

J. F. WHITE.  
ELECTRICAL MECHANICAL PLAYER FOR MUSICAL INSTRUMENTS,  
APPLICATION FILED JUNE 5, 1908.

975,187.

Patented Nov. 8, 1910.

6 SHEETS—SHEET 1.

Fig. 1

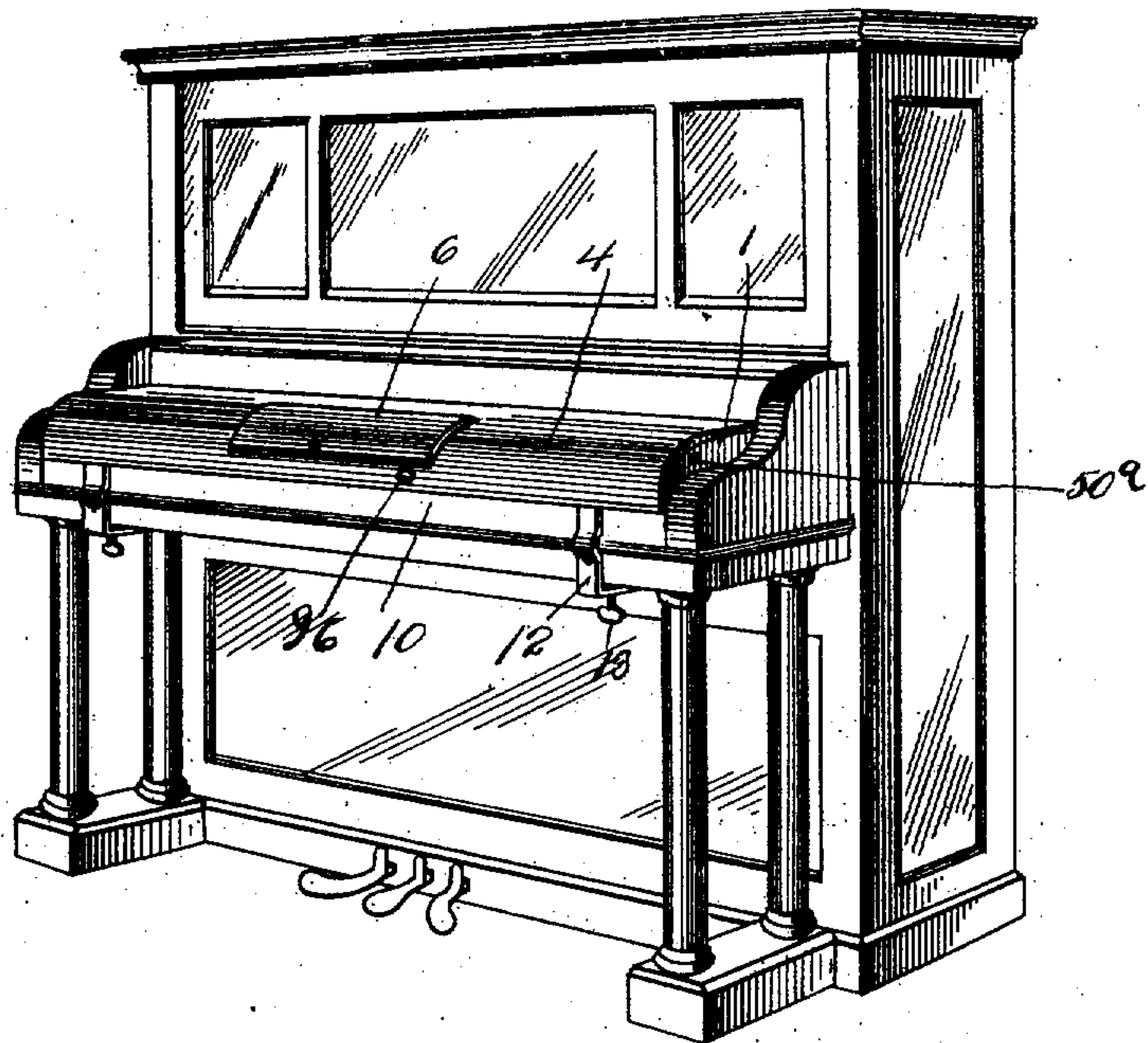
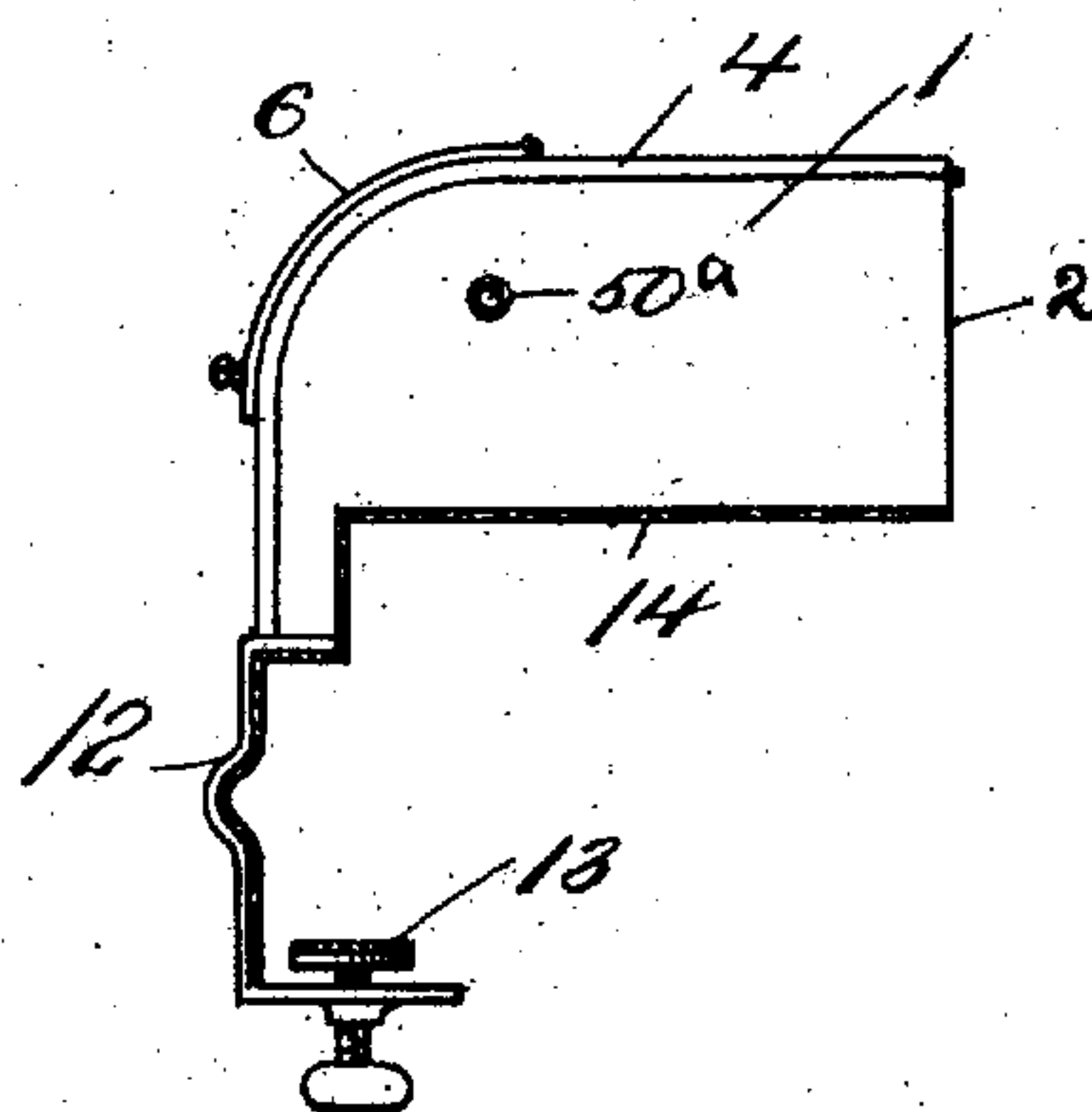


Fig. 2



Witnesses

Samuel Payne  
W. H. Butler

Inventor

John F. White

By

H. Evert & Co.

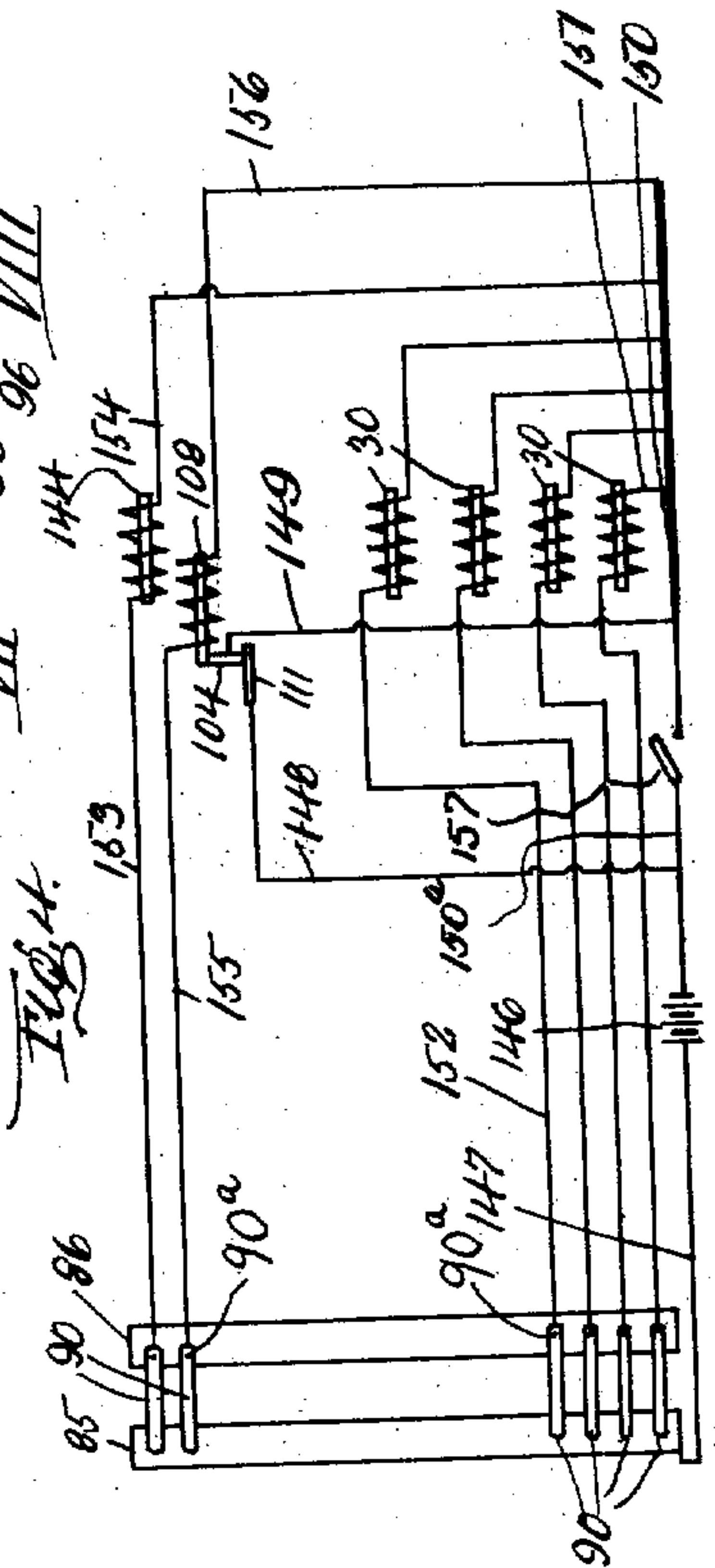
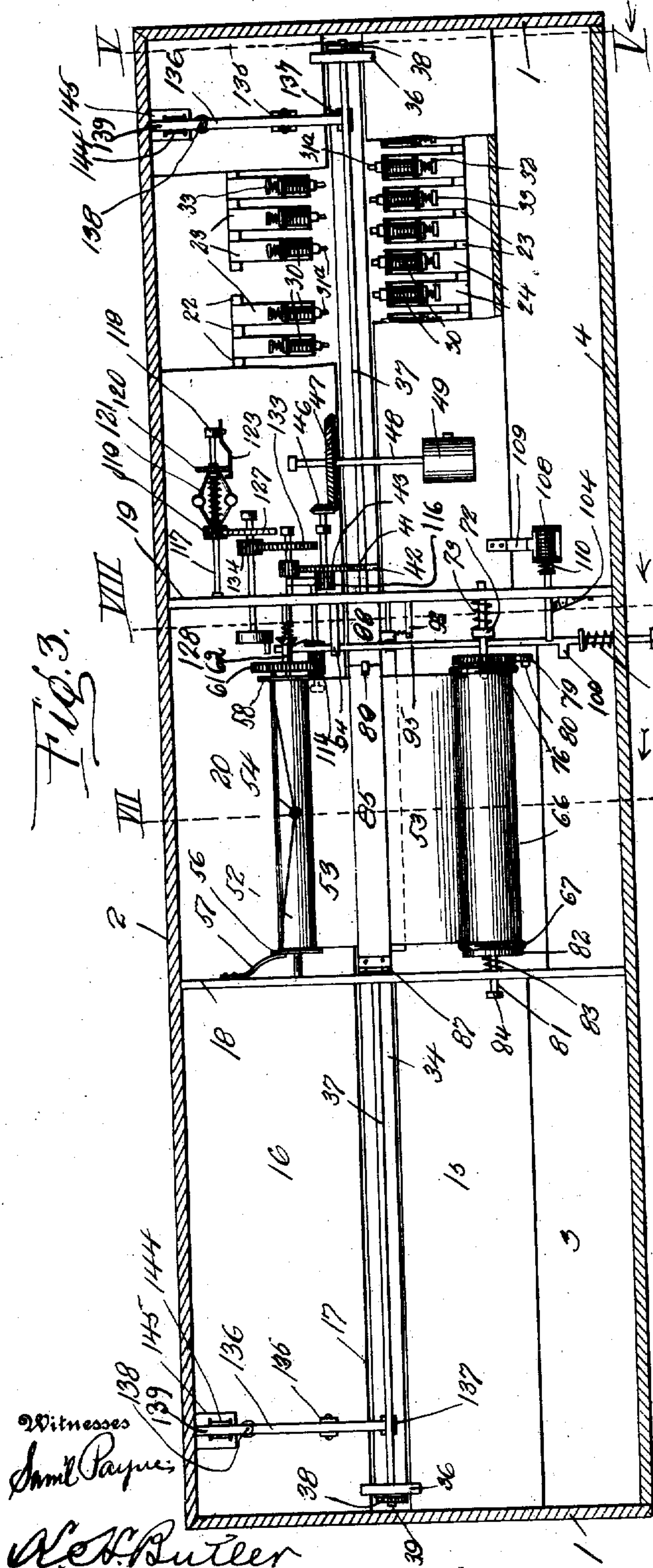
Attorneys

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8 SHEETS—SHEET 2.



Inventor  
John F. White.

By H. C. Evert & Co.

Attorneys

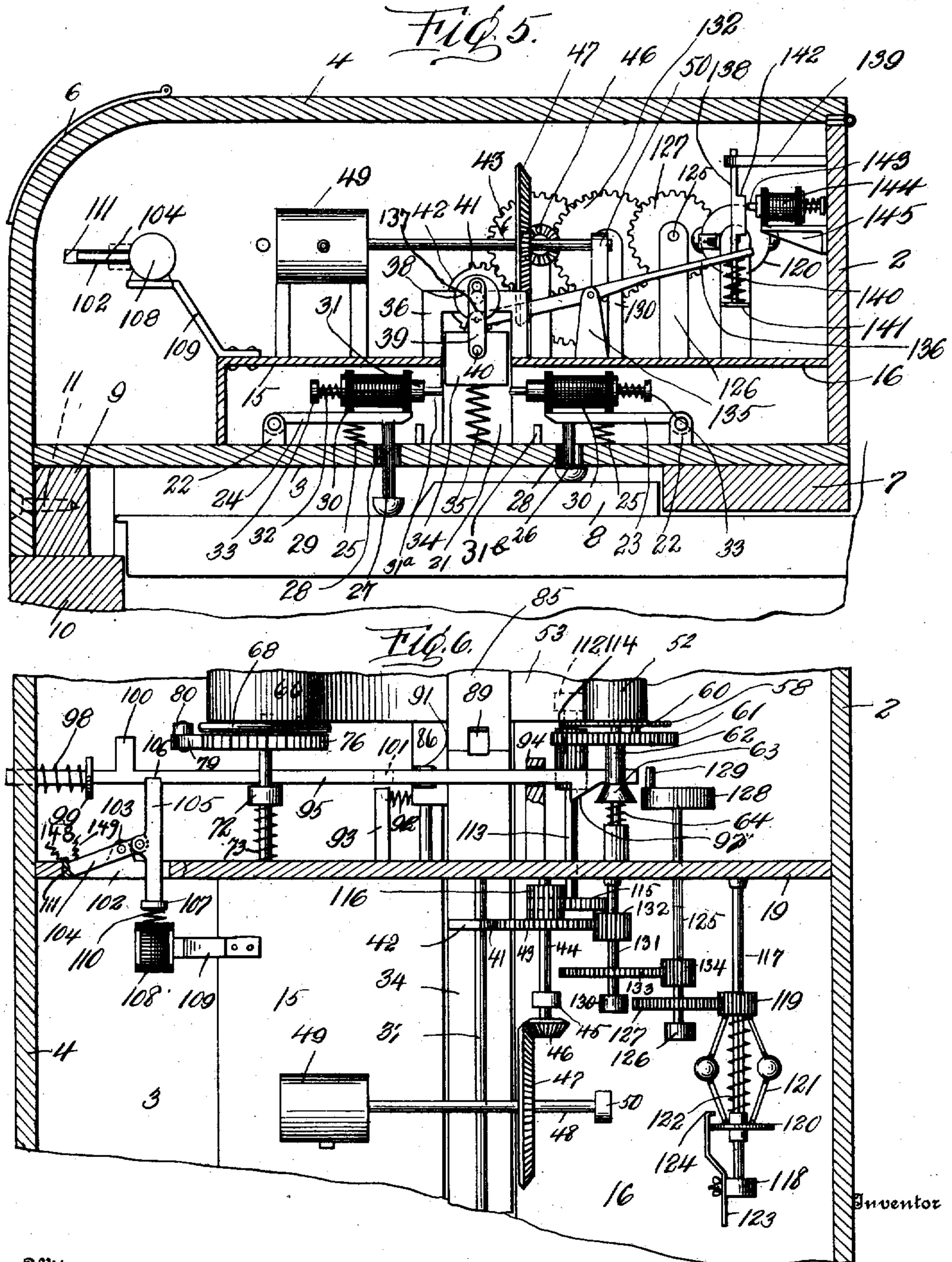


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6 SHEETS—SHEET 3.



Witnesses

*Samuel Payne.*  
*W. H. Butler*

*John F. White.*

By

*H. C. Evert & Co.*

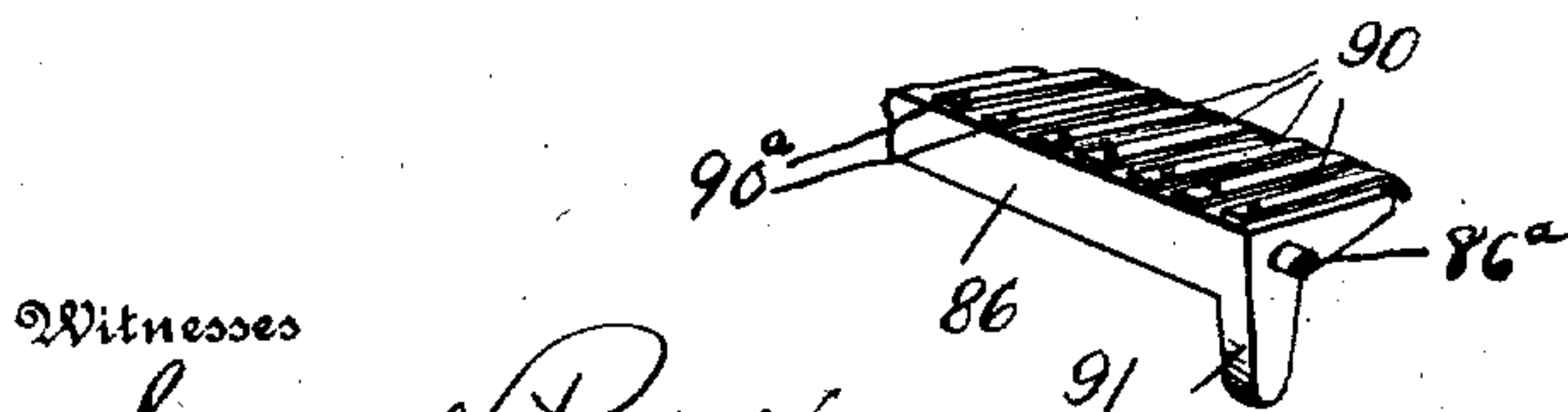
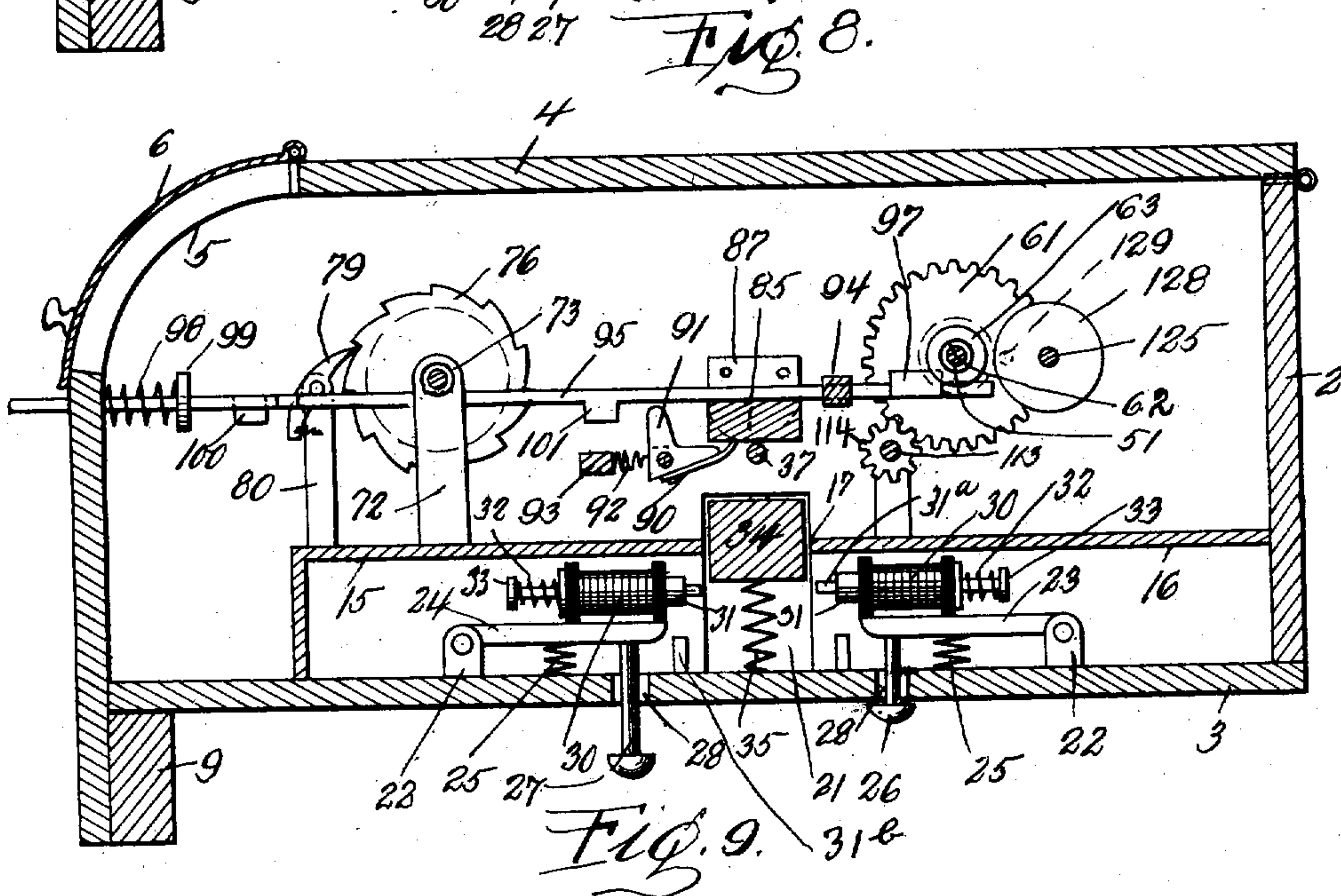
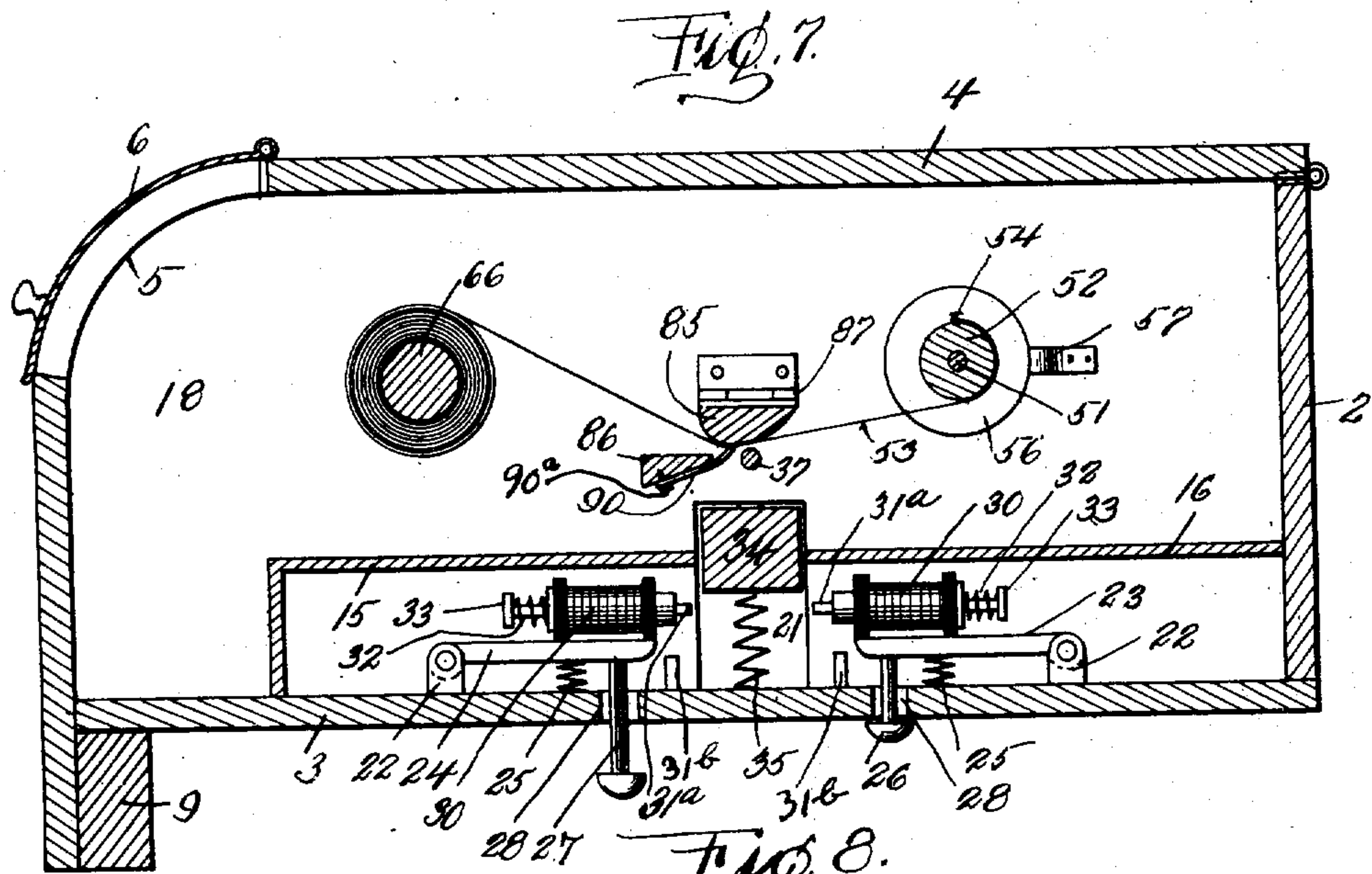
Attorneys

J. F. WHITE.  
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APPLICATION FILED JUNE 6, 1908.

975,187.

Patented Nov. 8, 1910.

8 SHEETS—SHEET 4.



Witnesses

Samuel Payne.  
O. N. Miller

Inventor

John F. White.

By H. Ewert & Co.

Attorneys

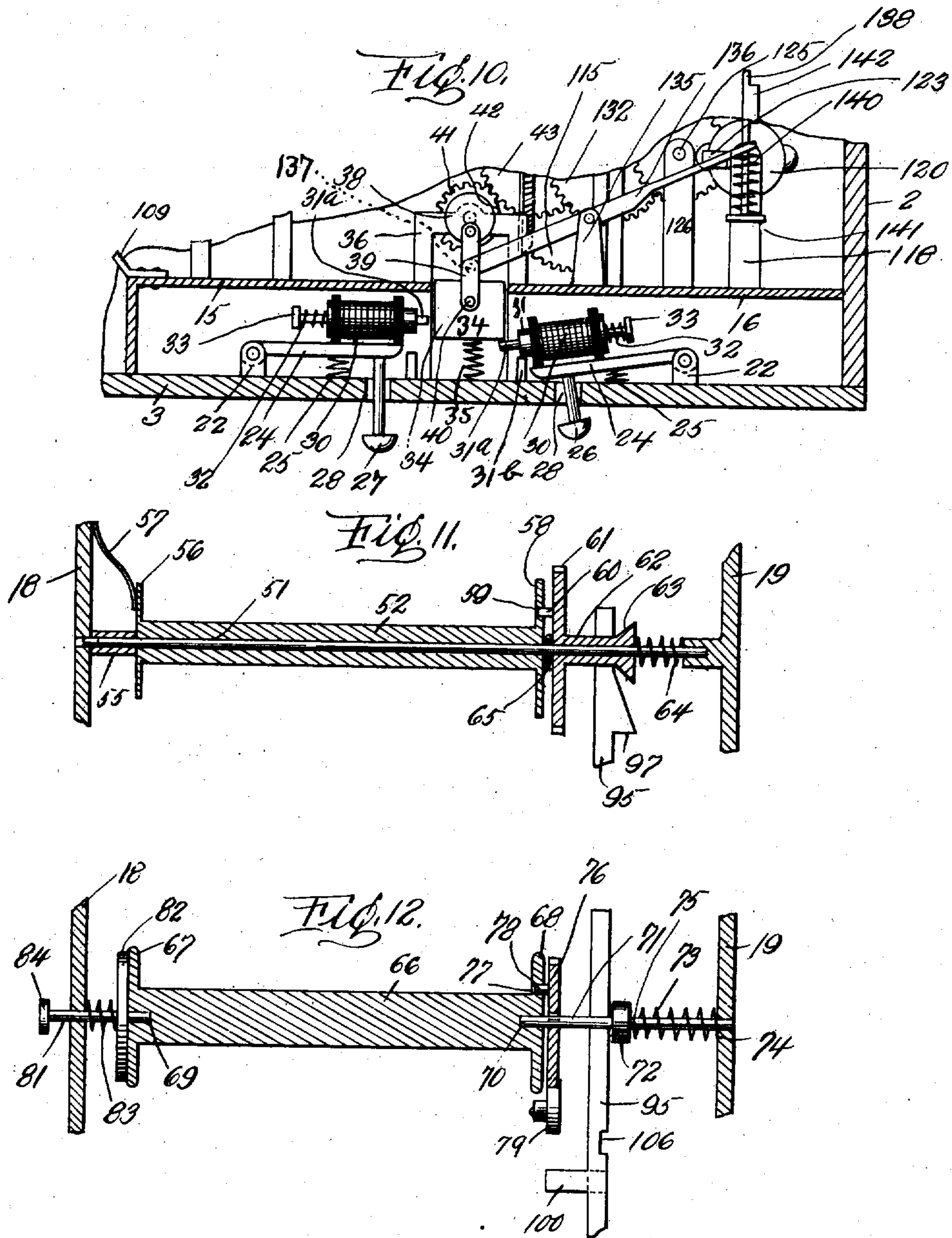


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6 SHEETS—SHEET 5.



Witnesses  
Samuel Payne  
Rev. Butler

Inventor  
John F. White.

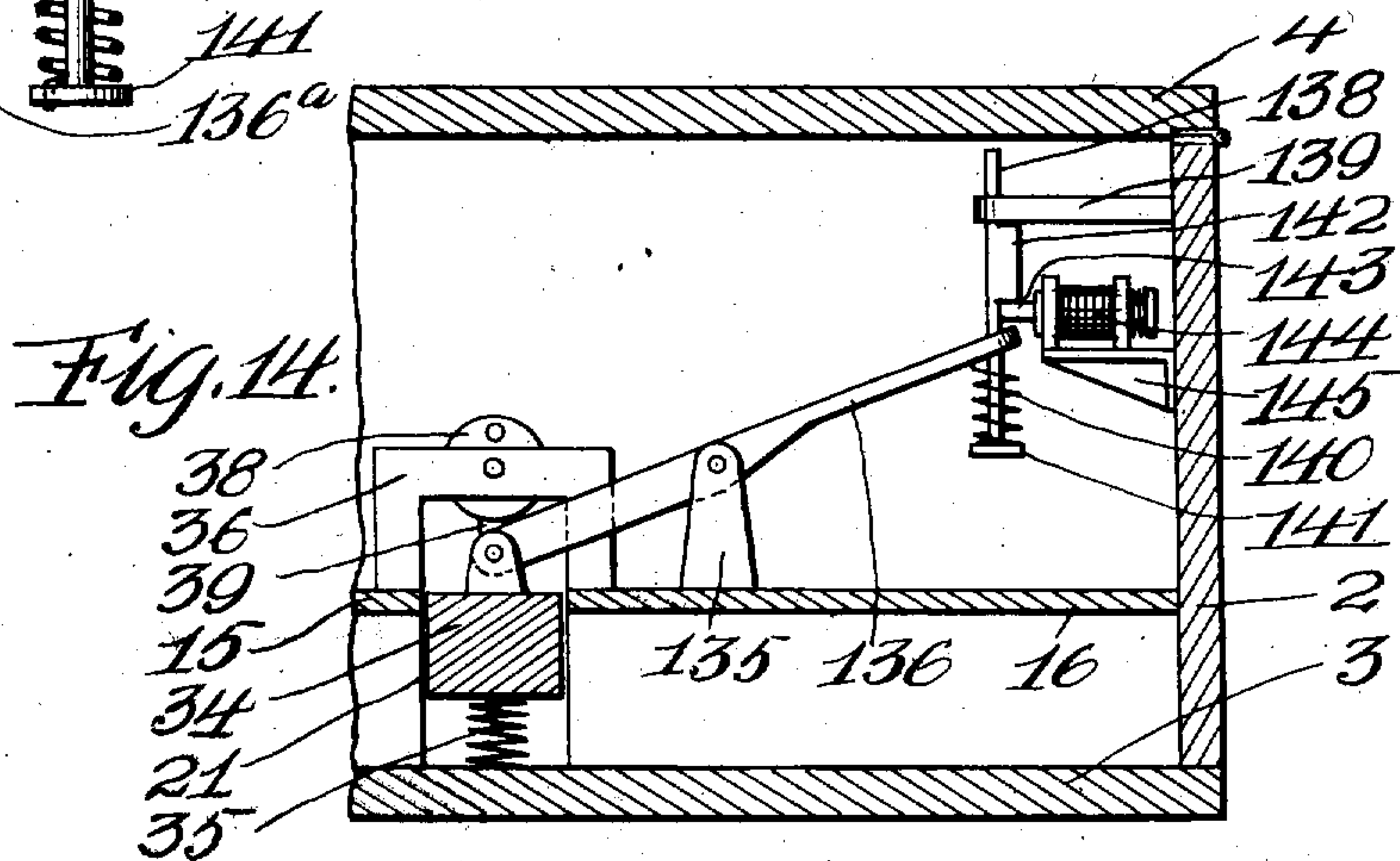
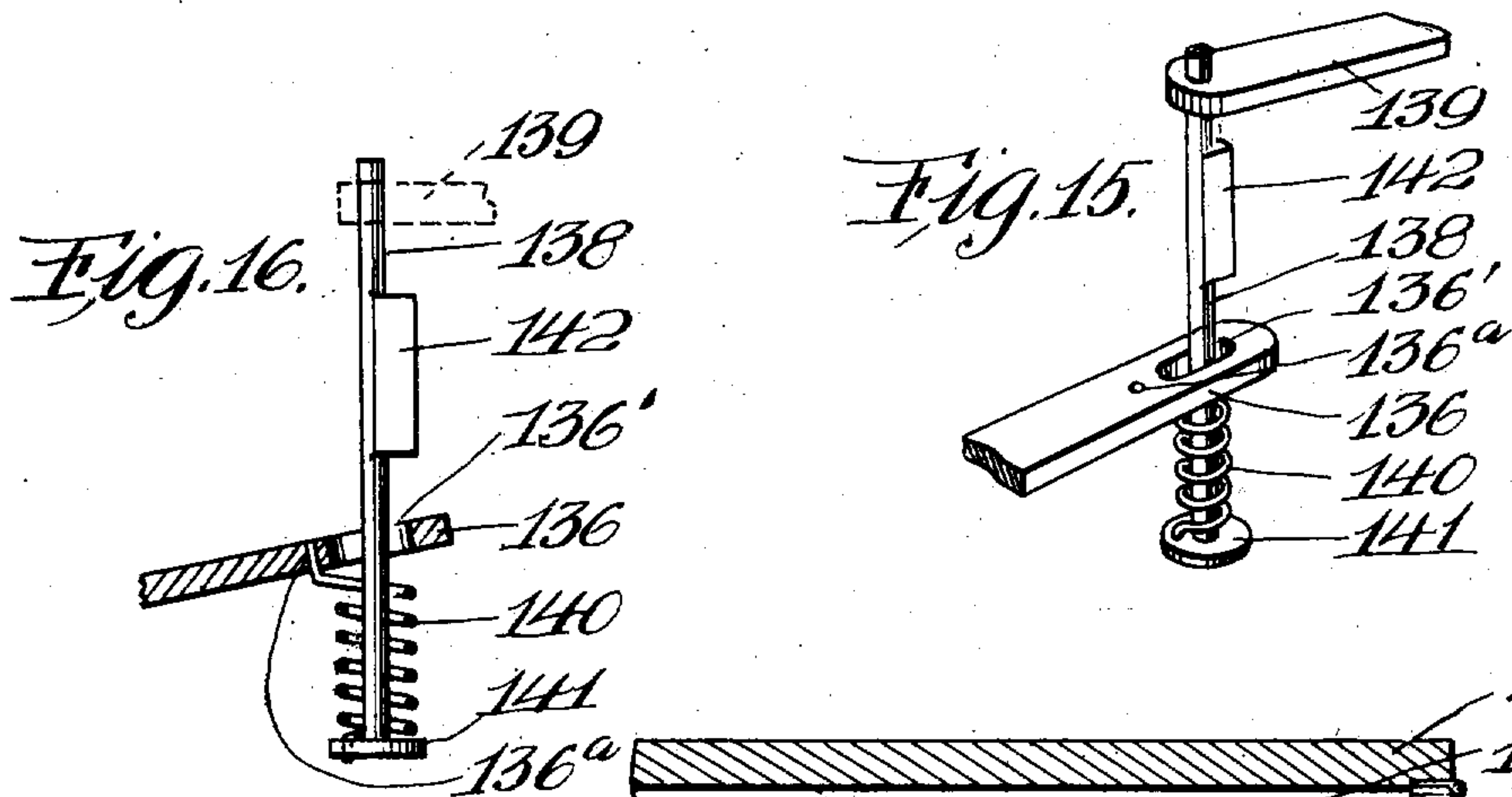
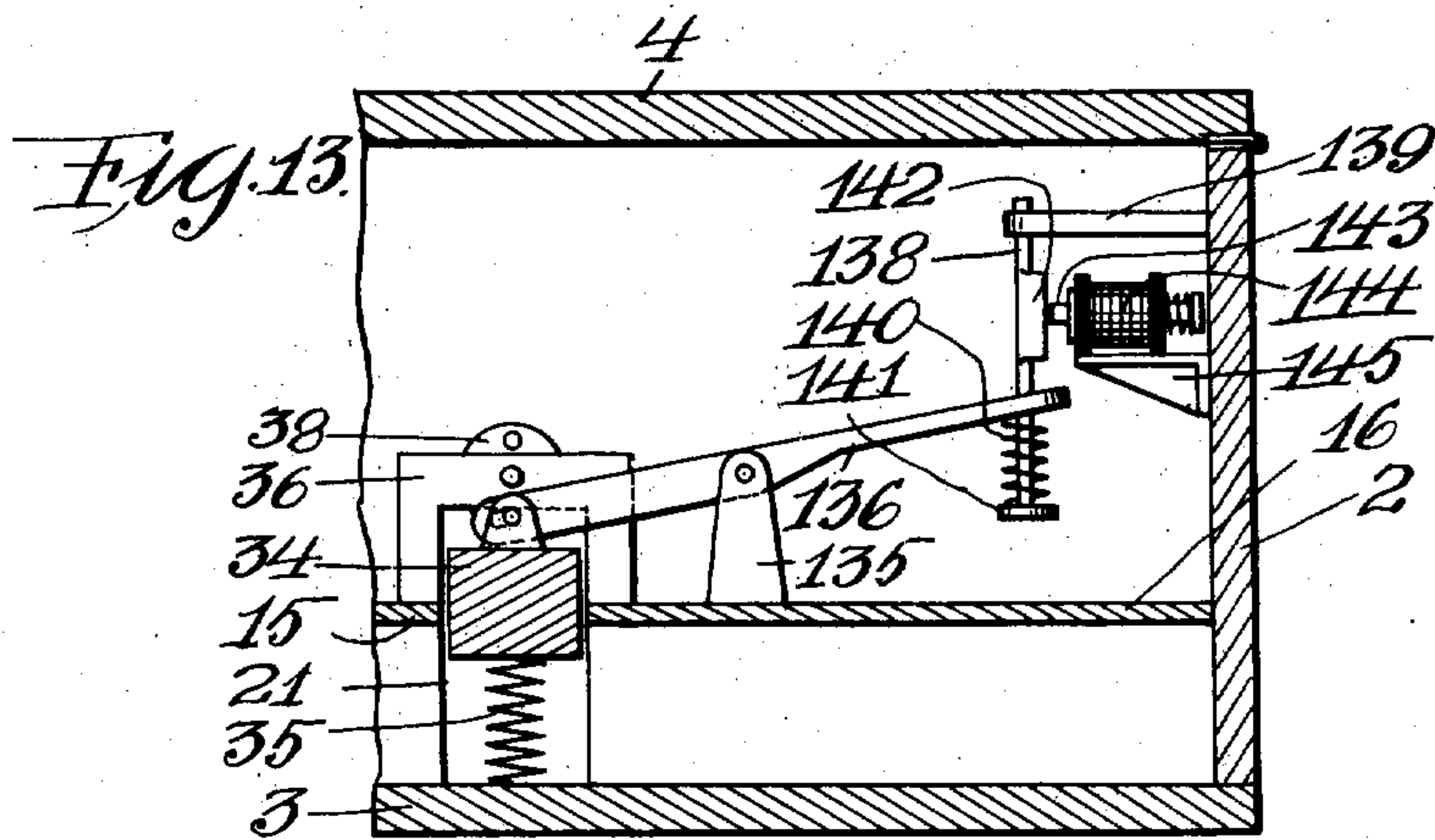
By H. C. Everett & Co.  
Attorneys.

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6 SHEETS—SHEET 6.



WITNESSES

*Samuel Payne.*  
*L. Cloud Newman.*

INVENTOR

*John F. White.*

*by N. C. Evert & Co.*  
*Attorneys.*



# UNITED STATES PATENT OFFICE.

JOHN F. WHITE, OF PITTSBURG, PENNSYLVANIA.

ELECTRICAL MECHANICAL PLAYER FOR MUSICAL INSTRUMENTS.

975,187.

Specification of Letters Patent.

Patented Nov. 8, 1910.

Application filed June 5, 1908. Serial No. 436,877.

*To all whom it may concern:*

Be it known that I, JOHN F. WHITE, a citizen of the United States of America, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Electrical Mechanical Players for Musical Instruments, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to an electrical mechanical player for musical instruments, and the invention has for its object the provision of a player of a novel form of construction adapted to be applied to a musical instrument, such as a piano, or a similar keyed instrument.

Another object of the invention is to provide a portable piano player that can be easily and quickly attached to a piano to operate the same, the player occupying the space above the key-board of the piano or like instrument without disfiguring or materially altering the appearances of the instrument.

A further object of the invention is to provide a mechanical piano player that can be actuated by motors of various types in conjunction with a suitable source of electricity for energizing key actuating solenoids.

The invention in its broadest aspect involves positive and reliable means for mechanically playing a piano, means for automatically producing forte effects and also novel means for controlling the operation of the player.

The principal elements of the invention—namely, a casing, solenoids for controlling the key-actuating bars, a horizontal reciprocating bar and the operating mechanism thereof, a tracker compartment, and the expression devices to produce forte effects—will be hereinafter separately and specifically described in detail, and the general operation then given.

In the drawings: Figure 1 is a perspective view of a piano with my mechanical player applied in position thereon, Fig. 2 is an end view of the player detached from the piano, Fig. 3 is a horizontal sectional view of the player, partly broken away illustrating the key actuating solenoids in plan view, Fig. 4 is a diagrammatic view of the electrical connections for the player, Fig. 5 is a cross sectional view of the player taken on the line V—V of Fig. 3 looking in the direction of

the arrow, Fig. 6 is an enlarged horizontal sectional view of a portion of the player illustrating principally the operating mechanism thereof, Fig. 7 is a cross sectional view taken on the line VII—VII of Fig. 3 looking in the direction of the arrow, Fig. 8 is a similar view taken on the line VIII—VIII of Fig. 3 looking in the direction of the arrow, Fig. 9 is a perspective view of a portion of the tracker, Fig. 10 is a cross sectional view of a portion of the player, illustrating one of the key solenoids in the position it occupies after being actuated, Fig. 11 is a longitudinal sectional view of the take-up roll of the player, Fig. 12 is a similar view of the music sheet spool or roll of the player. Fig. 13 is a cross-sectional view of a part of the player casing showing in side elevation the forte mechanism in normal position, other parts of the player mechanism being omitted for sake of clearness. Fig. 14 is a similar view showing the forte mechanism in the position to obtain the forte effect. Fig. 15 is a detail view in perspective of a part of the forte mechanism, and, Fig. 16 is a view of the same parts partly in side elevation and partly in section.

To put my invention into practice, I provide a suitable casing in which are located two rows of controlling solenoids for the key-actuating bars, one row being placed to control the actuation of the white keys of a piano and the other row the black keys thereof. Between the solenoids is arranged a vertically reciprocating horizontal bar adapted to engage solenoid cores projected into the path of travel of said bar by the solenoids being energized. The vertically reciprocating bar is operated from a suitable source of power located within the casing, the same source being employed for winding a sheet of perforated paper from the music sheet spool or roll onto the take-up roll. The tracker comprises a plurality of contact fingers equal in number to the keys of a piano, and additional contact fingers are employed for effecting a cessation in the operation of the player, and in connection with the expression devices employed to produce forte effects. The contact fingers are adapted to establish electrical circuits through the solenoids and control the actuation of the keys of a piano according to the perforations in the sheet of music.



The invention comprehends certain other novel features that will hereinafter appear, and reference will now be had to the detail construction of the various elements in the order heretofore mentioned.

*The casing.*—The element herein termed the casing is substantially oblong, and comprises end walls 1, a rear wall 2, a bottom plate 3, and a hinged top plate 4, which latter is curved downwardly to form the front wall of the casing. The top plate 4, intermediate the ends thereof, is provided with an oblong opening 5 normally closed by a hinged door 6, said opening permitting easy access being had to the tracker compartment of the player. The rear longitudinal edge of the bottom plate 3 is adapted to rest upon the longitudinal bar 7 of the piano case, directly in the rear of the black keys 8, while the forward longitudinal edge of the bottom plate 3 is provided with a longitudinally extending supporting bar 9 which rests upon the ledge 10 provided at the front of the piano case. The lower edge of the top plate 4 is secured to the bar 9 by screws 11 or similar fastening means. Secured to the lower edge of the bar 9 adjacent to the ends thereof, are two clamps 12, each clamp having a set screw 13 for clamping the player to the piano, as best shown in Fig. 1 of the drawings. The clamps 12, set screws 13 and the lower edges of the casing are provided with flexible material 14, such as felt to prevent the piano from being injured or marred by the player.

In the casing are arranged two horizontal partitions 15 and 16, which extend from one end of the casing to the other, and are spaced so as to provide a longitudinal slot 17 between the confronting edges thereof. The casing intermediate the ends thereof is provided with two vertical partitions 18 and 19, the space between these partitions constituting a central tracker compartment 20. The lower edges of the partitions 18, 19, are provided with cut-away portions 21 alining with the slot 17 and providing clearance for a horizontal bar that will be presently considered under another caption.

*Solenoids for controlling the actuation of the key hammers.*—The bottom plate 3 of the casing beneath the horizontal partitions 15 and 16 is provided with a plurality of bearings 22 in which are pivoted spring-held solenoid-supports 23 and 24, these supports being normally held in a horizontal position by coil springs 25 interposed between said supports and the bottom plate 3 of the casing. The free ends of these supports 23 and 24 are provided with depending hammers 26 and 27 respectively, which extend through openings 28 provided therefor in the bottom plate 3. The hammers 26 are of less length than the hammers 27, whereby the black keys 8 of the piano will

be struck with as great force by the hammers 26 as the white keys 29 are struck by the hammers 27. Upon each support 23, 24, is arranged a solenoid 30 having a core 31. Slidably mounted in said core is a rod 31<sup>a</sup> normally retained in a retracted position by a coil spring 32 interposed between the rear end of the solenoid and the head 33 carried by the rod 31<sup>a</sup>. The solenoids 30 of the supports 23 confront the solenoids on the supports 24, and when the solenoids are energized, the rods 31<sup>a</sup> protrude into the slot 17. The bottom plate 3 of the casing directly beneath the core of each solenoid is provided with a soft iron peg 31<sup>b</sup> for temporarily retaining the solenoid supports in a lowered position, as will be hereinafter described. It will of course be understood that a hammer is provided for each key of the piano and a solenoid for each hammer, whereby a plurality of keys can be struck simultaneously.

*Horizontal actuating bar and the operating mechanism therefor.*—In the slots 17 and 21 is arranged an actuating bar 34, extending substantially from end to end of the casing. This bar is attached to retractile springs 35, a spring being preferably located at each end of the casing. One end of each spring is attached to the bottom plate 3, while the opposite end of each spring is attached to the under side of the bar 34. Bridging the ends of the slot 17 are bearings 36 for a longitudinal shaft 37, which extends through the partitions 18 and 19. On each end of the shaft 37 is a wheel 38 and eccentrically connected to said wheels are pitmen 39, which are pivotally connected to the ends of the bar 34, as at 40, for supporting the same. The shaft 37 contiguous to the partition 19 is provided with a gear wheel 41 having a portion of its teeth removed, as at 42 for a purpose that will hereinafter appear. The gear wheel 41 meshes with a large gear wheel 43 mounted upon a shaft 44, journaled in the bearing 45 and the partition 19, said bearing being carried by the horizontal partition 16. One end of the shaft 44 is provided with a beveled pinion 46 meshing with a large beveled gear wheel 47 mounted upon the shaft 48 of a motor 49, the outer end of said shaft being journaled in a bearing 50 carried by the horizontal partition 16. The motor 49 is mounted upon the horizontal partition 15 and is conventionally illustrated to represent an air motor or an electric motor. When the motor is operated by air it will be connected by a hose or tubing (not shown) to an opening 50<sup>a</sup> (see Fig. 1) formed in the casing, this opening being connected to a blower or bellows (not shown). If the motor is operated by electricity, wires can be suitably arranged in the casing to connect with a suitable source of electrical energy.



*Tracker compartment.*—In the vertical partitions 18 and 19 is mounted a shaft 51 upon which is journaled a take-up roll 52 to which is attached a sheet of perforated paper 53 by a pin 54 or similar fastening means. Interposed between the end of the roll 52 and the partition 18 is a spacer sleeve 55, and engaging a peripheral flange 56 carried by the roll 52 is a spring 57, carried by the partition 18. The object of this spring is to frictionally engage the end of the roll and prevent the same from rotating too freely upon the shaft 51. The opposite end of the roll 52 is provided with a peripheral flange 58 having an opening 59 formed therein to receive a pin 60, carried by a gear wheel 61 loosely and slidably mounted upon the shaft 51. The gear wheel 61 is provided with a sleeve 62 surrounding the shaft 51, said sleeve having an enlarged beveled end 63 similar to a spool, the object of which will presently appear. Interposed between the partition 19 and the sleeve 62 is a coil spring 64 encircling the shaft 51. This spring normally holds the pin 60 of the gear wheel 61 within the opening 59 of the peripheral flange 58. To prevent the peripheral flange 58 from contacting with the gear wheel 61, the shaft 51 intermediate the end of the roll 52 and said gear wheel is provided with a cotter pin 65.

In the tracker compartment 20 is arranged a music sheet spool or roll 66 for supporting a roll of perforated paper as shown in Fig. 7. This roll 66 is detachably mounted in the compartment and besides having the ends thereof provided with peripheral flanges 67 and 68, the ends are provided with sockets 69 and 70. The socket 70 is adapted to receive the end of a shaft 71 journaled in a bearing 72 and in the partition 19, the bearing 72 being supported by the horizontal partition 15. Encircling the shaft 71 between the bearing 72 and the partition 19 is a rewind spring 73 having one end attached to the partition 19, as at 74 and the opposite end thereof attached to the shaft 71, as at 75. (See Fig. 12.) Mounted upon the shaft 71 is a ratchet wheel 76 having a pin 77 for engaging in an opening 78 provided therefor in the peripheral flange 68 of the roll 66. Adapted to engage the ratchet wheel 76 is a pivoted pawl 79, carried by a bearing 80 mounted upon the partition 15. The socket 69 of the roll 66 is adapted to receive a pintle 81 slidably mounted in the partition 18. The pintle 81 is provided with a disk 82 which is frictionally held in engagement with the peripheral flange 67 of the roll 66 by a coil spring 83 interposed between the partition 18 and the disk 82 and encircling the pintle. The outer end of the pintle 81 is provided with a head or button 84, whereby the pintle can be easily moved outwardly to disengage the same from the end of the

paper roll 66 and permit of said roll being removed from the end of the shaft 71.

Arranged transversely of the compartment 20 intermediate the rolls 52 and 66 are two bars 85 and 86, the former hereinafter termed the contact bar being made of metal and being hinged at one end, as at 87, whereby it can be swung upwardly to permit of a perforated sheet of music being placed in position and attached to the roll 52. The free end of the contact bar 85 is supported by an extension 88 carried by the partition 19, said extension being provided with a conventional form of clasp 89 for holding the contact bar 85 in a closed or horizontal position. The bar 86 hereinafter designated the finger bar is mounted between the partitions 18 and 19 and is provided with a plurality of resilient contact fingers 90 secured thereto by small screws or rivets 90<sup>a</sup>, and which fingers engage the contact bar 85 through the perforations in the music sheet 53. The under side of the contact bar 85 is rounded or beveled, whereby the sheet of paper 53 will smoothly pass over the same. The finger bar 86 at one end thereof is provided with an upwardly extending lug 91, and said finger bar is normally held in an operative position with the fingers 90 in engagement with the paper 53 by a tension spring 92 attached to the bar 86 and to a post 93 carried by the vertical partition 19.

The partition 19 is provided with a bracket 94, and slidably mounted in said bracket and the front of the casing is a control-rod 95. The rod protrudes through the front of the casing and is provided with a button or knob 96, whereby the same can be easily manipulated. The rod 95 is provided near its inner end with a beveled enlargement 97 adapted to contact with the beveled enlarged end 63 of the sleeve 62 for moving said sleeve, gear wheel 61, and pin 60 to release the take-up roll 52. The enlargement 97 is normally held out of engagement with the enlarged beveled end 63 of the sleeve 62 by a coil spring 98 encircling the rod 95, said spring having one end attached to the front of the casing and the opposite end thereof attached to a disk 99, carried by the rod 95 within the casing. The rod 95 is provided with a lug 100 adapted to engage with the lower end of the pawl 79 for moving said pawl out of engagement with the ratchet wheel 76. The rod 95 is also provided with a depending lug 101 adapted to engage with the lug 91 on the finger bar 86 and thus rock the bar 86 so as to swing the contact fingers 90 out of engagement with the sheet of paper 53, whereby the paper can be rewound upon the roll 66, as will hereinafter appear. That the bar 86 may be so moved, it is mounted in the partitions 18, 19 by means of short pins or trunnions 86<sup>a</sup> on the ends of the bar. (See Fig. 9.)



The partition 19 is provided with a transverse slot 102 and with a bearing 103 adjacent to said slot. Pivotally mounted upon the bearing 103 is a lever 104 supporting a locking bar 105 adapted to engage in a notch 106 provided therefor in the rod 95. The opposite end of the locking bar 105 is connected to the armature 107 of an electromagnet 108, which is supported by a bracket 109, carried by the horizontal partition 15. The armature 107 is connected to the electromagnet 108 by a coil spring 110, having sufficient tension to retain the locking bar 105 in the notch 106 of the rod 95. The free end of the lever 104 engages an electrical contact block 111, the object of which will presently appear.

Journalled in the partition 19 and a bearing 112 provided therefor in the partition 16 is a shaft 113. Mounted upon the shaft 113 is a gear wheel 114 adapted to mesh with the gear wheel 61 revolvably mounted upon the shaft 51 of the take-up roll 52. Upon the shaft 113 is also mounted a gear wheel 115 adapted to mesh with a gear wheel 116 mounted upon the shaft 44.

In connection with the mechanism just described, I use a governor. This governor comprises a revoluble shaft 117 journalled between the partition 19 and a bearing 118 provided therefor on the partition 16. Upon the shaft 117 is mounted a gear wheel 119 and slidably mounted upon the shaft is a head 120, said head being connected to the gear wheel 119 by weighted toggle links 121 of a conventional form. Interposed between the gear wheel 119 and the head 120 is a coil spring 122. The bearing 118 is provided with an adjustable arm 123 having a hook-shaped end 124 adapted to engage the head 120 and limit the movement of said head and the operation of the governor. The gear wheel 119 is actuated through the medium of a train of gears consisting of a shaft 125 journalled in the partition 19 and a bearing 126 carried by the horizontal partition 16. The shaft 125 is provided with a gear wheel 127 meshing with the gear wheel 119 and said shaft also carries a wheel 128 within the tracker compartment 20. This wheel 128 is provided with a wrist pin 129 adapted to be engaged by the rod 95 for stopping the operation of the governor. Journalled between the partition 19 and a bearing 130, carried by the horizontal partition 16 is a shaft 131. Mounted upon the shaft 131 are two gear wheels 132 and 133, the former meshing with the gear wheel 43 of the shaft 44 and the latter with a gear wheel 134 mounted upon the shaft 125.

*Forfe mechanism.*—This expression mechanism (see Figs. 13 to 16) is located upon the horizontal partition 16 adjacent each end of the horizontal reciprocating bar. The hori-

zontal partition 16 is provided with bearings 135, and pivotally mounted in said bearings are levers 136, the forward ends of said levers being pivotally connected to the horizontal bar 34, as at 137. The opposite ends of the levers 136 are provided with slots 136' to receive vertical rods 138, said rods being guided at their upper ends by brackets 139 carried by the rear wall 2 of the casing. The rods 138 are supported from the levers 136 by compression springs 140, said springs being attached to said levers 136 as at 136<sup>a</sup> and to the heads 141 on the lower ends of the rods 138, as at 141'. The rods 138 are provided above the levers 136 with projections 142 adapted to be engaged at their lower ends by spring-held rods 143 arranged in solenoids 144, which latter are supported by brackets 145 carried by the rear wall 2 of the casing. The tension of the springs 140 is always sufficient to hold the rods suspended in such position that the lugs 142 are some distance above the levers 136 so they may be engaged by the rods 143 when the rods 138 are elevated.

*Electrical circuits.*—Before describing the general operation of my player, reference will be had to Fig. 4 of the drawings, wherein I have illustrated diagrammatically the electrical connections between the various parts of my player, particularly the solenoids. The reference numeral 146 designates a suitable source of electrical energy as a battery. This battery is connected by a wire 147 to the contact bar 85, and by a wire 148 to the contact 111 arranged in the partition 19. The lever 104 is connected by a wire 149 to a bus-bar 150, and this bus-bar is connected by wires 151 to the solenoids 30 and said solenoids are connected by wires 152 to the fingers 90 of the finger bar 86. Since a solenoid 30 and a finger 90 is used for each key of a piano, it is obvious that sufficient wires 151 and 152 will be employed to connect the solenoids to the bus-bar 150 and said solenoids to the contact fingers. I have only illustrated a few of the contact fingers and solenoids in order that the electrical circuits can be understood. The contact finger 90 controlling the fortissimo or expression mechanism is connected by a wire 153 to its solenoid designated 144 and from said solenoid by a wire 154 to the bus-bar 150. The electro-magnet 108 controlling the lock is connected to one of the contact fingers 90 by a wire 155 and by a wire 156 to the bus-bar 150. Interposed in a circuit wire 150<sup>a</sup> is a normally open switch 157, this switch being located upon the interior or exterior of the casing of the player, preferably directly inside of the opening 5, whereby easy access can be had to the same by opening the door 6.

When an electrical connection is established between the contact bar 85 and one of



the contact fingers 90 a circuit through one of the solenoids 30 is as follows: From battery 146 through wire 147 to contact bar 85, contact finger 90, wire 152 to solenoid 30, wire 151 to bus-bar 150, wire 149 to lever 104, contact 111 through wire 148 to the battery 146. With one of the solenoids 30 energized, the rod 31<sup>a</sup> thereof is thrown out into the path of the reciprocating horizontal bar. When the electromagnet 144 controlling the fortissimo mechanism is energized, the circuit is as follows: From battery 146 over wire 147 to contact bar 85, contact finger 90, wire 153, solenoid 144, wire 154, bus-bar 150, wire 149, lever 104, contact 111, and wire 148 back to the battery 146. The circuit through the electro-magnet 108 is the same as the solenoid 144, with the exception that the circuit passes through wires 155 and 156 instead of the wires 153 and 149.

*General operation.*—To place a roll or perforated sheet of music in my player, the hinged door 6 is opened and the paper roll 66 placed upon the shaft 71 with the pin 77 of the ratchet wheel 76 engaging in the opening 78 of the peripheral flange 68 of said roll. The pintle 81 is then placed in the socket 69 of said roll. The contact bar 85 is then swung upwardly and the end of the perforated sheet of music attached to the take-up roll 52. The contact bar 85 is then swung into a horizontal position to guide the sheet of perforated music over the contact fingers 90. The door 6 can then be closed and the player is now in condition to operate the piano and reproduce the music indicated upon the sheet 53 by the perforations thereof. The motor 49 is now placed in operation by pulling outwardly on button 96 whereby rod 95 actuates bar 105 to move lever 104 into engagement with contact 111 and close the circuit. Rotary movement will then be imparted to the beveled gear wheels 47 and 46, shaft 44, gear wheels 116 and 115, shaft 113, gear wheels 114 and 61, the take-up roll being rotated by virtue of the pin 60 of the gear wheel 61 engaging in the opening 59 of the peripheral flange 58 of the roll 52. As this roll 52 is rotated, the sheet of perforated music is wound upon said roll and unwound from the roll 66, the rotary movement of the roll 66 placing the rewind spring 73 under tension, with the pawl 79 receding over the ratchet wheel 76 until a cessation in the operation of the player is desired.

As the sheet of perforated music 53 passes over the contact bar 85 the circuits are established through the solenoids 30 by reason of the contact fingers 90 engaging the contact bar 85 through the perforations in the music sheet 53. As each solenoid 30 is energized, the rods 31<sup>a</sup> thereof are moved into the path of travel of the reciprocating horizontal bar 34. This bar is reciprocated by

the gear wheel 41, shaft 37, and pitmen 39 connected to the ends of said bar. As the bar 34 travels downwardly it engages the projecting rods 31<sup>a</sup> of the solenoids and moves the supports 23 of said solenoids downwardly, causing the hammers 26 and 27 to strike the keys 8 and 29 of the piano, producing the notes represented by the perforations in the music sheet 53. The bar 34 is lifted from its lowest position by the gear wheels 41, 43 and crank disks 138; after it has reached and passed its highest point, the teeth on wheel 43 reach the untoothed portion of wheel 41 (which occupies less than half the circumference) and 41 is released from 43; the retractile springs 35 immediately complete the remainder of the downward stroke of the bar 34; at the end of this movement of the bar 34 the gear wheel 42 again meshes with the gear wheel 43, and said bar 34 will be elevated, placing the springs 35 again under tension. By employing the retractile springs 35, I obtain a sudden and pronounced downward movement of the bar 34, causing the hammers and 27 of the solenoid supports to strike the keys 8 and 29 with proper force. Immediately on breaking the circuits in the solenoids 30, the springs 32 return the rods 31<sup>a</sup> to their normal position and the springs 25 return the solenoid supports 23 and 24 to their normal position, again ready to be actuated. In case a long note is represented upon the perforated sheet of music 53, the soft iron pegs 31<sup>b</sup> will hold the solenoid supports in their lowered position, while the circuits are maintained in the cores of the solenoids with which the pegs 31<sup>b</sup> contact. These pegs however are not magnetized sufficiently to hold the solenoids unless the cores thereof are energized, consequently the springs 125 can return the solenoids to their normal horizontal position.

A forte effect is obtained by one of the perforations of the music sheet 53. When a circuit is established through the solenoids 144, the rods 143 thereof are immediately thrown out into the path of travel of the rods 138. Since the levers 136 are oscillated by the vertically reciprocating bar 34, and the rods 138 are connected to the levers 136 so as to be moved therewith, the rods 138 will be caught when in a raised position, by the rods 143 of the solenoids 144 engaging under the lower ends of the lugs 142. With the projections 142 of the rods 138 in a raised position, the springs 140 are compressed during the upward movement of the bar 34. It is therefore obvious that with the springs 35 under tension by elongation, due to the upward movement of bar 34, and the springs 140 under compression due to rods 138 being held elevated while the inner ends of the levers 136 move downward, that the bar will move downwardly with considerable



force, the expansion of the springs 140 suddenly oscillating the levers 136 and lowering the bar 34 with greater force than if the springs 35 alone were used.

5 When the piece of music has been reproduced and the end of the perforated sheet 53 is reached, a perforation in the music sheet allows a contact to be made energizing the electro-magnet 108. When this  
10 electro-magnet is energized the armature 107 thereof is retracted, withdrawing the locking bar 105 from engagement with the rod 95, and swinging the lever 104 out of engagement with the contact 111; consequently  
15 all circuits through the solenoids 30 are broken. The spring 98 on the rod 95 immediately forces the rod inwardly, the beveled enlargement 97 of said rod engaging the enlarged beveled end 63 of the sleeve 62, moving the pin 60 of the gear wheel 61 out of engagement with the peripheral flange 58 of  
20 the roll 52. This movement of the rod 95 places the spring 64 under compression, but the tension of the spring 98 is sufficient to overcome the tension of the spring 64, consequently the rod 95 will be retained in its released position until manually moved. When the rod 95 is moved inwardly by the  
25 spring 98, the inner end of the rod 95 engages the wrist pin 129 of the wheel 128, preventing the shaft 125 from rotating, consequently stopping the governor mechanism. The inward movement of the rod 95 causes the lug 100 to engage the lower end of the  
30 pawl 79, moving said pawl out of engagement with the ratchet wheel 76, and permitting the rewind spring 73, to rewind the music sheet upon the roll 66. The inward movement of the rod 95 also causes the depending lug 101 to engage the upwardly extending lug 91 of the finger bar 86 and tilt said bar; thereby the contact fingers 90 will be held out of engagement with the music sheet 53 as the same rewinds upon  
40 the roll 66.

The paper roll 66 can now be removed and another music sheet placed in position, and with the motor 49 set in operation, it is only necessary to pull outwardly upon the  
50 rod 95 and allow the locking bar 105 to engage in the notch 106 to hold the rod in an outward position. Immediately upon the rod 95 assuming this position, the spring 64 places the pin 60 of the gear wheel 61 in the opening 59 of the peripheral flange 58 of the roll 62, and allows the pawl 79 and the finger bar 86 to assume their normal position. It will be observed that the gear wheel 61 at all times meshes with the gear  
55 wheel 114, which latter wheel (see Fig. 6) is of a sufficient length to permit of the sliding engagement therewith of the gear wheel 61. The governor mechanism is designed to control the operation of the motor  
60 49 and maintain an even speed of the rolls

or spools 52 and 66 from the beginning of a piece of music to the end thereof.

While I have only shown mechanism for obtaining a fortissimo expression in connection with my player instrument, it is obvious that other expressions can be obtained by use of the ordinary pedals of the piano, shown in Fig. 1 of the drawings, the expressions required being determined by leaving the door 6 open and observing indications upon the sheet of music as it travels from the roll 66 to the roll 52.

While a piece of music is being played, should it be desired to stop the player, it is only necessary to close the switch 157, and the circuit is immediately established through the electro-magnet 108, which releases the rod 95 and at the same time breaks the circuits through the solenoids 30 and 144; the switch 157 normally remaining  
85 open.

It is apparent that I have devised a novel mechanical player instrument that can be attached to pianos of various types and easily removed should it be desired to manually play the piano, consequently can be used with an upright or grand piano.

While in the drawings forming a part of this specification there is illustrated a preferred embodiment of the invention, it will be evident that the arrangement and assemblage of the parts may be varied or changed without departing from the spirit or scope of the invention as defined in the claims.

Having now described my invention what I claim as new, is:—

1. A piano player embodying a casing, having an opening formed therein, horizontal partitions arranged in said casing, vertical partitions arranged in said casing and providing a central tracker compartment, two rows of pivoted solenoid supports arranged beneath said horizontal partitions, depending key-hammers carried by said supports, solenoids arranged upon said supports, rods adapted to be moved by energizing said solenoids, a vertically reciprocatory bar for engaging said rods, a motor mounted upon one of said horizontal partitions, a longitudinal shaft rotated by said motor, connections between said shaft and the bar for reciprocating said bar, a governor mechanism actuated by said shaft, a music sheet roll detachably and revolubly mounted in said tracker compartment, a take-up roll revolubly journaled in said tracker compartment, a gear wheel actuated by said shaft and adapted to rotate said take-up roll, a rewind spring placed under tension by said music-sheet when the latter is rotating in one direction, a pawl for preventing the rotation of said music-sheet roll in the opposite direction, a control-rod extending into said compartment for engagement with said gear wheel and said pawl, a locking bar for  
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110  
115  
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125  
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locking said control-rod, an electro-magnet for releasing said control rod, a finger bar mounted for rocking movement in said compartment and actuated by said rod, a plurality of contact fingers carried by said bar and in circuit with said solenoids, a contact bar hinged in said compartment and in circuit with said solenoids and adapted to be engaged by said contact fingers, an expression mechanism located in said casing, said mechanism including solenoids each in circuit with one of said contact fingers, actuating levers pivotally connected at one end to said bar, vertically reciprocating means for holding the outer ends of said levers elevated when the bar is lowered, and means for energizing said solenoids and electro-magnet.

2. In a piano player, the combination with a suitable source of electrical energy, of a casing, horizontal partitions arranged in said casing, vertical partitions arranged in said casing and providing a central tracker compartment, two rows of pivoted solenoid supports arranged beneath said horizontal partitions, depending key hammers carried by said supports, solenoids arranged upon said supports, rods in said solenoids actuated by the energizing of the solenoids, a vertically reciprocating horizontal bar for engaging said rods, a motor mounted upon one of said horizontal partitions, a longitudinal shaft rotated by said motor, connections between said shaft and the bar for reciprocating said bar, a governor mechanism actuated by said shaft, a music sheet roll detachably and revolubly mounted in said tracker compartment, a take-up roll revolubly journaled in said tracker compartment, a gear wheel actuated by said shaft for rotating said take-up roll, a rewind spring placed under tension by said music sheet roll when the latter is rotated in one direction, a pawl for preventing the rotation of said music sheet roll in the opposite direction, a control-rod extending into said compartment for engagement with said gear wheel and said pawl, a locking bar arranged in one of said vertical partitions for locking said rod, an electro-magnet supported by one of said horizontal partitions and in circuit with said source of electrical energy for releasing said rod, a finger bar trunnioned in said compartment and engaged by said rod, a plurality of contact fingers carried by said bar and in circuit with said solenoids and said source of electrical energy, a contact bar hinged in said compartment and in circuit with said solenoids and said source of electrical energy and engaged by said contact fingers to establish the aforesaid circuits, an expression mechanism located in said casing, said expression mechanism including solenoids each in circuit with one of said fingers and said source of electrical energy,

and springs acting with said solenoids to actuate said horizontal bar.

3. In a piano player, the combination with a suitable source of electrical energy, of a casing, partitions arranged in said casing and providing a tracker compartment, two rows of pivoted solenoid supports arranged within said casing, depending key hammers carried by said supports, solenoids arranged upon said supports and in circuit with said source of electrical energy, rods movable by the energizing of said solenoids, a vertically reciprocating horizontal bar for engaging said rods, a motor arranged within said casing, a longitudinal shaft rotated by said motor, connections between said shaft and the bar for reciprocating the latter, a music sheet detachably and revolubly mounted in said tracker compartment, a take-up roll journaled in said tracker compartment, a gear wheel actuated by said shaft to rotate said take-up roll, a rewind spring placed under tension by said music sheet roll rotating in one direction, a pawl for preventing the rotation of said music sheet roll in the opposite direction, a control-rod extending into said compartment for engagement with said gear wheel and said pawl, a finger bar trunnioned in said compartment and engaged by said rod, locking means for normally holding said rod in a fixed position, a plurality of contact fingers carried by said bar and in circuit with said solenoids and said source of electrical energy, a contact bar hinged in said compartment and in circuit with said solenoids, and an expression mechanism located in said casing and including solenoids each in circuit with one of said fingers, and said source of electrical energy.

4. In a piano player, the combination with a suitable source of electrical energy, of a casing, partitions arranged in said casing and providing a tracker compartment, two rows of pivoted solenoid supports arranged within said casing, depending key hammers carried by said supports, solenoids arranged upon said supports and in circuit with said source of electrical energy, rods disposed to be moved by the energizing of said solenoids, a vertically reciprocating horizontal bar for engagement with said rods, a motor arranged within said casing, a longitudinal shaft rotated by said motor, connections between the shaft and the bar for reciprocating said bar, a music sheet detachably and revolubly mounted in said tracker compartment, a take-up roll journaled in said tracker compartment, a gear wheel actuated by said shaft for rotating said take-up roll, a rewind spring placed under tension by said music sheet roll when the latter is rotating in one direction, a control-rod extending into said compartment for actuating said gear wheel and said pawl, a finger bar trunnioned in



said compartment and actuated by said rod, locking means for normally holding said rod in a fixed position, a plurality of contact fingers carried by said bar and in circuit  
5 with said solenoids and said source of electrical energy, a contact bar hinged in said compartment and in circuit with said solenoids, and an expression mechanism located in said casing and including solenoids each  
10 in circuit with one of said fingers, and said source of electrical energy.

5. In a piano player, the combination with a suitable source of electric energy, of a casing, partitions arranged in said casing and providing a tracker compartment, two  
15 rows of pivoted solenoid supports arranged within said casing, depending key hammers carried by said supports, solenoids carried by said supports and in circuit with said  
20 source of electrical energy, rods disposed to be actuated by the energizing of said solenoids, a horizontally-disposed vertically reciprocating bar coacting with said rods, a motor arranged within said casing, a longitudinal shaft rotated by said motor, connections between the shaft and the bar for reciprocating said bar, a music sheet roll detachably and revolubly mounted in said  
25 tracker compartment, a gear wheel actuated by said shaft for rotating said take-up roll, a rewind spring placed under tension by said music sheet roll when the latter is rotating in one direction, a control-rod extending into said compartment for engagement with said  
30 gear wheel and said pawl, a finger bar trunnioned in said compartment and mounted to be rocked by said rod, locking means for normally holding said rod in a fixed position, a plurality of contacts carried by said  
35 finger bar and in circuit with said solenoids and said source of electrical energy, and a contact bar hinged in said compartment and in circuit with said solenoids and said source of electrical energy.

45 6. In a piano player, the combination with a suitable source of electrical energy, of a casing, two rows of pivoted solenoid supports arranged within said casing, depending key hammers carried by said supports,  
50 solenoids carried by said supports and in circuit with said source of electrical energy, rods actuated by said solenoids, a vertically reciprocating horizontal bar mounted to engage said rods, a motor arranged within said casing, connections between said motor and the bar for reciprocating said bar, a music sheet roll detachably and revolubly mounted in said casing, a take-up roll journaled in said casing and actuated by said motor, a  
60 rewind spring placed under tension by the rotation of said music sheet roll when the latter is rotating in one direction, a rod extending into said casing for controlling said rewind spring and the operation of  
65 said take-up roll, locking means for nor-

mally holding said rod in a fixed position, a finger bar trunnioned in said compartment and moved by said rod, a plurality of contact fingers carried by said finger bar and in circuit with said solenoids and said  
70 source of electrical energy, a contact bar hinged in said compartment and in circuit with said solenoids and engaged by said contact fingers to establish said circuits, and an expression mechanism located in said  
75 casing and cooperating with said horizontal bar.

7. In a piano player, the combination with a suitable source of electrical energy, of a casing, two rows of pivoted solenoid supports arranged within said casing, depending key hammers carried by said supports, solenoids carried by said supports and in circuit with said source of electrical energy, rods actuated by said solenoids, an actuating bar mounted to engage said rods, a motor arranged within said casing, connections between said motor and the bar for reciprocating said bar, a music sheet roll detachably and revolubly mounted in said casing, a  
80 take-up roll journaled in said casing and actuated by said motor, a rewind spring placed under tension by the rotation of said music sheet roll in one direction, a rod extending into said casing for controlling said rewind  
85 spring and the operation of said take-up roll, locking means for normally holding said rod in a fixed position, a finger bar trunnioned in said compartment and engaged by said rod, a plurality of contact fingers carried by said bar and in circuit with said solenoids and said source of electrical energy, and a contact bar hinged in said compartment and in circuit with said solenoids and engaged by said contact fingers to  
90 establish said circuits.

8. A piano player comprising a casing, pivoted solenoid supports arranged within said casing, key hammers carried by said supports, solenoids carried by said supports, rods actuated by the energizing of said solenoids, a reciprocating actuating bar for engagement with said rods, a motor arranged within said casing, connections between said motor and bar for reciprocating said bar, a  
110 music sheet roll detachably and revolubly mounted in said casing, a take-up roll journaled in said casing and rotated by said motor in one direction, means operating in connection with said music sheet roll for rotating  
115 said rolls in the opposite direction, a control-rod for said rolls extending into said casing, means for normally holding said rod in a fixed position, a finger bar trunnioned in said casing and actuated by said rod, electrical contact fingers carried by said bar and in circuit with said solenoids, a contact bar hinged in said compartment and in circuit with said solenoids and engaged by said contacts to establish said circuits, and an ex-  
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pression mechanism located in said casing and cooperating with said reciprocatory actuating bar.

9. A piano player comprising a casing, solenoid supports arranged within said casing, key hammers carried by said supports, solenoids carried by said supports, rods actuated by the energizing of said solenoids, a reciprocatory actuating-bar coacting with said rods, a motor within said casing, connections between said motor and bar for reciprocating said bar, a music sheet roll detachably and revolvably mounted in said casing, a take-up roll journaled in said casing and rotated by said motor in one direction, means cooperating with said music sheet roll for rotating said rolls in the opposite direction, a control-rod extending into said casing for controlling the movement of said rolls, means for normally holding said rod in a fixed position, a finger bar trunnioned in said casing, electrical contact fingers carried by said finger bar and in circuit with said solenoids, and a contact bar hinged in said compartment and in circuit with said solenoids and engaged by said contacts to establish said circuits.

10. In a piano player, the combination with a casing, of a player mechanism comprising solenoid supports arranged within said casing, hammers carried by said supports, solenoids carried by said supports, rods actuated by the energizing of said solenoids, a reciprocatory actuating bar for moving said supports, a motor, connections between said motor and bar for reciprocating said bar, a contact bar and a finger bar arranged in said casing, a plurality of contact fingers carried by said finger bar for engagement with the contact bar and in circuit with said solenoids, and means actuated by said motor for moving a perforated music sheet between said contact bar and the fingers of said finger bar.

11. A piano player comprising a casing, pivoted supports arranged in said casing, key hammers carried by said supports, solenoids carried by said supports, rods actuated by the energizing of said solenoids, a reciprocatory actuating bar for actuating said solenoid supports, means for moving said bar, a contact bar and a finger bar within said casing, a plurality of contact fingers carried by said finger bar and in circuit with said solenoids and arranged to engage the contact bar, and means for moving a sheet of perforated paper between said contact bar and the fingers of the finger bar.

12. In a piano player, two rows of pivotally mounted solenoid supports, hammers

secured to said supports, solenoids carried by said supports, a reciprocatory actuating bar for actuating said supports and thereby the solenoids, a motor, connections between said motor and bar for reciprocating said bar, a contact bar, and a finger bar, contact fingers carried by said finger bar, said fingers in circuit with the solenoids of said supports and disposed to engage the contact bar, and means actuated by said motor for moving a perforated music-sheet between said contact bar and the fingers of said finger bar.

13. In combination with a piano, a player mechanism comprising a plurality of solenoid supports pivotally mounted above the keys of the piano, a key hammer carried by each support, a solenoid carried by each support, a rod carried by each solenoid and disposed to be projected thereby, and a vertically reciprocatory actuating bar cooperating with said rods to actuate said supports.

14. In combination with a piano, a plurality of solenoid-supports pivotally mounted above the keys of the piano, key-hammers secured to said supports, a solenoid carried by each support, a rod mounted in each solenoid and adapted to be projected beyond said supports when the solenoid is energized, and a vertically reciprocatory actuating bar cooperating with said rods to actuate said supports.

15. In combination with a piano, a player mechanism comprising a casing, a plurality of solenoid supports pivotally-mounted therein, a solenoid carried by each support, a source of electrical energy in circuit with said solenoids, key hammers secured to said supports, means within said casing for moving said solenoids when they are energized, and means within said casing for establishing circuits through said solenoids to energize the same.

16. In combination with a piano, a player mechanism comprising a casing, movable solenoids located in said casing, a source of electrical energy in circuit with said solenoids, means within said casing for moving said solenoids when they are energized, hammers movable in unison with the solenoids, a perforated music sheet removably-mounted in said casing, and means controlled by said perforated sheet for energizing said solenoids.

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

JOHN F. WHITE.

Witnesses:

JOS. A. WHITE,  
MAX H. SROLOVITZ.