

A. A. AARONS.  
 AUTOMATIC PIANO PLAYER.  
 APPLICATION FILED FEB. 5, 1910.

973,839.

Patented Oct. 25, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

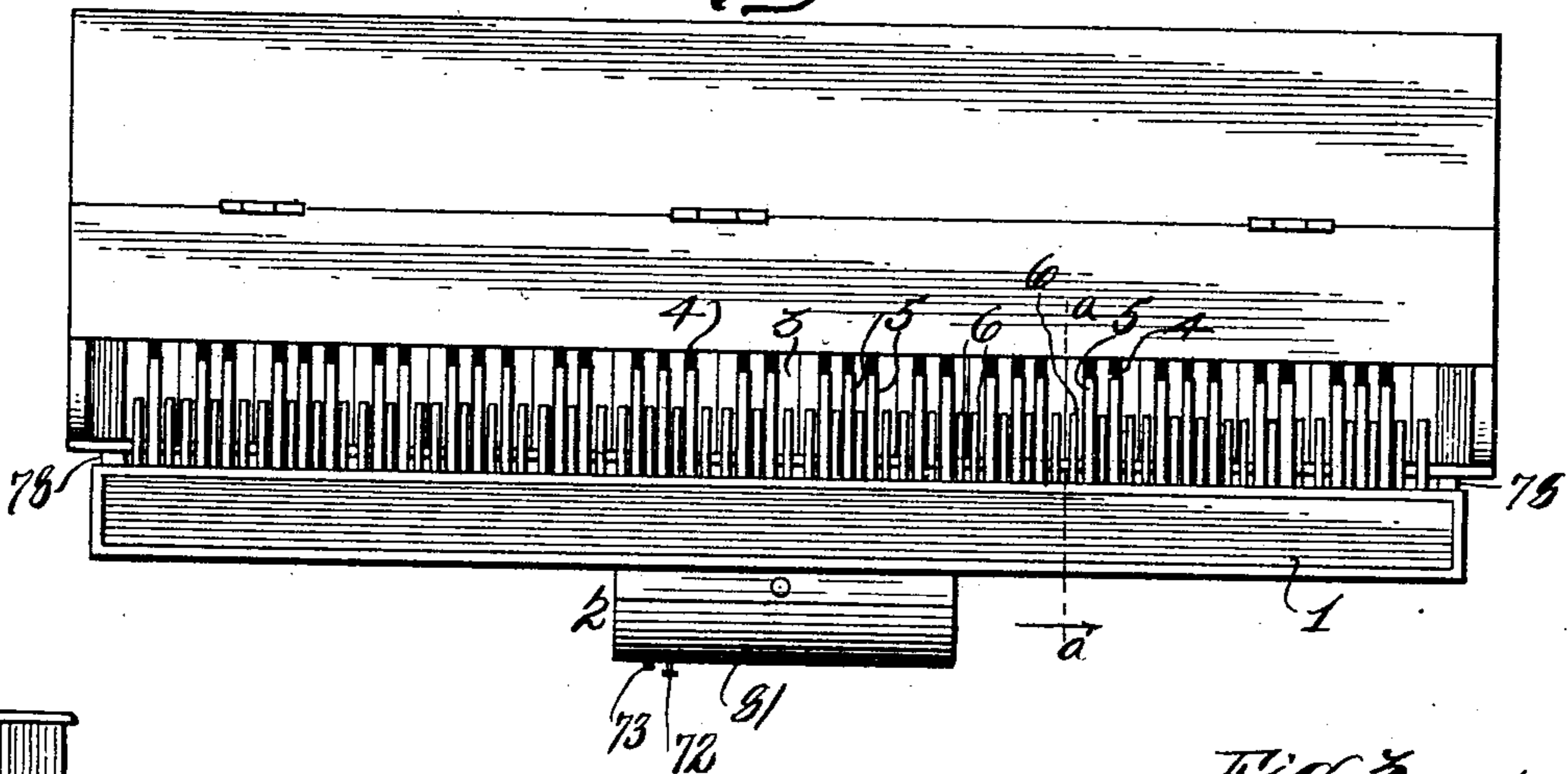


Fig. 2.

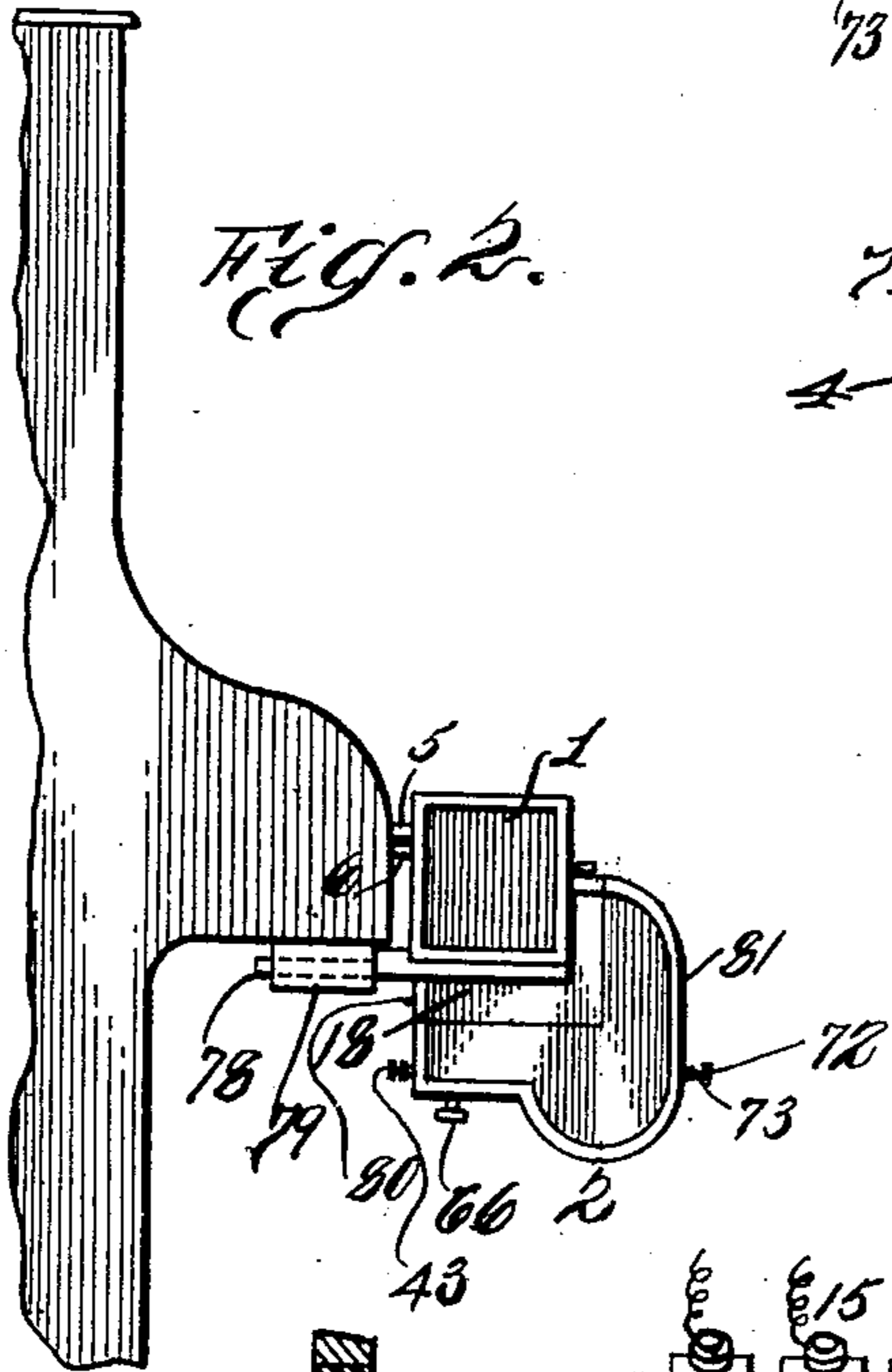


Fig. 3.

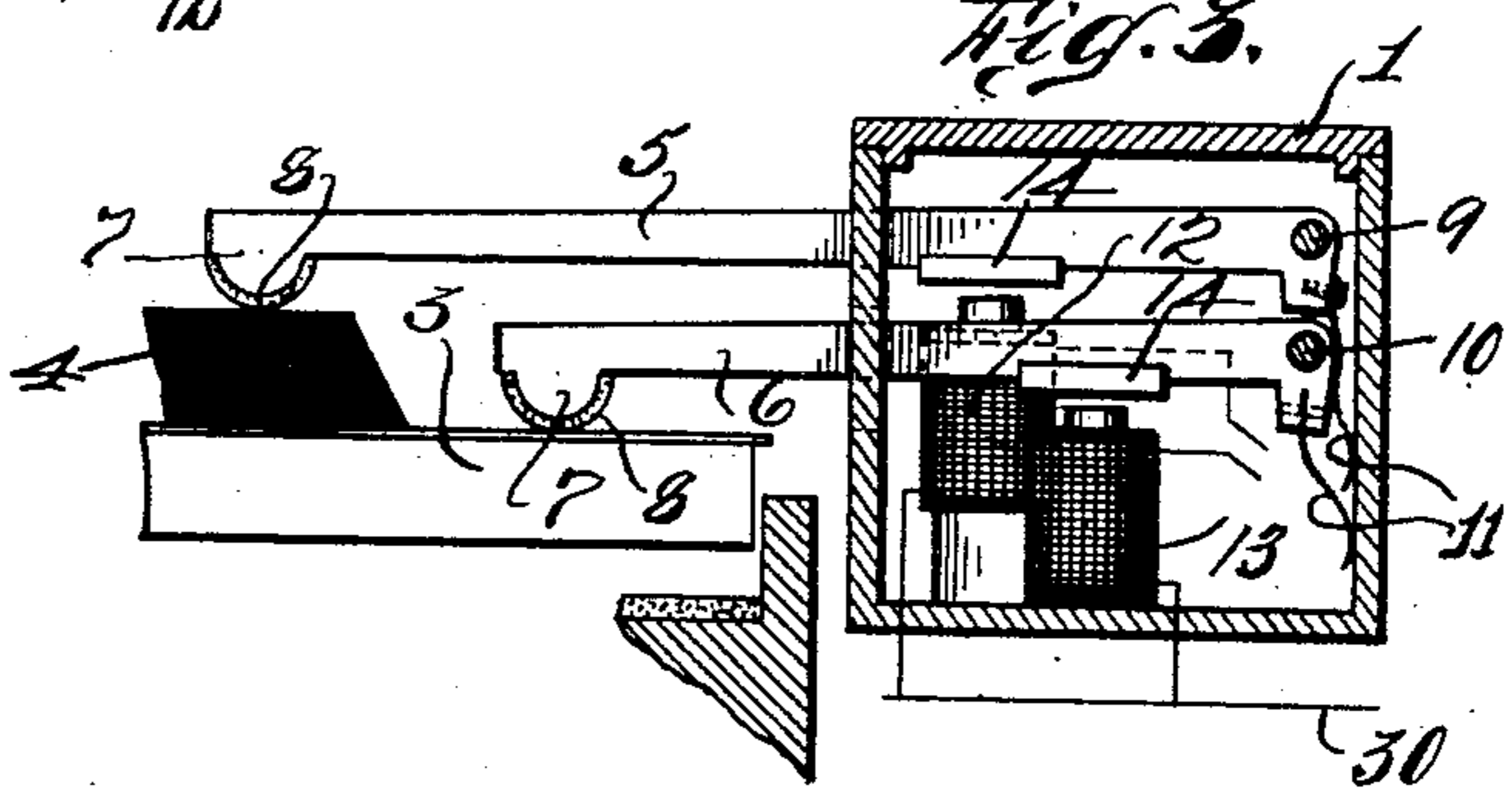


Fig. 4.

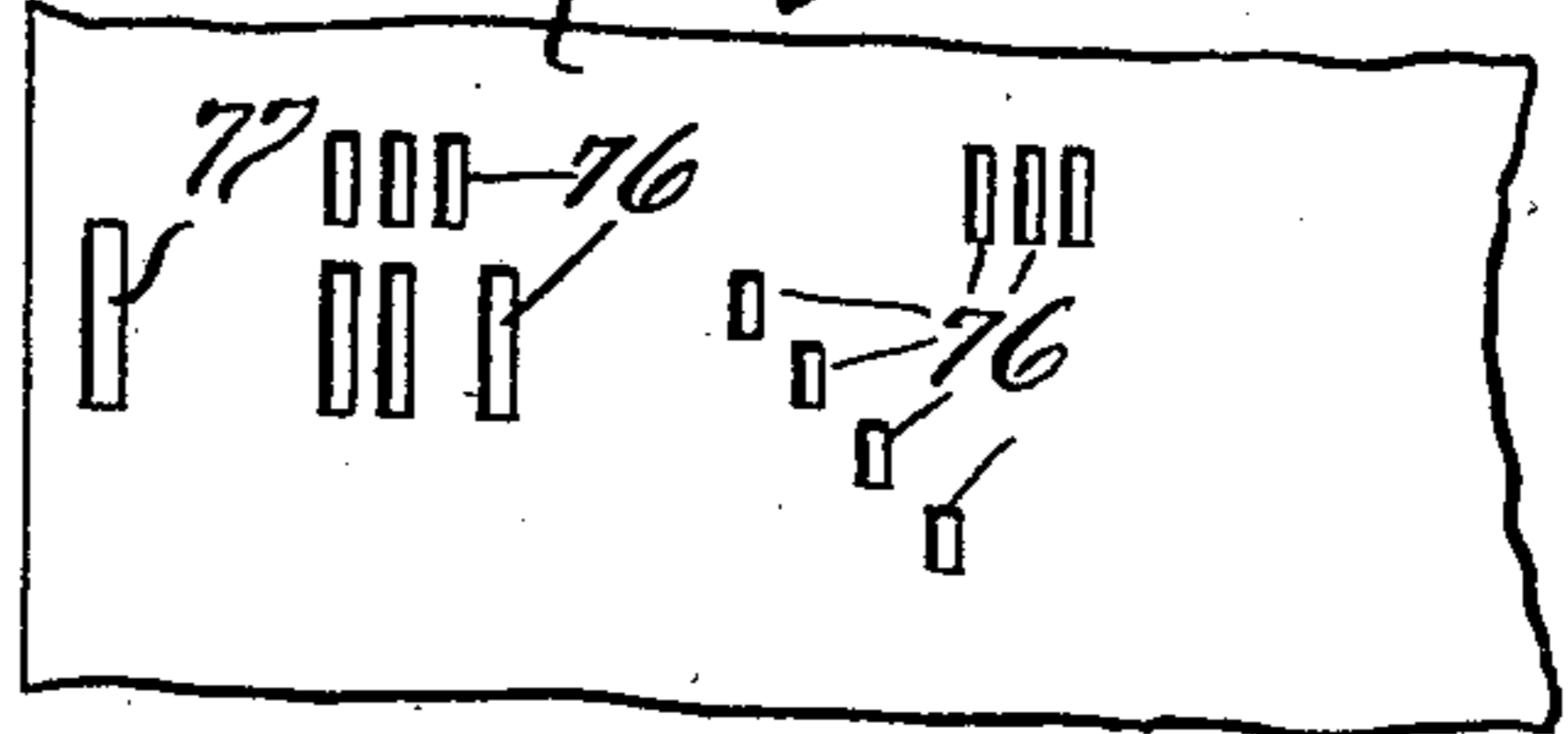


Fig. 5.

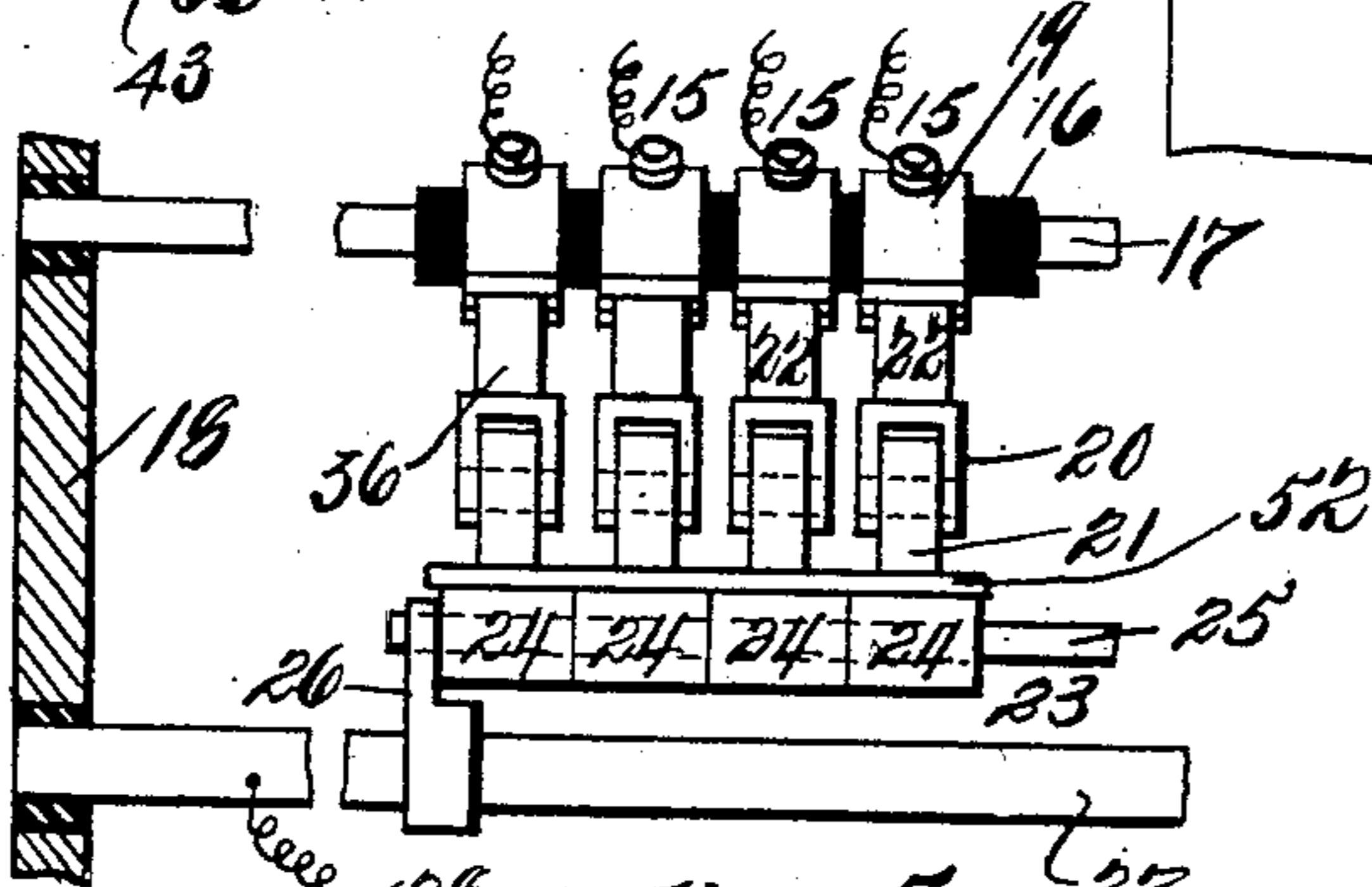
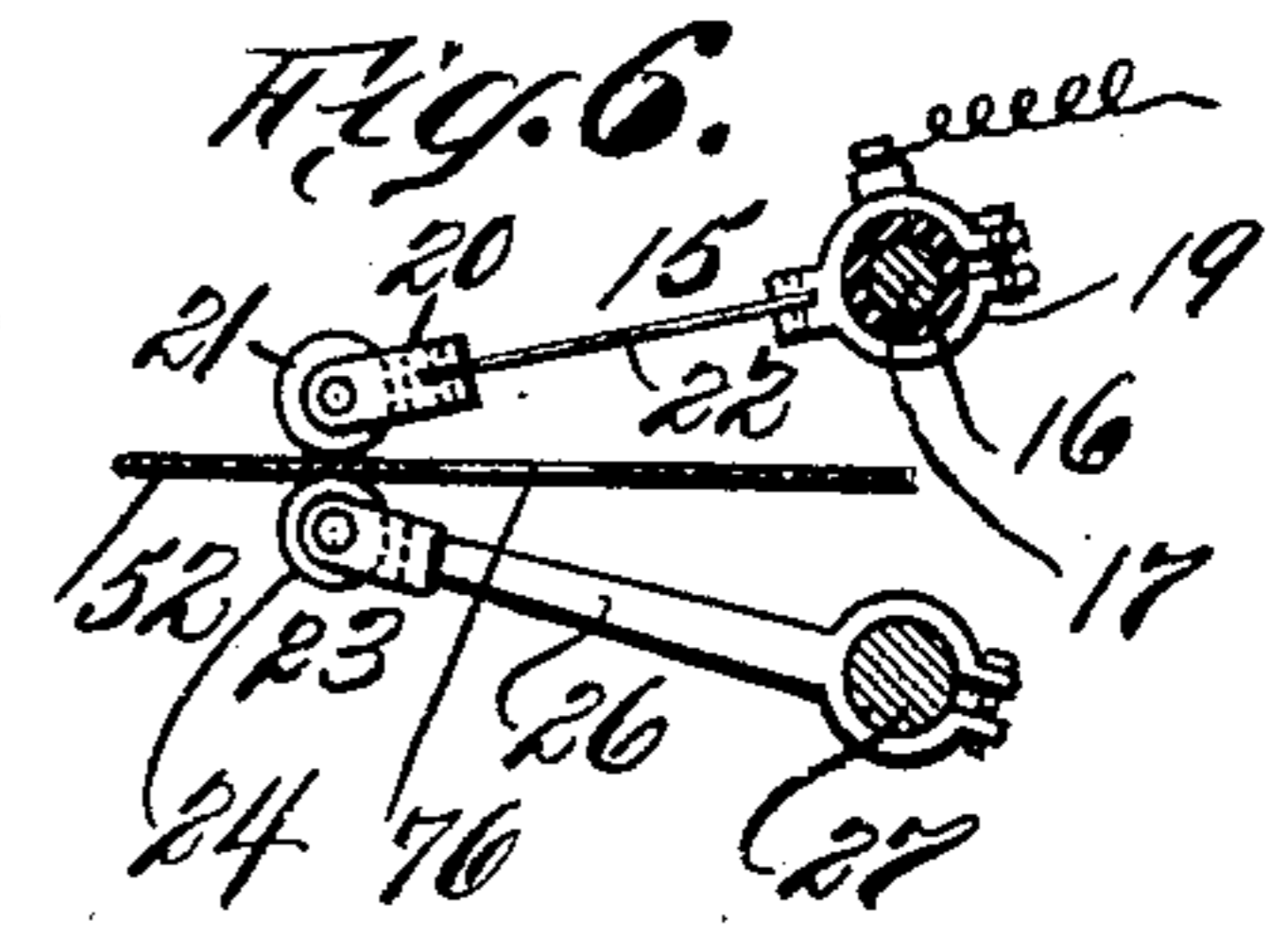


Fig. 6.



Witnesses:  
 C. A. Jarvis  
 Estelle O. Hamburger.

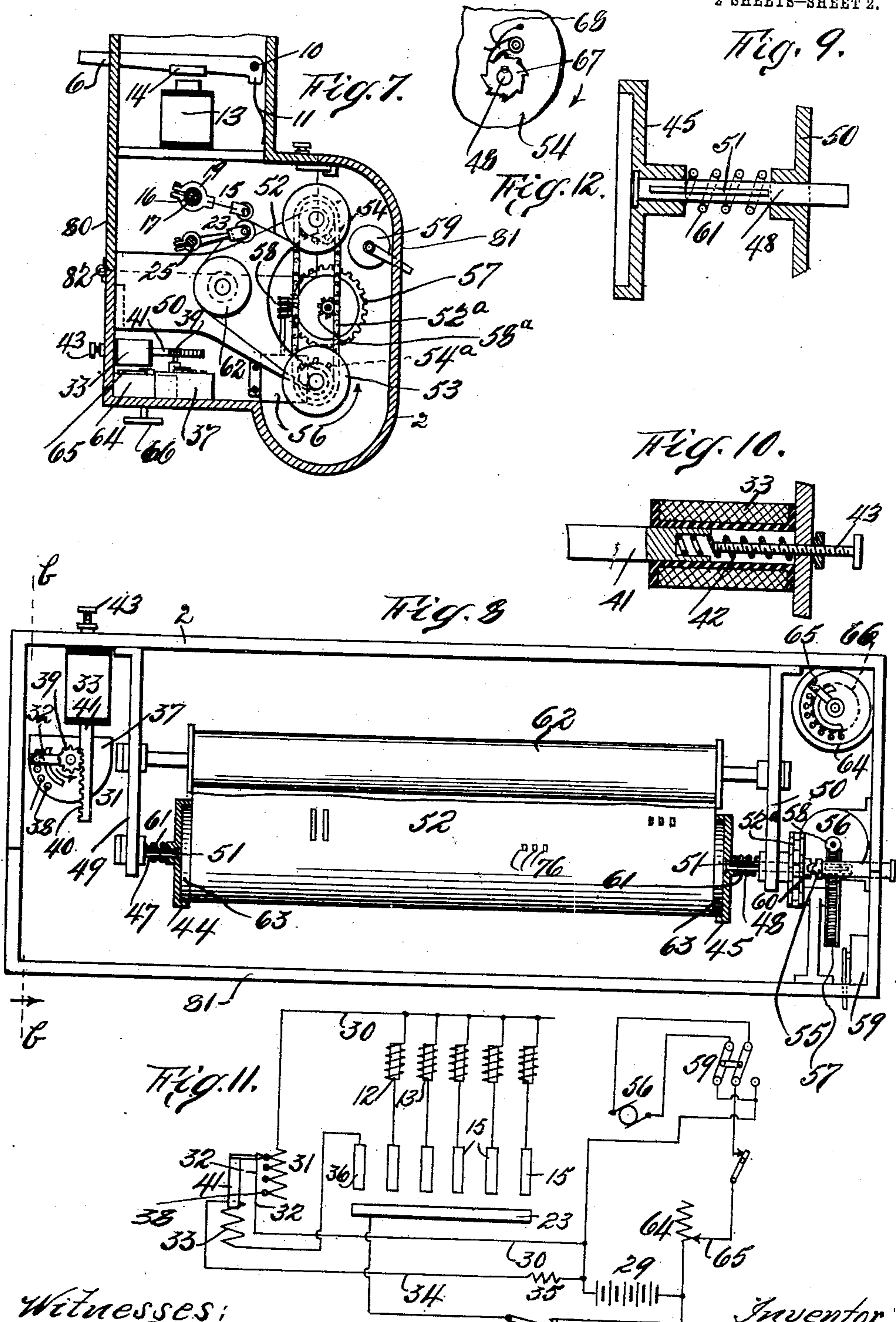
Inventor:  
 Alexander A. Aarons  
 by *Wm. B. Bloch*  
 attorney.

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2 SHEETS—SHEET 2.



Witnesses:  
E. A. Jarvis  
Estelle O. Hamburger.

Inventor  
Alexander A. Aarons  
by *Wm. V. Block*  
attorney.

# UNITED STATES PATENT OFFICE.

ALEXANDER A. AARONS, OF NEW YORK, N. Y.

AUTOMATIC PIANO-PLAYER.

973,839.

Specification of Letters Patent.

Patented Oct. 25, 1910.

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*To all whom it may concern:*

Be it known that I, ALEXANDER A. AARONS, a citizen of the United States, residing at the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Automatic Piano-Players, of which the following is a clear, full, and exact description.

This invention relates to an automatic electro-magnetically operated device which is adapted for application to any piano for the purpose of acting upon the sound-producing elements thereof to produce music.

In practice I preferably embody my improvement in the form of an attachment that may be detachably secured to the casing of a piano, the said attachment being designed to be supported wholly by the piano and having no legs, or other supporting elements, which rest upon a floor.

My improved device, as herein illustrated, is in the form of an elongated box which extends substantially the full length of the piano, the said box containing elements which coöperate to actuate and control the actuation of the sound-producing devices of the piano.

Other features of my improvement will hereinafter appear.

I will now proceed to describe my invention, the novel features of which I will finally claim, reference being had to the accompanying drawings, forming part hereof, wherein:

Figure 1 is a top plan view of an upright piano having my improved device attached thereto; Fig. 2 is a fragmentary side view of an upright piano showing an end elevation of my improvement; Fig. 3 is an enlarged cross-sectional detail view, the section being taken on a line *a—*a** in Fig. 1 and looking in the direction of the arrow, showing the arrangement of the electro-magnets relative to their coöperating key-depressing levers, a portion of a white key and a black key being also shown; Fig. 4 is a fragmentary plan view of the perforated music roll which, as it passes between contacts, controls the actuation of the key-levers; Fig. 5 is an enlarged fragmentary front view of a number of coöperating contacts; Fig. 6 is an enlarged sectional side elevation of some of the contacts, showing the perforated music roll therebetween; Fig. 7 is an enlarged vertical

sectional view, the section being taken through one end of the box, the section being indicated by the line *b—b* in Fig. 8, the end frame adjacent thereto being removed; Fig. 8 is a plan view, the box and upper part of the receptacle being removed; Fig. 9 is an enlarged detail sectional view of one of the upper roll supporting devices; Fig. 10 is an enlarged sectional view of an operating magnet for the rheostat; Fig. 11 is a diagrammatic view of the electrical wiring which I employ; and Fig. 12 is a modified form of connection between the music roll rotating ratchet and spindle.

My improved automatic piano-playing device, as herein embodied and illustrated, comprises an elongated box, or casing, 1 (see Fig. 1) provided with an auxiliary receptacle 2 within which are placed the music-roll, operating mechanism therefor, and the contacts which coöperate with the music-roll to complete the circuit for the electro-magnets.

As the perforated sheet which controls the operation of my electro-magnets is known in the trade as a music-roll, I will hereinafter refer to same as a music-roll.

The devices which I have, in this instance, employed to actuate the white keys 3 and black keys 4 of the piano consist of levers or arms 5 and 6, having rounded projections 7, provided with a pad 8 of rubber, leather, felt or the like. As can be seen in Fig. 3, the levers 5 and 6 are pivotally mounted upon rods 9 and 10, respectively, the said levers being provided with springs 11 adapted to hold the outer ends of said levers upwardly when the device is removed from the piano. The rods 9 and 10 extend the entire length of the box 1 and support all of the levers or arms 5 and 6. To actuate or pull downwardly the arms 5 and 6, I employ electro-magnetic devices, in this instance, electro-magnets 12 and 13 respectively, which act upon armatures 14 carried by the said levers. Each magnet 12 for the longer arms 5 and each magnet 13 for the shorter arms 6 is connected to a circuit-closer 15, as can be seen in Fig. 11, the said circuit-closers being shown in Figs. 5 and 6. Each of the circuit-closers 15 is adapted to aid in closing the circuit for its connected magnet independently of the rest of the said circuit-closers, and to render the said circuit-closers independent I mount the same upon a

sleeve 16 of insulating material (see Figs. 5 and 6). The sleeve 16 is carried by a rod 17 which extends the length of the receptacle 2. In Fig. 5 is illustrated one end 18 of the said receptacle 2.

The circuit-closers 15 consist of a clamp-member 19, a jaw-member 20, provided with a roller 21, and a spring-member 22, preferably of spring brass, which ties the said clamp-member 19 and jaw-member 20 together. The spring-member 22 tends to force the roller 21 downwardly by its own resiliency, as the member 19 is tightly clamped to the sleeve 16, which, together with its supporting rod 17, is fixed or immovable.

To cooperate with the circuit-closers 15, I have provided a contact 23, which consists of a plurality of sleeves 24 rotatably mounted upon a rod 25, which in turn is supported, at each end thereof, (one only being shown) by an arm 26 firmly clamped to a fixed rod 27 carried, at each end thereof, by the end walls of the receptacle 2. The contact 23 is electrically connected by a wire 28 to one side of a source of electrical energy 29 (see Fig. 11), the other side of the source of electrical energy being connected to all of the magnets 12 and 13 by a wire 30. The magnets 12 and 13, and their connected circuit-closers 15, are connected in parallel with the source of electrical energy 29.

To vary the strength of the current for the magnets 12 and 13, I interpose in the circuit 30, a variable resistance 31, the circuit-closer 32 of which is operated by a plunger-magnet (in this instance) 33. The magnet 33 is connected to one side of the source of electrical energy 29 by a wire 34, a resistance 35 being included in this leg of the circuit for the magnet 33. The magnet 33 is also connected to a circuit-closer 36, the construction of which is the same as that of the circuit-closers 15. The circuit-closer 36 completes the circuit for the magnet 33 at certain predetermined periods during the travel of the music-roll with the aid of the contact 23. The function of the variable resistance, or rheostat 31 will hereinafter be explained. The function of the resistance 35 is to prevent the magnet 33 from getting current enough to short-circuit the magnets 13 and 12, when the magnet 33 is energized.

It may here be stated that as there are fifty-two white keys in a standard piano key-board, I employ that number of arms 6 and magnets 13, as well as arms 5 and magnets 12 for the black keys, there being a circuit-closer 15 for each white key and black key; also that there is a rotatable sleeve 24 for each circuit-closer 15, as well as one extra sleeve 24 for the circuit-closer 36 for the magnet 33.

Referring to Fig. 8, the rheostat 31 com-

prises a casing 37 which contains the resistance coils of any of the well-known forms. The coils in the casing 37 are connected in the usual manner to contacts 38 against which the circuit-closer 32 bears. The circuit-closer 32 carries a gear 39 which meshes with the teeth 40 of the plunger 41 of the magnet 33. The plunger 41 is returned after each actuation thereof by a compression-spring 42. The inward movement of the plunger 41 is regulated by an adjustable screw 43 (see Fig. 10). By means of the adjustable screw 43, I am able to regulate the extent of rotation of the circuit-closer 32 of the rheostat 31, whereby the amount of resistance offered to the current for the magnets 12 and 13 can be regulated for a purpose to be hereinafter explained.

The music-roll 52 (see Fig. 8), which I employ, is mounted at each end thereof, in cups 44 and 45, which are slidably mounted upon spindles 47 and 48 respectively, which in turn are rotatably mounted in the frame members 49 and 50. The spindles 47 and 48 are provided with keys or splines 51, which operatively connect the said spindles and cups. The spindle 48 extends through the frame member 50 and carries a sprocket wheel 54 (see Fig. 7) over which a sprocket chain 52<sup>a</sup> passes. The take-up, or lower roll 53 is also rotatably mounted in the frame members 49 and 50 and is adapted to take up the perforated music-roll as it is fed through the circuit-closers 15 and contact 23. The take-up roll 53 is rotated by a sprocket wheel 54<sup>a</sup> (see Fig. 7) over which the chain 52<sup>a</sup> passes. The sprocket wheel 54 is loosely mounted upon the spindle 48 and does not transmit any movement to the roll 52, while the said roll is being fed. After the roll 52 has been run out, it may be wound up again by throwing in a clutch 55, which is keyed to but adapted to slide upon the spindle 48.

To feed the roll 52, I provide an electric motor 56 which operates a worm-gear 57 by means of a worm 58. When the chain 52<sup>a</sup> is operated, by the sprocket pinion 58<sup>a</sup> the take-up roll 53 imparts movement to the music-roll by winding it thereupon. After the roll 52 has run out it may be rewound by causing the motor to run in the opposite direction, by means of a pole-changer 59 (see Fig. 11), after the clutch 55 has been caused to engage the clutch-jaw member 60 (see Fig. 8) on the sprocket 54.

To place the roll 52 in the cups 44 and 45, it is but necessary to pull the cups toward their respective frame members against the tension of a spring 61 on each spindle. Movement is transmitted to the roll 52 through the cup 45 by virtue of the pressure of the spring 61, the cup 44 acting as a support or alining device only. A roller 62 is provided (see Fig. 7) for the music-roll to

pass over. As can be seen in Fig. 8 each end of the reel 63 upon which the roll 52 is wound is located in an adjacent cup.

The speed of the motor 56 is controlled by a rheostat 64. To operate the circuit-closer 65 of the rheostat 64, I employ a hand wheel 66.

The music-roll 52 which I employ is of a well-known form, having perforations 76 therein, which are disposed relatively to the contacts 15, so as to cause the magnets 12 and 13 to operate the keys of the piano to produce music. As the roll 52 travels between the circuit-closers 15 and sleeves 24 of the contact 23, the said circuit-closers and contact will complete the circuit for any of the magnets 12 and 13, whenever a perforation permits the corresponding circuit-closers to strike the contact 23. When a circuit, or circuits, is, or are, closed, the magnets, corresponding to the circuit-closers 15 which strike the contact 23 (which in turn correspond to certain keys on the key-board of the piano) will become energized and pull down their respective arms 5 or 6. When the arms are pulled down the keys, which they contact with, will be depressed, whereby a note or notes of music will result. As the action of an armature, when acted upon by a magnetic field, is quick, the effect upon the key will be more or less staccato; hence the hammer will be caused to strike the strings a sharp or quick blow which will cause the strings to vibrate quickly and not with the muffled vibration usually resulting with the pneumatically-operated automatic piano-playing devices.

A further feature of my improvement comprises the rheostat 31 and means of operating same. It is usual in the so-called self-playing attachments, to soften the music by means of a manually operable device, but in connection with other features of my invention, I have incorporated an automatically operable device to throw into the line, or circuit, for the magnets which depress the keys, sufficient resistance to weaken the said magnets, whereby the keys are depressed with less force. I have, furthermore, provided means whereby any desired resistance may be thrown into the line, whereby I am able to soften the music to any desired extent.

To carry out the above named operation automatically, I provide the music-roll 52 with extra perforations 77, one only being shown in Fig. 4. The said perforations are positioned to permit the circuit-closer 36 to strike the contact 23 whenever the said perforations register therewith. It will be, of course, understood that a perforation 77 will be placed opposite only to the notes or chords that are to be softly played, the length of the perforations being determined by the number of measures of music that are to be

softly played. The perforation 77 is preferably started a little in advance of the opposite perforations 76 in order to give the circuit-closer 32 time to reach the desired contact 38 before the key-magnets are energized. By adjusting the screw 43 inwardly or outwardly the extent of the movement of the plunger 41 can be regulated, which in turn controls the extent of movement of the circuit-closer 32 and consequently the amount of resistance thrown into the line. The normal position of the contact 32 cuts all resistance out of the circuit for the key-magnets.

Fig. 11 illustrates the circuit for the motor 56.

To attach the box 1 to the piano, I provide the same with brackets 78 which are adapted to enter sockets 79 on the under side of the key-board portion of the casing (see Fig. 1).

The rotatable sleeves 24 act as a roller-bearing for the music-roll as well as contacts for the circuit-closers 15. The rollers 21 of the circuit-closers 15 and the rotatable contacts 24 not only serve to complete the circuits for the key-magnets, but they also facilitate the feeding of the music-roll.

The receptacle 2 is in two parts, 80 and 81, hinged at 82, in order that the part 81 may be swung open in order to have access to the mechanism in said receptacle (see Fig. 7).

In Fig. 12 is illustrated another form of device which I am able to adopt for the purpose of transmitting to the roll 52 movement, when I desire to rewind the said roll. The device referred to comprises a ratchet 67, which is rigidly secured to the spindle 48, and a pawl 68, which is mounted upon the loosely mounted sprocket wheel 54. When the motor 56 is caused to operate in a direction to rewind the roll 52 the pawl 68 on the sprocket wheel 54 will engage the teeth of the ratchet 67, whereby the cup 45 will be rotated and the reel 52 rewound. While the roll 52 is being fed, as indicated by the arrow in Fig. 12, the pawl 68 will jump the teeth of the ratchet 67.

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

1. In a piano-playing device, a plurality of electrically operated devices for actuating the keys of a piano, a parallel circuit for each of said electrical devices, means for controlling the flow of current to said electrical devices, a common conductor for said parallel circuits, a rheostat located in said common conductor provided with a movable circuit-closer, means for actuating said circuit-closer and an adjustable device for controlling the extent of operation of said circuit-closer.

2. In a piano-playing device, a plurality of electrically operated devices for actuating

the keys of a piano, a parallel circuit for each of said electrical devices, means for controlling the flow of current to said electrical devices, a common conductor for said parallel circuits, a rheostat located in said common conductor, provided with a movable circuit-closer, means for actuating said circuit-closer, said means comprising a solenoid and a longitudinally movable core actuated thereby, and means for controlling the extent of movement of said core.

3. In a piano-playing device, a plurality of electrically operated devices for actuating the keys of a piano, a parallel circuit for each of said electrical devices, means for controlling the flow of current to said electrical devices, a common conductor for said parallel circuits, a rheostat located in said common conductor, provided with a movable circuit-closer, means for actuating said circuit-closer, said means comprising a solenoid and a longitudinally movable core actuated thereby, and an adjustable screw for

controlling the extent of movement of said core.

4. In a piano-playing device, a plurality of electrically operated devices for actuating the keys of a piano, a parallel circuit for each of said electrical devices, means for controlling the flow of current to said electrical devices, a common conductor for said parallel circuits, a rheostat located in said common conductor, provided with a plurality of contacts and a pivotally mounted circuit-closer, a gear carried by said circuit-closer, a rack in engagement with said gear, an electrical device for actuating said rack, and an adjustable screw for controlling the extent of operation of said rack.

Signed at New York city, N. Y., this 2d day of February, 1910.

ALEXANDER A. AARONS.

Witnesses:

EDWARD A. JARVIS,  
ESTELLE O. HAMBURGER.