

No. 748,142.

PATENTED DEC. 29, 1903.

E. D. ACKERMAN.

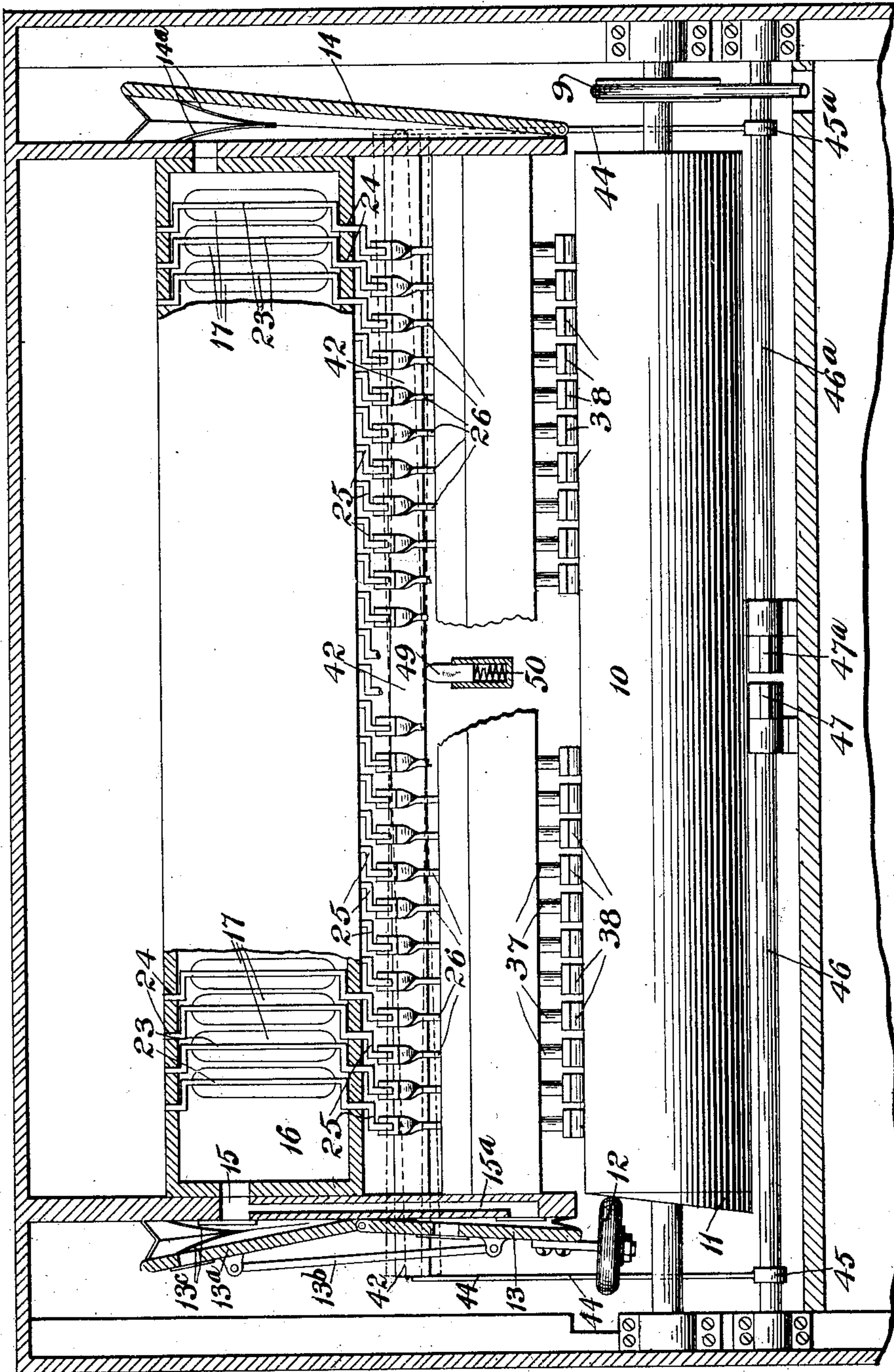
MECHANICAL PLAYING ATTACHMENT FOR MUSICAL INSTRUMENTS.

APPLICATION FILED JUNE 25, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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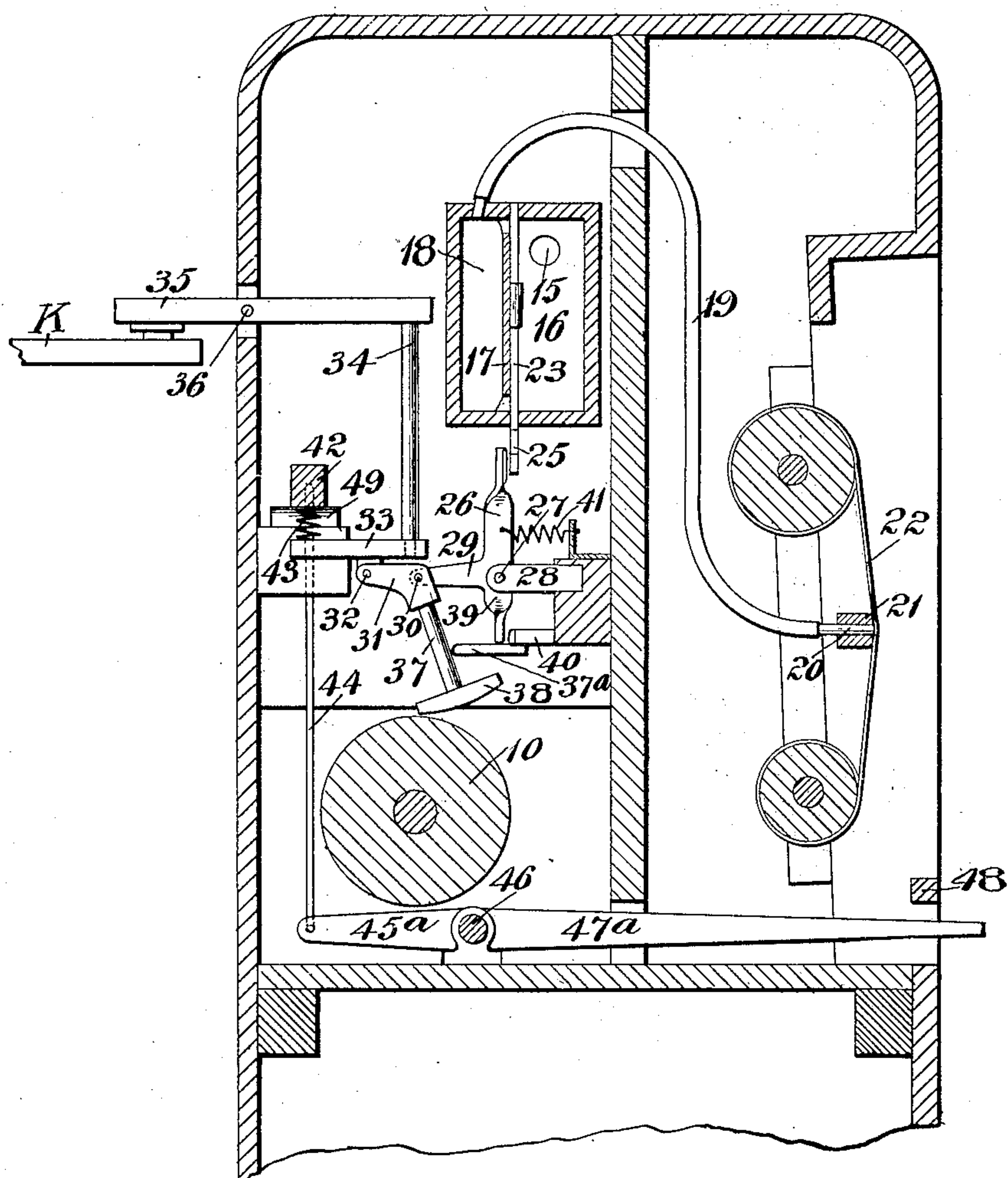
MECHANICAL PLAYING ATTACHMENT FOR MUSICAL INSTRUMENTS.

APPLICATION FILED JUNE 25, 1902.

NO MODEL.

2 SHEETS—SHEET 2.

Fig. 2.



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# UNITED STATES PATENT OFFICE.

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MECHANICAL PLAYING ATTACHMENT FOR MUSICAL INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 748,142, dated December 29, 1903.

Application filed June 25, 1902. Serial No. 113,134. (No model.)

*To all whom it may concern:*

Be it known that I, EDWIN D. ACKERMAN, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Mechanical Playing Attachments for Musical Instruments, of which the following is a specification.

This invention relates in part to means for operating the pneumatics for actuating the key-strikers of mechanical playing attachments and in part to means for modulating the strength of tones produced thereby, either throughout the whole keyboard or relatively in different parts thereof.

In the accompanying drawings, Figure 1 is a vertical longitudinal section taken directly in rear of the central partition shown in Fig. 2 and with the supporting-bar directly in rear of same, partly broken away and the pneumatic-chamber partly in section. Fig. 2 is a transverse section of the same.

The note-selecting devices are designed to be controlled by the operation of a perforated music-sheet in a manner well known in the art. The mechanism for operating the music-sheets forms no part of the present invention; but I have described suitable mechanism for this purpose in another application of even date herewith.

10 represents a friction-drum, to which continuous rotation is imparted from any source of power—for example, through the medium of a belt-pulley 9. This drum is employed to actuate the selected friction-shoes 38, by which the key-strikers are operated, as hereinafter described.

On one end of the drum 10 is formed a cam 11, which operates on a roller 12, mounted on a suction-bellows 13, which is connected by a rod 13<sup>b</sup> with a second bellows 13<sup>a</sup>, which is expanded by a spring 13<sup>c</sup>, so that in their reciprocating movement the coupled bellows 13 13<sup>a</sup> act alternately to exhaust the air through a suction-pipe 15 from a common vacuum-chamber 16, the bellows 13 being connected with the suction-pipe 15 through a duct 15<sup>a</sup>.

14 represents an equalizing-bellows expanded by a spring 14<sup>a</sup> and serving to equalize the exhaust produced in the vacuum-chamber 16 by the alternating action of the bellows 13 and 13<sup>a</sup>.

One wall of the vacuum-chamber 16 is formed of a series of individual diaphragms 17, which separate it from independent pneumatic-chambers 18, one for each key of the instrument, in which chambers a partial exhaust may be maintained by an ordinary bleeder or small leak in the diaphragms 17. The independent chambers 18 are connected by individual suction-pipes 19 with apertures 20 in the tracker-bar 21, any of which apertures may be uncovered by the appropriate perforations in the traveling music-sheet 22, so as to admit atmospheric pressure to the corresponding chambers 18 and by the consequent movement of their individual diaphragms 17 select the keys to be struck by throwing selected shoes 38 into operative contact with the friction-drum 10.

The diaphragms 17 act upon cranks 23, pivoted at 24 in the vacuum-chest and having at their outer ends tappet crank-arms 25, (see Fig. 1,) which act against the upper ends of bell-crank levers 26, which are fulcrumed at 27 in fixed brackets 28, so that the pressure of air in the separate chambers 18 acting through the corresponding diaphragm-cranks 23 and throwing their outer crank-arms 25 in the opposite direction throws the upper end of the corresponding bell-crank levers 26 to the left in Fig. 2, thereby depressing the outer end of the horizontal arm 29 of the bell-crank, the extremity of which is pivoted at 30 to a bell-crank 31, forming the heel of the friction-shoe 31 and fulcrumed at 32 to a horizontal lever 33, which is pivoted at its front end to a vertical rod 34, the upper end of which is pivoted to the front end of a rocking striker-arm 35, fulcrumed at 36 and acting at its outer end by a downward stroke on the corresponding key K of the instrument. Mounted in the lower end of each of the shoe-heels 31 is a staff 37, on the end of which the customary segmental-formed friction-shoe 38 is mounted, the construction and position of the parts being such that when the upper end of the bell-crank 26 is thrown to the left in Fig. 2 by the admission of atmospheric pressure to the corresponding air-chamber 18 the corresponding friction-shoe 38 is thrown down into contact with the friction-drum 10, the movement of which throws up the rear end 32 of the



shoe-heel 31, and thereby through the medium of the rocking lever 33 and rod 34 strikes the corresponding key of the instrument.

Near the upper end of each bell-crank 26 is connected a tension-spring 41, which when the pressure of the corresponding crank-arm 25 is withdrawn by the shutting off of air from the corresponding chamber 18 and the retraction of the diaphragm 17 by customary spring action retracts the upper end of the bell-crank 26, thereby throwing up the outer end of its horizontal arm 29 and lifting the friction-shoe 38 free from the drum and restoring it to the normal position. (Shown in Fig. 2.)

Each bell-crank lever 26 is formed with a rigid arm 39 projecting downward, so as to bear against the rest 40 when the upper end of the bell-crank lever is thrown out, so as to depress the shoe into active position.

The operation of this device is as follows: Atmospheric pressure being admitted to one of these separate chambers 18, the upper end of the corresponding bell-crank lever 26 is thrown outward, as already described, depressing the horizontal arm 29 and causing the heel of the friction-shoe to turn upon the pivot 32 as a fulcrum, thereby depressing the shoe 38 into effective contact with the friction-drum 10. The bell-crank lever 26 being thus brought to stationary position against the rest 40, the pivot 30, intermediate of the ends of the heel-plate 31, becomes a fixed fulcrum on which the friction-shoe turns by the force of the friction-drum 10 in delivering its stroke to the key-striker. Fig. 2 shows one of the friction-shoes in normal position of rest or at the beginning of its stroke. After the stroke is delivered and when the chamber 18 is relieved of atmospheric pressure by cutting off the air the retracting-spring 41 restores the bell-crank lever 26 to normal position, leaving the friction-shoe clear of the friction-drum and throwing its staff back against a rest 37<sup>a</sup>, which may be common to all the friction-shoes.

In order to modulate the strength of tone, either uniformly throughout the keyboard or relatively in different parts thereof, I employ a horizontal bar 42, sliding at its ends in vertical guideways and bearing by individual compression-springs 43 on the rear ends of the respective horizontal bars 33, in which the shoe-heels 31 are fulcrumed. The respective ends of the spring-bar 32 are connected by rods 44 with the rear ends of arms 45 45<sup>a</sup>, keyed on separate rock-shafts 46 46<sup>a</sup>, mounted end to end in the frame and rotatable, separately or together, by means of horizontal levers 47 47<sup>a</sup>, which project forward in convenient position to be drawn up by the fingers of the operator, while the thumbs may rest on the front bar 48 of the frame.

From the above description it will be understood that if a forte or loud effect be desired throughout all the keys of the instrument the levers 47 47<sup>a</sup> are both drawn up, thereby

applying increased pressure to all the springs 43 and accentuating the strokes which will be delivered through any of the rods 34, which may be operated by the selected friction-shoe 38. If it be desired to accentuate the bass notes relatively to the treble, the left-hand lever 47 only is drawn up, the effect of which will be to deflect the spring-bar 42 to the left, as shown in dotted lines, and thereby apply stronger pressure to the springs 43 toward the left end, and consequently cause the delivery of stronger strokes to the bass keys. If, on the other hand, it be desired to accentuate the treble notes relatively to the bass, the right-hand lever 47<sup>a</sup> is drawn up, so as to deflect the spring-bar 42 in the opposite direction.

In carrying this invention into effect I prefer to employ a yielding rest 49 for the center of the bar, supported by a spring 50, so that by drawing up one of the levers only one end of the spring-bar 42 will be depressed and the other end correspondingly raised, whereby a forte effect may be produced on the bass notes and a pianissimo effect on the treble notes, or vice versa, or by drawing up one lever with greater force and the other with less force forte effect may be produced in the notes at one end, while those at the other end are struck with normal strength, the spring 50 yielding so as to permit a slight depression of the center rest 49. If both the levers are drawn up so as to produce forte effect throughout the keyboard, the rest 49 yields downward to the entire depression of the spring-bar.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a mechanical playing attachment for musical instruments, the combination of an operating friction-drum 10; oscillating friction-shoes 38 engaging therewith and transmitting movement to the key-strikers; pneumatic selecting mechanism by which the several friction-shoes are thrown into operative relation with the drum; an operating-cam 11 on the friction-drum; and a bellows 13 operated by said cam and transmitting pneumatic force to operate the selecting devices, substantially as described.

2. In a mechanical playing attachment for musical instruments, a tone-modulating device consisting of a series of levers connected at one end to the respective key-strikers, bearing at the other end on individual springs and connected intermediately to suitable actuating mechanism; a common bearing-bar for the individual springs; and means for depressing said bar at either or both ends so as to increase the force of the stroke throughout the keyboard or relatively in different parts thereof, at the will of the operator, substantially as described.

3. In a mechanical playing attachment for musical instruments, the combination of a series of shoes 38 for transmitting movement to the respective key-strikers; a series of le-



vers 33 to the central part of which the shoes  
are pivoted; striker-rods 34 on which the re-  
spective levers 33 act at one end; bearing-  
springs 43 resisting the movement of the other  
5 end of said levers; a common bar 42 bearing  
on the springs 43; and means for depressing  
the ends of the bar relatively or simultane-  
ously at the will of the operator in order to  
produce variable strength of tone in different  
10 parts of the instrument, as explained.

4. In a mechanical playing attachment for  
musical instruments, the combination of a se-  
ries of shoes 38 for transmitting movement to  
the respective key-strikers; a series of levers  
15 33 to the central part of which the shoes are

pivoted; striker-rods 34 on which the respec-  
tive levers 33 act at one end; bearing-springs  
43 resisting the movement of the other end of  
said levers; a common bar 42 bearing on the  
springs 43; a yielding rest 49 for the said bar, 20  
intermediate of its ends; a spring 50 support-  
ing said rest; and means for depressing the  
ends of the bar relatively or simultaneously  
at the will of the operator in order to produce  
variable strength of tone in different parts of 25  
the instrument, as explained.

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