

No. 827,068.

P. B. KLUGH.

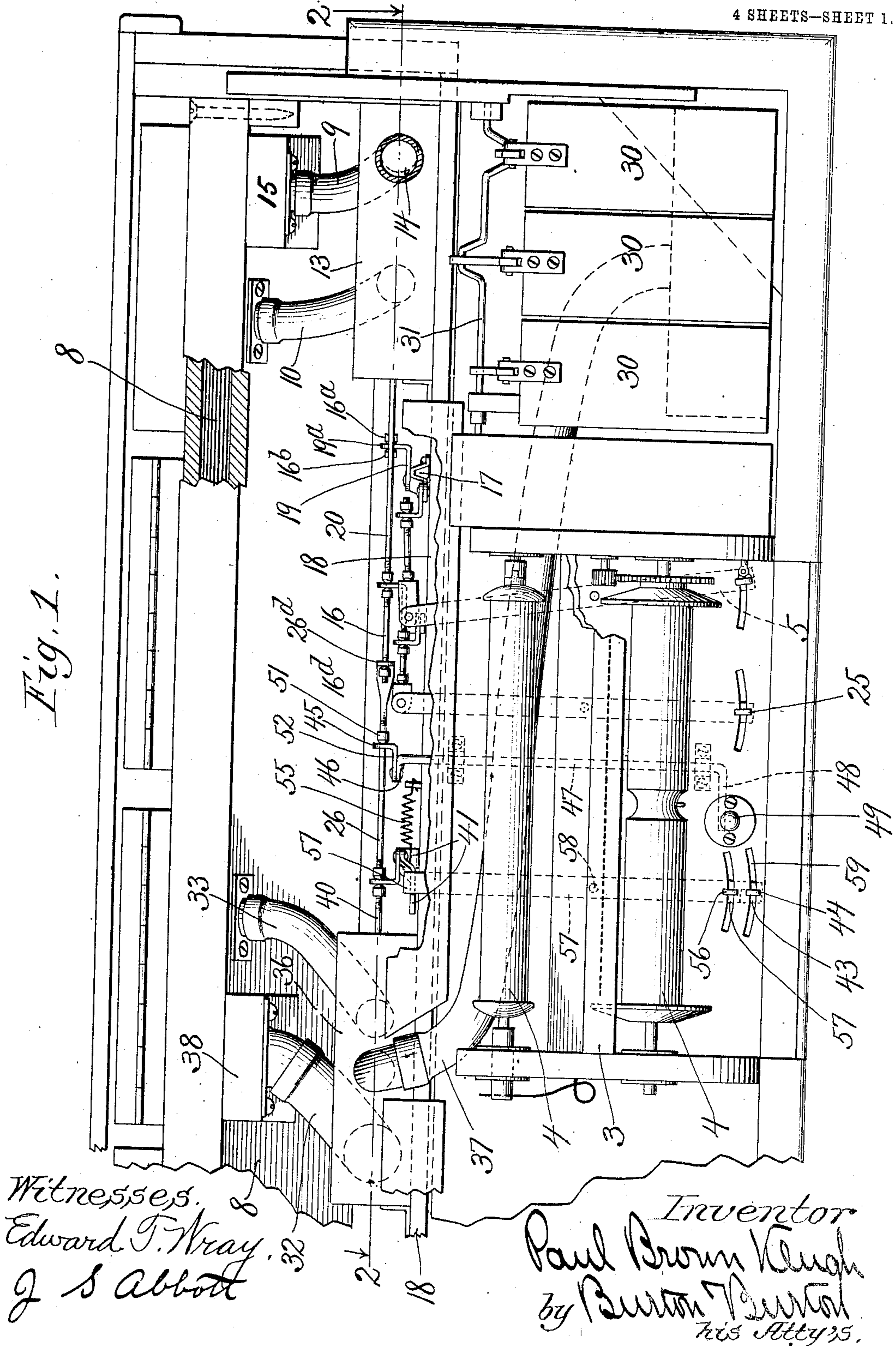
PATENTED JULY 24, 1906.

ACCENT AND EXPRESSION REGULATING MEANS FOR AUTOMATIC MUSICAL INSTRUMENTS OR PLAYERS.

APPLICATION FILED JULY 19, 1905.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses.
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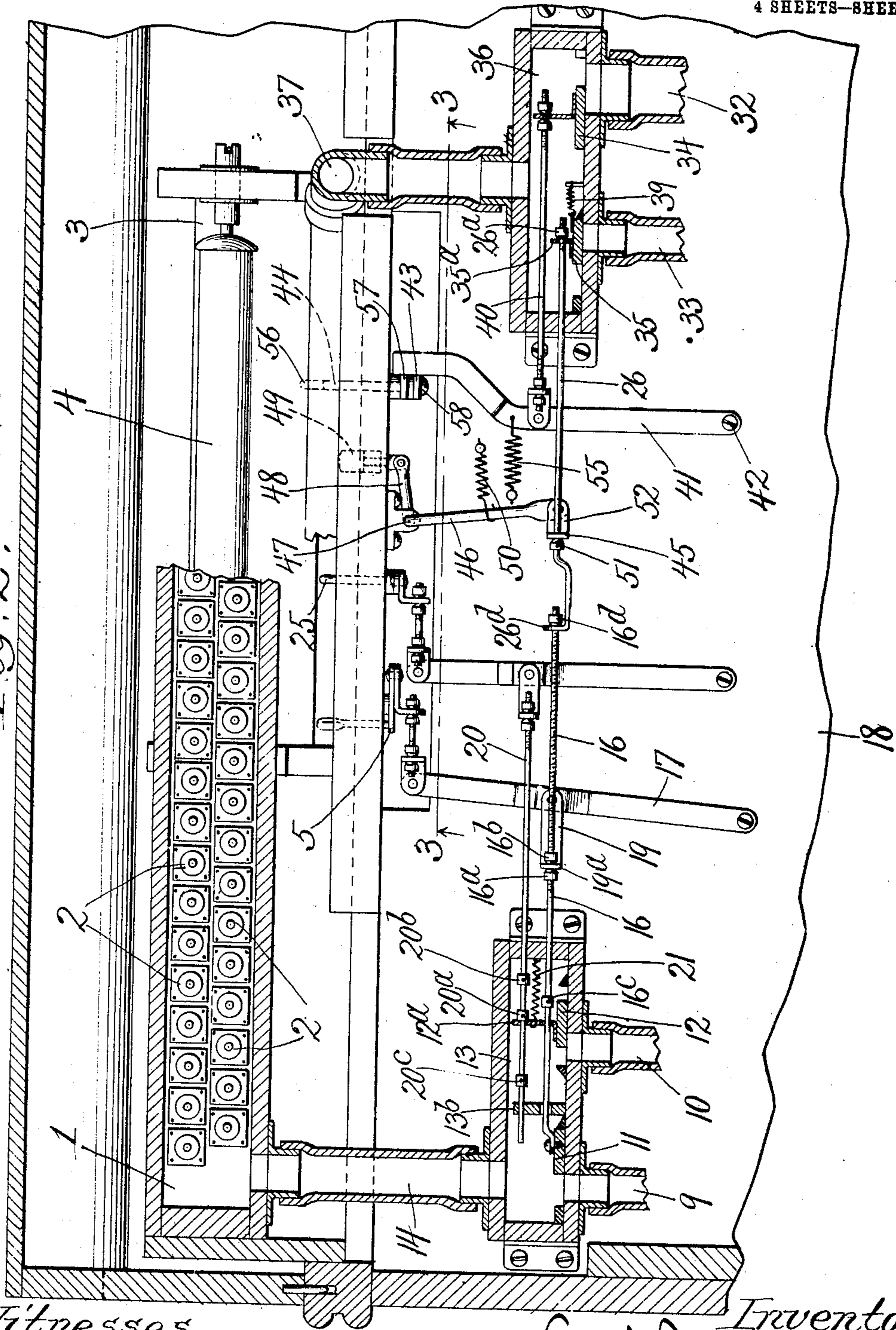
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4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 3.

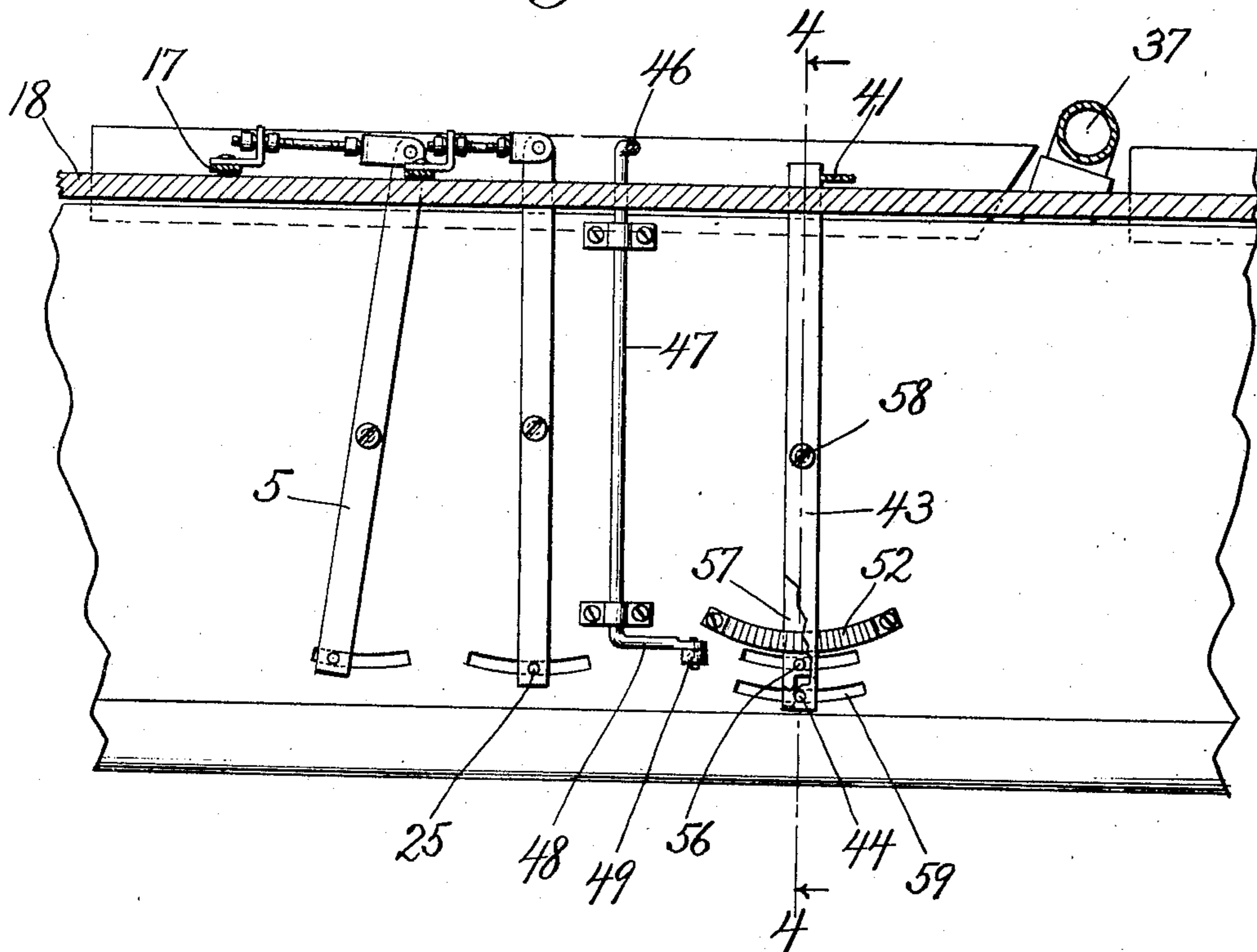
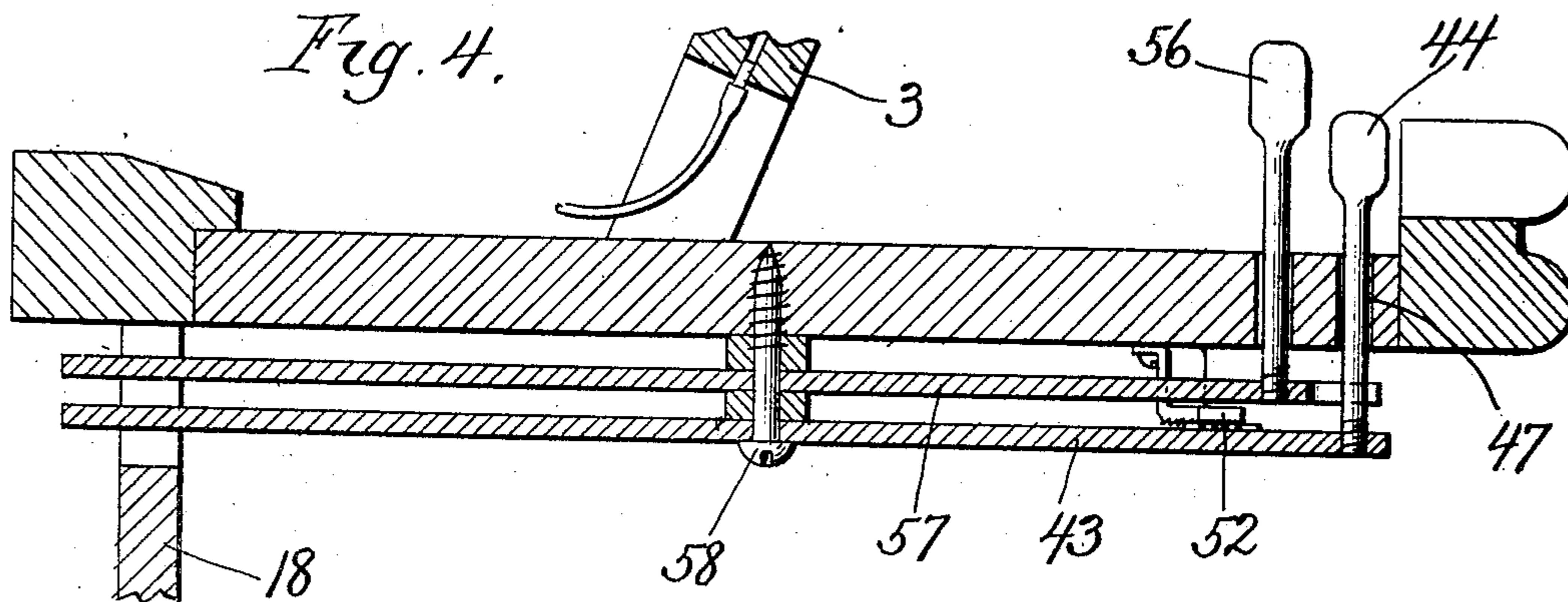


Fig. 4.



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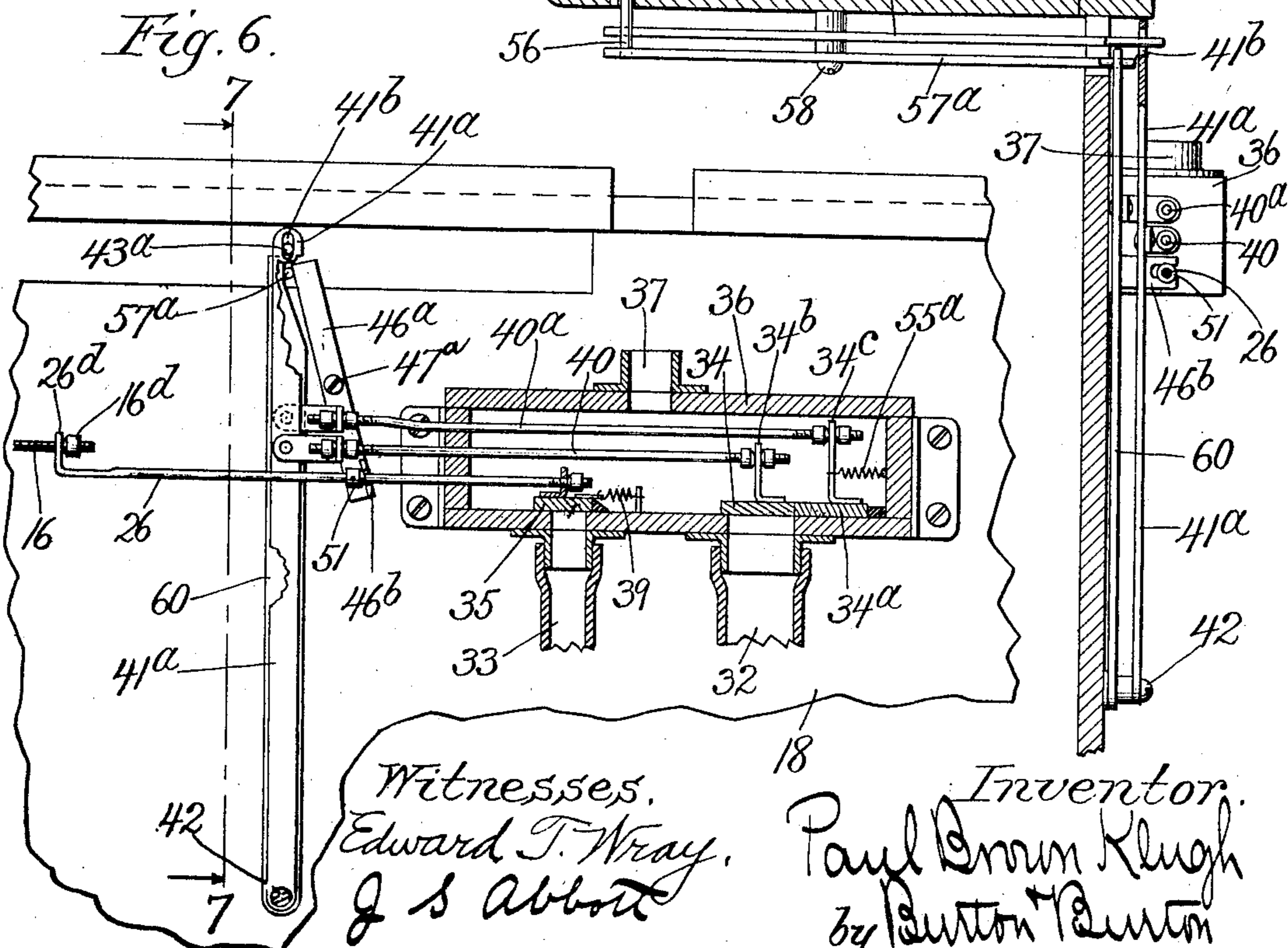
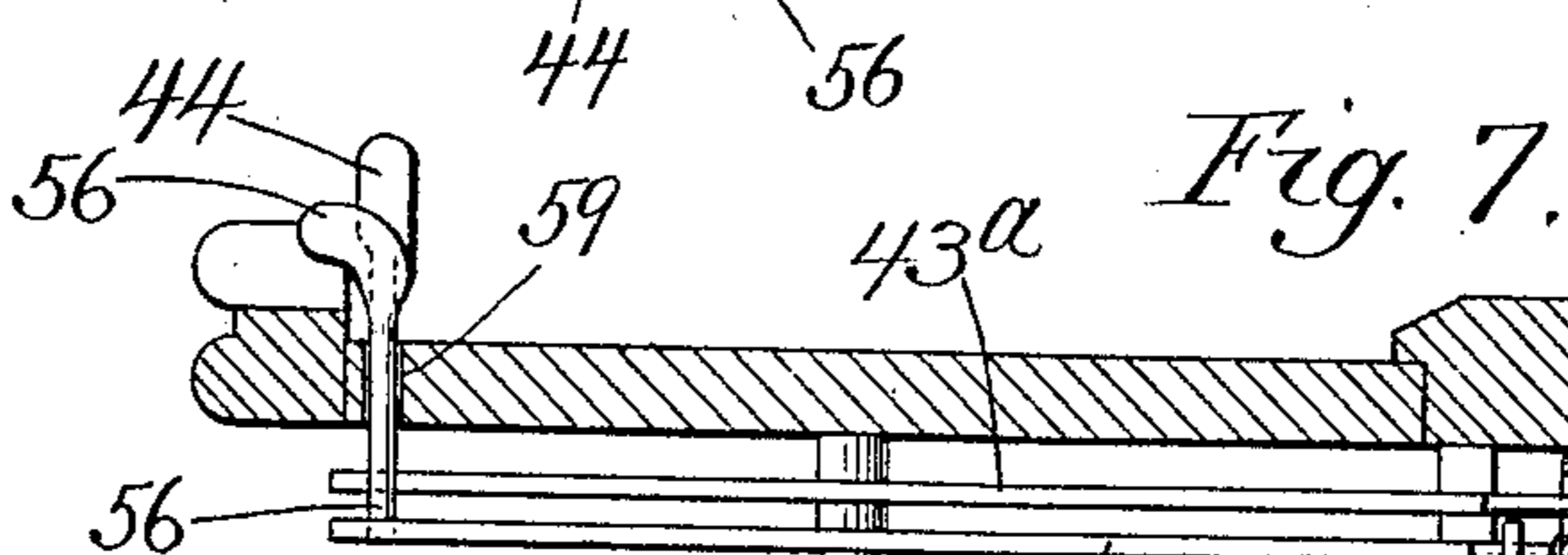
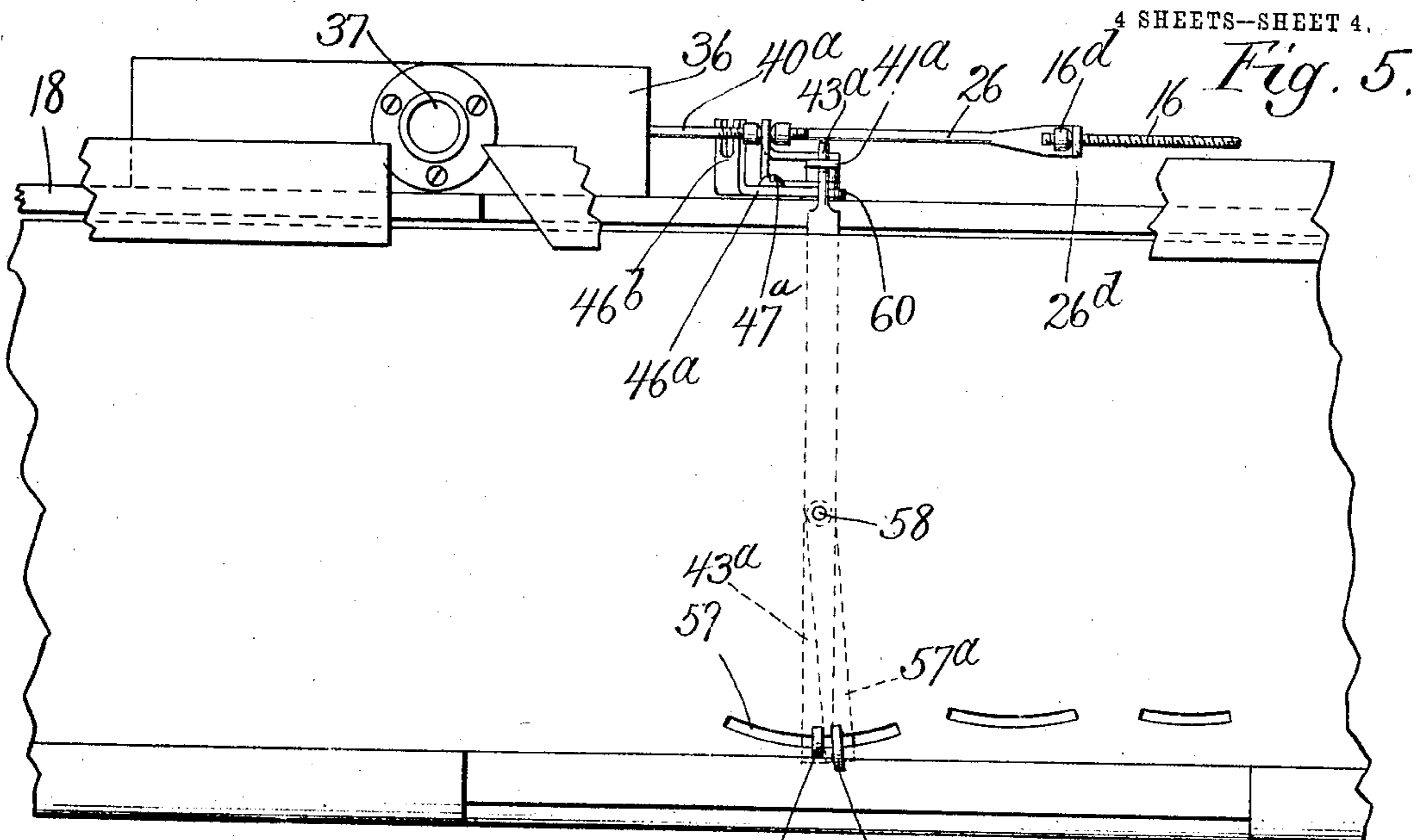
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INSTRUMENTS OR PLAYERS.

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4 SHEETS--SHEET 4.



Witnesses,
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UNITED STATES PATENT OFFICE.

PAUL BROWN KLUGH, OF EVANSTON, ILLINOIS, ASSIGNOR TO THE CABLE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

ACCENT AND EXPRESSION REGULATING MEANS FOR AUTOMATIC MUSICAL INSTRUMENTS OR PLAYERS.

No. 827,068.

Specification of Letters Patent.

Patented July 24, 1906.

Application filed July 19, 1905. Serial No. 270,317.

To all whom it may concern:

Be it known that I, PAUL BROWN KLUGH, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented new and useful Improvements in Accent and Expression Regulating Means for Automatic Musical Instruments or Players, of which the following is a specification, reference being had to the accompanying drawings forming a part thereof.

The purpose of this invention is to provide improved devices for phrasing the music, including regulating the speed and controlling the intensity of the playing-action, of an automatic musical instrument or player for the purpose of accenting the music and modifying the tempo and expression or emphasis at different parts.

It consists of the features of construction set out in the claims.

In the drawings, Figure 1 is a plan view of a portion of an automatic player, the upper part being broken away to show the devices underneath. Fig. 2 is a section at the line 2 2 on Fig. 1, section extending also above the parts shown in that figure, cutting through the air-chamber of the pneumatic-action, which is partly broken away, showing the other parts. Fig. 3 is a section at the line 3 3 on Fig. 2 looking upward. Fig. 4 is a section at the line 4 4 on Fig. 3. Fig. 5 is a detail plan view of a part of the stop board or table, showing certain modifications in the speed-regulating stop-action. Fig. 6 is a partly-sectional rear elevation of these modified devices, section being made in vertical plane longitudinally through the valve-box. Fig. 7 is a section at the line 7 7 on Fig. 6.

The drawings show a familiar form of many elements of an automatic player, which will not be particularly described, but only mentioned for identification.

1 is the air-chamber of the pneumatic-action of a pneumatically-operated automatic player of the general type which employs primary pneumatics 2 2 in such chamber for controlling the action of the motor-pneumatics, which actuate the strikers for striking the keys, such motor-pneumatics and the connections between them and the primary pneumatics not being shown.

The tracker-board 3 and rolls 4 4 for carrying the perforated controlling-sheet (the lat-

ter not being shown) are of familiar form.

Any form of motor for rotating the rolls to cause them to propel the controlling-sheet may be employed, and any form of devices for shifting the driving power so as to wind the sheet on one roll for playing and rewind it upon the other roll may be employed. There is shown in the drawings of such mechanism only the lever 5, which operates the shifting devices and is hereinafter referred to as the "rewind-lever," and without reference to the particular form of such devices it is to be understood that the lever is moved to the right (in the plan view, Fig. 1) for connecting the power with the take-up roll for playing and to the left for connecting it with the rewind-roll.

The wind-chest or main exhaust-chamber 8 is connected with the pneumatic air-chamber 1 through two passages 9 and 10, which are separately controlled by valves 11 and 12, both mounted in the box 13, from which a single passage or connecting-tube 14 leads to the air-chamber 1. A governor 15 is interposed in the passage 9 between the wind-chest and the valve-box. The passage 10 is uncontrolled except by the valve 12. The two valves 11 and 12 being in the form shown in Fig. 2 adapted to slide to close their respective ports are arranged to be both operated by a rod 16, connected with the rear end of the rewind-lever 5 by means of an interposed lever 17, fulcrumed at its lower end on the back board 18 and at its upper end to said rear end of the lever 5, the rod 16 being connected with the lever intermediate the ends, the particular means for this connection being a flat link 19, which is flexibly and adjustably connected to the rod 16 by having a terminal lug 19^a, through which the rod 16 extends loosely, the rod being threaded and provided with nuts 16^a and 16^b at opposite sides on the lug, with their ends toward the lug rounded so as to permit considerable freedom of movement at the joint thus formed. The rod 16 passes substantially air-tight through the end of the valve-box 13, and within the box it passes through a stem 12^a, which extends rigidly up transversely from the valve 12, and a stop button or collar 16^c on the rod 16 between said stem and the end of the valve-box through which the rod enters by encountering the stem moves the

valve 12 in direction to cover its port when the rod 16 is thrust inward. Said rod is positively connected to the valve 11, so that it carries the latter valve positively with it in its movement in either direction.

20 is a rod parallel with the rod 16, which extends in through the same end of the valve-box and through the same stem 12^a of the valve 12. On this rod are stops 20^a and 20^b, the former in position to stand against the stem 12^a of the valve 12 when the said valve 12 is entirely off its seat, and at this position of the rod the stop 20^b is against the inner face of the end of the box through which the rod enters. The rod 20 is guided in a cross-bar 13^b in the box, and it has also a third stop 20^c, which stops against this cross-bar 13^b when the rod is thrust in a sufficient distance to cause its stop 20^a to carry the valve 12 into closed position over its port. Since the rod 16 passes loosely through the stem 12^a—that is, without operative engagement—the movement of the said valve 12 by the stop 20^a when the rod 20 is thrust in, as described, is without effect upon the rod 16 or the valve 11, which is positively connected to said rod—that is to say, the valve 12 may be seated over its port by the inward thrust of the rod 20 while the valve 11 stands wide open. A spring 21 is provided acting on the valve 12 to retract it to open position and to yieldingly resist the closing movement whether caused by the rod 16 or the rod 20.

When the rolls for propelling the controlling-sheet are driven by a wind-motor operated by the exhaust-air from the exhaust-air chamber or wind-chest, a valve mechanism for controlling the action is necessary, and such valve mechanism and operating devices are shown in the drawings.

The motor is represented conventionally by the three bellows 30 30 30 and the triple-cranked shaft 31, from which any suitable train (not shown) may be understood as being employed to communicate power to the rolls for driving them according to the adjustment of the lever 5 to the right or left. The motor air-chamber is connected with the wind-chest through two passages 32 and 33, which are separately controlled by valves 34 and 35, both mounted in a box 36, from which a single passage or connecting-tube 37 leads to said motor air-chamber. A governor 38 is interposed in the passage 32 between the wind-chest and the valve-box. The passage 33 is uncontrolled except by the valve 35. The two valves 34 and 35 may be in form adapted to slide to close their respective ports. For the ordinary action of the motor the valve 35 over the ungoverned port is closed, and the motor is operated only by the air derived through the governed passage past the valve 34. For intensifying the action of the motor for accelerating the time of

the music the valve 35 may be opened more or less, thus adding to the force derived from the governed passage such amount as may be necessary, derived through the ungoverned passage, which will drive the motor at any speed up to that which the maximum exhaust tension of the wind-chest is adequate to cause. When the driving connection is shifted to the rewind-roll for reversing the direction of travel of the controlling-sheet over the tracker-board, the maximum speed of the motor may be used, no governing being necessary, because no playing is being done, and for that purpose the valve 35 is opened wide whenever the lever 5 is shifted to the left for rewinding. It will be remembered that in the same case—that is, during rewinding—the communication from the wind-chest to the pneumatic playing-action should be entirely closed, because no playing is desired. I therefore connect the rod 16, which operates the expression-valves 11 and 12, with the valve 35 in such manner that the movement of the rod 16 for closing the valves 11 and 12 will move the valve 35 to wide-open position; but since the valve 35 must sometimes be opened more or less for accelerating the music when the valve 11 is not closed the connection of the rod 16 with the valve 35 is made by having the rod 26, which constitutes the connection from the rod 16, extended through the stem 35^a of the valve 35 without operative engagement therewith and providing on said rod 26, beyond the stem 35^a, a stop-button 26^a for engaging the stem to pull the valve open, but not adapted to prevent it from being opened by other means. A spring 39 is provided, connected in any convenient manner with the valve 35, reacting to hold said valve normally closed and adapted to yield for opening it to such extent as it may be forced by the movement of the rod 16 or other means. The rod 16 is connected with the rod 26 for operating the latter by the pull of the former and not otherwise, the connections consisting of an offset eye 26^d on the rod 26, through which the rod 16 extends, a stop-button 16^d being fixed on the rod 16 behind the eye at such position that when the valve 35 is closed the eye encounters the button as soon as the rod 16 is moved in direction for closing the valve 11, and the further progress of such closing movement opens the valve 35 as much as the valve 11 is closed.

The valve 34 has a rod or stem 40 extending out through the end of the valve-box 36 and connected to the lever 41, which is fulcrumed at 42 on the rear side of the back board. Said lever extends up past the rear end of the tempo-stop lever 43, which has at its forward end a tempo-stop finger 44, projecting up through a slot 59 in the stop-board. A spring 55, acting on the lever 41, tends to

hold the valve 34 open and the tempo-stop finger 44 at the extreme left-hand limit of the slot 59, and the movement of the stop toward the right closes the valve more or less, according to the distance and thereby enables the operator to control the amount of air drawn in through the motor and the resultant speed of the controlling-sheet and the rate of playing up to the maximum speed for which the governor 38 is adjusted. For temporary retardment there is provided the retard-stop 56, which is a finger at the forward end of the retard-lever 57, which is fulcrumed on the stud 58, which also affords fulcrum for the tempo-stop lever 43. Said retard-lever 57 at its rear end extends past the upper end of the lever 41, the lever 57 being above the lever 43 and the retard-stop finger 56 being behind and extending higher than the tempo-stop finger 44. The forward end of the lever 43 runs under a ratchet-bar 52, which engaging said end of the lever holds it at the position to which it is adjusted against the tension of the spring 55, the lever being disengageable from the ratchet-bar by depressing the tempo-stop finger, springing down the forward end of the lever 43. The lever 57 extends forward past the right-hand side of the tempo-stop finger, so that the latter constitutes a stop and limit for the movement of the retard-lever to the left, while permitting it to be moved without restraint farther to the right.

The operation of the tempo and retard stops will be understood from the foregoing description to be that the tempo-stop being moved to the right closes the valve 34 a distance corresponding to the extent of such movement and being moved to the left permits the valve to be reopened by the reaction of the spring 55 and that the engagement of the lever 43 with the ratchet 52 prevents the spring 55 from retracting the lever for opening the valve, while the tempo-stop stands at any position to which it may be thus adjusted for regulating the general rate of playing suitably to the music. The retard-stop may be moved farther to the right and held for any length of time, thereby retarding the playing so long as it is thus held, and when released it will be retracted by the spring 55, operating on the lever 41, and press against the rear end of the lever 57; but only until the forward end of said lever 57 collides with the tempo-stop finger, so that after the temporary retardment the previous rate of playing determined by the adjustment of the tempo-stop is resumed without attention on the part of the operator. For exceptional acceleration the valve 35 may be opened more or less to give the motor-director ungoverned communication with the wind-chest, and for that purpose the rod 26, which operates this valve, extends through an eye 45, carried at the

lower end of a lever-arm 46 of a rock-shaft 47, which is mounted on the under side of the stop-board and has at its forward end a lever-arm 48, connected with a stop-button 49, which extends up through the stop-board, a spring 50 being provided to uphold the button and yieldingly resist its depression. This spring is conveniently placed, as shown, operating on the lever-arm 46 to hold it in direction for upholding the button. A stop-button 51 on the rod 26 at the side of the eye remote from the valve-box is encountered by the eye in the movement of the lever-arm 46, caused by depression of the stop-button, and the valve 35 is thereby opened and held open as long as the button is depressed by the operator. For accommodating the eye to the rod 26 throughout the curved path of movement of the end of the lever-arm 46 the eye is offset from the end of a short link 52, which is pivoted at the other end to the lower end of the lever-arm 46. It will be observed that by the coöperation of the tempo-stop and the accelerando-stop button 49 the operator having adjusted the tempo-stop for the rate of playing desired at any particular point in the music can momentarily or for a short time accelerate the music to any desired extent by depressing the button 49, and upon releasing the button the original rate of playing will be resumed, because the tempo-stop and the position of the valve 34 remain unaffected by the temporary opening of the valve 35 by the accelerando-stop button.

At all times when the stop on the forward end of the lever 5 stands at the right of its range of movement (see Fig. 1) the take-up roll is connected with the driving-train and rotated for propelling the controlling-sheet over the tracker-board for playing. At this position of said stop the rod 16 holds the valve 11 wide open, and the stop-button 16 on said rod permits the valve 12 to stand wide open; but in ordinary operation of the player the accent or expression stop 25 is at the position for holding the rod 20 at the innermost position to which it may be thrust in the valve-box and holding the valve 12 closed. In this ordinary position of the parts the pneumatic action is exposed to the governed air from the wind-chest or main exhaust-chamber, and the result is an intensity of stroke by the key-strikers, providing the softest expression of the music of which the instrument is capable with a given adjustment of the governing device. For increasing the force of the stroke and the intensity of the music the stop 25 is moved to the right more or less, according to the increase or intensity desired, causing the valve 12 to be opened more or less in the same degree and adding to the force derived through the governed passage such additional force as may be derived from the ungoverned passage

from the wind-chest to the air-chamber, according to the degree to which the valve 12 is thus opened, and when the valve is held wide open by the movement of the stop 25 to the extreme limit of its range to the right the maximum intensity or loudness of playing is produced. When the lever 5 is shifted to the left for reversing the driving connection, shifting the power from the take-up roll to the rewind-roll and causing the controlling-sheet to be propelled in reverse direction over the tracker-board, the air communication from the wind-chest to the pneumatic action should be entirely cut off, because no playing action is desired, and it will be observed that this result follows automatically from the movement of the take-up lever 5 to the left as necessary for reversing the driving connection, because that movement thrusts the rod 16 inward to its bearing in the valve-box and carries both the valves 11 and 12 to closed position. When for any reason it is desired to interrupt the playing, whether with or without reversing the travel of the controlling-sheet, and to resume playing again, the playing will be resumed with the same force or intensity as when it was interrupted, because the movement of the rod 16 for closing the valves 11 and 12 leaves the rod 20 unaffected in position, and when the rod 16 is again withdrawn for opening the valves while the valve 11 will open fully the valve 12 will only open back to the point to which it had been set by the adjustment of the expression or accent stop—that is, the stem 12^a will come back to the stop-button 20^a on the rod 20 and no farther.

The lever 5 being connected with both the rod 16 and the rod 26 in such manner that the movement of the lever for shifting the driving power to the rewind-roll operates for closing the valves 11 and 12 and for opening the valve 35, only one action is necessary to accomplish all that is requisite for rewinding—to wit, (a) reversing the driving connection, (b) cutting off the air from the pneumatic action, (c) giving the motor uncontrolled communication with the wind-chest for the most rapid action, and these results are accomplished, as it will be observed, while retaining through the “accelerando” and “tempo” stops and their connections independent control of the two valves 34 and 35 and control of the valve 35 without the reversion of the driving connection and without cutting off or affecting the communication between the wind-chest and the pneumatic action.

In Figs. 5, 6, and 7 of the drawings there is shown a modification of the accelerando and retard stop actions in order that the same stop operated in opposite directions may be employed for accelerating and retarding and also that the tempo-stop may be adapted to

retain its position without the necessity of a locking device, such as the ratchet 52. The construction illustrated in these figures has in addition to the tempo-valve 34 over the governed air-passage 32 a second valve 34^a, which slides from the opposite side of the port to close it, a spring 55^a, connected with the stem 34^c of the valve, operating to hold the valve normally off its seat, leaving the port, so far as this valve is concerned, entirely open. When the two valves 34 and 34^a have their proximate edges together, wherever they may stand, the port is closed, and the distance between the proximate edges of the valves, if they are not together, determines the actual speed of playing. The tempo-stop connections are adapted to set the valve 34 at any position with any degree of opening and the retard-stop connections are adapted to draw the valve 34^a more or less toward the valve 34 when the latter is at any open position. For this purpose two levers 43^a and 57^a are mounted upon the same fulcrum 58 on the under side of the stop-board, said levers having at their forward ends upwardly-protruding stop-fingers 44 and 56, respectively, which, however, both protrude through the same slot 59 instead of through different slots, as in the other construction, standing alongside each other in the slot, the stop-finger 44 being at the left and the stop-finger 56 at the right. At the rear end the lever 43^a engages a slot 41^b in the upper end of a lever 41^a, fulcrumed at 42 on the back board, and to said lever 41^a intermediate its fulcrum and the engagement of the lever 43^a therewith the rod 40 is pivotally connected, as in the other construction, said rod engaging the stem 34^b of the valve 34, as in the other construction. The arrangement of the parts is such that when the stop-finger 44 occupies a position at about the middle of the segment-slot 59 the valve 34 is over the port of the passage 32, completely closing the same, and the movement of the stop-finger 44 to the left, it will be seen, will uncover the port. The lever 57^a at its rear end projects alongside of the upper end of a lever 60, which is also fulcrumed at 42, and intermediate its fulcrum and the point of contact with the lever 57^a is connected by the rod 40^a with the stem 34^c of the valve 34^a. The arrangement of the parts is such that when the stop-finger 56 occupies a position at the middle of the segment-slot 59 the spring 55^a, which operates to retract the valve 34^a from off the port, holds the upper end of the lever 60 against the rear end of the lever 57^a when said valve 34^a is entirely off the port, as shown in Fig. 6. When, therefore, the two stop-fingers 44 and 56 are together at the middle of the slot 59 the valve 34 completely closes the port, and the valve 34^a is completely off of it, but

the two valves are in contact at their opposite edges. If now the tempo-stop 44 is moved to any distance to the left to open the valve 34 for any desired speed, the operator by moving the stop-finger 56 more or less to the left approaching the stop-finger 44 will cause the valve 34^a to follow the path taken by the valve 34 more or less and cover more or less of the port which was uncovered by such movement of the valve 34, thus reducing the speed for the time being, and while the stop-finger 56 is held at such position according to the approach of the two stop-fingers 44 and 56, which corresponds to the approach of the two valves 34 and 34^a. In order that the stop 56 and its connections may also operate the valve 35 for acceleration, there is fulcrumed at 47^a on the back board a lever 46^a, which at the upper end extends past the rear end of the lever 57^a at the opposite side thereof from the lever 60 and at the lower end is forked or slotted, as seen at 46^b, and has the rod 26 passing through its slot or fork-notch, a stop 51 being provided on the rod 26, as in the other construction, at the side of said lever 46^a opposite the valve-box, so that the movement of said lever at the upper end in the direction corresponding to the movement of the stop-finger 56 to the right will cause the lower end of said lever 46^a to act against the stop 51 for pulling the rod 26 and moving the valve 35 off its seat against the retraction of the spring 39. The action of the rod 26, valve 35, and spring 39 is in all respects precisely the same as in the first above-described construction when said rod 26 is actuated by the lever-arm 46 of the rock-shaft 47 upon the depression of the accelerando-button 49; but this action, it will be observed, is produced by moving the stop-finger 56 in the slot 59 in the opposite direction from that in which it is moved in the same slot from the middle point thereof for retarding. Thus the stop-finger 56 becomes both the retard and accelerando stop, moving in one direction for one purpose and the opposite direction for the other purpose, its movement to the left for retarding being such as at all times to indicate by its distance from the stop 44 the extent of opening of the valve and its movement in the opposite direction having no effect upon the tempo stop or valve.

I claim—

1. In an automatic musical instrument or player, in combination with a pneumatic-motor and the wind-chest, two passages connecting them; a separate valve controlling each passage; a governor in one of said passages between the wind-chest and the valve; a pneumatic-action comprising an air-chamber; communication from the wind-chest to the air-chamber and a valve for controlling such communication; a stop and connections

therefrom for operating such valve and for operating also the valve of the ungoverned passage from the wind-chest to the motor, said connections being arranged to operate said valves simultaneously for opening one and closing the other.

2. In an automatic musical instrument or player, in combination with a pneumatic-motor and the wind-chest, two passages connecting them; a separate valve controlling each passage; a governor in one passage between the wind-chest and the valve; a tempo-stop and connections by which it operates the valve of the governed passage; a pneumatic-action comprising an air-chamber; communication between the wind-chest and such air-chamber; a valve controlling such communication; a stop and connections therefrom for operating said valve and for operating also the valve of the ungoverned motor-passage, said connections being arranged to operate the two valves simultaneously for opening one and closing the other.

3. In an automatic musical instrument or player, in combination with a pneumatic-motor and the wind-chest, two passages connecting them; a valve controlling each passage; a governor in one passage between the wind-chest and the valve; a tempo-stop and connections by which it operates the valve of the governed passage; means for holding the other valve normally closed; a pneumatic-action comprising an air-chamber and a communication between the wind-chest and such air-chamber; a valve for opening and closing such communication; a stop and connections therefrom for operating said valve and the valve of the ungoverned motor-passage, arranged for simultaneously closing the former and opening the latter valve, and an accelerando-stop and connections therefrom for also opening said latter valve.

4. In an automatic musical instrument or player, in combination with a pneumatic-motor and the wind-chest, communication between the motor and the wind-chest; a valve for controlling such communication; a pneumatic-action comprising an air-chamber and a communication between the wind-chest and such chamber and a valve controlling such communication; a stop and connections therefrom for operating the two valves simultaneously for closing the latter and opening the former, and another stop and connections therefrom for opening said former valve independently of the first stop connections, and means for holding said former valve normally closed.

5. In an automatic musical instrument or player, in combination with a pneumatic-motor and the wind-chest, communication between them; a valve which controls such communication; a pneumatic-action and communication between the same and the wind-

chest and a valve which controls such communication; a rewind-stop and connections therefrom for operating both said valves simultaneously for closing the latter and
 5 opening the former, and another stop and connections therefrom for opening said former valve independently of the rewind-stop.

6. In an automatic musical instrument or player, in combination with a pneumatic-
 10 motor and the wind-chest, two communications between them; a governor in one of said communications; a valve which controls the governed communication; a stop and connections therefrom for operating such valve in-
 15 dependently of the other; a valve controlling the ungoverned communication; an accelerando-stop and connections therefrom for operating said valve; a rewind-stop and connections therefrom to the connections for oper-
 20 ating said last-mentioned valve adapted to operate the same independently of the accelerando-stop.

7. In an automatic musical instrument or player, in combination with a pneumatic-
 25 motor and a wind-chest, a governed communication between them; two valves for closing said communication, each adapted to be operated independently of the other, and separate stops for so operating them.

30 8. In an automatic musical instrument or player, in combination with a pneumatic-motor and a wind-chest, having a governed communication between them; two valves for controlling such communication, both be-
 35 ing adapted for gradually opening and closing, one of the valves being adapted to rest at any position at which it is set, the other valve being normally open and means for auto-
 40 matically returning it to open position from any closed position when released, and two stops and their respective connections for operating the two valves independently.

9. In an automatic musical instrument or player, in combination with a pneumatic-
 45 motor and a wind-chest and a communication between them; two valves, each adapted without the other to entirely close the communicating port and moving in opposite di-
 50 rections for such closing; two stops and independent connections therefrom for operating said valves respectively.

10. In an automatic musical instrument or player, in combination with a pneumatic-
 55 motor and a wind-chest communicating therewith; two valves, each of which is adapted to control the port of communication; two stops for moving the valves respectively, in-
 60 dependently of each other for opening and closing the port, the valves being mounted for moving in opposite directions to close the port, and the stop connections being adapted to cause opposite movement of the stops to close the valves respectively.

11. In an automatic musical instrument or

player, in combination with a pneumatic- 65
 motor and a wind-chest having a governed and an ungoverned communication with the motor; a tempo-valve and a retard-valve, each adapted independently of the other to control the governed communication; stops 70
 for operating said valves respectively independently of each other; a valve for controlling the ungoverned communication; means holding said valve normally closed, and a stop and connections for opening the valve 75
 more or less at will.

12. In an automatic musical instrument or player, in combination with a pneumatic-
 motor and a wind-chest having a governed 80
 and an ungoverned communication with the wind-chest; two valves which control the governed port, each adapted independently of the other to close the same to any degree, one of said valves being adapted to rest at any position to which it is adjusted, means 85
 for holding the other normally open; stops and connections therefrom for operating said valves at will independently of each other; a valve controlling the ungoverned com-
 90 munication means for holding it normally closed, and connections from the stop which operates the normally open valve of the other port for operating said normally closed valve by movement in the opposite direction.

13. In an automatic musical instrument or 95
 player, in combination with a pneumatic-motor and a wind-chest having a governed and an ungoverned port of communication with the motor; two valves, each adapted in-
 100 dependently of the other to close the governed port to any degree, the first of them being adapted to rest at any position and the second of them provided with means for yieldingly resisting its closure and retracting it to open position; a third valve for the un- 105
 governed port provided with means for yieldingly resisting its opening and retracting it to closed position; a tempo-stop for operating said first valve, and a retard and accelerando stop and connections therefrom for operating 110
 the other two valves by movement of the stop in opposite directions against the yielding resistance of said valves to closing and opening respectively.

14. In an automatic musical instrument or 115
 player, in combination with a pneumatic-motor and a wind-chest having a governed and an ungoverned port of communication with the motor; a tempo-valve and a retard-
 120 valve moving in opposite directions for closing the governed port; an accelerando-valve for closing the ungoverned port; two stop-levers having a common fulcrum and stop-fingers on them respectively, adapted to move in the same path as the levers swing 125
 about their fulcrum; connections from one of said levers for operating the tempo-valve; and two levers at opposite sides of the other

of said first-mentioned levers in position to be encountered by said lever in its respective movements in opposite directions, one of said two levers being connected with the retard-
5 valve and the other with the accelerando-valve.

In testimony whereof I have hereunto set

my hand, at Chicago, Illinois, this 7th day of July, A. D. 1905.

PAUL BROWN KLUGH.

Witnesses:

CHAS. S. BURTON,
M. GERTRUDE ADY.