

No. 629,103.

G. H. DAVIS.

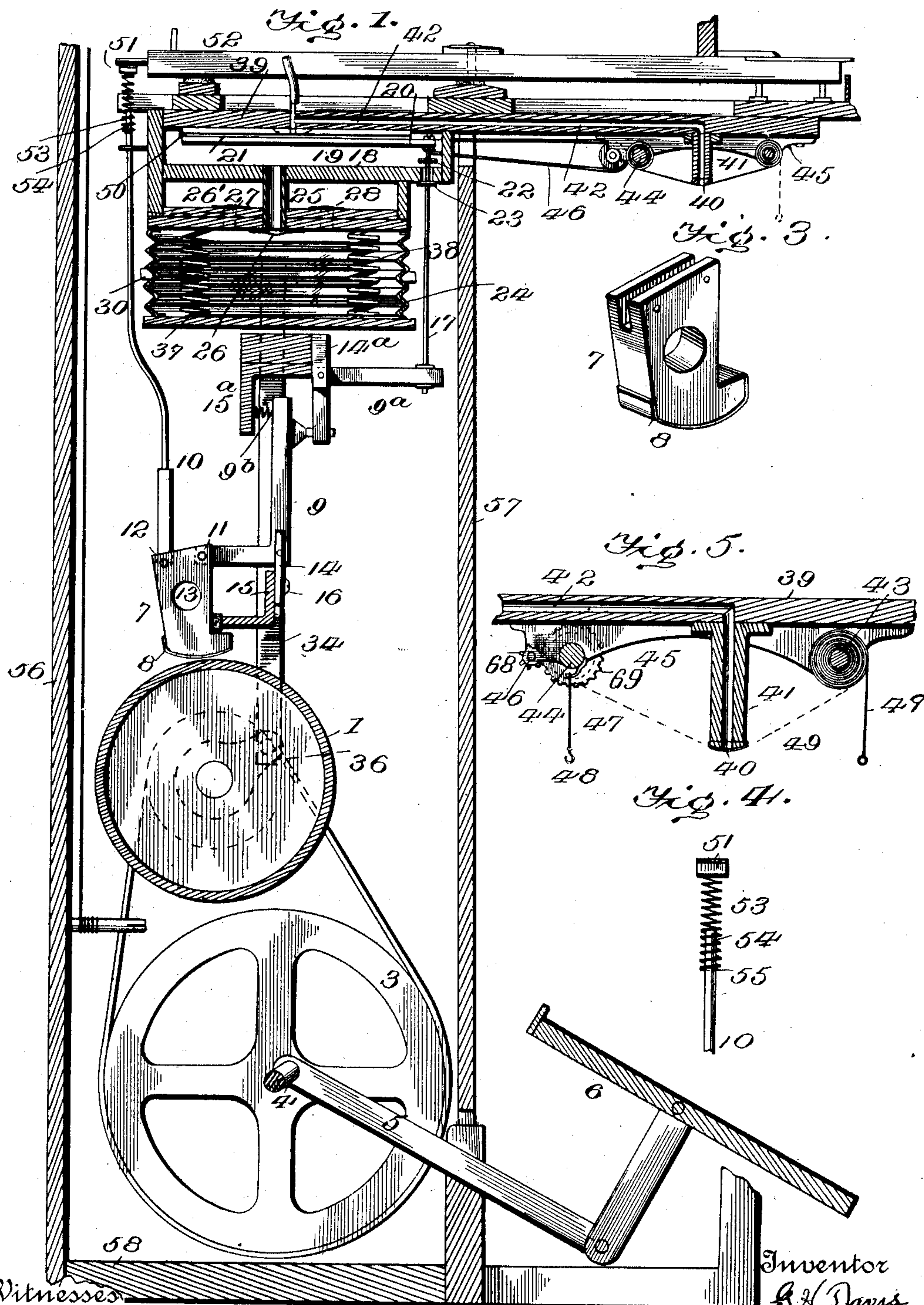
Patented July 18, 1899.

ATTACHMENT FOR AUTOMATICALLY OPERATING PIANOS.

(Application filed Mar. 16, 1897.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses

*John D. Miller*  
*Simon F. Messer*

Inventor

*G. H. Davis*

*By Davis & Co.*

Attorneys

No. 629,103.

G. H. DAVIS.

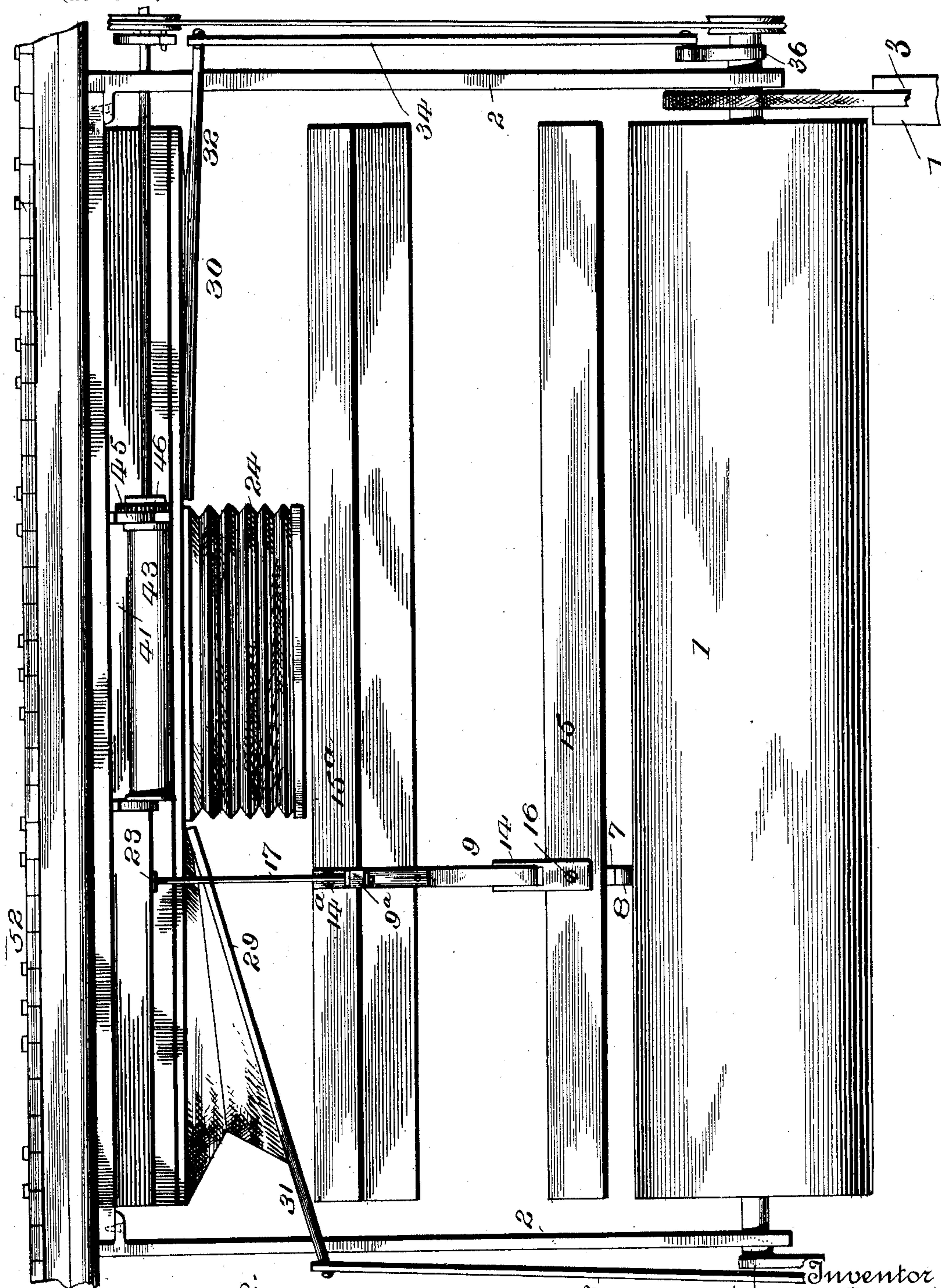
Patented July 18, 1899.

ATTACHMENT FOR AUTOMATICALLY OPERATING PIANOS.

(Application filed Mar. 16, 1897.)

(No Model.)

3 Sheets—Sheet 2.



Witnesses  
John L. Mirie.  
Simon S. Messer.

W. B. L.

Inventor,  
G. H. Davis  
By Davis & Co.  
Attorneys





# UNITED STATES PATENT OFFICE.

GEORGE HOWLETT DAVIS, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE PIANOPHONE COMPANY, OF SAME PLACE.

## ATTACHMENT FOR AUTOMATICALLY OPERATING PIANOS.

SPECIFICATION forming part of Letters Patent No. 629,103, dated July 18, 1899.

Application filed March 16, 1897. Serial No. 627,899. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE HOWLETT DAVIS, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new, useful, and valuable Improvement in Attachments for Automatically Operating Pianos, of which the following is a full, clear, and exact description.

My present invention relates to attachments for automatically operating pianos, and particularly to that class of devices which employ pneumatics in the whole or part, and my present improvement may be termed a "semi-pneumatic" device, as pneumatics are employed only in the initial or indicative power.

My invention has for its object to provide an attachment which when compared with others of its class will be pronounced to be decidedly simple, practical, and economical of construction.

As a further object my invention has to provide an attachment which can be applied to any ordinary piano within a few hours and without removal of piano from a purchaser's residence.

As a further object my invention has to provide an attachment which can be applied to any ordinary piano without cutting, mar-

ring, or defacing it in the least. As a further object my invention has to dispense with any ordinarily-visible parts, such as a large and clumsy music-holder projecting for a foot or more downwardly from the front of the keyboard, my music-holder only becoming visible by getting down and looking under the keyboard.

As a further object my invention has to provide means for attaching the rear of the piano-keys with greater rapidity and decision than any device operated entirely by pneumatics and yet when not in use to leave the keys perfectly free to be operated manually.

As a further object my invention has for its object to provide a device which can be operated by foot-power without undue exertion and yet, when it is desired, produce a strong decisive percussion blow as distinct from the pneumatic piano attachments now on the market.

The objections above referred to and which this invention overcomes actually exist in all pneumatic devices now on the market, particularly in those operated by foot-power, and it is mainly by the proper use and combination of centrifugal force, together with an ingenious arrangement of coöperating parts and their individual special construction, that I attain the many advantages above stated, all of which will be hereinafter fully described.

I am fully aware that the utilization of centrifugal force derived from a shoe and drum is old in many arts, that it has been done mechanically and electrically, as will appear from my United States Patent No. 546,582, dated September 17, 1895, and from my several allowed applications, and that it has been attempted pneumatically, but in the latter instance without success, owing to the lack of the special combination of parts herein covered, and to which I will limit the claims concluding this specification, thus disclaiming any rights as a pioneer inventor, but yet seeking such breadth of claims as will protect me in a just use of my improvements.

To these ends my invention consists in the combination and arrangement of parts illustrated in the accompanying drawings, and in which—

Figure 1 is a transverse vertical section of my complete attachment. Fig. 2 is a front view of the same. Fig. 3 is a perspective view of my improved shoe. Fig. 4 is an enlarged detailed view of the upper end of my key-striking rod. Fig. 5 is an enlarged detailed view of my music-holder frame and music-spools. Fig. 6 is a view in elevation of the mechanism preferably employed for driving and governing the take-up roller, portions of the frame being broken away for the sake of clearness. Fig. 7 shows a different type of actuating mechanism for the driving and governing device shown in Fig. 6. Fig. 8 shows a modified form of friction-shoe.

Proceeding with a detail description of my improvements, frequent reference being given to the accompanying drawings, on which I have placed numerals of reference, those recurring in two or more views indicating the



same parts differently shown, I will first call attention to the parts which are old, the same being the drum 1, journaled in the supporting-brackets 2, the driving-pulley or fly-wheel 3, the cranked shaft 4, the pitman 5, and pedals 6, all connected as shown and needing no further explanation, as I do not propose to claim them except in combination. Directly above the said drum 1 is an angle-lever 7, commonly called a "shoe," and to which latter designation I shall adhere throughout the remainder of this specification. Said shoe 7 is of special construction, being formed of one piece of wood, as shown in Fig. 3, is preferably faced with cloth or leather 8 on its surface next the drum, and is recessed at its upper portion to receive the inner end of the lever 9 and the lower end of the striker-rod or sticker 10, both bearing upon the pins 11 12, as shown. This shoe is made much smaller than usual, and to further lighten it I bore a hole 13 through its body. The advantages of this shoe are its extreme lightness, which allows it to be thrown in and out of contact with the drum quicker and with the minimum power, its smallness, which economizes space, and its integrity, which renders it far less liable to warp or fall apart than the ordinary wood shoes made of three pieces glued together. The lever 9, carrying the said shoe at its inner end, is pivoted in the cleat 14, adjustably secured on the metal angle-iron 15 by the screw 16, all as clearly shown in Fig. 1. It will be seen that by thus adjustably mounting the bell-crank levers 9 on the support 15 the position of the shoes 7 relative to the drum 1 may be varied at will, so as to secure the proper operative relation between the drum and shoe without changing the connections between the shoe 7 and its operating-lever 9 and key-lever 10.

To the front end of the upper bell-crank lever 9<sup>a</sup> is adjustably secured the lower end of the tracker 17, the upper end of which extends through the lower board 18 of the pneumatic-chamber 19 and connects to the toe or movable end 20 of the pneumatic 21, said tracker being provided with the usual puppet-valves 22 23 to prevent any but a slight and momentary communication between the said pneumatic-chamber 19 and the outer atmosphere. The bell-crank lever 9<sup>a</sup>, like the lower one, 9, pivots in a cleat 14<sup>a</sup>, secured to an angle-rail 15<sup>a</sup>, the lower end of said lever 9<sup>a</sup> engaging the upper end of the lower lever 9 and indirectly the upper lever 9<sup>a</sup>, being always returned to their normal positions by the coil-spring 9<sup>b</sup>. Employing the exhaust system, the said chamber 19, containing a series of pneumatics 21, all connected to their respective shoes 7, as explained, is kept exhausted to the usual degree by the centrally-located bellows 24, communicating therewith through the tube 25, faced with the ordinary flap-valve 26, all as clearly shown in Fig. 1.

Disposed at each side of the bellows 24 and communicating therewith through the cham-

ber 26 and inlets 27 28 are two exhausters 29 30, having the outer ends of their free boards 31 32 connected by the pitmen 33 34 to cranks 35 36 in the ends of the drum 1, which obviously upon being revolved by foot-power, electric motor, or otherwise alternately opens and closes the two exhausters, which in turn contract the bellows 24 against its springs 37 38, and this bellows in turn exhausts the chamber 19, but with greater rapidity, owing to the action of the springs 37 38, as is well known to those skilled in the art to which this invention pertains. Projecting outwardly is a board 39, which acts as a base-board for my entire action, also as the top board for the chamber 19, also as a base for the supporting-brackets 2, and also as a channel-board to connect the inlets 40 of the tracker-board 41 with their respective pneumatics 21, the ducts 42 being readily traceable on Fig. 1. Arranged on either side of said tracker-board 41 are the usual forms of delivery and take-up spools 43 44, supported in the stationary frame 45, screwed to the base-board 39, as clearly shown. The take-up roller takes motion from the shaft 46, connected to the drum 1 in any suitable way, but preferably through the spring-motor and governing mechanism to be hereinafter described, and I may further provide this roller with a centrally-secured elastic cord 47, having a hook 48 at its free end, so that in securing the front end of the music-sheet to the take-up roller a person can reach under and draw the hook 48 toward him sufficiently far to conveniently hook it to the loop on the end of the music-sheet, which is then drawn into position first by the contraction of the cord 47 and later by the movement of the take-up roller.

Assuming now that the driving mechanism has been put in motion through the operation of the foot-pedals, that the chamber 19 is under proper exhaust, and that the note-sheet or music-sheet 49, with properly-arranged perforations therein, is slowly propelled forward, then whenever a perforation passes over an inlet 40 the duct 42, which said inlet controls and hitherto kept in partial vacuum by the imperforated portion of the music-sheet, is suddenly filled with outside air, and its pneumatic 21 succumbs to the tendency of the exhausted chamber 19, and being hinged at the point 50 its movable end acts on the sticker-rod 17 and through the levers 9 9<sup>a</sup> forces the shoe 7 into contact with the revolving drum 1, which instantly throws the shoe over and causes the upper end 51 of the sticker 10 to raise the rear end of the key 52 and sound the note, all these parts instantly assuming their normal positions when the perforation has passed the inlet 40.

The upper end or cap 51 of the sticker or striker rod 10 (see Fig. 4) is supported upon a stiff coil-spring 53, the lower half of which incases the extreme upper end 54 of said sticker and is prevented from being forced farther down over the same by a drop of sol-



der 55 upon the said sticker, which is of metal, or if it be of wood then the spring may be secured by shouldering its upper end by tightly winding the lower end of the spring about the wood or in any other suitable way.

If it be desired to increase the size and strength of the pneumatics 21, I may double their width by arranging them in two series in the same chamber, so as to alternate with each other, or I may provide a second chamber directly under the chamber 19 and arrange the second alternating set therein. However, as the pneumatics in this case have but a slight function to perform—*i. e.*, moving the shoe 7 only one thirty-second of an inch—these pneumatics when properly constructed one-half of an inch wide and five inches long will do the work required of them.

In the many devices wherein the power-pneumatic controlled by a primary pneumatic directly attacks the key such power-pneumatics must of necessity require a comparatively great amount of pressure or exhaust to actuate them, and hence three or more large exhausters operated at a high rate and with an expenditure of power equal to about one-sixth horse-power is necessary, whereas in my device my pneumatics require approximately but one-tenth the power of an ordinary power-pneumatic, and hence two exhausters worked slowly will properly exhaust them. The nine-tenths of the power thus saved is only partially expended in rapidly revolving the drum 1, which in reality is an elongated fly-wheel and known to all expert mechanics to more than compensate by its momentum and equalizing effects for the extremely-slight force required to keep it in revolution, and it is further known that one or more shoes, such as shown here, do not materially retard said drum or fly-wheel upon engaging its periphery.

The many advantages of so arranging the parts herein shown so as to occupy only such space in a piano as is usually wasted—*i. e.*, the space under the keyboard and between the iron string-frame 56, the bottom front board 57, and the base-board 58—appear so obvious as to require no further explanation, particularly when it is considered that after many years of effort no pneumatic device has ever yet been put on the market which can be applied to a piano without considerably enlarging its dimensions, nor has any other semipneumatic device accomplished this end.

I will now describe the preferred means for giving motion to the shaft 46, which drives the take-up roller 44. Said shaft 46, having the pinion 68, meshing with the gear 69 of the take-up roller 44, (see Fig. 5,) is extended through and beyond the right-hand supporting-bracket 2 to a supplemental bracket 59. (See Fig. 6.) Revolvably located upon said shaft 46 intermediate of the brackets 2 59 is a grooved pulley 60, guided on the right by the fixed collar 61 and driven directly from the drum 1 through the medium of the connecting-belt 67. Located to the left of the

said pulley 60 is a flat coil-spring 62, which has its inner end secured to the shaft 46 and its outer end connected to a pin 66, secured to said pulley 60. Upon said shaft 46, near the bracket 59, is also secured a gear 63, which meshes with a small gear 64, fixed to an auxiliary shaft 65, which also carries a stationary collar 66 and a sliding collar 67, the latter having a flange 71. Four thin flat springs 72, having the weights 73 affixed to each, connect the said collars 66 67, the movable collar 67 being caused to slide toward the stationary collar 66 whenever the carrying-shaft 65 is rapidly revolved, owing to the action of the weights 73, as is common in all forms of similar centrifugal governors. In the path of movement of said flange 71 I arrange a brake 74, which is adjustably secured upon the sliding rod 75, the friction-point 76 of said brake being preferably formed of a small tough piece of rawhide fixed to the end of a thumb-screw 77, thus giving several means of adjustment to said brake and preventing noise when said friction-point is in contact with the flange 71. The sliding rod 75 is so connected and arranged as to be under the control of the hand of the operator, it being preferable to so arrange the operating-knob 78 and lever 79 as to require a considerable movement of said knob to effect a slight movement of the brake 74.

The especial function of the spring-motor and governing mechanism just described is to prevent any irregularity, acceleration, or retardation in the revolution or movement of the drum or other propelling mechanism from being transferred directly and immediately to the music-sheet, which would occur if the take-up roller were belted directly to the drum 1, whereas under the arrangement I have just described the spring 62 receives and stores the movement of the drum through the loose pulley 60, which tends to wind up said spring from the outside, while the governing mechanism located upon the auxiliary shaft 65 controls at the will of the operator the speed of revolution of the driving-shaft 46 and thence the movement of the music-sheet, it being obvious that the set or position of the manually-adjustable brake 74 governs, first, the movement of the flange 71; second, the revolution of the auxiliary shaft; third, the main shaft 46, geared thereto and normally tending to overcome the governor or brake, and, fourth, the rate of travel of the music-sheet, which latter represents the tempo of the music, the latter heretofore having been imperfectly accomplished in all other forms of musical instruments, in all of which the movement of the music-sheet is more or less affected by the irregularity of the initial power.

In Fig. 7 I have shown how my spring-motor and governing mechanism may be utilized in instruments which have no revoluble parts connected with the initial power, such as foot-power applied to two foot-pedals, as 80. In such a case I extend a connecting-rod 81 up



from one or both of the pedals 80 to an arm 82, carrying a pawl 83, the retaining-pawl 84 holding any wind-giver, and the outer end 85 of the spring 62 being connected to the arm 86, extended from the ratchet 87. This method of transforming from a reciprocating to a rotary motion is too old and well known to require further explanation in this case. Instead of employing a pawl and ratchet I may employ any form of clutch, preferably of a noiseless form.

In Fig. 8 I have shown a modified form of friction-shoe 7', in which I employ a stiff wire 87 of the form shown, running across the top edge of the shoe, and the purpose of which is to provide means upon which the lower end of the striker-rod 10 can slide backward or forward thereon, according to the position of the shoe. When the shoe is in its normal position, the striker-rod will rest at the outer end 88 of the wire; but upon the shoe being thrown into action the inner end 89 of the wire will be lower than the outer end 88, and while the striker-rod will remain at point 88 until the initial blow is struck, owing to the extreme rapidity of movement of the shoe, yet during sustained notes it will have time to slide down to point 89 during most of the time, and thus because of the change of leverage the drum 1 will not have to exert so much power through frictional contact to sustain the shoe in a raised position, and when, say, fifteen shoes are bearing upon the roller at one time the power required to keep them, together with the superimposed piano-actions, raised is considerable and frequently retards the revolution of the drum 1 to a noticeable extent.

Having now particularly described my invention and its *modus operandi*, what I claim as new is—

1. In a mechanical musical instrument, the combination with a revoluble driving-drum, of a series of lever-shoes in proximity to said drum, but normally out of contact therewith, a series of bell-crank levers from which said lever-shoes are suspended, means for operating said bell-crank levers to throw said shoes into contact with said drum, and key-levers or striker-rods so connected with said lever-shoes as that after the initial blow of said lever-shoe the point of connection between said shoe and key-lever will be changed so as to change the leverage exerted on the shoe by the drum and relieve the latter from excessive strain during sustained notes.

2. In a mechanical musical instrument, the combination with a revoluble driving-drum, of a series of lever-shoes in operative relation to said drum but normally out of contact therewith, means for throwing said shoes into contact with said drum, a series of striker-rods or key-levers and connections between said lever-shoes and key-levers so as that the leverage exerted on said key-levers by said shoes is changed after the initial blow of the shoe and the drum is relieved of excessive

strain and consequent retardation during sustained notes.

3. In an automatically-operated musical instrument controlled by a perforated music-sheet, a take-up roller provided with an elastic cord having one end centrally secured thereto, the other end of said cord being provided with means for securing to end of music-sheet.

4. In a musical instrument of the class described, the combination with the delivery-roller on which the note-sheet is wound, of a take-up roller, and means for securing the note-sheet to said take-up roller, said note-sheet-securing means acting to draw the note-sheet taut and into operative relation to the tracker-board immediately said sheet and take-up roller are connected and before the take-up mechanism is started.

5. In a musical instrument of the class described, the combination with the delivery-roller on which the note-sheet is wound, of a take-up roller provided with an elastic connection for securing the note-sheet so as that said sheet will be drawn taut and into operative relation to the tracker-board immediately the connection between the take-up roller and note-sheet is made.

6. In a musical instrument, the combination with a revoluble driving-drum, of a lever-shoe coöperating therewith, said shoe being recessed at its top to receive the supporting-lever, and a striker-rod connected with said shoe so as to have a horizontal sliding movement toward and from the said supporting-lever.

7. In a musical instrument a striker-rod, the striking end of which is surmounted by a coiled spring and the spring surmounted by a cap secured by the spring and removed, normally, away from the end of the striker-rod.

8. In a musical instrument, the combination with a revoluble drum of a lever-shoe adapted to engage the periphery of said drum and having a wire across its upper edge upon which the lower end of a striker-rod can move toward or away from the hinged point of the shoe according to the position of the latter.

9. In a musical instrument of the class described, the combination with a perforated music-sheet, of delivery and take-up rollers for said sheet, a shaft geared to said take-up roller, a pulley loosely mounted on said shaft, means for driving said pulley, a coiled spring having one end secured to the said pulley and the other end secured to said shaft, a counter-shaft geared to said first-named shaft, a centrifugal governor on said counter-shaft, a sliding collar actuated by said governor, and a friction-point under the control of the operator to engage said collar and retard the speed of said motor, as desired.

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

G. HOWLETT DAVIS.

Witnesses:

D. HOWARD HAYWOOD,  
E. M. YEOMANS.