

No. 754,498.

PATENTED MAR. 15, 1904.

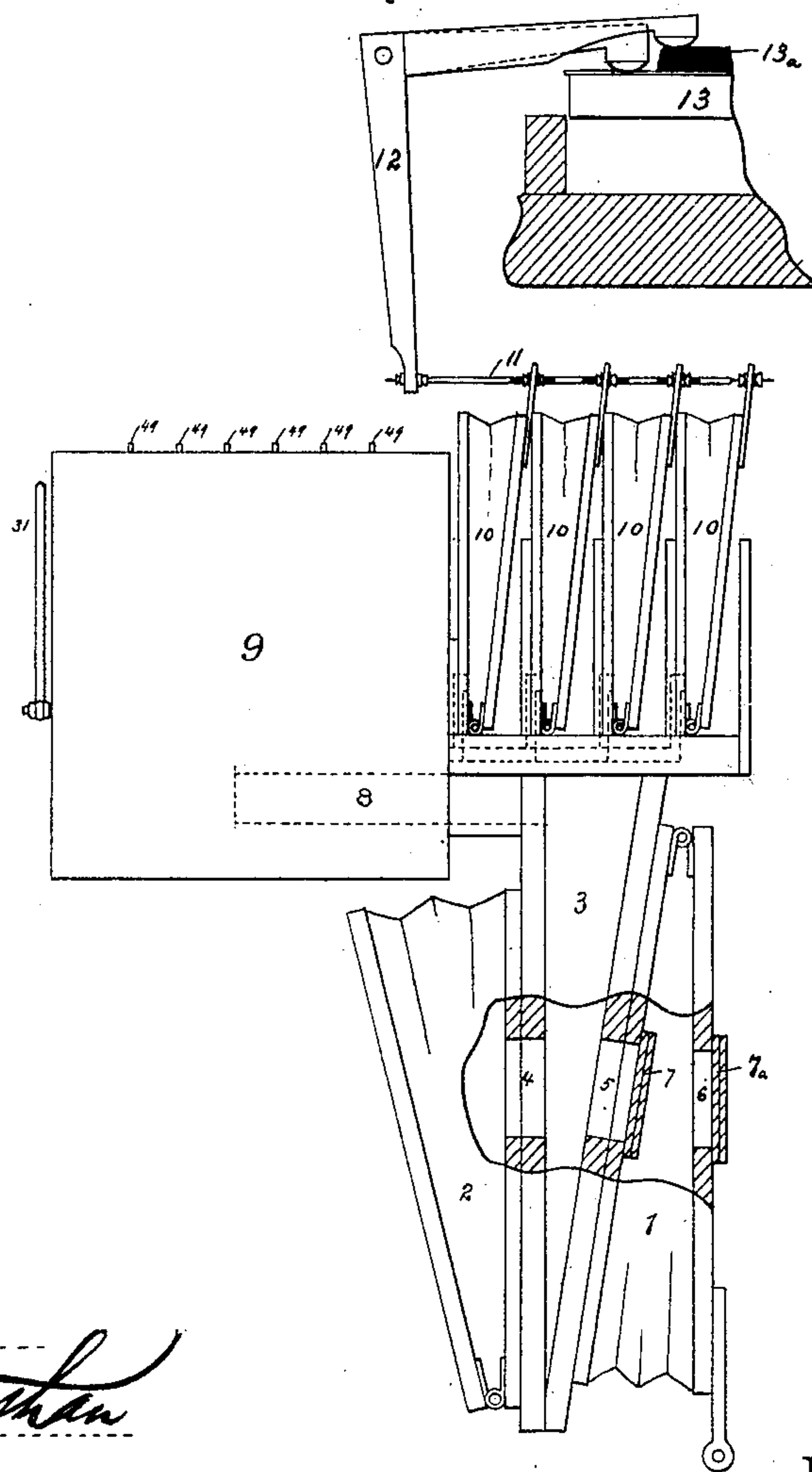
R. C. PRYOR.  
PNEUMATIC PIANO ATTACHMENT.

APPLICATION FILED MAR. 28, 1903.

NO MODEL.

4 SHEETS—SHEET 1.

*Fig. 1.*



**WITNESSES**

WITNESSES  
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4 SHEETS—SHEET 2.

Fig. 3.

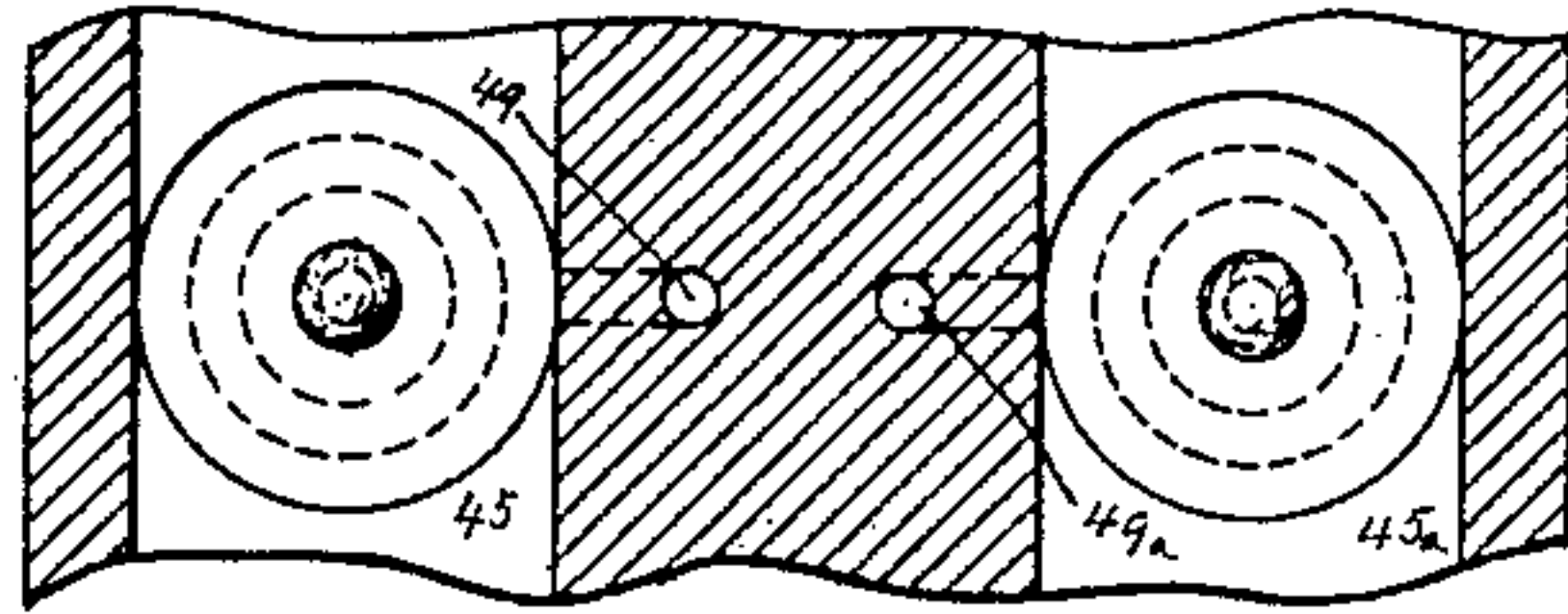


Fig. 2.

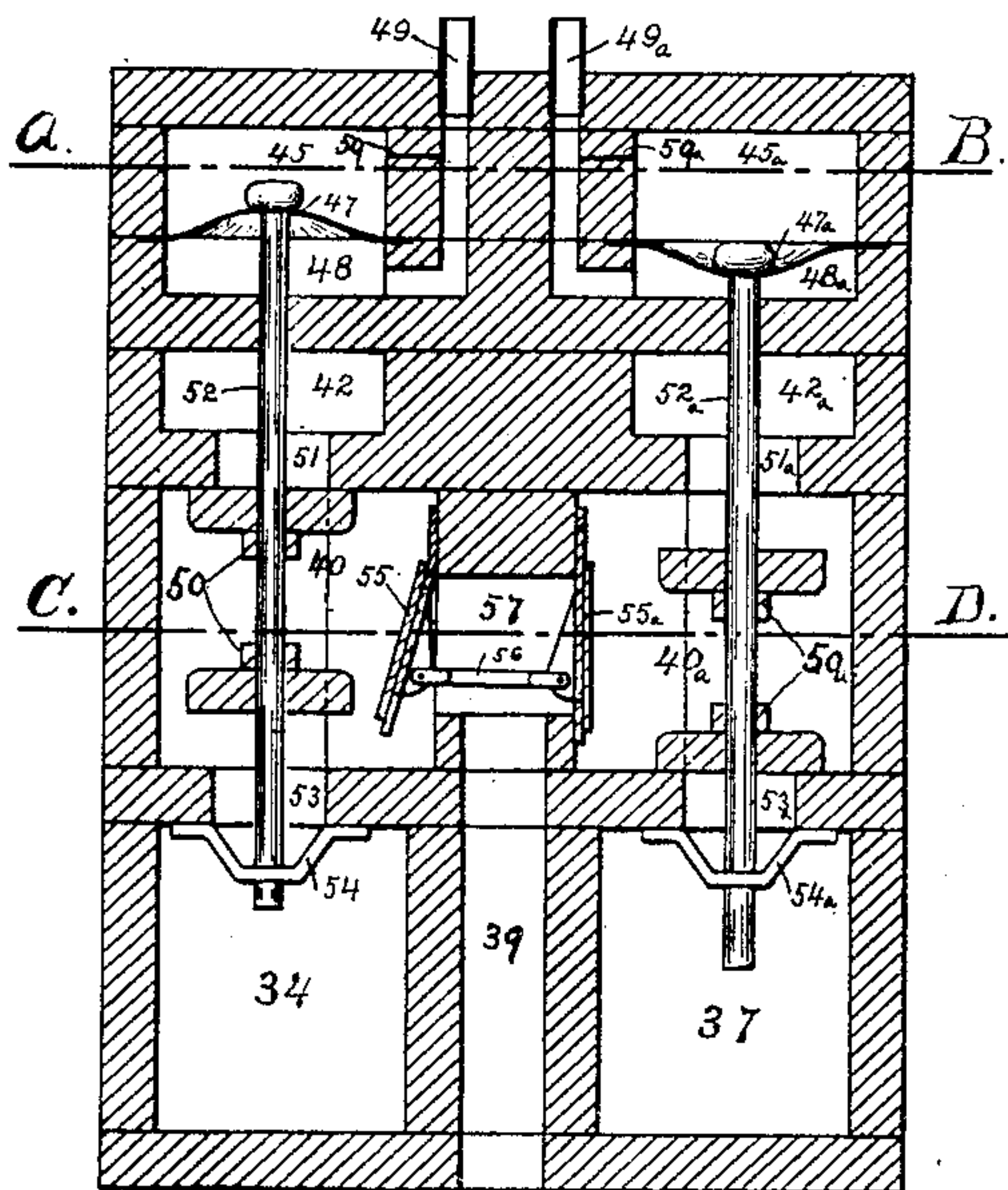
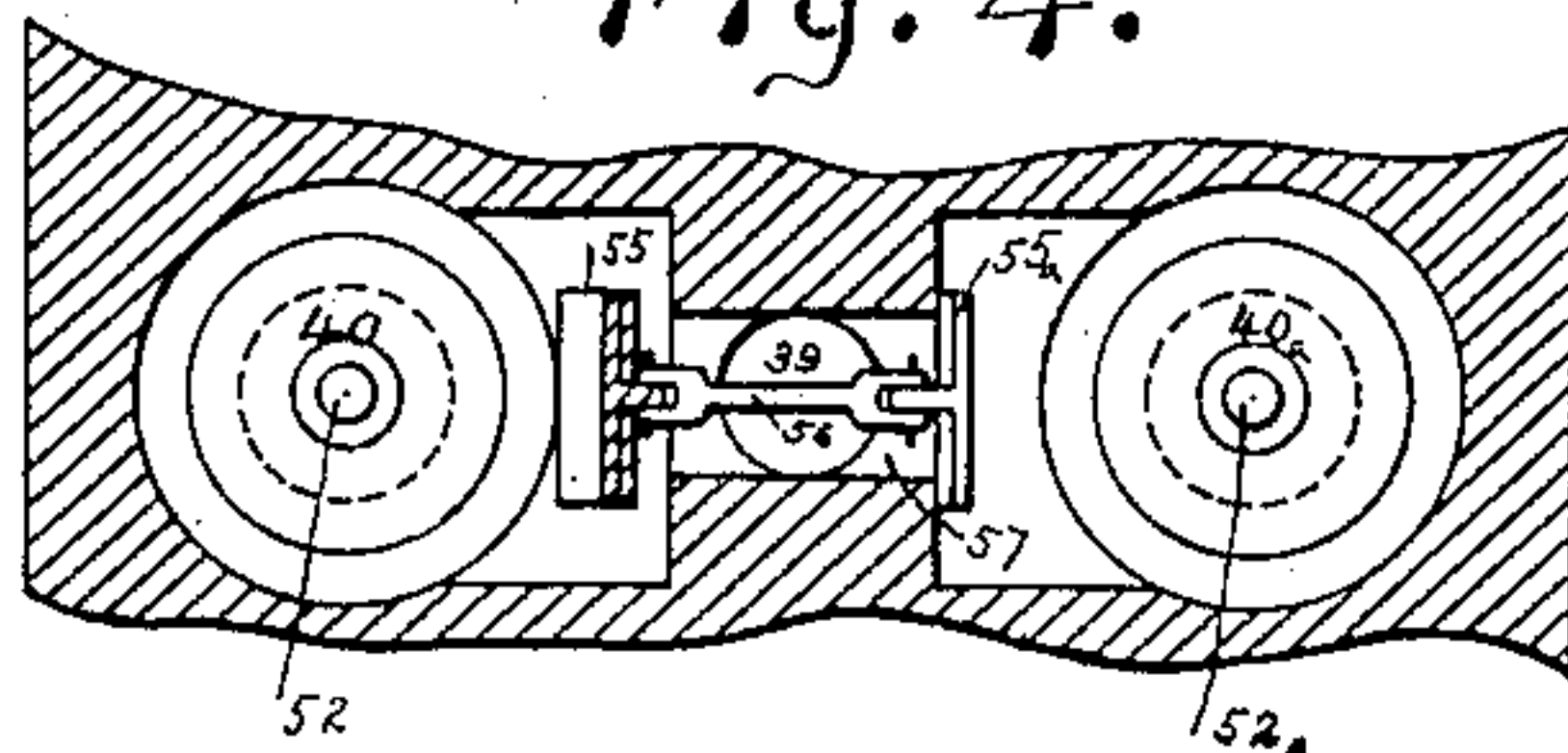


Fig. 4.



WITNESSES

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4 SHEETS—SHEET 3.

Fig. 5.

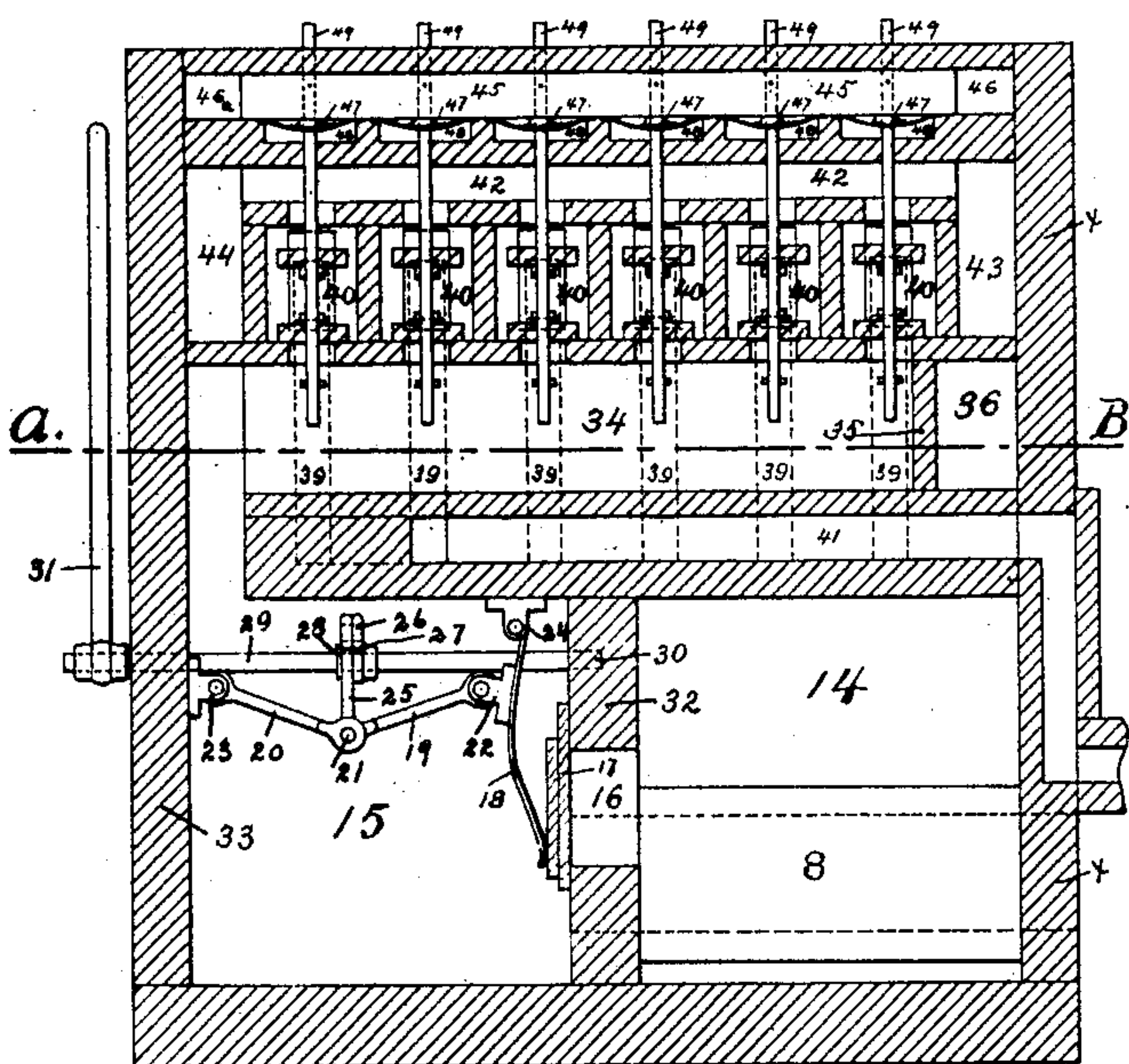


Fig. 6.

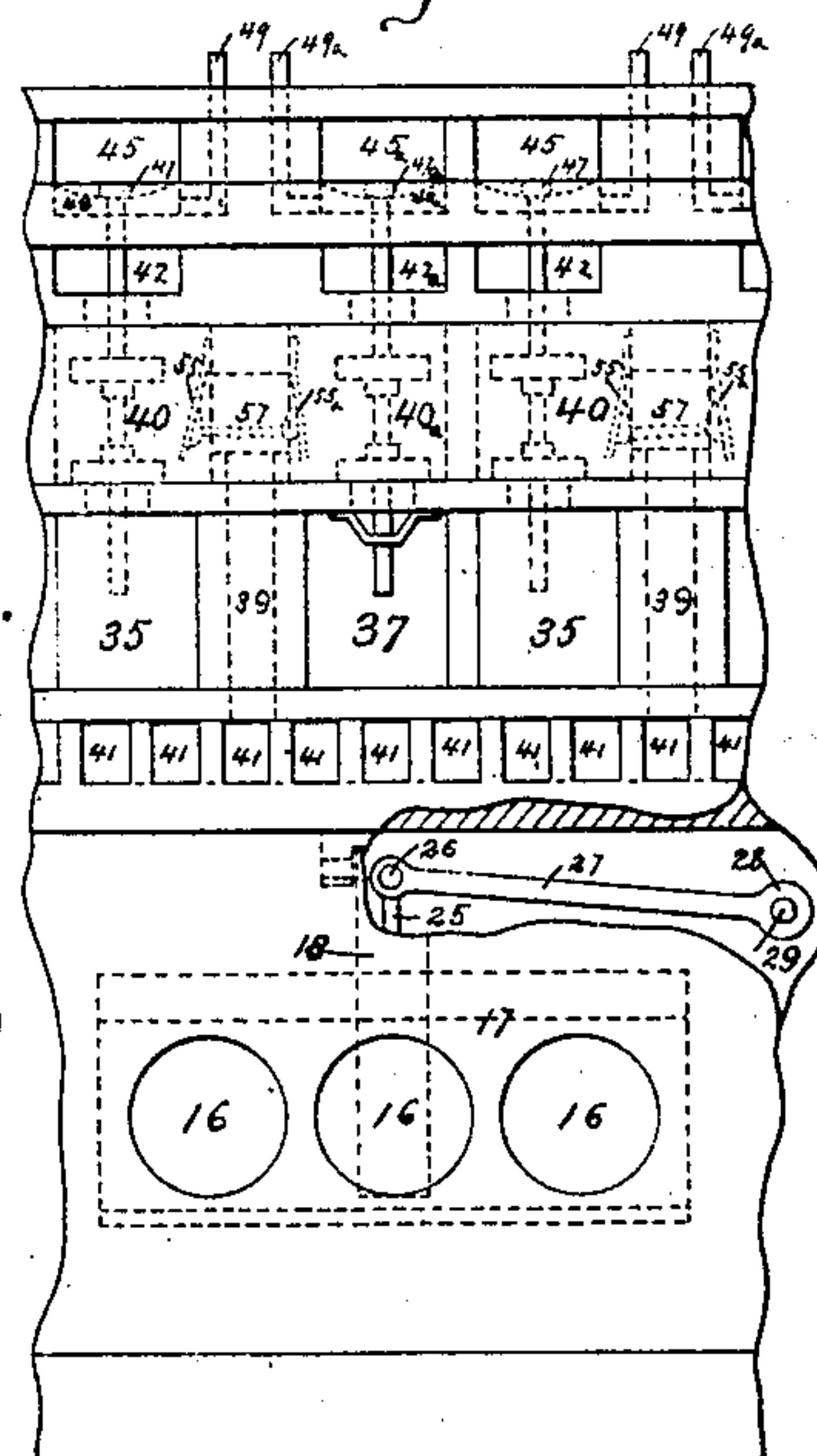
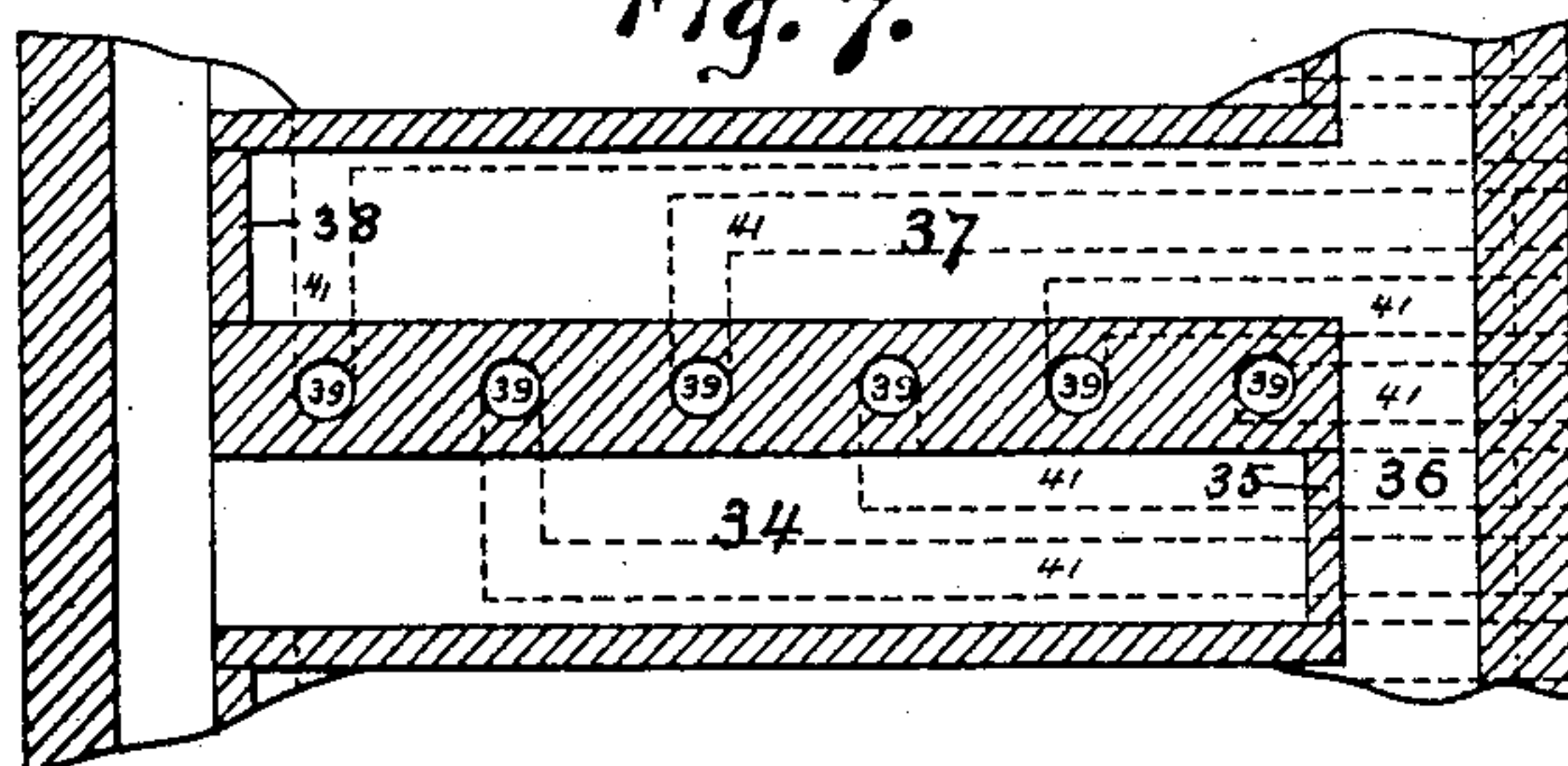


Fig. 7.



WITNESSES

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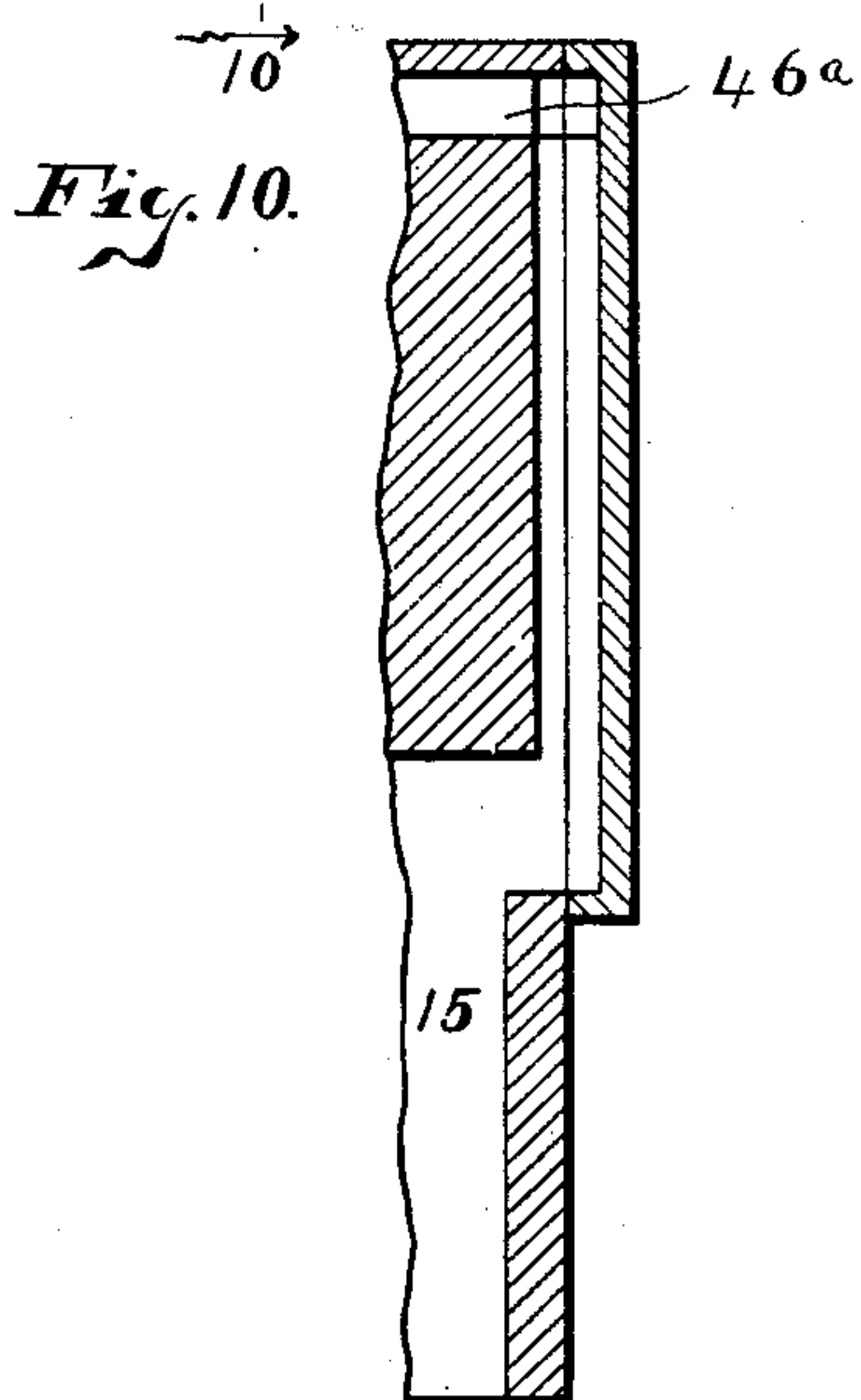
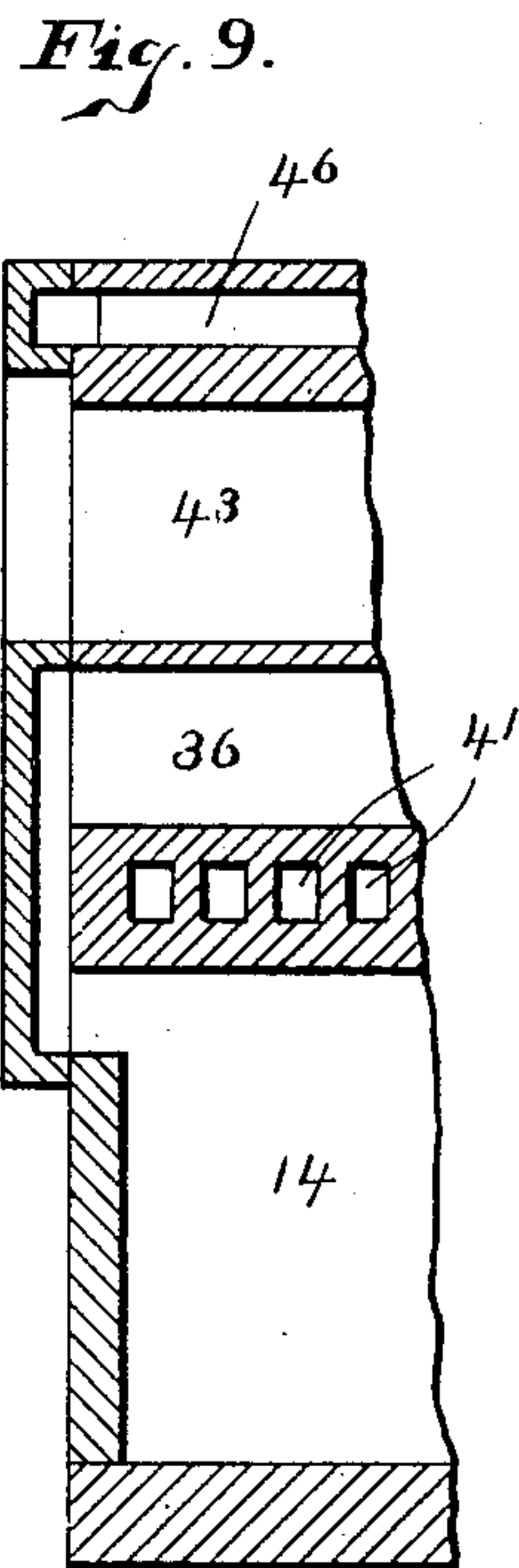
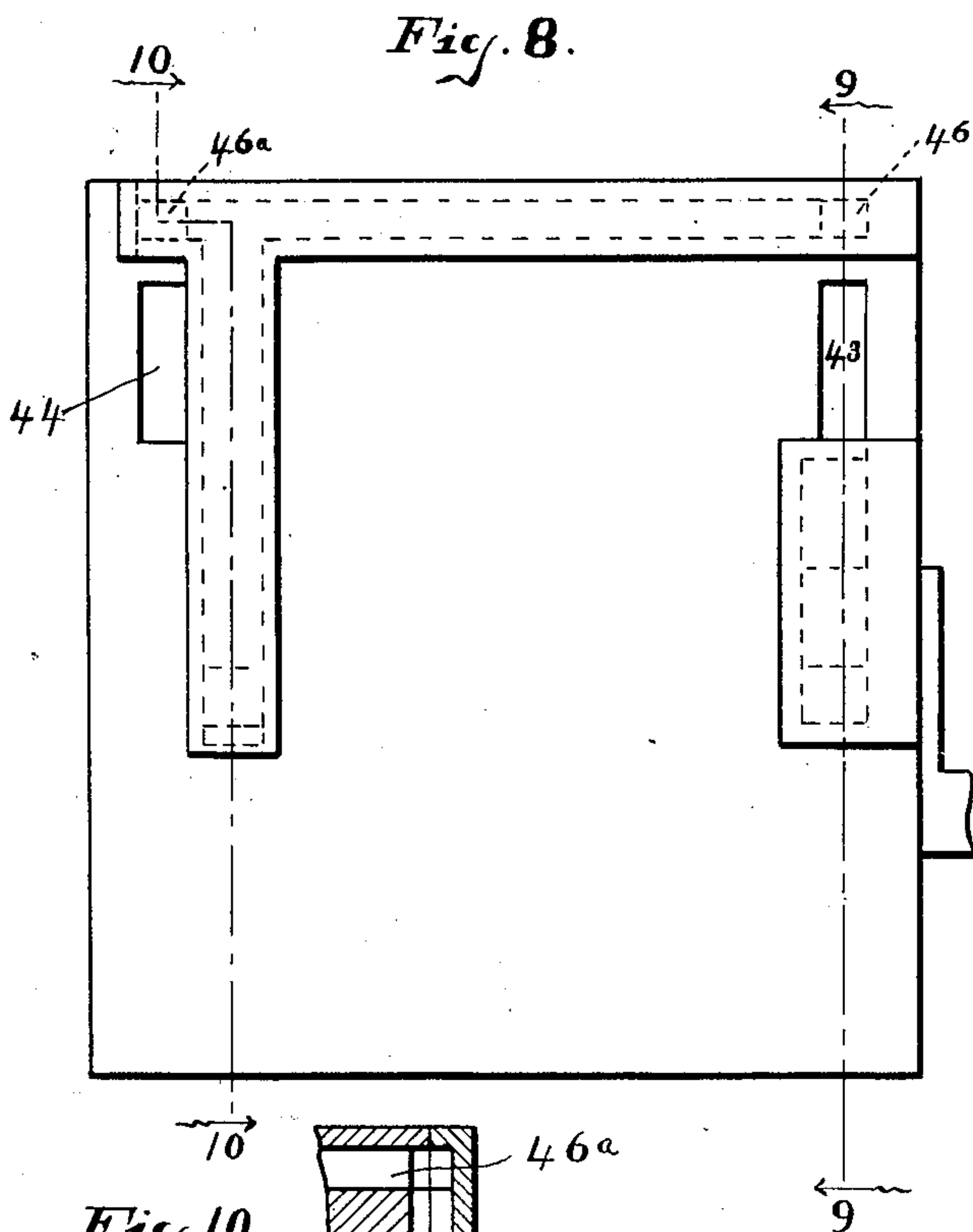
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NO MODEL.

4 SHEETS—SHEET 4.



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# UNITED STATES PATENT OFFICE.

REGINALD C. PRYOR, OF HOUGHTON, MICHIGAN.

## PNEUMATIC PIANO ATTACHMENT.

SPECIFICATION forming part of Letters Patent No. 754,498, dated March 15, 1904.

Application filed March 28, 1903. Serial No. 150,076. (No model.)

*To all whom it may concern:*

Be it known that I, REGINALD C. PRYOR, a citizen of the United States, residing at Houghton, in the county of Houghton and State of Michigan, have invented a certain new and useful Improvement in Pneumatic Piano Attachments, of which the following is a clear and exact description.

This invention relates to pneumatic piano attachments, and more particularly to the class of devices in which the primary valve action is operated by impulses of air admitted by the passage of a perforated sheet of flexible material over a tracker-board.

The object of my invention is, first, to so improve a pneumatic piano attachment that it will strike two different keys or sets of keys at the same instant with different degrees of power, such that the one tone or set of tones so produced will be louder than the other tone or set of tones which are produced at the same instant; second, to control the difference in power with which different keys or sets of keys are struck at the same instant.

In the accompanying drawings I have shown a device embodying my invention.

Figure 1 is an end view of a portion of the mechanism of a pneumatic piano attachment, showing the relative arrangement of some of its parts. Fig. 2 is an enlarged longitudinal vertical section showing two connected valves in detail. Fig. 3 is a horizontal section on the line A B of Fig. 2. Fig. 4 is a horizontal section on the line C D of Fig. 2. Fig. 5 is a vertical transverse section of the valve-box 9, Fig. 1. Fig. 6 is a longitudinal view of Fig. 5 with the side  $x$  removed, also a portion of partition 32 broken away. Fig. 7 is a horizontal section of Fig. 5 on the line A B. Fig. 8 is an end elevation of the box shown in Fig. 5; Fig. 9, a section on line 9 9 of Fig. 8, and Fig. 10 a section on line 10 10 of Fig. 8.

Similar characters of reference indicate corresponding parts in the different views.

Referring to Fig. 1, 1 represents the exhaust-bellows; 2, the equalizer; 3, the main exhaust-chamber; 4, passage from equalizer to exhaust-chamber; 5, passage from exhaust-chamber to bellows; 6, passage from exhaust-bellows

to the air; 7, valve over passage 5; 7<sup>a</sup>, valve over passage 6; 8, passage from main exhaust-chamber 3 to auxiliary exhaust-chamber 15, located in valve-chamber 9. 10 represents the pneumatics which operate the finger-pieces 12, which strike the keys 13 and 13<sup>a</sup>. I make no claim as to the relative arrangement of these parts.

14 is an auxiliary exhaust-chamber. The passage 8, leading from 15 to 3, is located at one end of the chamber 14. There may be two passages 8, one at each end, if desired. 15 is a second auxiliary exhaust-chamber.

16 represents passages connecting 15 and 14.

17 is a valve covering the passage 16.

18 is a spring fastened at 24 by a hinged joint to the upper wall of the exhaust-chamber 15.

19 and 20 represent a rod with hinged joint 21 and connected to the side wall of 15 by hinged joint 23 and to the spring 18 by the hinged joint 22. The rod 25 connects the arm 27 at 26 to the rods 19 and 20 at the joint 21. The arm 27 is fastened to the rod 29 at 28. The rod 29 passes through the outer wall of the chamber 15 and into the wall dividing 14 and 15 at 30. The rod 29 can revolve. The lever 31 is fastened to rod 29, so as to revolve it through a portion of the revolution. By moving lever 31 the joint 21 may be raised or lowered, thus increasing or decreasing the pressure of the spring 18 on the valve 17.

The chamber 34 is connected directly to the chamber 15. The wall 35 separates the chamber 34 from the passage 36. The chamber 37 connects directly to passage 36. The passage 36 is connected directly to the chamber 14 at both ends. Chamber 37 is prevented from communicating with chamber 34 by the wall 38. The valve-chambers 40 communicate directly with the chamber 34. The valve-chambers 40<sup>a</sup> communicate directly with the chamber 37. The valve-chambers 40 and 40<sup>a</sup> are connected directly to the passages 42 and 42<sup>a</sup>, respectively. These passages are connected with passages 43 and 44, which are connected directly with the atmosphere at their ends. The valve-chambers 40 and 40<sup>a</sup> are connected to the pneumatics 10 by the passages 57, 39, and 41. The valves 50 and 50<sup>a</sup> are operated



by the diaphragms 47 and 47<sup>a</sup>. The chambers 45 and 45<sup>a</sup> are connected directly with the passages 46 and 46<sup>a</sup>. The passages 46 and 46<sup>a</sup> are connected directly with chamber 15 at its 5 ends. The chambers 48 and 48<sup>a</sup> have passages 49 and 49<sup>a</sup> leading from them. The passages 49 and 49<sup>a</sup> are connected directly by flexible tubes to the tracker-board, each having a separate aperture in the tracker-board, or the pas- 10 sages 49 and 49<sup>a</sup> may lead to primary valves, which in turn are connected with the tracker-board in a well-known manner. The passage 57 has a valve 55 at one end and the valve 55<sup>a</sup> at the other end. The valves 55 and 55<sup>a</sup> are con- 15 nected by the rod 56, which holds them a certain fixed distance apart. The brackets 54 and 54<sup>a</sup> hold the lower end of the valve-stem 52 in position. The puppet-valves 50 and 50<sup>a</sup> are so arranged that by rising they close the pas- 20 sages 51 and 51<sup>a</sup>, and by lowering close the passages 53 and 53<sup>a</sup>. The puppet-valves 50 and 50<sup>a</sup> are connected by the valve-stems 52 and 52<sup>a</sup> to the diaphragms 47 and 47<sup>a</sup>.

There must be one pneumatic 10 and two 25 connected valve mechanisms, as shown in Fig. 2, and two apertures in the tracker-board, each connected with one of the two connected valves for each key of the piano to be played.

From the foregoing it will appear that 30 when the exhaust-bellows 1 are operated the air is exhausted from the equalizer 2 and the exhaust-chamber 3, and through the passage 8 the air is exhausted from the chamber 15. If there is no pressure on the valve 17 by the 35 spring 18, the air is also exhausted from the chamber 14 to the same extent as from 15. If a pressure is exerted on the valve 17 by the spring 18, caused by moving the lever 31, the vacuum created in 14 will be less than 40 that in 15. The greater the pressure of the spring 18 on the valve 17 the greater the difference in the vacuum in the chambers 15 and 14. Therefore the difference in the de- 45 gree of vacuum in the two chambers 14 and 15 becomes under the control of the operator by moving the lever 31. The vacuum in chamber 34 is the same as that in chamber 15. The vacuum in chamber 37 is the same as in chamber 14. Now when an impulse of air is 50 admitted through the tracker-board in a well-known manner and through the flexible connections to 49, or first through a primary valve which opens 49 to the atmosphere, the diaphragm 47 is raised, thus raising the puppet- 55 valve 50, which closes the passage 51 and opens the passage 53 to the chamber 34, in which is already created a partial vacuum, as before described. This vacuum is immediately transmitted to chamber 40. The vacu- 60 um sucks the valve 55 open, and the valve 55, through the rod 56, pulls the valve 55<sup>a</sup> shut. The valve 55<sup>a</sup> is also held closed by the atmospheric pressure in 40<sup>a</sup>. Immediately upon the opening of valve 55 the air rushes from

the pneumatic 10, through the passages 41, 65 39, and 57 and the valve-chamber 40 and passage 53, to the exhaust-chamber 34, thus causing the pneumatic 10 to collapse, which in turn causes the finger-piece 12 to strike 70 the key 13. As soon as the passage of air through the tracker-board which enters the passage 49 or which controls the opening of the passage 49 to the atmosphere is stopped in a well-known manner the small passage 59 75 exhausts the air from 48 and 49 into the vacuum-chamber 45. This causes the puppet-valve 50 to close the passage 53 and open the passage 51. This immediately destroys the vacuum in 40, as it is then open to the atmos- 80 phere. Because the valves 55 and 55<sup>a</sup> are held a certain fixed distance apart by the rod 56 the air enters 57, either through 55 or 55<sup>a</sup>, or both of them, and from 57 rushes back through 39 and 41 to the pneumatic 10, which again 85 opens, causing the finger-piece 12 to release the pressure on key 13. In the manner just described by admitting the impulse of air through 49<sup>a</sup> instead of 49 the same pneu- 90 matic may be exhausted into the chamber 37 instead of 34. Thus any one pneumatic operating any one key on the piano may be exhausted at will into either the cham- 95 bers 34 or 37, according as the air is admitted through the passage in the tracker-board which joins with 49 or 49<sup>a</sup>, and this is deter- 95 mined by the position of the perforation in the sheet of flexible material which passes over the tracker-board.

As is well known, the force with which any given pneumatic 10 will cause the finger- 100 piece 12 to strike the key 13 will depend upon the degree of vacuum in the vacuum-chamber into which it exhausts, the greater the vacuum the more force with which the key is struck.

As explained before in this description, the 105 vacuum in 34 may be the same as in 37, or a greater vacuum may be maintained in 34 than in 37, and the difference in the vacuum in these two chambers is under the control of the operator, as described. 110

From the foregoing description it is seen that one set of pneumatics may be exhaust- 115 ing into the chambers 34, which are connected to chamber 15, while another set is exhausting into chambers 37, which are connected with chamber 14. Thus one key or set of keys may be struck with greater force than another key or set of keys which are struck at the same instance, and the difference in power with which they are struck depends 120 upon the difference in the vacuum in the chambers 14 and 15, which is directly under the control of the operator through the lever 31.

Having now given a detailed description of 125 the various parts of my invention and the manner in which these parts operate and coöperate to perform their function, what I claim



as new, and desire to secure by Letters Patent, both in conjunction with and separate from an attachable and detachable device, is—

5 1. In an automatic piano-player, the combination with power-pneumatics and key-operating devices, of a pair of pressure-chambers, valves between each of said chambers and each of the power-pneumatics whereby each  
10 power-pneumatic may be connected to each pressure-chamber, and means under the control of the operator for accurately adjusting the relation of pressures in the two chambers.

15 2. In an automatic piano-player, the combination with power-pneumatics and key-operating devices, of a pair of pressure-chambers, a valve between said chambers, means under the control of the operator for determining the action of said valve, means for maintain-  
20 ing desired pressure in said two chambers, one through the other, and valve mechanism between the power-pneumatics and the two pressure-chambers whereby any power-pneumatic may be connected with either pressure-  
25 chamber.

3. In an automatic piano-player, the combination with power-pneumatics and key-operating devices, of a pair of puppet-valve structures for each power-pneumatic, a pair of  
30 passages leading from said tracker-board one to each of the valve structures, a passage forming a communication between each power-pneumatic and its pair of puppet-valves, a valve controlling said passage to close com-  
35 munication between it and either of the puppet-valves, a pair of pressure-chambers one communicating with one puppet-valve, and the other with the other, and means for producing desired pressures in said chambers.

40 4. In an automatic piano-player, the combination with power-pneumatics and key-operating devices, of a pair of puppet-valve structures for each power-pneumatic, a pair of passages leading one from each of said valve struc-  
45 tures to the tracker-board, a passage forming a communication between each power-pneumatic and its pair of puppet-valves, a valve controlling said passage to close communication between it and either of the puppet-  
50 valves, a pair of communicating pressure-chambers one communicating with one puppet-valve and the other with the other, a valve between said chambers, means under control of the operator for determining the action of

said last-mentioned valve, and means operating 55 upon one chamber through the other for producing desired pressures in said chambers.

5. In an automatic piano-player having a pair of differential pressure-chambers, a valve mechanism for each note to be voiced consist- 60 ing of a pair of puppet-valve chambers one communicating with one pressure-chamber and the other with the other, a passage forming a communication between said puppet-valve chambers, a passage leading from said 65 communicating passage to voicing mechanism, and a valve capable of closing communication between either of said puppet-valve chambers and said last-mentioned passage and open- 70 ing communication between said last-mentioned passage and the other puppet-valve chamber.

6. In an automatic piano-player having a pair of differential pressure-chambers, a valve mechanism for each note to be voiced consist- 75 ing of a pair of puppet-valve chambers one communicating with one pressure-chamber and the other with the other, a passage forming a communication between said puppet-valve chambers, a passage leading from said com- 80 municating passage to voicing mechanism, and a pair of flap-valves mounted in the communicating passage, one upon each side of the voicing-passage, for the purpose set forth.

7. In an automatic piano-player, the combi- 85 nation, with the note-controlling pneumatics, of a pair of communicating pressure-chambers connected with said pneumatics, a valve arranged between said chambers, a spring engaging said valve, and means under the con- 90 trol of the operator for regulating the resistance of said spring upon said valve.

8. In an automatic piano-player, the combination, with the note-controlling pneumatics, of a pair of communicating pressure-cham- 95 bers connected with said pneumatics, a valve arranged between said chambers, a spring engaging said valve, a toggle-lever engaging said spring, a rock-shaft under the control of the operator, and a connection between said 100 rock-shaft and said toggle-lever whereby the resistance of said spring to the valve may be controlled by the operator.

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