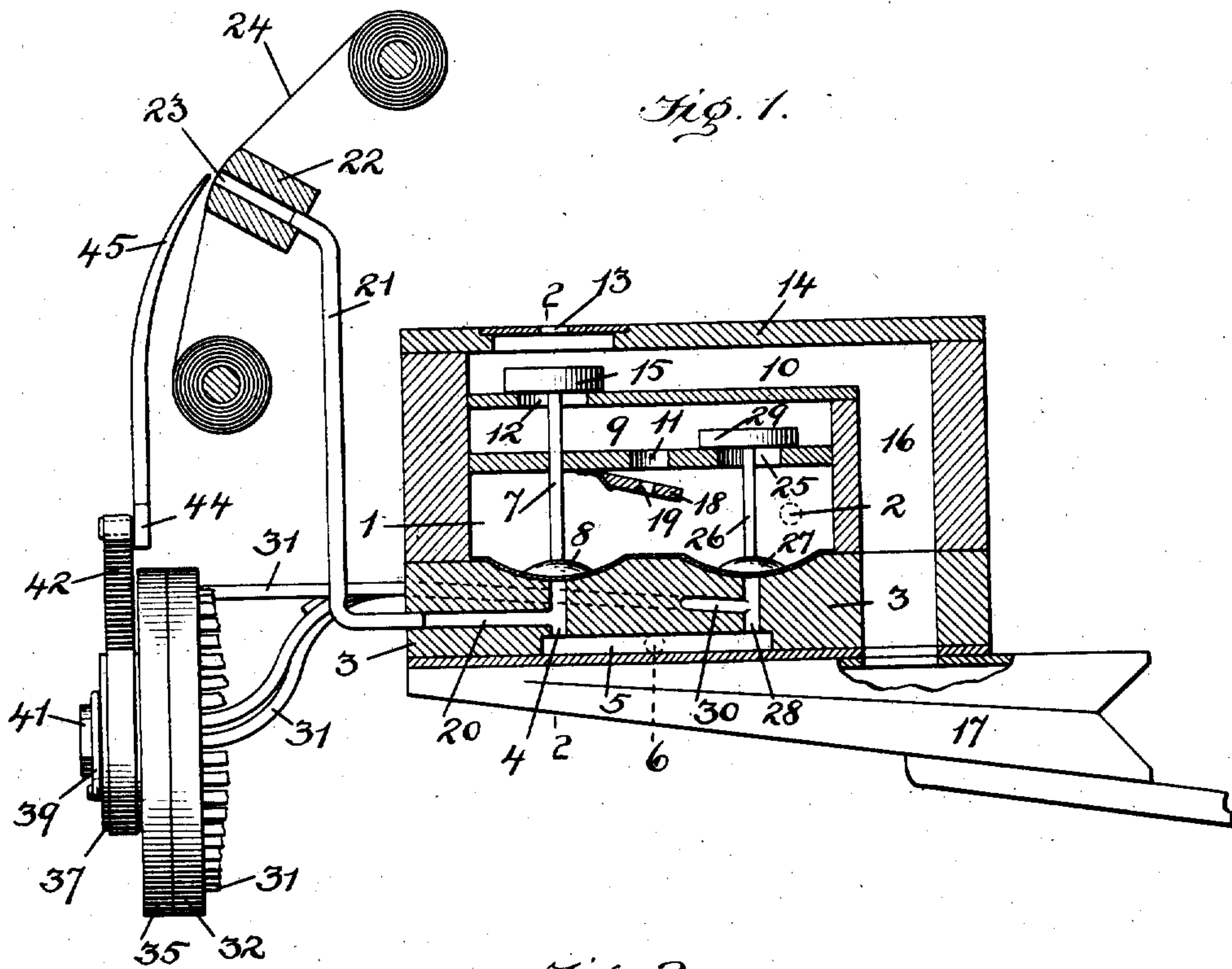


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PNEUMATIC ACTION FOR MUSICAL INSTRUMENTS.
APPLICATION FILED MAY 16, 1907.

901,068.

Patented Oct. 13, 1908.

2 SHEETS—SHEET 1.

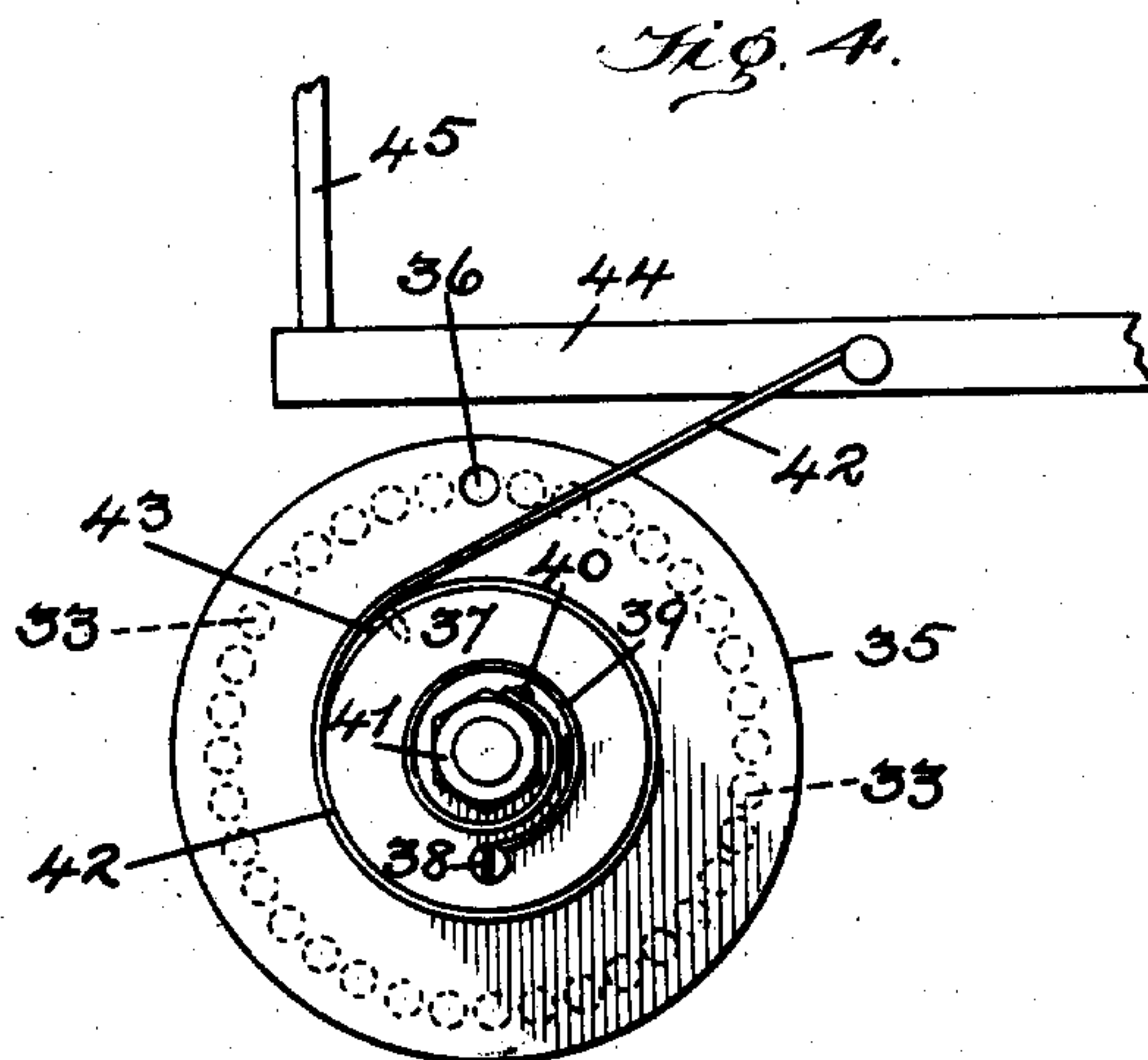
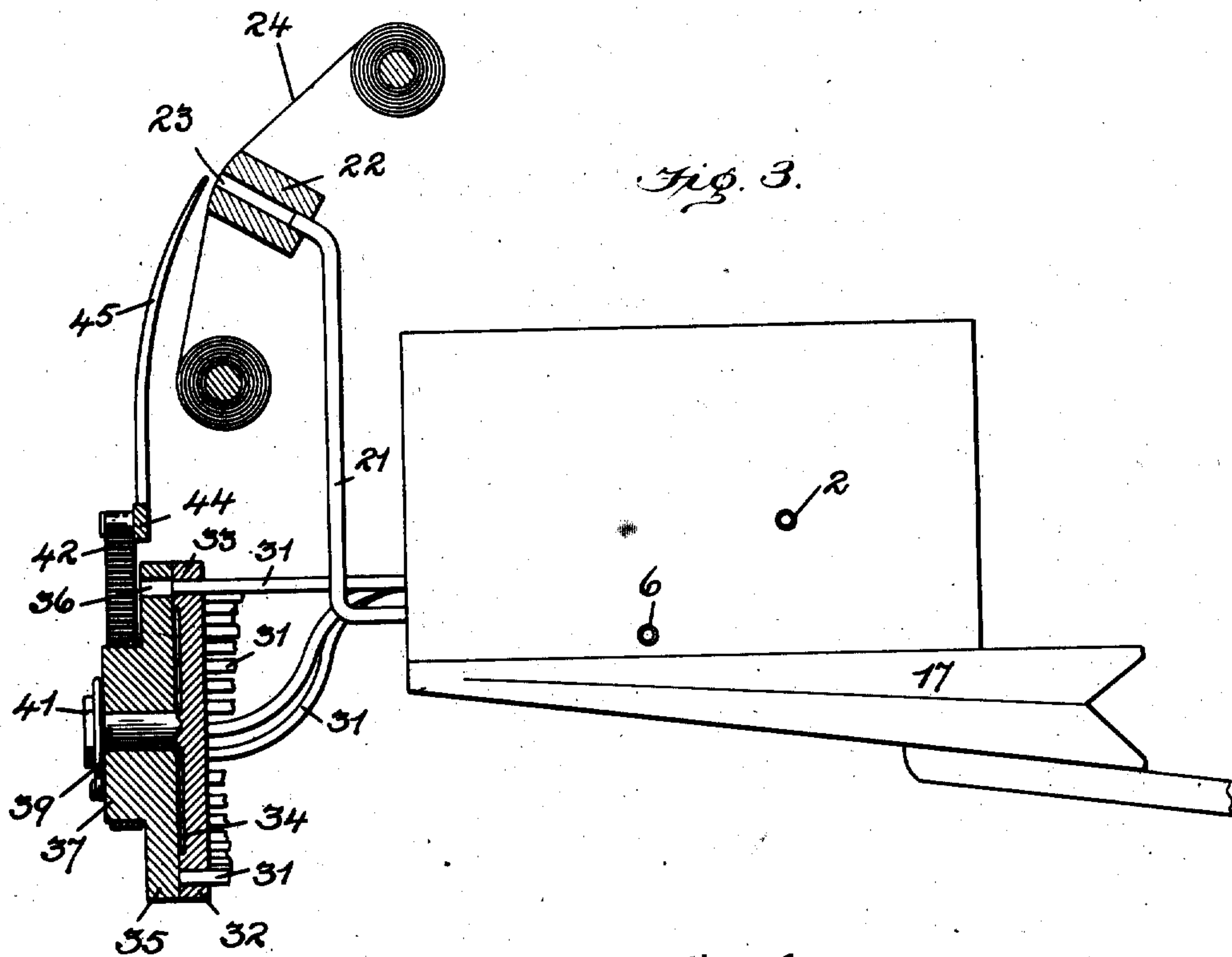


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PNEUMATIC ACTION FOR MUSICAL INSTRUMENTS.

No. 901,068.

Specification of Letters Patent.

Patented Oct. 13, 1908.

Application filed May 16, 1907. Serial No. 378,909.

To all whom it may concern:

Be it known that I, JAMES P. CAULFIELD, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Pneumatic Actions for Musical Instruments, of which the following is a specification.

My invention relates to improvements in pneumatic-actions for piano players.

The object of the invention is to improve the construction of pneumatic actions for piano players by which the performer may be able to emphasize any desired note in any chord, regardless of the position of the chord, and thus give a marked expression or predominance of tone to the melody or any desired strain of harmony, while the accompaniment, variations, or other portion of the chord may be rendered in a softer or subdued tone.

By my invention I am enabled to control the power or force of tone of any desired note in any chord without affecting all the notes, and thus the operator can control separately the volume of every individual note in the instrument. My improved device also permits the operator to interpret the music in accordance with his own ideas, in that he may emphasize any desired note independently of all the others.

Another object and advantage of my invention is that the mechanism and devices employed to separately control the force or power applied for each note is permanent in, and a part of, the player in distinction to a second perforated sheet that is especially perforated for use only with another particular music sheet.

The invention is illustrated in the accompanying drawings in which,—

Figure 1, shows a vertical cross-sectional view of the device. Fig. 2, illustrates a longitudinal sectional view of a portion of the same. Fig. 3, shows a vertical sectional elevation through the expression controlling device, and Fig. 4, a front elevation of the same.

Referring to the drawing the numeral, 1, designates the longitudinal exhaust chest which extends throughout the length of the apparatus and is at all times in communication with a bellows or other device which will maintain a suction in said chamber through the pipes, 2. The bottom, 3, of this chest is provided with a plurality of pas-

sages, 4, which communicate with a bottom exhaust channel, 5, which extends beneath said passages. This exhaust channel also communicates with a suction apparatus by pipes, 6. The exhaust channel, 5, connects with the same exhaust apparatus as does exhaust chamber, 1. A valve stem, 7, extends vertically from each of the passages, 4, and at the lower end of each stem there is a diaphragm, 8, which covers a recess around each passage,—the suction in the channel, 5, draws the diaphragm and valve stem down and holds it there so long as the pressure in the passage, 4, and exhaust chamber 1, on opposite sides of the diaphragm is equalized. It is to be understood that there will be one valve stem for every note of the action or instrument and also a like number of passages, 4.

Above the main exhaust chest, 1, the device is provided with a plurality of intermediate chambers, 9,—one also for each key, and above said intermediate chamber I provide a plurality of upper chambers or passages, 10. Ports, 11, are provided in the partition between the main chest, 1, and the intermediate chambers, 9, while ports, 12, are also provided in the partition between the upper chambers or passages, 10, and intermediate chamber, 9. Each valve stem, 7, extends from the diaphragm, 8, through the intermediate chamber, 9, and the port, 12; and has position beneath an upper port, 13, in the top 14, of the device. Flat circular valve plates, 15, are carried on the upper ends of the valve stem and when the stem is in the lowermost position with the diaphragm down in the recess around the lower passages, 4, the valve plate, 15, is seated over the port, 12, so as to cut off communication between the chamber, 9, and upper passage, 10, while the port, 13, is left uncovered. Each chamber, 10, has a passage, 16, which extends therefrom and communicates with a striking pneumatic, 17, which latter in turn operates suitable lever mechanism which causes a depression of the keys to sound the note. This lever mechanism is well known in the art and hence its illustration is deemed unnecessary.

A valve bar, 18, in the present instance is pivotally sustained with respect to the partition between the exhaust chest, 1, and the plurality of intermediate chambers, 9, and this valve bar extends throughout the length of said exhaust chest, 1, and is mounted so as

to swing up and cover all of the ports, 11, which open into the said intermediate chambers. The construction of this valve bar, 18, may vary considerable as its function is to more or less close all of said ports, 11, simultaneously, although it never entirely closes said ports. In the present instance this valve bar is provided with a plurality of small ports, 19, which latter, when said bar is swung upwardly beneath the ports, 11, will register with said ports and merely cause a reduction in the size of the passage between the exhaust chest, 1, and all of the intermediate chambers, 9. It is obvious that when the valve bar is down or away from the ports, 11, the suction through the port will be greater and quicker than when said valve bar is up and the smaller ports, 19, are in register with the ports, 11. It is to be understood that when the valve bar, 18, is raised or lowered it simultaneously covers or uncovers all the ports, 11, in all of the intermediate chambers, 9. The object of this will presently be described.

Beneath the diaphragms, 8, each passage, 4, is provided with a laterally extending passage, 20, and tracker tubes, 21, connect these lateral passages and said tubes extend to the tracker board, 22, having the ordinary air inlet ports, 23. The usual perforated sheet, 24, travels over the tracker board so as to uncover the ports therein in the usual manner.

In so far as has been described the device is similar to others heretofore designed for ordinary piano playing, and the valve stems, 7, are caused to be moved vertically by the interruption or breaking of the suction on the under side of the diaphragms by the admission of air through the tracker tubes, 21, when a perforation in the sheet permits the entrance of the air.

In the ordinary operation of the device as heretofore described the valve bar, 18, is under the hand control of the operator so that said operator can raise or lower said valve bar when desired. If it is desired that the volume of the tone shall be normal the valve bar, 18, will be wide open and thus fully uncover all of the ports, 11, and so long as said valve bar remains in the lowered position the force or power of tone is normal in the entire instrument. When however, it is desired to soften the tone the valve bar will be raised and the ports, 11, thereby partly covered. By such arrangement alone the entire instrument is affected, that is, all the notes are rendered in a normal tone or all are soft. By my improved device I am enabled to emphasize any particular note alone and without, at the same time, emphasizing all the notes, and thus I may produce a marked expression or predominance of tone to the melody or any desired strain of harmony while the accompaniment, variations, or other portion of the

chord may be rendered in a softer or subdued tone. In order to effect this operation and produce this result I provide in each of the intermediate chambers, 9, a second port, 25, which extends through the partition between the said chambers and the exhaust chest, 1.

Valve stems, 26, extend downwardly from the ports, 25, and pass through the exhaust chest, 1, and the lower ends of these valve stems are provided with diaphragms, 27, which cover the upper ends of vertical passages, 28, while valves, 29, are carried at the upper ends of the stems, 26, and cover the said ports, 25, in the intermediate chambers. The lower ends of the vertical passages, 28, vent, into the bottom exhaust channel, 5, while passageways, 30, extend from the passages, 28, and communicate with tubes, 31. As each intermediate chamber, 9, is provided with a valve, 29, and there are as many of said chambers and valves as there are keys on the keyboard, there will also be a like number of passages, 28, and 30, and a similar number of tubes, 31. The tubes, 31, all lead to and connect with an expression controlling device. This expression controlling device may vary in construction but in the present instance it comprises a stationary plate or disk, 32, having a plurality of ports or perforations, 33, to which the tubes, 31, all lead and have connection. The number of the perforations, 33, in the stationary disk corresponds with the number of valve chambers, 9, and tubes, 31, and these perforations are arranged preferably in a circle around the disk and adjacent the periphery thereof. This stationary disk in the present instance, is provided with a central cavity, 34, for a purpose presently to be described.

A revoluble disk, 35, is pivotally mounted at the side of the stationary disk and in sliding contact therewith so that it may be moved to uncover any one of the perforations, 33, in the stationary disk. By providing the cavity, 34, in the stationary disk the area of the contact surface between the two disks is reduced to a minimum and an air tight joint may more readily be made to prevent air from passing between said disks and entering the perforation, 33, and tubes, 31. The revoluble disk, 35, is provided with a port, 36, adjacent its outer edge and the position of this port is such that by revolving the disk the port may be made to register with any one of the ports, 33, in the stationary disk, 32, for the purpose of operating any one of the valves, 29, in the intermediate chambers, 9, as will presently be explained.

The revolution of the disk, 35, may be accomplished in any suitable manner. In the present instance I prefer to operate the said disk by hand so it may be under the control of the operator and to this end I provide a

drum, 37, at the side of the revoluble disk and to this drum I attach one end, 38, of a spring band, 39, while the other end, 40, of said spring is attached to a stationary object
 5 such as the nut, 41. A strap or band, 42, is wound around the circumference of the drum, 37, and has its inner end, 43, attached thereto while the outer end of said strap extends tangentially from the drum and is con-
 10 nected, in the present instance, to a suitable sliding bar, 44. This sliding bar is mounted so as to slide horizontally and in a plane below the perforated sheet, 24, and tracker board, 22, and a suitable indicator arm or
 15 finger, 45, projects upwardly from the sliding bar, 44, and projects over the said perforated sheet.

In the operation of the device the perforated sheet will travel over the tracker board and cause an interruption to the exhaust be-
 20 low the diaphragm, 8, at which time such diaphragm will rise, carrying the valve stem, 7, with it. The upward movement of the said valve stem will then cause the valve,
 25 15, to rise and cover the port, 13, while the exhaust or suction in the chamber, 1, will draw the air out of the striking pneumatic, 17, through the passages, 16, and 10, and also through the intermediate chamber, 9. This
 30 causes the striking pneumatic to actuate the key. If the valve, 18, is open the suction on the striking pneumatic, 17, will be accomplished so as to effect the normal force or tone but if said valve, 18, is closed and the
 35 suction is accomplished through the ports, 19, then the tone will be softened. This operation however, is found in other pneumatic actions.

Now in case the operator should desire to
 40 emphasize any desired note while the other notes may be rendered in a softer or subdued tone this may be done by revolving the disk, 35, until the single port, 36, therein will be brought into register with the port, 33, whose
 45 tube, 31, will lead to the valve device of the particular note desired. As soon as said ports, 36, and, 33, are in register the valve, 29, of the particular note desired will rise from the port, 25, and will remain raised so
 50 that when the valve, 15, of the same note is operated the suction from the passage, 10, through the intermediate chamber, 9, into the exhaust chest, 1, will be rapidly effected because both ports, 11, and 25, will be open to
 55 the exhaust chest. This results in the rapid collapsing of the striking pneumatic and a harder blow on the key actuating device.

Having thus described my invention what I claim as new and desire to secure by Let-
 60 ters Patent is,—

1. In a pneumatic-action for musical instruments having an air chest and a plurality of intermediate chambers at one side of said chest, in combination with a plurality of
 65 striking pneumatics; a valve for controlling

communication between the air chest and one of the striking pneumatics; a valve for governing the passages between the air chest and all of the intermediate chambers, and a valve interposed between each intermediate
 70 chamber and the air chest.

2. A pneumatic-action for musical instruments having an air chest, a plurality of intermediate chambers, a plurality of striking pneumatics and a plurality of passages one
 75 from each intermediate chamber and leading to a striking pneumatic, in combination with a valve interposed between the air chest and all of said intermediate chambers; a valve interposed between each intermediate cham-
 80 ber and each passage leading to a striking pneumatic; a valve interposed between each intermediate chamber and the air chest, and means for operating said latter valves independently of each other.
 85

3. A pneumatic-action for musical instruments having a tracker board; a plurality of striking pneumatics; an air chest; a plurality of intermediate chambers; passages lead-
 90 ing from each intermediate chamber to a striking pneumatic; a single valve interposed between the air chest and all of the intermediate chambers; a valve interposed between each intermediate chamber and the corresponding striking pneumatic passage,—said
 95 latter valves being actuated from the tracker board; a valve interposed between each intermediate chamber and the air chest and means under the control of the operator for actuating said latter valves independently of
 100 each other.

4. In a pneumatic-action for musical instruments, the combination with the air chest and the plurality of chambers connected with said chest by means of ports, of a cut-off
 105 valve extending lengthwise of the chest and controlling the passage of air through all of the ports into the said chambers; a separate expression valve for each of said chambers; a controlling device having connection with
 110 all of said expression valves and means for operating the controlling device at will to actuate any one of the expression valves.

5. The combination with a tracker board having a plurality of ports, of a perforated
 115 music sheet traveling over the tracker board; a striking pneumatic for each note in the action; a valve interposed between each striking pneumatic and one of the ports of the tracker board; an air-chest; a second valve
 120 interposed between each striking pneumatic and the air chest; a stationary head having a plurality of passages,—each communicating with the pneumatic of one of said second valves, and a rotary head at the side of the
 125 stationary head and having a single port to register with any one of the separate passages of the stationary head,—said rotary head being revoluble by the operator.

6. The combination with a tracker board
 130

having a plurality of ports, of a perforated music sheet traveling over the tracker board; a striking pneumatic for each note in the action; a valve interposed between each striking pneumatic and one of the ports of the tracker board; an air chest; a second valve interposed between each striking pneumatic and the air chest; a stationary head having a plurality of ports; tubes leading from the ports of the stationary head and each tube communicating with the pneumatic of one of the said second valves; a rotary head in close contact with the stationary head and

having a single port open to the atmosphere; an indicator adapted to coact with and trace the music sheet, and means operatively connecting the indicator with the rotary head to cause the head to revolve as the indicator is moved.

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

JAMES P. CAULFIELD.

Witnesses:

JOHN W. HEWES,

CHARLES B. MANN, Jr.