No. 734,032. PATENTED JULY 21, 1903.

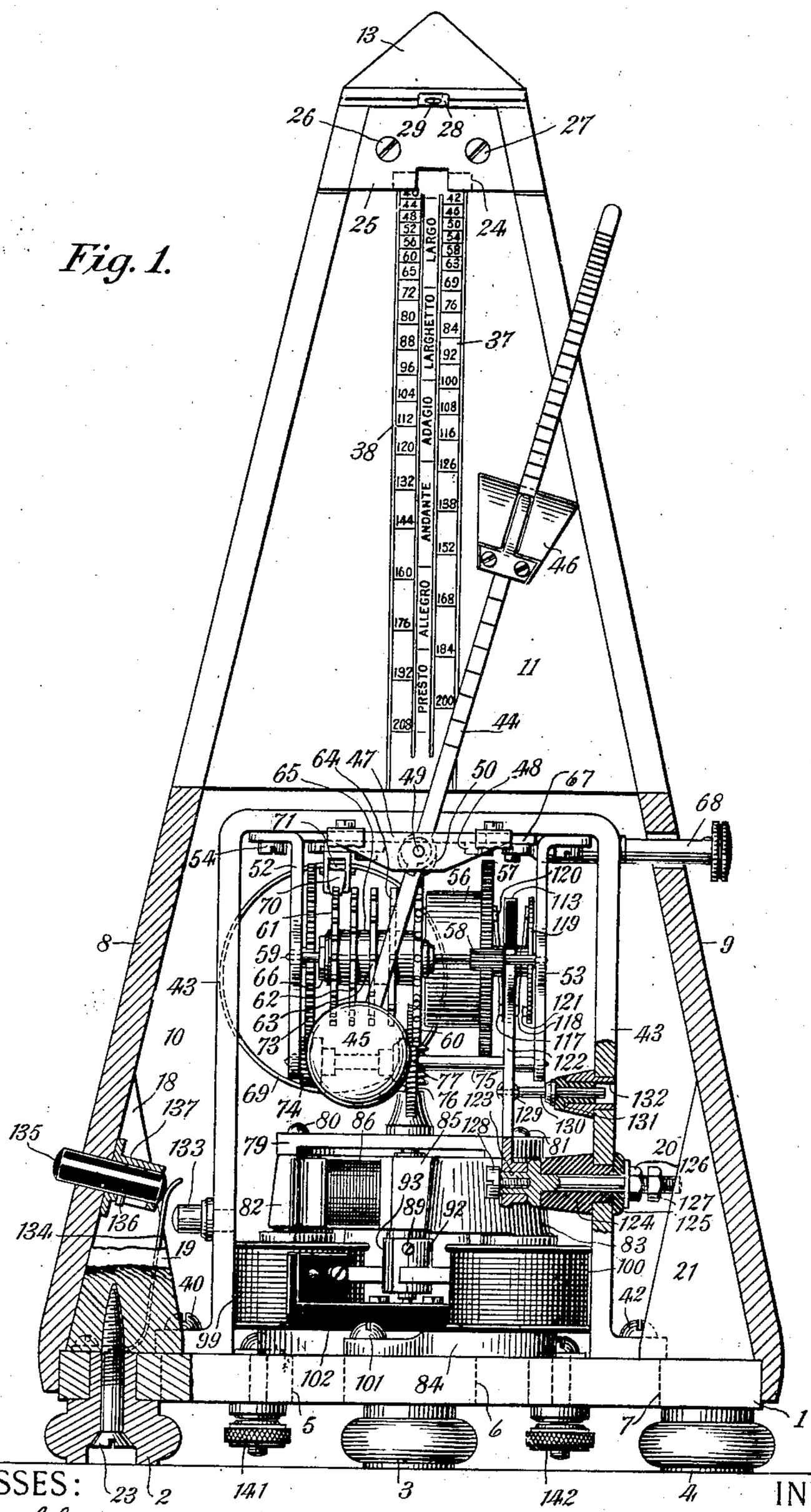
E. K. ADAMS.

ELECTRIC METRONOME.

APPLICATION FILED JULY 30, 1902.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.



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INVENTOR

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NO MODEL. 4 SHEETS—SHEET 2.

Fig. 7.

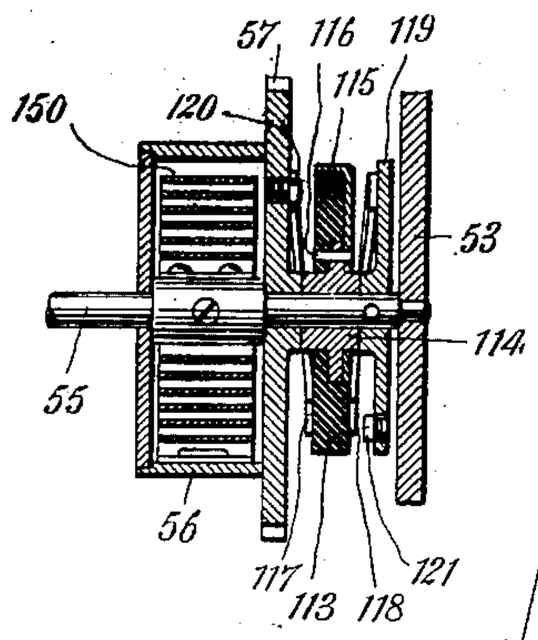

Fig. 2.

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NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3.

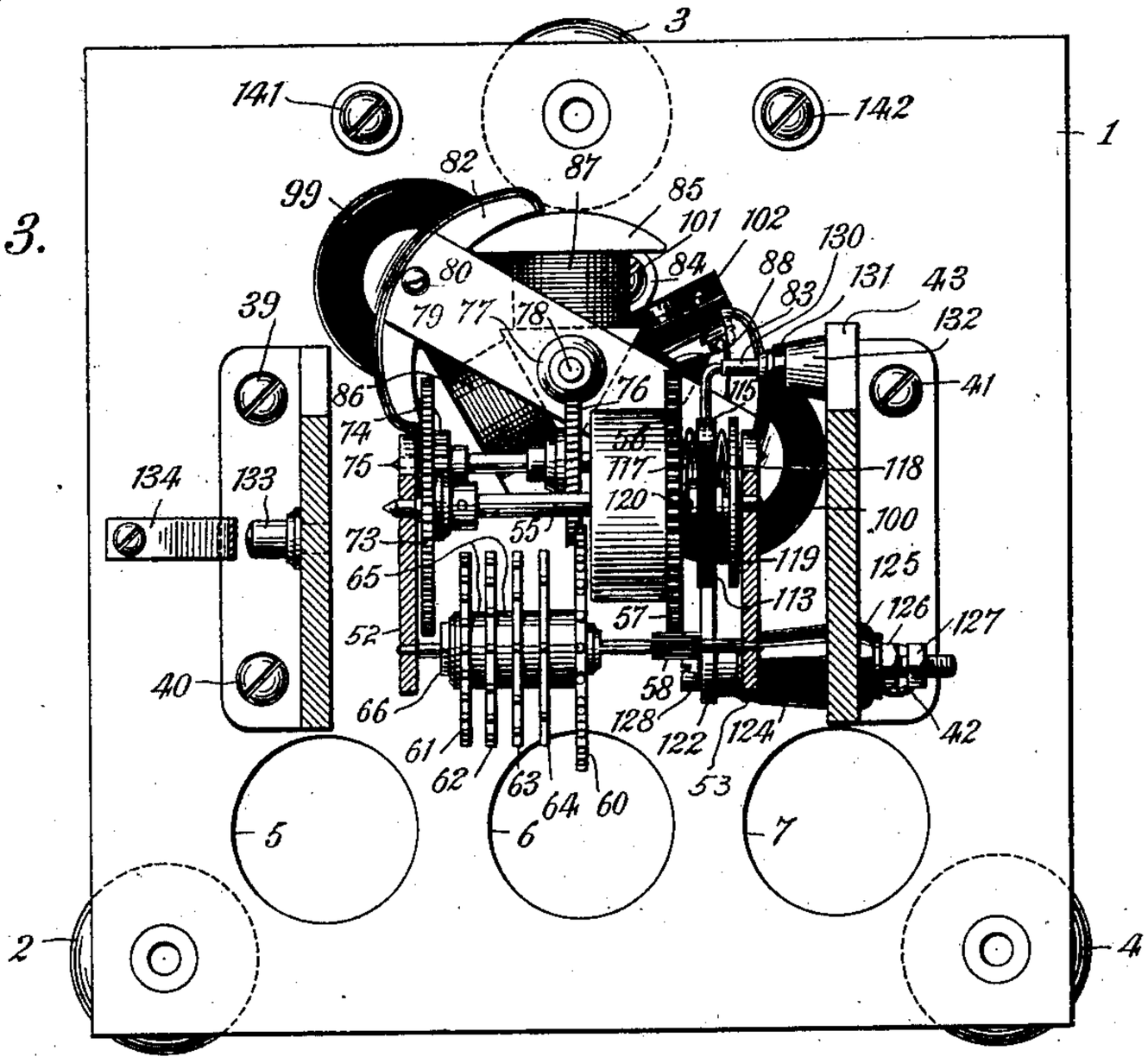


Fig. 8.

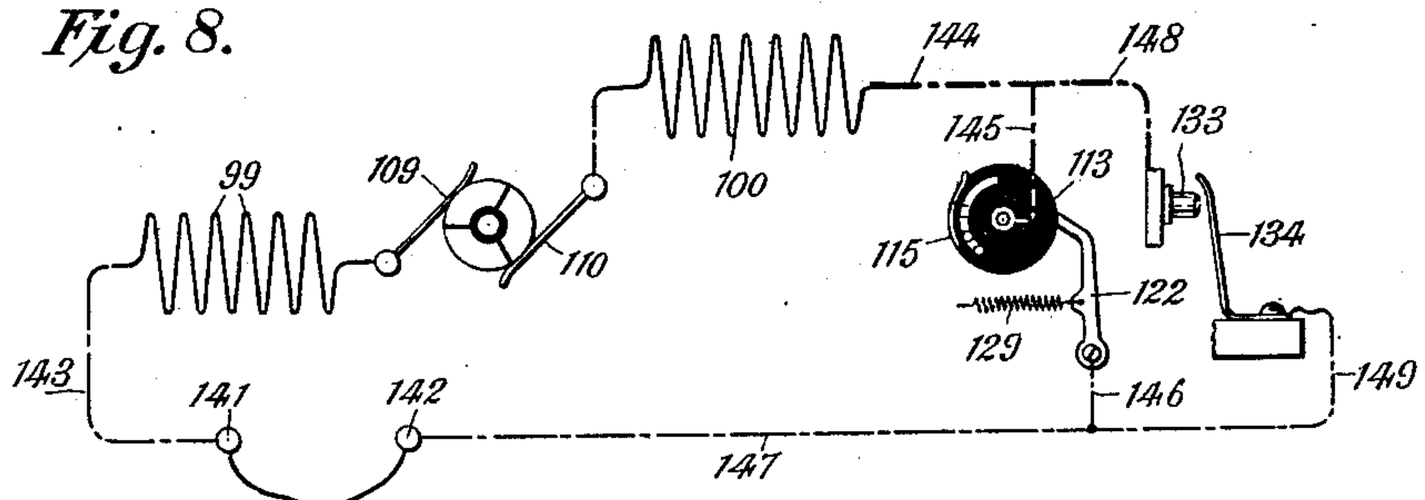


Fig. 4.

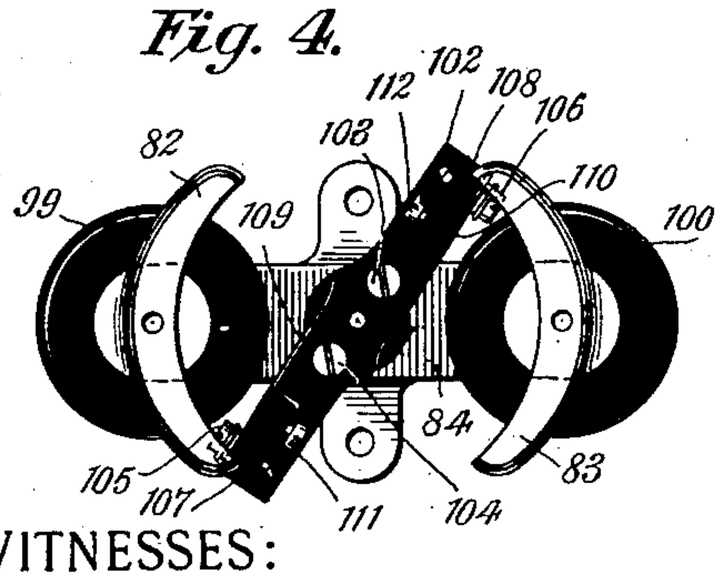


Fig. 5.

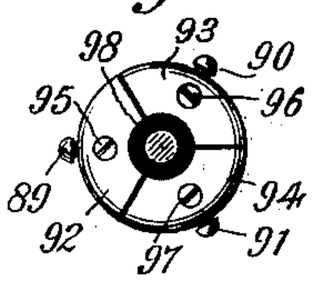
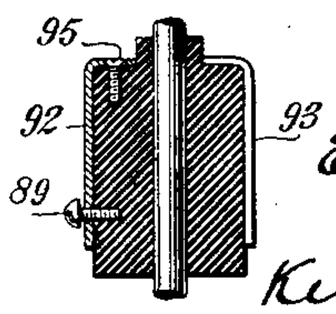
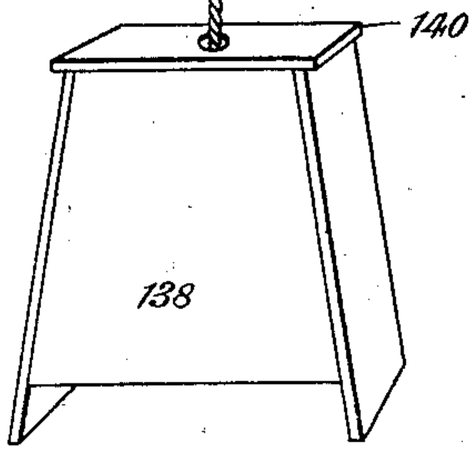


Fig. 6.





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ELECTRIC METRONOME.

APPLICATION FILED JULY 30, 1902.

NO MODEL. 4 SHEETS—SHEET 4.

Fig. 9.

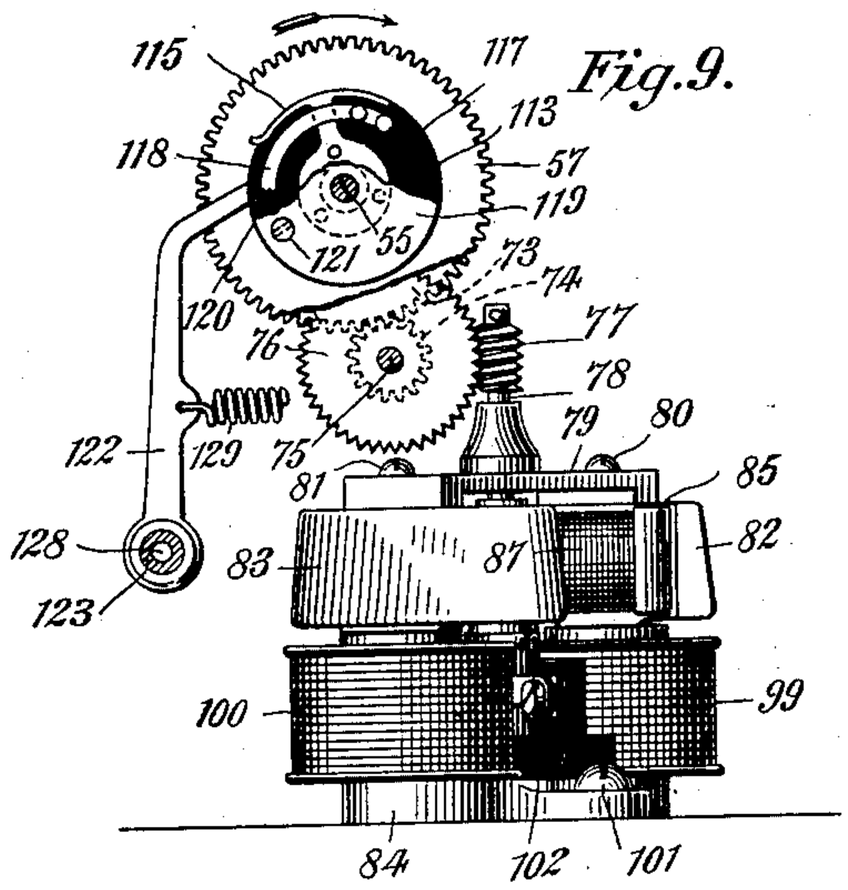
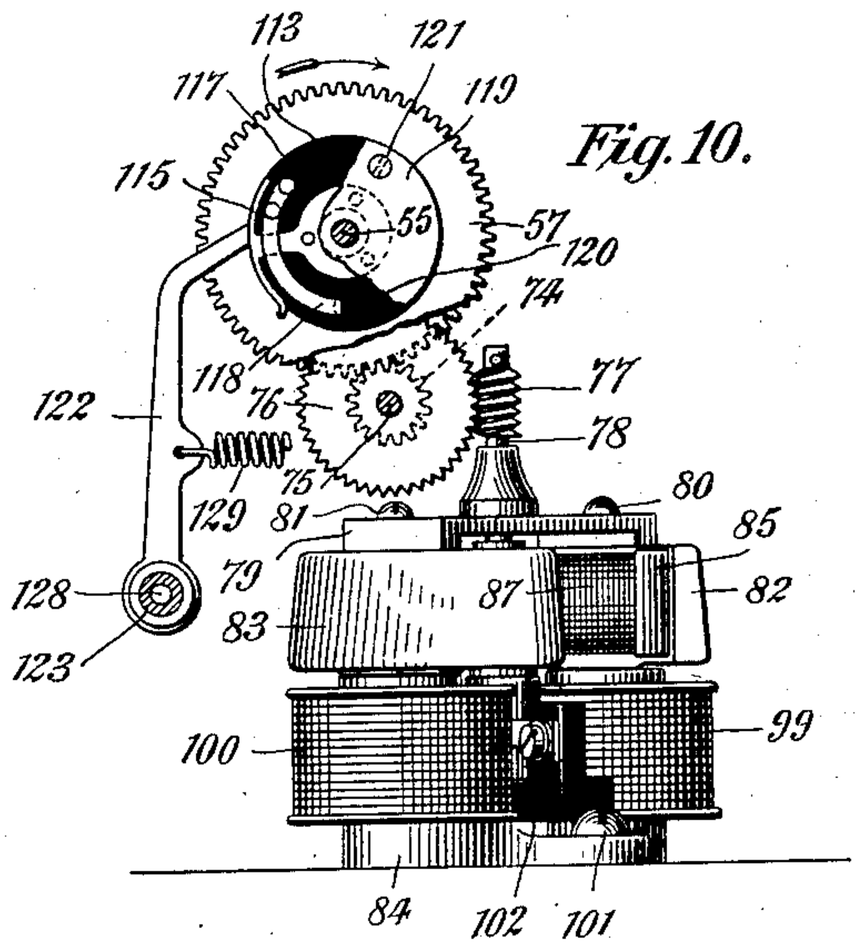


Fig. 10.



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No. 734,032. Patented July 21, 1903.

UNITED STATES PATENT OFFICE.

ERNEST K. ADAMS, OF NEW YORK, N. Y.

ELECTRIC METRONOME.

SPECIFICATION forming part of Letters Patent No. 734,032, dated July 21, 1903.

Application filed July 30, 1902. Serial No. 117,727. (No model.)

To all whom it may concern:

Be it known that I, ERNEST K. ADAMS, a citizen of the United States, residing at New York, county and State of New York, have invented certain new and useful Improvements in Electric Metronomes, of which the following is a specification, reference being had to the drawings accompanying and forming part of the same.

In the study of music the metronome has come to be an important element not only in determining the tempo that a certain composition shall be played at, but in aiding the student in technical exercises to maintain a precision of rhythm in any tempo from a largo to a presto. There is, however, a disadvantage in the present marketable types, that consists in the necessity of stopping frequently and often in the middle of a difficult passage to wind up the barrel-spring of the device. In the present subject a small electric motor has been added to the customary percussion mechanism of a metronome in such a way that when the barrel has made but one revolution the motor is automatically started and made to noiselessly wind up the mainspring. This has a twofold advantage—the first being that the musician is provided with a metronome that will continue to run without attention as long as the battery lasts, which if several cells of dry battery are employed will be in the neighborhood of a year, and, second, that by reason of the barrel being allowed but one revolution before the mainspring is recoiled the force for operating the pendulum will be more constant than otherwise and the beat of the pendulum not marked by any perceptible variation. In the design of the instrument the features of simplicity and cheapness of manufacture have been the cardinal ones.

By reference to the drawings, Figures 1 and 2 are sectional elevations of the device; Fig. 3, a plan of the same with the upper portion of the case removed; Figs. 4, 5, and 6, details of the electric motor; Fig. 7, a section of the controlling-switch; Fig. 8, a diagram of the required wiring; Fig. 9, a detail view of the contact mechanism, and Fig. 10 a similar view of the same during the winding operation.

The case of the metronome consists, first, of a base 1, having three turned feet 2, 3, and 4 glued therein. The base is further perforated with three holes 5, 6, and 7. Fitting upon the base 1 is the body of the instrument, which is made up of two sides 8 and 9, back 10, front pieces 11 and 12, cap 13, horizontal portion 14, together with a cover formed of three pieces 15, 16, and 17. Glued into the corners of the case are four blocks 18 to 21, inclusive. There is also a fifth block 22 glued to the back 10, which, together with the front portions 19 and 21, forms a place for one of three screws 23, passing through the feet 2, 3, and 4, to screw into. Let into the apex of the case is a piece 24, over which a brass plate 25 is fastened by two screws 26 and 27. The plate 25 is provided with a tongue 28, which is let into the under side of the cap 13. A small depression 29 is drilled in the tongue 28 for a button 30, incorporated in the cover 15, to rest in. The button 30 is formed upon the top of a rod 31, having a pin 32 therein, which is normally held by a compression-spring 34 against the under side of a plate 33, screwed to the top of the cover 15. This cover is held at the bottom by two dowels 35 and 36. A paper pendulum-scale 37, covered by a strip of transparent celluloid 38, is secured in a groove cut in the front plate 11.

Fastened to the base 1 by four screws 39 to 42, inclusive, is a cast frame 43, upon which the customary percussion elements of the metronome are mounted. These parts consist of a pendulum 44, bob 45, sliding counterpoise 46, mounting 47, fastening-screws 48, spindle 49, escapement cam device 50, journal-bearing 51, frame-plates 52 and 53, screws 54, barrel-arbor or spring-shaft 55, spring-barrel 56, barrel-gear 57, pinion 58, spindle 59, escapement-wheel 60, bell-ringing wheels 61 to 64, inclusive, collars 65, fastening-nut 66, slide 67, rod 68, bell 69, hammer member 70, spring 71, and adjustment-screw 72. Pinned to the barrel-arbor 55 is a gear 73, which is driven by a pinion 74, mounted upon a spindle 75, journaled between the frame-plates 52 and 53. The ratio of the pinion 74 to the gear 73 is one to five. Also mounted upon the spindle 75 is a worm-gear 76, having fifty teeth. In mesh with this worm-gear 76 is a worm 77, which is pinned to the shaft 78 of a small electric motor. The total reduc-

tion from the barrel-arbor 55 to the motor-shaft 78 on account of the above gearing is one to two hundred and fifty. The general arrangement of the motor is a vertical one, the armature-shaft 78 being both journaled in a bridge-piece 79, secured by two screws 80 and 81, together with several dowels, to two field-magnet poles 82 and 83, respectively, and pivoted in a hard-steel button let into a yoke 84, the end of the shaft 78 being pointed. Fastened to the shaft 78 by a set-screw is a tripolar armature 85, having three coils 86, 87, and 88 wound thereon. The coils 86, 87, and 88 are connected together in series, the junctions being electrically joined by the screws 89, 90, and 91 to three segments 92, 93, and 94, respectively, of a commutator. These segments 92, 93, and 94 are respectively held by three screws 95, 96, and 97, together with several dowels, to a fiber cylinder 98, driven upon the armature-spindle 78. The pole-pieces 82 and 83, together with two field-cores, are fastened to the yoke 84 by two machine-screws. Wound about these cores are two field-magnets 99 and 100, which are placed in series with the armature-coils 86, 87, and 88. The yoke 84 is rigidly held to the base 1 by two wood-screws 101, the clearances in the aforesaid yoke around the screws being sufficient to allow of a correct adjustment of the worm 77 to its gear 76. A fiber-brush rocker 102 is adjustably secured to the yoke 84 in any desired plane of commutation by two screws 103 and 104. Mounted by two screws 105 and 106 upon two projections 107 and 108 from the rocker 102 are two commutator-brushes 109 and 110, respectively. The friction of these brushes is capable of convenient regulation by two further screws 111 and 112. On account of the vertical arrangement of the armature-spindle 78 and its cone-pivot the motor will run without noise at a high speed with several cells of dry battery, the time required to wind the barrel 56 of the metronome being several seconds. The automatic switch for controlling the motor at each rotation of the barrel 56 consists of an insulating fiber disk 113, brass bushing 114, platinum contact 115, fastening-pins 116, semicircular spring 117 and 118, arbor-disk 119, barrel-screw 120, disk-screw 121, contact or lever 122, journaling-sleeve 123, fiber post 124, washer 125, nuts 126 and 127, screw 128, retractile spring 129, post 130, insulating-bushing 131, and sleeve 132. An auxiliary device is provided for shunting the main switch when it is desired to run the motor at intervals other than those controlled by the aforesaid main switch. This arrangement consists of a post 133, spring 134, ebonite push-button 135, securing-pin 136, and metal sleeve 137.

The wiring of the metronome, shown in Fig. 8, consists, primarily, of a battery-box 138, in which are placed several cells of dry battery, a flexible twin cord 139 passing through the box-cover 140 and joining them with two terminals 141 and 142, screwed to the base 1. The motor-circuit is made up from the post 141 of a wire 143, field 99, brush 109, commutator of motor, armature-coils of the same, brush 110, field-magnet 100, frame portions 144 and 145, platinum contact 115, lever 122, and conductors 146 and 147 back to the other post 142. The auxiliary shunt for completing the motor-circuit consists of the frame portion 148, post 133, spring 134, and wire 149.

To follow the automatic winding function of the metronome, let it be considered that the pendulum 44 is beating and the barrel 56 in running down is revolving the switch-disk 113 through the medium of the projecting screw 120 and spring 117. When this has continued for a time, the contact 115 will pass under the lever 122, and a current will then proceed over the motor-circuit, made up of the members 141, 143, 99, 109, 110, 100, 144, 145, 115, 122, 146, 147, and 142. The motor is thus speeded and winds the spring 150 in the barrel 56. The other screw 121 now revolves and when it has made nearly a full turn comes against its spring 118, thus pushing the contact 115 from under the lever 122 and breaking the motor-circuit until the same cycle of operations is again performed. The projection on the contact 115 (shown in Fig. 2) is for preventing the same from being moved away from the lever 122 before the disk-screw 121 arrives at its spring 118 simply by the rotation of the barrel-arbor 55.

It will be readily understood that my invention is capable of numerous embodiments other than the particular form herein set forth, and therefore I do not consider myself limited thereto; but

What I claim is—

1. In a metronome, the combination with the spring-shaft, an insulating-disk, a contact supported on said disk, a second contact bearing constantly on said disk, and an electric motor arranged to rotate said shaft, electrically connected with said contacts, of means for rotating said disk intermittently at predetermined intervals to bring the contacts together, as set forth.

2. In a metronome, the combination with the spring-shaft, an insulating-disk, a contact supported on said disk, a second contact bearing constantly on said disk, and an electric motor arranged to rotate said shaft, electrically connected with said contacts, of means for rotating said disk intermittently at predetermined intervals to bring the contacts together, and means to separate the contacts, as set forth.

3. In a metronome, the combination with the spring-shaft, an insulating-disk, a contact supported on said disk, a second contact bearing on said disk, and an electric motor arranged to rotate said shaft, electrically connected with said contacts, of means for rotating said disk to bring the contacts together, and a second disk rotated by the spring-shaft,

and having means to engage the insulating-disk to rotate the same and separate the contacts, as set forth.

4. In a metronome, the combination with the spring-shaft, an insulating-disk movably mounted on said shaft, a contact supported on said disk, a second contact bearing on said disk and an electric motor arranged to rotate the spring-shaft, electrically connected with said contacts, of means for rotating said insulating-disk to bring the contacts together, and a second disk rigidly secured to the spring-shaft, having means to engage the insulating-disk to rotate the same and separate the contacts, as set forth.

5. In a metronome, the combination with the spring-barrel, the spring-shaft, an insulating-disk movably mounted on the spring-shaft and having a device to be engaged by the spring-barrel, a contact supported on the insulating-disk, a second contact bearing on the insulating-disk, and an electric motor arranged to rotate the spring-shaft, electrically connected with the contacts, of a second disk rigidly mounted on the spring-shaft, and having means to engage the insulating-disk to rotate the same and separate the contacts, as set forth.

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