piano or organ player, 60 the combination of the recessed valve-board, the annular valve-seats secured in the recesses in the valve-board, a valve-stem provided with valves adapted to engage said valve-seats, and centrally recessed or grooved 65 guide-bars provided with openings adapted to receive said stem.

Signed by me, at Buffalo, Erie county, New York, this 17th day of July, 1901.

JOSEPH H. CHASE.

Witnesses:

L. J. BUNDY,

GEO. A. BAKER, Jr.