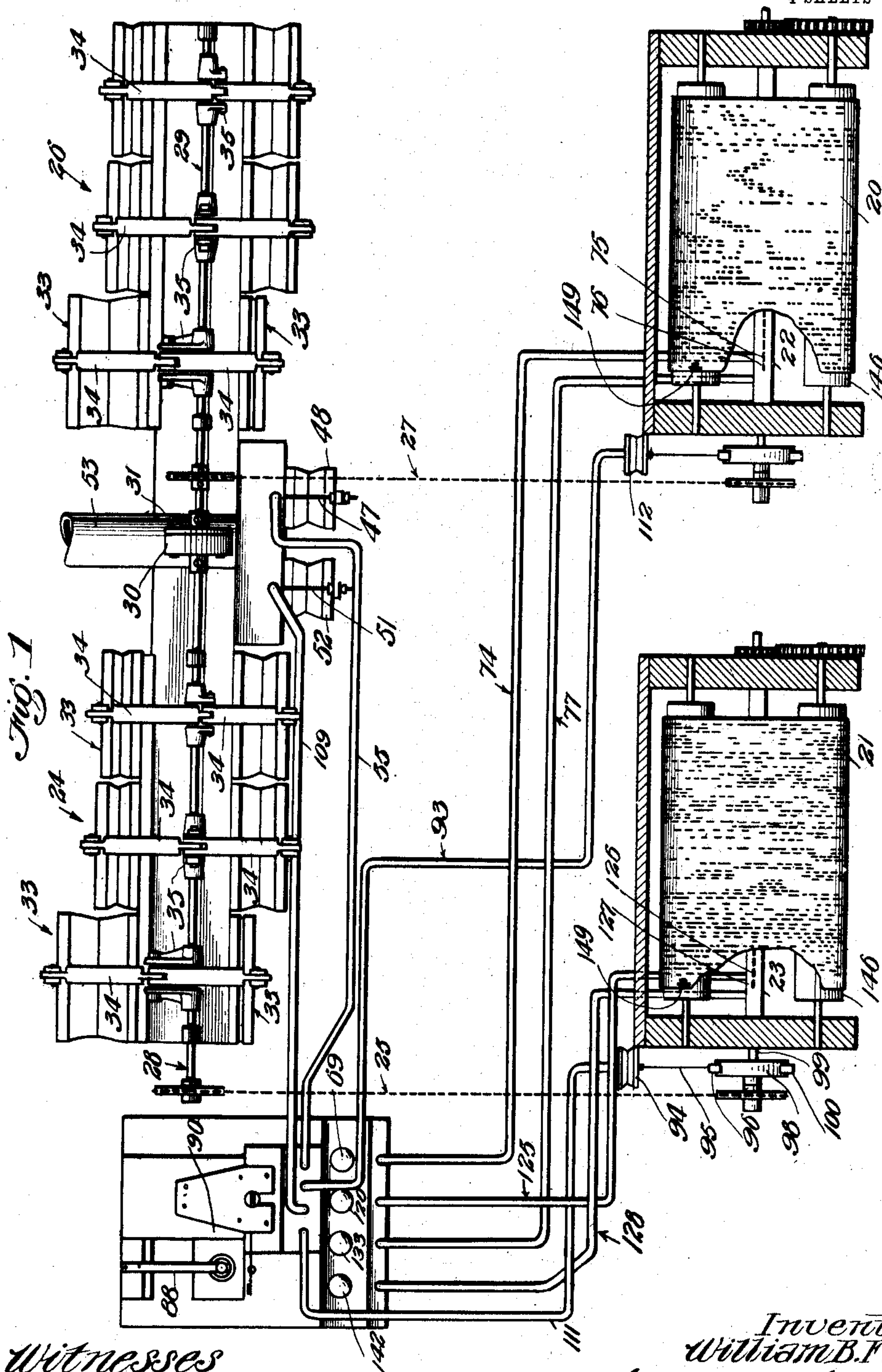


No. 811,912.

PATENTED FEB. 6, 1906.

W. B. FLEMING.
MUSICAL INSTRUMENT.
APPLICATION FILED MAR. 15, 1905.

4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

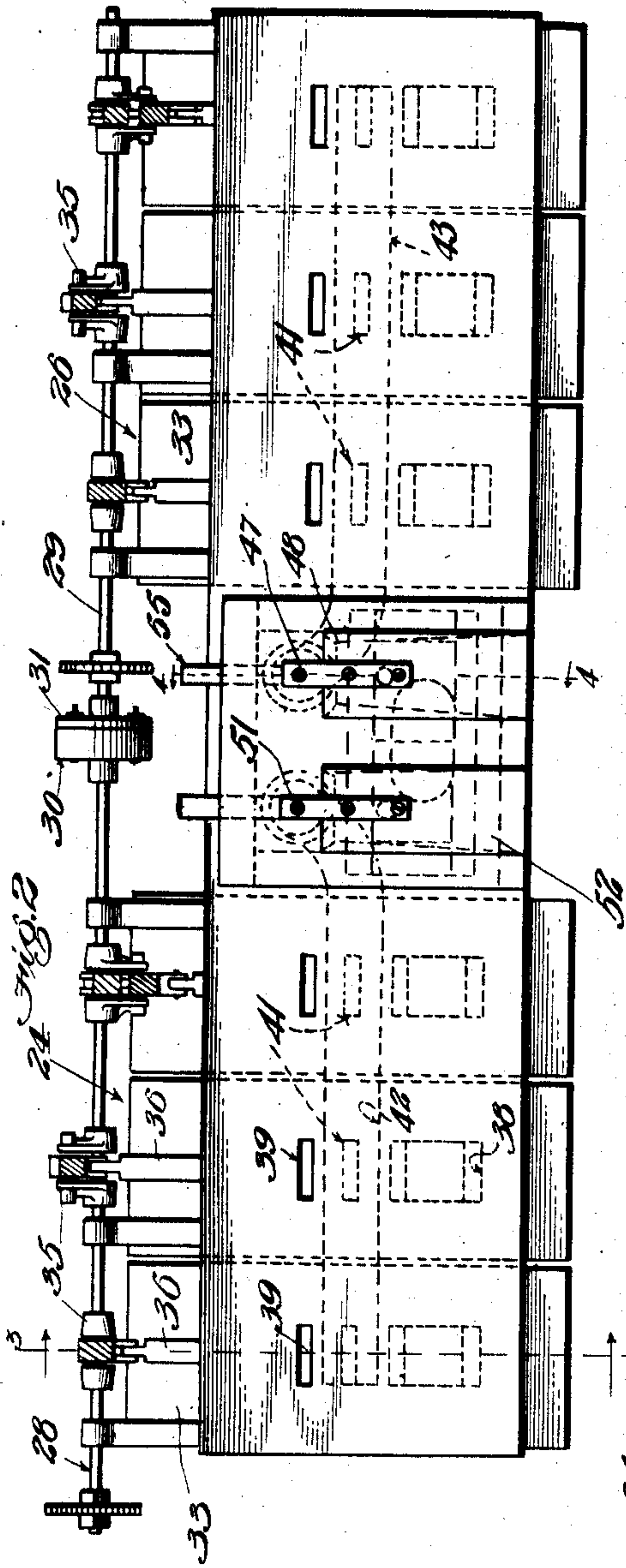


Fig. 2

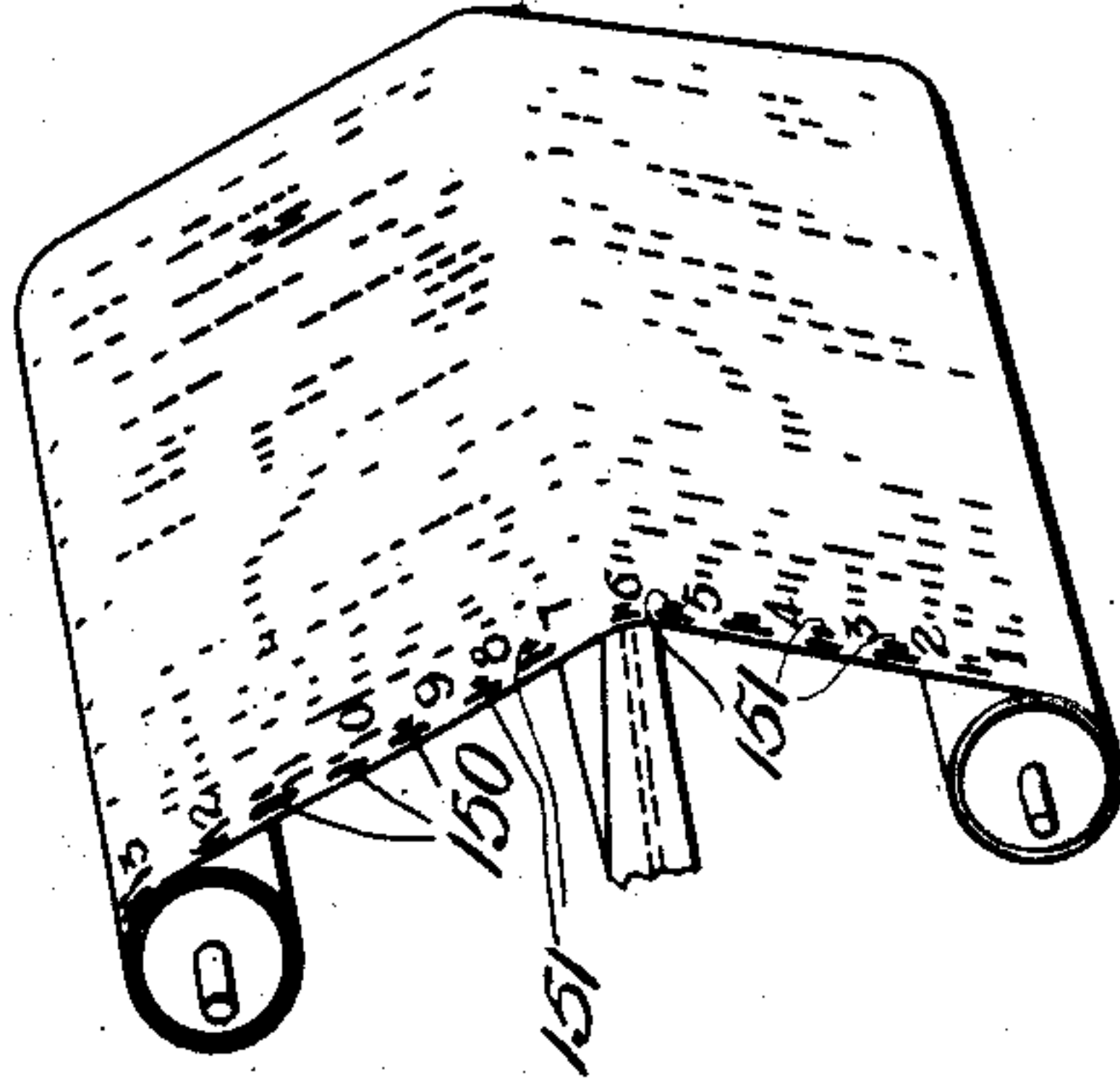


Fig. 14

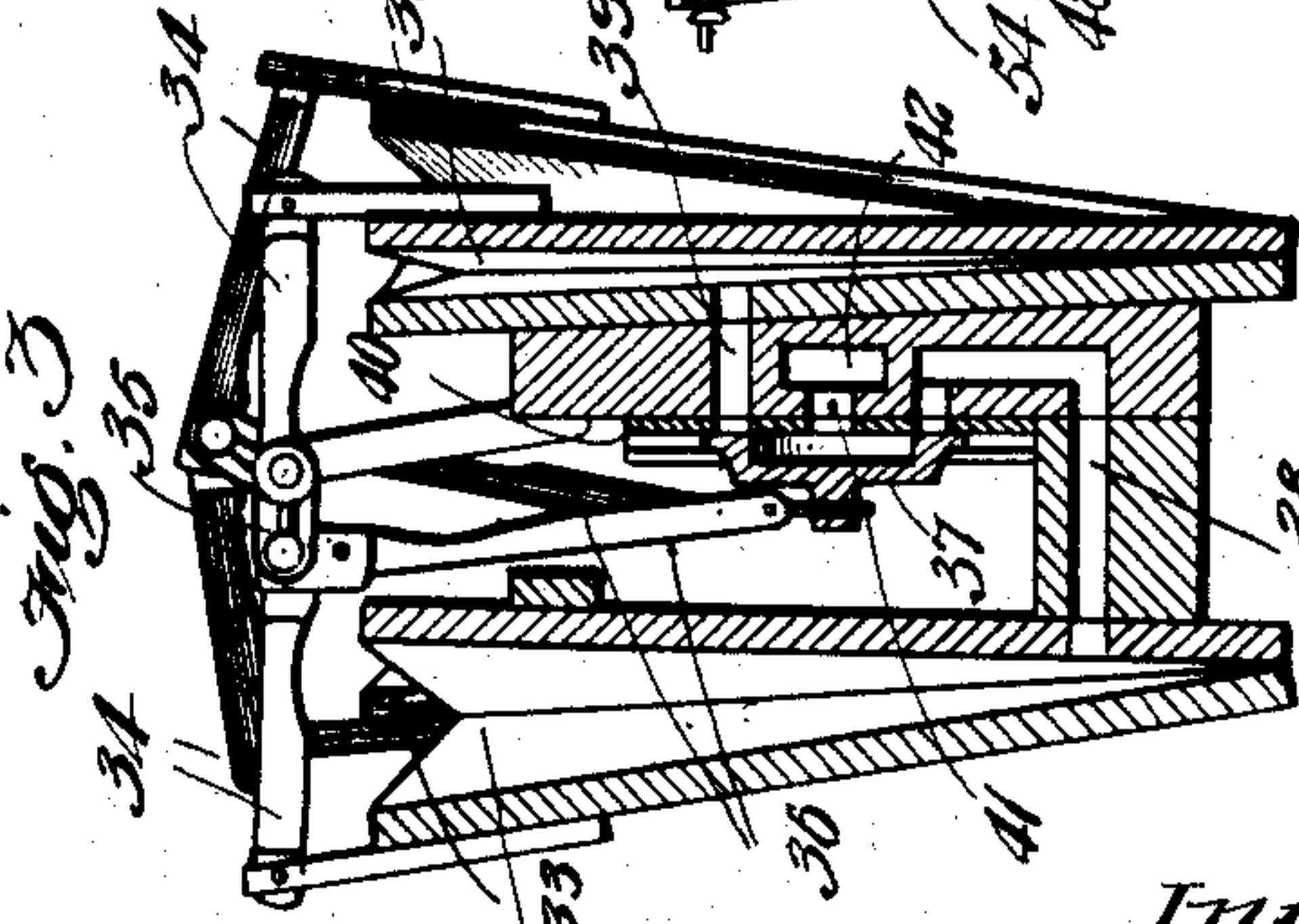


Fig. 3

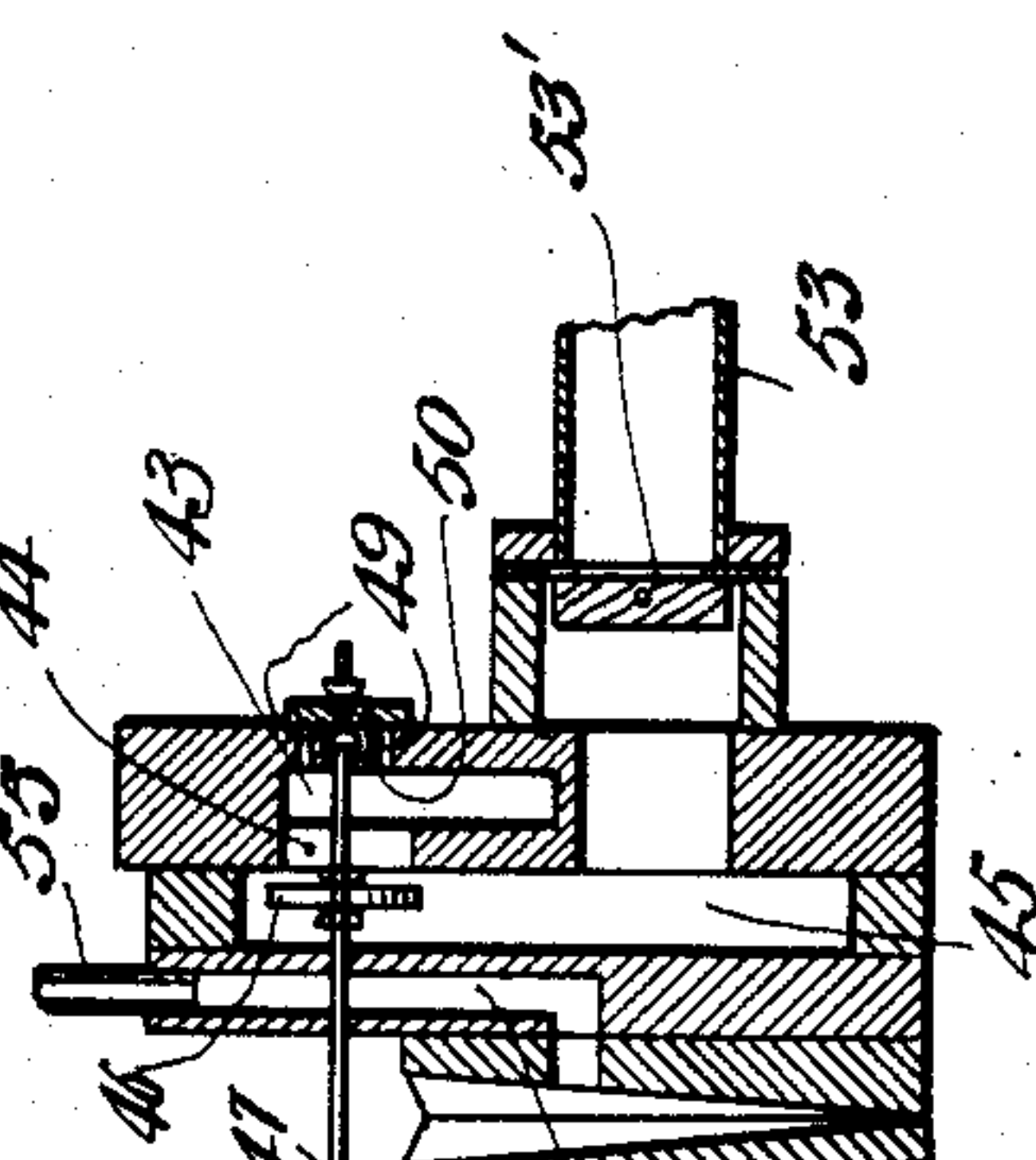


Fig. 1

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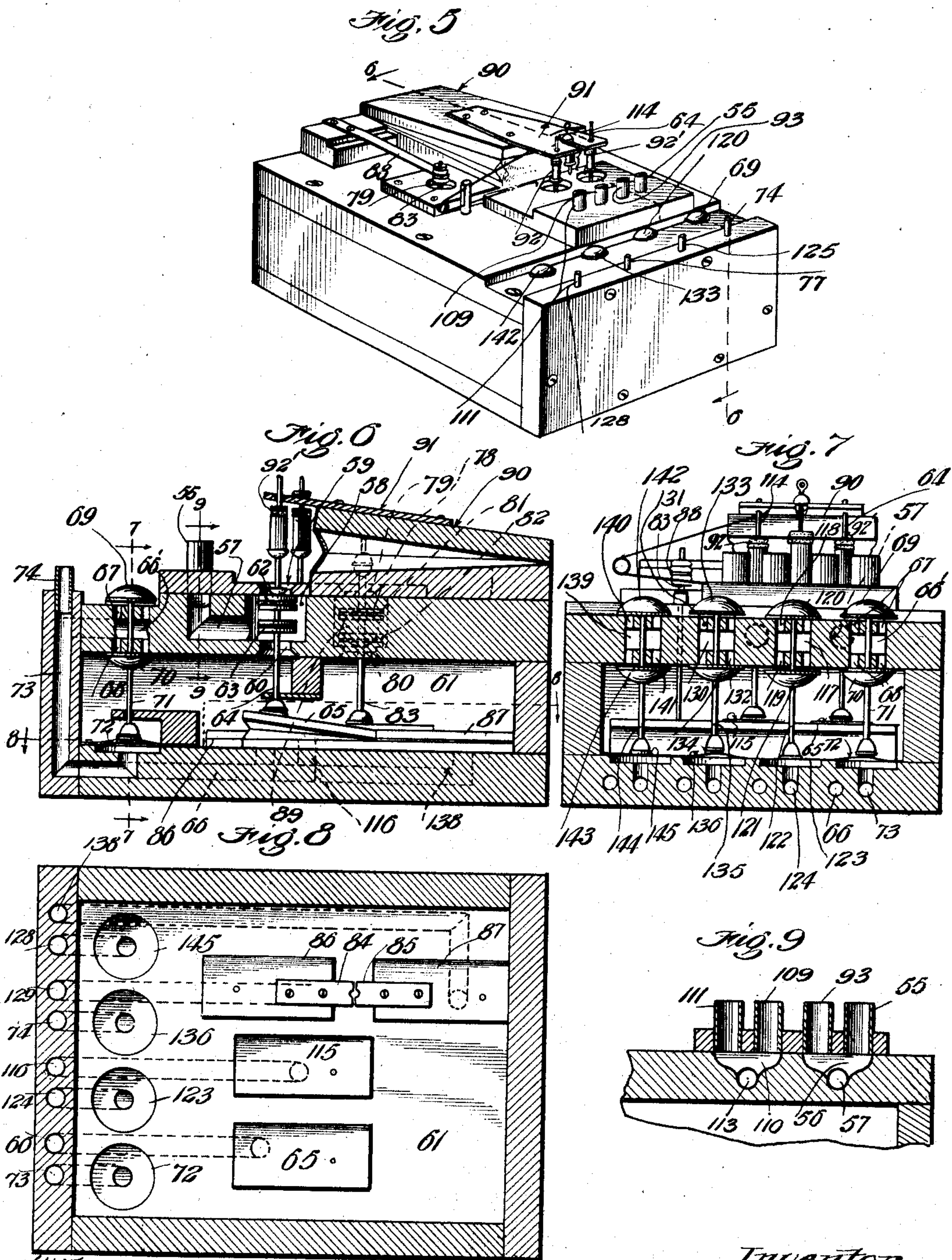
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4 SHEETS—SHEET 3.



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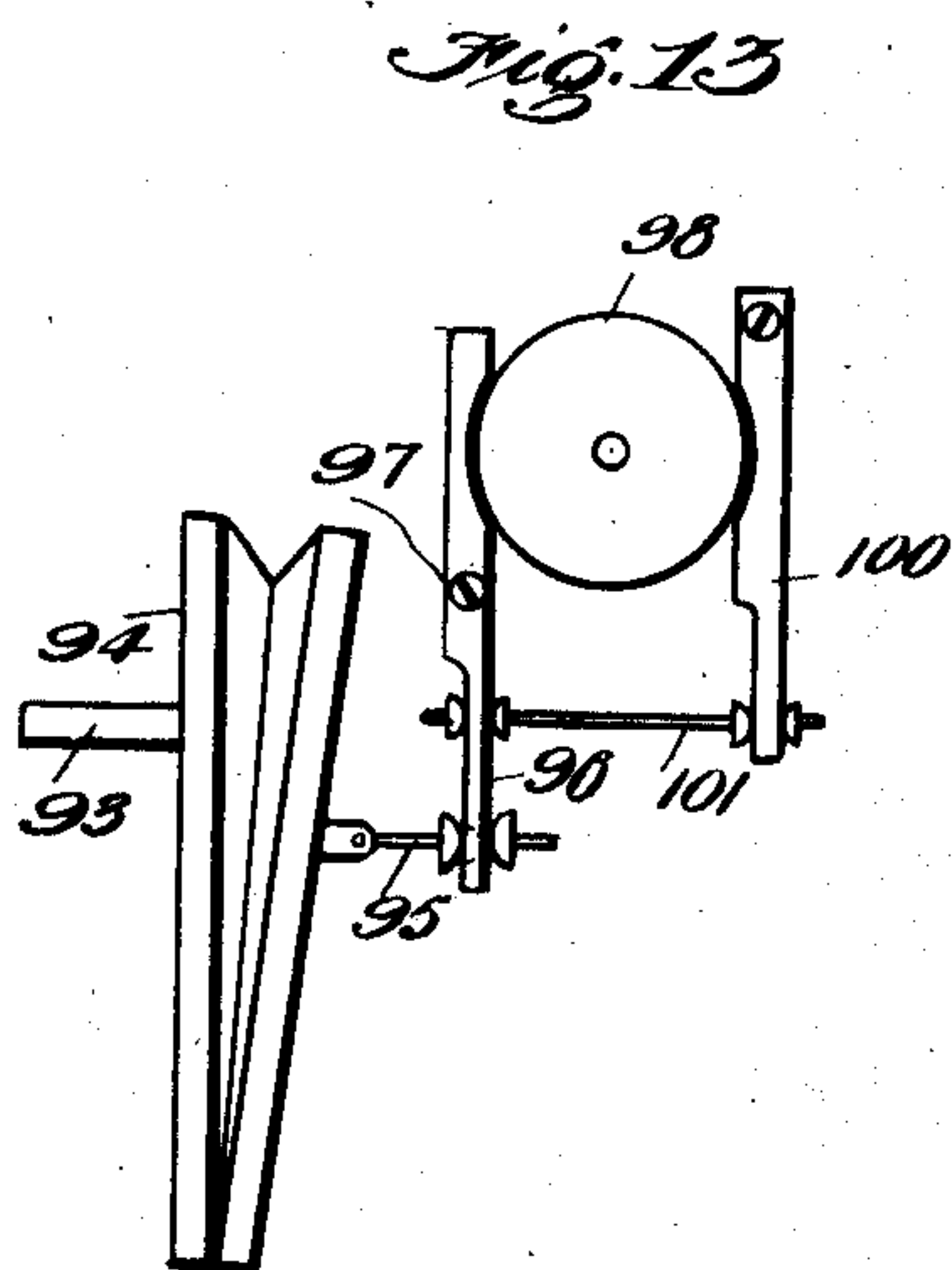
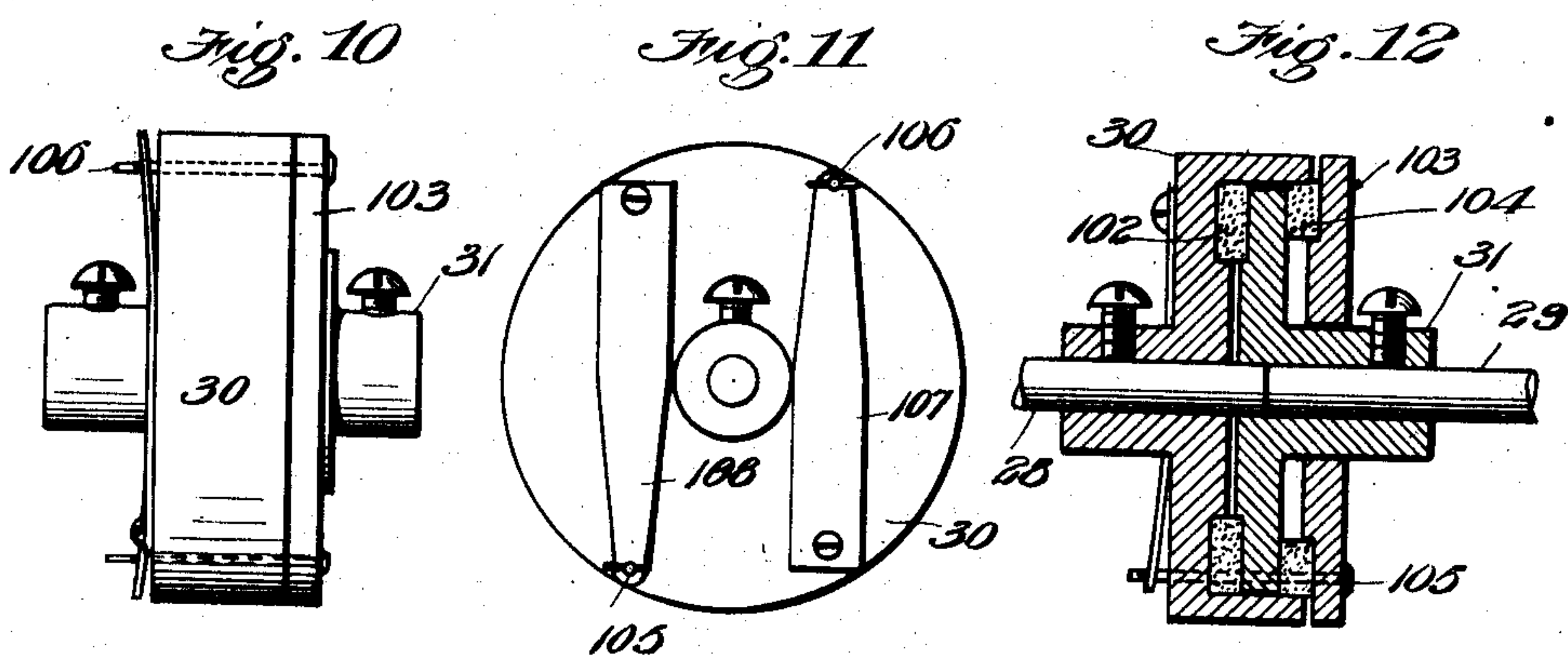
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

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MUSICAL INSTRUMENT.

No. 811,912.

Specification of Letters Patent.

Patented Feb. 6, 1906.

Application filed March 15, 1905. Serial No. 250,266.

To all whom it may concern:

Be it known that I, WILLIAM B. FLEMING, a citizen of the United States, residing at South Pasadena, in the county of Los Angeles and State of California, have invented new and useful Improvements in Musical Instruments, of which the following is a specification.

My invention relates to mechanical musical instruments in which perforated sheets of paper are used in combination with a series of air ducts or passages leading to musical reeds, pipes, or other sounding devices or to mechanism for operating the sounding devices which are caused to sound by the exhaustion or pressure of air or by electrical contacts in the well-known manner; and the object thereof is to produce mechanism to cause two or more perforated music-sheets each operating a separate and independent musical instrument to run synchronously, whereby all the musical instruments will play together in unison. I accomplish this object by the mechanism described herein and illustrated in the accompanying drawings, in which—

Figure 1 is a view, partly in plan and partly diagrammatic, of the regulating mechanism. Fig. 2 is a front elevation, partly in section, of the motors which drive the music-sheets. Fig. 3 is a section on line 3 3 of Fig. 2 looking in the direction indicated by the arrows. Fig. 4 is a section on the line 4 4 of Fig. 2 looking in the direction indicated by the arrows. Fig. 5 is a perspective view of the regulating-box. Fig. 6 is a longitudinal section on the line 6 6 of Fig. 5. Fig. 7 is a cross-section on the line 7 7 of Fig. 6 looking in the direction indicated by the arrows. Fig. 8 is a horizontal section on the line 8 8 of Fig. 6 looking toward the base. Fig. 9 is a detail section taken on line 9 9 of Fig. 6. Figs. 10, 11, and 12 are details of the disk mechanism. Fig. 13 is a side elevation of the brake mechanism. Fig. 14 is a diagrammatic view of my improved music-sheet.

In the drawings, 20 and 21 are independent perforated music-sheets, each of which operates a separate and independent musical instrument in the usual well-known manner. Sheet 20 travels over tracker-board 22, and sheet 21 travels over tracker-board 23. Sheet 21 is driven by a motor 24, motion being imparted thereto by means of sprocket-chain 25. Music-sheet 20 is driven by motor 26, motion being imparted thereto by means of

sprocket-chain 27. In the drawings I have illustrated these motors as being pneumatic motors; but electric or other mechanical motors may be used for imparting motion to drive the music-rolls. The driving-shaft 28 of motor 24 and the driving-shaft 29 of motor 26 are in line, and on the contiguous ends of said shafts are friction-disks which engage each other, one member 30 of which is secured upon shaft 28, and the other member 31 is secured upon shaft 29. These disks are designed to start in motion either one of said shafts when it has been stopped after the brake is released, as hereinafter explained. I have used my device practically in playing large pipe-organs and have illustrated the mechanism used therefor and will describe the same herein as applied for that purpose. I have found in practice that three pairs of pneumatics 33, arranged as shown in Fig. 1 and connected by links 34 to cranks 35 of the driving-shaft of the motors, produce satisfactory results. The cranks on the driving-shafts are set at different angles, so as to prevent dead-centers and so that there will be at least one pneumatic in active operation at all times when it is desired to have the driving-shaft revolved. Pitman-rods 36 are connected to cranks 35 and to slide-valves 37. These slide-valves control channels which lead into the motor-pneumatics. Channel 38 leading to the rear pneumatic and channel 39 leading to the front pneumatic. Slide-valve 37 is in shape a shallow flat box with the open side resting upon a valve-seat 40, through which channels 38 and 39 pass. There is one slide-valve for each pair of pneumatics in the motors, and a short channel 41 connects the interior of each slide-valve with a suction-channel, of which there is one for each motor, as shown in dotted lines in Fig. 2, which channels are numbered 42 and 43. Channel 43 is connected by a port 44 with the valve-chamber 45, and channel 42 is connected by a like port 41 with said valve-chamber. Port 44 is controlled by valve 43 on stem 47, which stem is carried by pneumatic 48. Channel 42 is connected to the outside atmosphere by ports 49, which ports are controlled by valve 50, carried by stem 47. Channel 42 is provided with ports connecting it with valve-chamber 45 and with the outside atmosphere which are controlled by valves of similar construction to those illustrated in Fig. 4 as applying to channel 43, which valves are carried by a stem 51, Fig. 1,

which is carried by pneumatic 52, the construction and location being a duplicate of that shown in Fig. 4. Valve-chamber 45 is connected by pipe 53 to the suction-box, (not shown,) there being passages connecting said chamber and pipe. A gate 53', controlled in any suitable manner may be operated to regulate the air admitted to the motors. A channel 54 opens into pneumatic 48. This channel is connected by tube 55 to chamber 56 in the casing of the regulating-box. Chamber 56 is connected by channel 57 with valve-chamber 58, in the top of which is a port 59, which connects said chamber with the open air, and a port 60 in the bottom thereof, which connects said chamber with suction-box 61. These ports are respectively controlled by valves 62 and 63, which are carried by stem 64, which stem is secured to pneumatic 65 in the suction-box 61. Pneumatic 65 is provided with a channel 66, at the outer end of which is a chamber 66' having ports 67, which connect said chamber with the open air, and ports 68, which connect said chamber with the suction-box 61. These ports are respectively controlled by valves 69 and 70, carried by stem 71, which stem is secured to pneumatic 72 and carried thereby. A channel 73 opens into pneumatic 72 and is connected by pipe 74 with duct 75 of the tracker-board 22. Duct 76 of tracker-board 22 is connected by tube 77 with pneumatic 136. Valve-chamber 78 (shown in dotted lines in Fig. 6) is connected by port 79 with the outside atmosphere and by port 80 with the suction-box. These ports are respectively controlled by valves 81 and 82, carried by stem 83, which stem is supported and carried by arms 84 and 85, which arms are carried by pneumatics 86 and 87, which pneumatics are in the suction-box. A spring 88 bears upon the top of stem 83 and has a tension greater than the power of either one of said pneumatics 86 or 87, but less than the combined power of both. Valve-chamber 78 is connected by channel 89 (shown in dotted lines in Fig. 6) with pneumatic 90, which pneumatic carries an arm 91, through which arm passes stems 64 and 114, which carry buttons 92 and 92' just below said arm, which buttons are adapted to be engaged by the arm when the pneumatic is collapsed and to cause the collapsing of pneumatics 65 and 115 in case the same should be expanded, as hereinafter explained. Chamber 56 is connected by tube 93 with pneumatic 112. Pneumatic 94 is connected by rod 95 to brake-lever 96, which lever is pivoted at 97 and engages disk 98, mounted on shaft 99, which last shaft drives the take-up roll of sheet 21 in the usual manner. A brake-bar 100 is connected to brake-bar 96 by rod 101. When pneumatic 94 is in its expanded position, as shown in Figs. 1 and 13, these brake-bars do not engage disk 98; but when the

pneumatic is collapsed, as hereinafter explained, said bars engage said disk to instantly stop the movement of said shaft.

The disk 30, which is secured to shaft 28, the details of which are best shown in Fig. 12, projects over disk 31 a short distance and has secured thereto a ring of leather 102 to make the same noiseless. A washer 103 surrounds the hub of disk 31, which member is secured to shaft 29. Between the washer and disk 31 is a ring of leather 104. This washer is held in place by pins 105 and 106, which pins also pass through disk 30, as shown in dotted lines in Fig. 12, and through springs 107 and 108, being held by cotter-pins. These springs have a tension sufficiently strong to hold the members of the clutch to start and run either shaft after it has been stopped and the brake on the take-up roll is released.

A channel similar to channel 54 opens into pneumatic 52 and is connected by tube 109 with chamber 110, Fig. 9, in the casing of the regulator-box. This chamber is connected by tube 111 with pneumatic 94.

Pneumatic 112 operates a brake mechanism for music-sheet 20 similar in construction and operation to the brake mechanism before described for music-sheet 21. Channel 113 (shown in Fig. 9) leads from chamber 110 to a chamber similar to valve-chamber 58, which contains valves and has ports similar in construction to those described as pertaining to valve-chamber 58. The valve-stem 114 of these last valves is carried and operated by a pneumatic 115 in the suction-box 61, which pneumatic is provided with a channel 116, which ends in a chamber 117, having ports 118 and 119, which ports are governed by valves 120 and 121 on stem 122, which stem is carried and operated by pneumatic 123. Pneumatic 123 is connected by channel 124 and tube 125 with duct 126 of tracker-board 23. Duct 127 of tracker-board 23 is connected by tube 128 to a channel which ends in pneumatic 145. Pneumatic 86 has leading therefrom a channel 129, which ends in chamber 130, having ports 131 and 132, which ports are controlled by valves 133 and 134 on the stem 135, which stem is carried by pneumatic 136. Pneumatic 87 has leading therefrom a channel 138, which ends in a chamber 139, having ports 140 and 141, which ports are controlled by valves 142 and 143 on stem 144, which stem is carried by pneumatic 145.

In the operation of my device the music-rolls 20 and 21 are placed in position in the usual manner, and the outer ends thereof are secured to the take-up rolls 146 in the usual manner. Suction is applied through tube 53 by means of a bellows, (not shown,) thereby causing the operation of the motor-pneumatics with the same speed and same power which would cause the travel of the music-sheets at the same rate of speed if they were

exactly alike in size and wound in the same manner. As this is not possible, one of the sheets will inevitably travel a little faster or a little slower than the other at times. In order to compel them to travel together, I have provided music-sheets with a double row of perforations at the left-hand edge thereof, the right-hand row being shorter than the left-hand row. The longer perforations project beyond both extremities of the shorter perforations a sufficient distance so that when a sheet is stopped it will be started again by the time the short perforation in the traveling sheet registers with its appropriate duct and to prevent any action by the pneumatics controlled thereby when the shorter perforations are traveling together and reach their appropriate ducts. Should one of the music-sheets travel faster than the other, its movement will be stopped as soon as a short perforation of such advanced sheet reaches register with its proper duct, and it will be held stopped until the other music-sheet catches up, which is accomplished in the following manner: Say that it is sheet 20 that is traveling faster than sheet 21. As soon as a long perforation 150 registers with duct 76 air is admitted to pneumatic 136, which permits it to expand, thereby causing valve 134 to close ports 132 and raising valve 133 to open ports 131, which throws pneumatic 86 in communication with the outside air, and the suction of the box 61 would cause said pneumatic to expand, but that the power of spring 88 is such that the pneumatic is held against expansion. As soon as the short perforation 151 reaches register with duct 75, which occurs in an infinitesimal period of time, pneumatic 72 is opened to exterior air and expands, thereby carrying valve 69 to open ports 67 and valve 70 to close ports 68, which opens pneumatic 65 to the outside air, and said pneumatic then expands by reason of the suction in such box 61. This action carries valve 63 to open port 60 and valve 62 to close port 59, thereby through channel 57, chamber 56, and tube 55 connecting pneumatic 48 to suction, which causes the pneumatic to collapse. The collapsing of pneumatic 48 carries valve 46 to its seat and cuts off the communicating or suction of the motor-pneumatics which were driving sheet 20. At the same time that pneumatic 48 is thrown to suction pneumatic 94 is also thrown to suction, thereby causing the brake-bars 96 and 100 to engage disk 98 and absolutely stop the movement of the music-sheet 20. As soon as a long perforation 152 registers with duct 127 pneumatic 145 expands, thereby causing valve 143 to close ports 141 and valve 142 to open ports 140, which throws pneumatic 87 in communication with the outside air, and the suction of box 61 exerted thereon, together with the suction before exerted on pneumatic 136, overcomes the power

of spring 88, and both pneumatics expand, thereby throwing pneumatic 90 into suction, which causes it to collapse, thereby through connecting mechanism causing pneumatic 65 to collapse and returning valve 63 to close port 60 and valve 62 to open port 59 and restoring communication between chamber 58 and the outer air, whereupon a spring (not shown) within pneumatic 48 expands said pneumatic and restores the communication between the pneumatic of motor 26 and the suction which operates the same, whereupon said pneumatics begin to operate and drive sheet 20. Should sheet 21 be the advanced sheet, it will be stopped and started in the similar manner. At the same time that pneumatic 48 is put in communication with the open-air brake pneumatic 94 is also put into communication with the open air, and a spring (not shown) causes the pneumatic to expand and release the brake-bars contacting with disk 98. As soon as the brake on disk 98 is released the frictional engagement between the members of the clutch will cause the rotation of shaft 28 of motor 24; but said frictional engagement between said members is not sufficient to overcome the power of the brake on disk 98.

Pneumatics 72, 123, 136, and 145 are primary pneumatics, and pneumatics 65, 115, 86, and 87 are secondary pneumatics. If desired, the primary pneumatics could be omitted and the air admitted to the secondary pneumatics by the same means as described for the primary pneumatics, but the action would not be as quick, and hence I prefer to use the primary pneumatics.

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

1. In a musical instrument in combination, two independently-traveling and independently-driven music-sheets, each provided with perforations at one side thereof arranged in pairs consisting of a long and a short perforation; independent motors for driving said sheets; means to supply power for driving said motors; means to cut off said power-supply for each sheet whenever it travels faster than its companion sheet, said means being actuated through the said short perforations, each sheet controlling its own cut-off mechanism; and means to restore said power-supply to either of said motors when the slower-traveling sheet catches up with the advance sheet, said means being actuated through the long perforations of both sheets.

2. In a musical instrument in combination, two independently-traveling music-sheets, each provided with perforations arranged in pairs consisting of a long and a short perforation; a take-up roll for each of said sheets; an independent motor for driving each of said take-up rolls; a brake for each take-up roll; means to supply power for driving said mo-

tors; means to cut off said power-supply for each sheet whenever it travels faster than its companion sheet, said means being actuated through the said short perforations, each sheet controlling its own cut-off mechanism; and means to restore said power-supply to either of said motors when the slower-traveling sheet catches up with the advance sheet, said means being actuated through the long perforations of both sheets.

3. In a musical instrument in combination, a perforated music-sheet provided with perforations arranged in pairs consisting of a long and a short perforation, each long perforation being arranged to project beyond both extremities of the short perforation; a take-up roll for said music-sheet; a motor for driving said take-up roll; a brake for said take-up roll; and pneumatically-actuated mechanism arranged to control said motor and said brake.

4. In combination two perforated music-sheets, each provided with perforations at one side thereof arranged in pairs consisting of a long and a short perforation; two shafts on which said sheets are mounted, one sheet on each shaft; independent motors for driving said shafts; said motors having the driving-shafts thereof in common line; disks secured upon the contiguous ends of said motor-shafts, one disk being secured to one shaft and the other disk being secured to the other shaft; means to supply power for driving said motors; means to cut off said power-supply for each sheet whenever it travels faster than its companion sheet, said means being actuated through the said short perforations, each sheet controlling its own cut-off mechanism;

and means to restore said power-supply to either of said motors when the slower-traveling sheet catches up with the advance sheet, said means being actuated through the long perforations of both sheets.

5. In a musical instrument a plurality of perforated music-sheets, each provided with perforations at one side thereof arranged in pairs consisting of a long and a short perforation; take-up rolls mounted on shafts, one for each sheet, said take-up rolls being provided with means for securing said music-sheets thereto; motors composed of a plurality of oppositely-disposed pneumatics, one motor for each take-up roll; crank-shafts operatively connected to said pneumatics, one for each motor; means to alternately connect the members of each pair of pneumatics of said motors to suction; means to connect the shaft driven by said motors with the take-up rolls of the music-sheet; means governed by the short perforations at the edges of the music-sheets to cut off the power which drives the motors whereby the travel of the music-sheets is stopped, each sheet controlling its own stoppage mechanism; and means to restore the power to the stopped motor, said means being controlled by the long perforations of both sheets.

In witness that I claim the foregoing I have hereunto subscribed my name this 4th day of March, 1905.

WILLIAM B. FLEMING.

Witnesses:

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