

E. M. TORMIN.  
CIRCUIT INTERRUPTER.  
APPLICATION FILED OCT. 7, 1910.

990,790.

Patented Apr. 25, 1911.

2 SHEETS—SHEET 1.

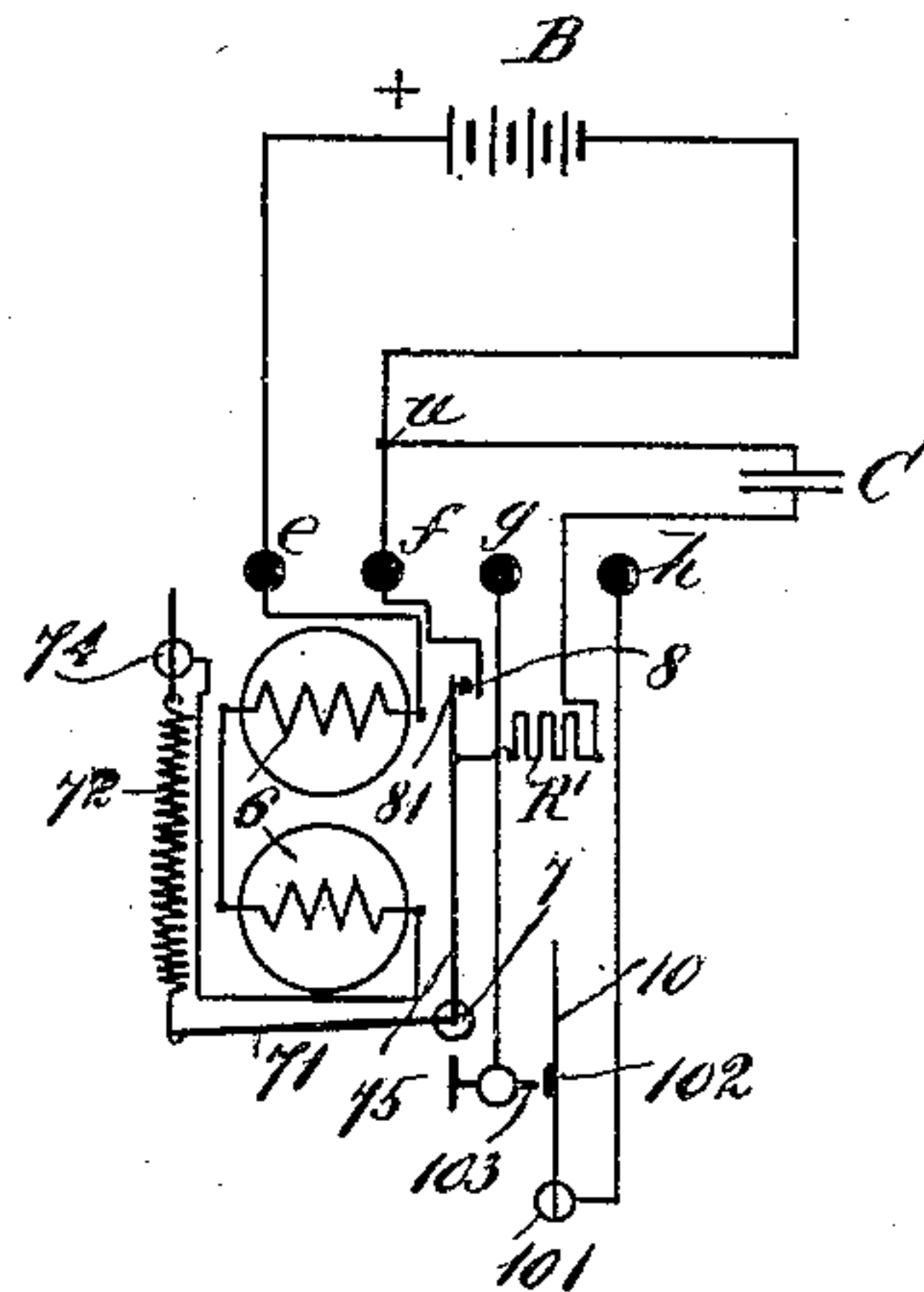


Fig. 1.

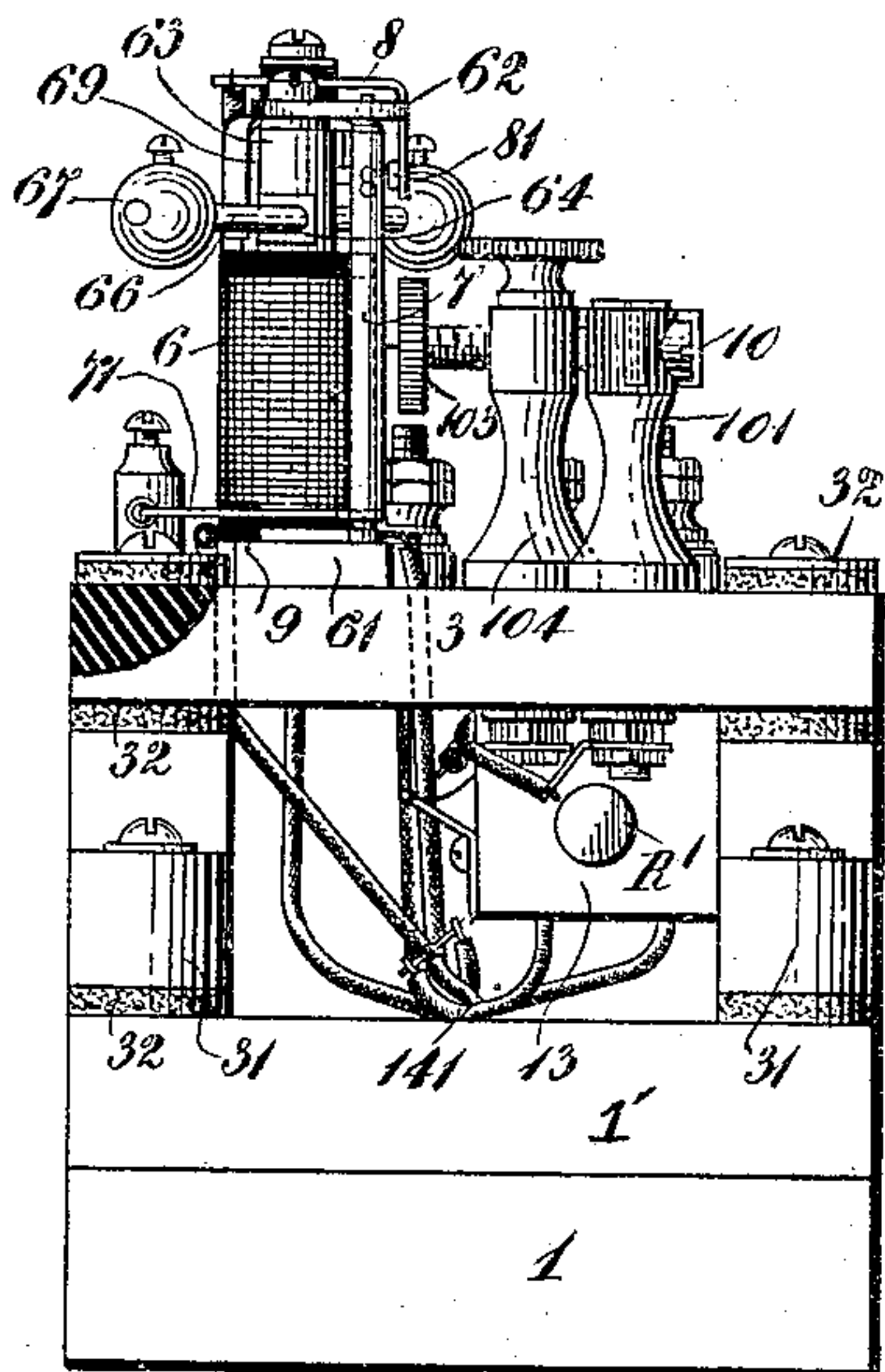


Fig. 2.

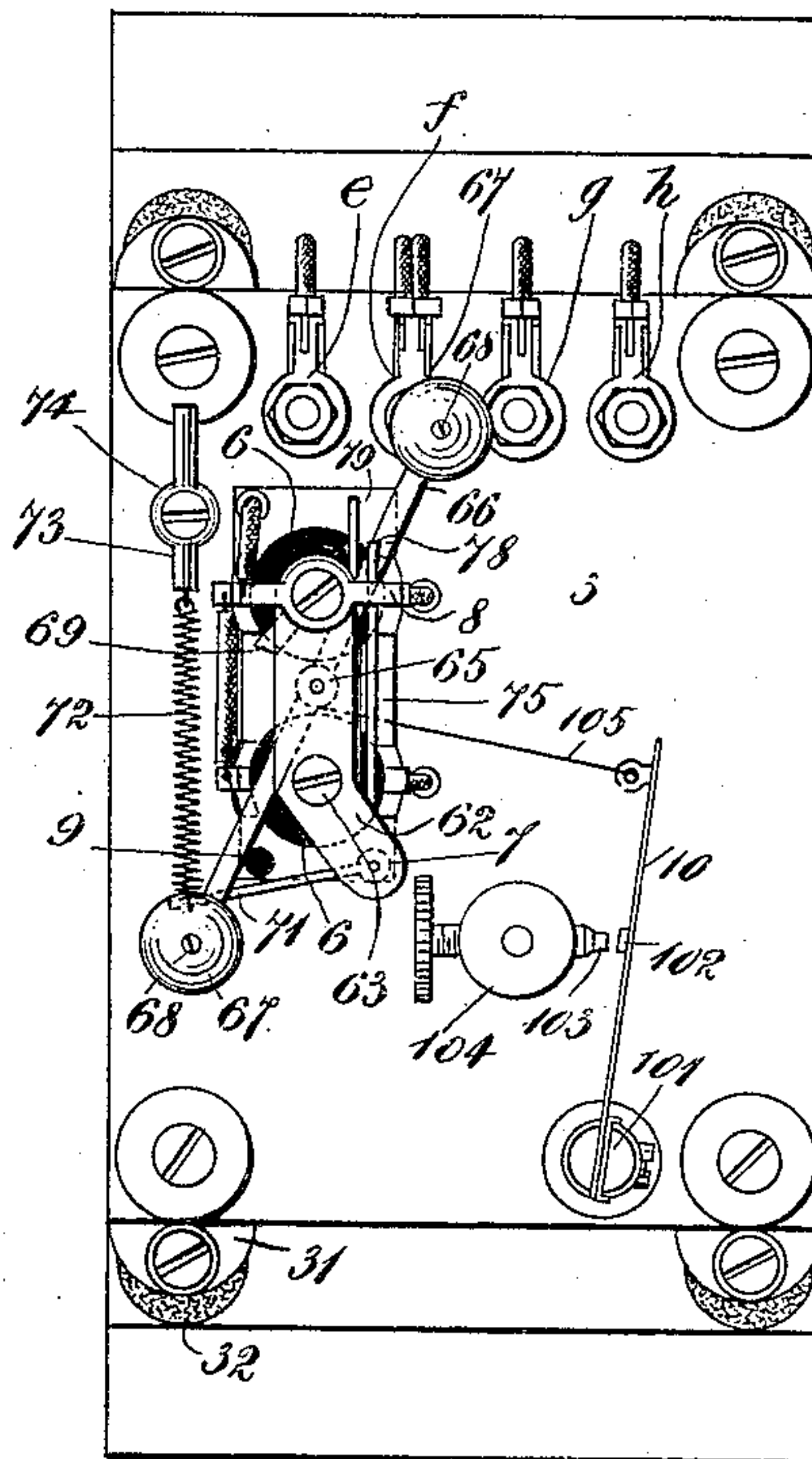


Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## CIRCUIT-INTERRUPTER.

990,790.

Specification of Letters Patent.

Patented Apr. 25, 1911.

Original application filed March 29, 1910, Serial No. 552,125. Divided and this application filed October 7, 1910. Serial No. 585,807.

*To all whom it may concern:*

Be it known that I, EGMONT M. TORMIN, a subject of the Emperor of Germany, and a resident of Newton Center, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Circuit-Interrupters, of which the following is a specification.

My invention relates to circuit interrupters and its object is to provide an apparatus commonly known as a "busy-back timer" adapted especially for regulating the cadence of the signals produced by a busy-back vibrator or other suitable source of varying current, although it is capable of use with a circuit energized by direct current.

The drawings which accompany and form a part of this specification illustrate one embodiment of my invention whereby the above stated object has been realized in practice.

In the drawings—Figure 1 is a diagram showing one mode of connecting the several sets of apparatus illustrated in the other figures. Fig. 2 is a front elevation of one form of apparatus constituting my invention, the cover being shown in section. Fig. 3 is a plan view with the cover removed. Fig. 4 is a side view of the busy-back timer and Fig. 5 is an inverted plan view of the same. Fig. 6 is a section taken on the line 6 6 of Fig. 4.

In that particular embodiment of my invention illustrated in the drawings, 1 represents a base of hard wood or other suitable material carrying the slab 3, which may be of slate mounted on the brackets 31, which may be secured to the base by screws or other suitable means. Felt washers 32 may be interposed between the brackets and the base and between the slab and the brackets as well as between the slab and the heads of the screws which hold the slab on the brackets.

It is often desirable for many reasons to vary the cadence of the "busy" signals in telephony as distinguished from varying the frequency thereof. For example, if the frequency of the signaling current is three hundred per second, it is desirable in certain systems that one exchange be provided with apparatus for interrupting the circuit of the vibrator say thirty times per minute so that the subscriber will receive a busy sig-

nal produced by a plurality of groups, each of 300 pulsations of current having a frequency of three hundred per second, each group being repeated thirty times per minute—in other words, a varying current signal having a cadence of thirty per minute; and that other exchanges be provided with similar apparatus for giving different cadences to their busy signals produced by signaling current having a frequency which may or may not be the same as that of the first exchange. It is also sometimes desirable that a single exchange be provided with a plurality of devices for interrupting the varying current produced by a vibrator at different rates or for impressing on such current different cadences in order to enable the operator to transmit various information to a subscriber, such for instance as the information that the party called does not answer, etc.

In order to regulate the cadence of the busy signals, I provide a timer of novel construction and have shown the same in the present instance mounted on the slab 3. The electromagnets 6 for energizing the timer are mounted on the base 61 of iron and are provided with the cores 63, 63' which extend above the magnets and support the cross-piece 62 of brass or other suitable material. The cores are provided with oppositely arranged grooves 64 which serve as pole pieces for the oscillating armature 66, which in the present case consists of a governor mounted on the vertical rod 65 of hardened steel journaled in the base 61 and cross-piece 62. The governor may be provided with means such as the balls 67 adjustably secured thereto by the screws 68 for assisting in timing the period thereof. A back-stop 69 secured between the core 63' and the cross-piece 62 may be employed to limit the movement of the governor. A vertical rod 7 of steel also journaled between the base 61 and the cross-piece 62 carries at or near its lower end a pin 71 to which the spring 72 is connected, and the tension of said spring may be adjusted by the pin 73 which is adjustably secured in the post 74 and which is attached to said spring. Secured near the upper end of the rod 7 is the arm 75 carrying the lateral extension 76 which extends over the governor and is provided with a down-



wardly extending insulated finger 77 nominally contacting said governor. The arm 75 at its outer extremity is provided with an upwardly extending finger 78 arranged to strike against the leaf-spring 79 which is attached to the core 63. The stationary contact 8 carried by and insulated from the core 63' normally is in contact with the point 81 on the arm 75. A stop 9 mounted on the base 61 may be employed to limit the inward movement of the pin 71.

A leaf spring 10 mounted on the post 101 carries the contact 102 arranged to cooperate with the adjustable contact 103 which is carried by the post 104. The outer end of the spring 10 is connected to the rod 65 by a flexible connection 105 which in the present instance consists of a silk thread making a half turn around said rod and secured in a hole therein, preferably by knotting the end of the thread, and passing the same through the hole which may be tapering.

When the magnets 6 are energized by the direct current, the governor-armature 66 of soft iron is attracted to the cores 63, 63' into the grooves 64 which constitute the pole-pieces for said armature, and thereby the normally maintained contact between the points 8 and 81 is broken by the armature striking the finger 77 and drawing the arm 75 which carries the contact 81 away from the contact 8. The circuit of the magnets 6 as more fully explained by reference to the diagram shown in Fig. 1, is now opened between the points 8 and 81 and the magnets thereby deenergized, whereupon by the combined action of the leaf spring 79, which acts against the upturned finger 78 of the arm 75, and the spring 72, which through the pin 71 acts on the pivoted upright rod 7, the arm 75 is forced back to its normal position so that the circuit of the magnets is again closed at the points 8 and 81; and at the same time the finger 77, which is rigid with the pivoted rod 7, acts on the governor armature and throws the same outward away from its pole-pieces with considerable force so that said armature is carried outside the magnetic attraction of the magnets. The partial rotation of the pivoted rod 65 causes the thread 105 to pull on the spring 10 until the contact is closed at the points 102 and 103; and the centrifugal action of the governor causes said spring to be slightly bent so that it operates as a lever with the contact point 103 as a fulcrum. The spring 10 thus serves to limit the motion of the governor, to bring it to rest and to cause it to move back toward its original position within the magnetic attraction of the magnets, whereupon, the magnets being energized (the magnet-circuit having been closed at the points 8 and 81) again attract the governor armature and the cycle is repeated.

It will be obvious that by suitably varying the adjustable contact screw 103, the tension of the spring 72 and the position of the balls on the governor, the period of oscillation of the latter may be varied throughout a wide range so that a circuit connected in series with the contacts 102, 103 may be opened and closed as many times per minute as desired.

Any suitable source of varying current produced in any suitable manner, as for example, by a vibrator, may be connected in series with the contacts 102, 103.

It is desirable that means be provided for preventing sparking at the contacts 8 and 81, and in the present case I prefer to use for this purpose the non-inductive resistance R' secured to the under side of the slab 3 by brackets such as shown at 13, 13, together with the condenser C.

The various sets of conductors are brought through the hole 141 of the block 1' which is secured to the base 1 and the condensers and inductance connections are joined thereto.

Referring to the diagram shown in Fig. 1, which shows schematically the various devices above described, and in which the timer mechanism is omitted for clearness, B represents a battery or other suitable source of current. The circuit carrying the current to be interrupted or varied includes the contacts 102, 103 connected respectively to the posts *h*, *g*. The current for energizing the magnets 6 flows from the battery B to binding post *f*, contacts 8, 81, arm 75, vertical rod 7, pin 71, spring 72, post 74, and thence through the magnets 6 and back to the battery by way of the post *e*. Across the contacts 8, 81 the non-inductive resistance R' and condenser C are connected in series, the circuit being traced from the contact 81 to resistance R', thence to condenser C, and back to the contact 8 by way of the point *u*, the function of this arrangement being to prevent sparking at the contacts 8, 81.

This application is a division of my application Serial No. 552,125 filed March 29, 1910.

It will be understood that while I have described with some particularity one form of apparatus and circuit arrangements whereby my invention has been successfully practiced, I do not wish to limit myself thereto inasmuch as both the apparatus and circuit arrangements may be subjected to a wide range of variation without departing from the spirit of my invention.

I claim:

1. In a telephone signaling system, a timer for periodically controlling a circuit comprising in combination, an electromagnet, a pivoted armature arranged when in attracted position to open the circuit



through said electromagnet, spring means arranged to move said armature away from said electromagnet and outside the magnetic attraction thereof, and other spring means arranged to bring said armature within the magnetic attraction of said electromagnet.

2. In a telephone signaling system, a timer for periodically controlling a signaling circuit comprising in combination, an electromagnet, a pivoted armature arranged when in attracted position to open the circuit through said electromagnet, spring means arranged to move said armature away from said electromagnet and outside the magnetic attraction thereof and means arranged to bring said armature within the magnetic attraction of said electromagnet and to periodically control said signaling circuit.

3. In a telephone signaling system, a timer for periodically controlling a signaling circuit comprising in combination, an electromagnet, a pivoted armature arranged when in attracted position to open the circuit through said electromagnet, spring means arranged to move said armature away from said electromagnet and outside the magnetic attraction thereof, other spring means arranged to bring said armature within the magnetic attraction of said electromagnet, and means for periodically controlling said signaling circuit carried by said last mentioned spring means.

4. In a telephone signaling system, a timer for periodically controlling a circuit comprising in combination, an electromagnet, an armature pivoted to oscillate in a plane normal to the axis of said electromagnet, spring means arranged to move said armature away from said electromagnet and outside the magnetic attraction thereof, and other spring means arranged to bring said armature within the magnetic attraction of said electromagnet.

5. In a telephone signaling system, a timer for periodically controlling a signaling circuit comprising in combination, an electromagnet, an armature pivoted to oscillate in a plane normal to the axis of said electromagnet, spring means arranged to move said armature away from said electromagnet and outside the magnetic attraction thereof, and means arranged to bring said armature within the magnetic attraction of said electromagnet and to periodically control said signaling circuit.

6. In a telephone signaling system, a timer for periodically controlling a signaling circuit comprising in combination, an electromagnet, an armature pivoted to oscillate in a plane normal to the axis of said electromagnet, spring means arranged to move said armature away from said electromagnet and outside the magnetic attraction thereof, other spring means arranged to bring said

armature within the magnetic attraction of said electromagnet, and means for periodically controlling said signaling circuit carried by said last mentioned spring means.

7. In a telephone signaling system, a timer for periodically closing and opening a circuit comprising in combination, an electromagnet, an armature pivoted to oscillate in a plane normal to the axis of said electromagnet, spring means arranged to move said armature away from said electromagnet and outside the magnetic attraction thereof, and other spring means arranged to bring said armature within the magnetic attraction of said electromagnet.

8. In a telephone signaling system, a timer for periodically closing and opening a signaling circuit comprising in combination, an electromagnet, an armature pivoted to oscillate in a plane normal to the axis of said electromagnet, spring means arranged to move said armature away from said electromagnet and outside the magnetic attraction thereof, and means arranged to bring said armature within the magnetic attraction of said electromagnet and to periodically close and open said signaling circuit.

9. In a telephone signaling system, a timer for periodically closing and opening a signaling circuit comprising in combination, an electromagnet, an armature pivoted to oscillate in a plane normal to the axis of said electromagnet, spring means arranged to move said armature away from said electromagnet and outside the magnetic attraction thereof, other spring means arranged to bring said armature within the magnetic attraction of said electromagnet, and a contact for periodically closing and opening said signaling circuit by said last mentioned spring means.

10. In a telephone signaling system, a timer for periodically controlling a circuit comprising in combination an electromagnet, an armature pivoted to oscillate in a plane normal to the axis of said electromagnet, a pair of normally closed contact members in the circuit of said electromagnet, means associated with one of said contact members and arranged to be struck by said armature when in its attracted position to separate said contact members, spring means arranged to move said armature away from said electromagnet and outside the magnetic attraction thereof, and other spring means arranged to bring said armature within the magnetic attraction of said electromagnet.

11. In a telephone signaling system, a timer for periodically controlling a signaling circuit comprising in combination an electromagnet, an armature pivoted to oscillate in a plane normal to the axis of said electromagnet, a pair of normally closed contact members in the circuit of said electromagnet, means associated with one of said



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net and arranged to open the circuit through said electromagnet when in its attracted position, means for moving said armature away from said electromagnet and outside the magnetic attraction thereof, and other means for bringing said armature within the magnetic attraction of said electromagnet.

19. In a telephone signaling system, a timer for periodically controlling a circuit comprising in combination, an electromagnet, an armature pivoted to oscillate in a plane normal to the axis of said electromagnet and arranged to open the circuit through said electromagnet when in its attracted position, means for moving said armature away from said electromagnet and outside the magnetic attraction thereof, other means for bringing said armature within the magnetic attraction of said electromagnet, and means for varying the natural period of said armature.

20. In a telephone signaling system, a timer for periodically controlling a circuit comprising in combination, an electromagnet, an armature pivoted to oscillate in a plane normal to the axis of said electromagnet and arranged to open the circuit through said electromagnet when in its attracted po-

sition, means for moving said armature away from said electromagnet and outside the magnetic attraction thereof, other means for bringing said armature within the magnetic attraction of said electromagnet, and weights secured to said armature for varying the natural period thereof.

21. In a telephone signaling system, a timer for periodically controlling a circuit comprising in combination, an electromagnet, an armature pivoted to oscillate in a plane normal to the axis of said electromagnet and arranged to open the circuit through said electromagnet when in its attracted position, means for moving said armature away from said electromagnet and outside the magnetic attraction thereof, other means for bringing said armature within the magnetic attraction of said electromagnet, and weights secured to said armature and adjustable longitudinally thereof for varying the natural period of said armature.

In testimony whereof, I have hereunto subscribed my name this 28th day of September, 1910.

EGMONT MAX TORMIN.

Witnesses:

GEO. K. WOODWORTH,  
E. B. TOMLINSON.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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