Oct. 18, 1932. W. E. PORTER 1,882,891

ELECTRIC CLOCK

Filed May 18, 1927 2 Sheets-Sheet 1

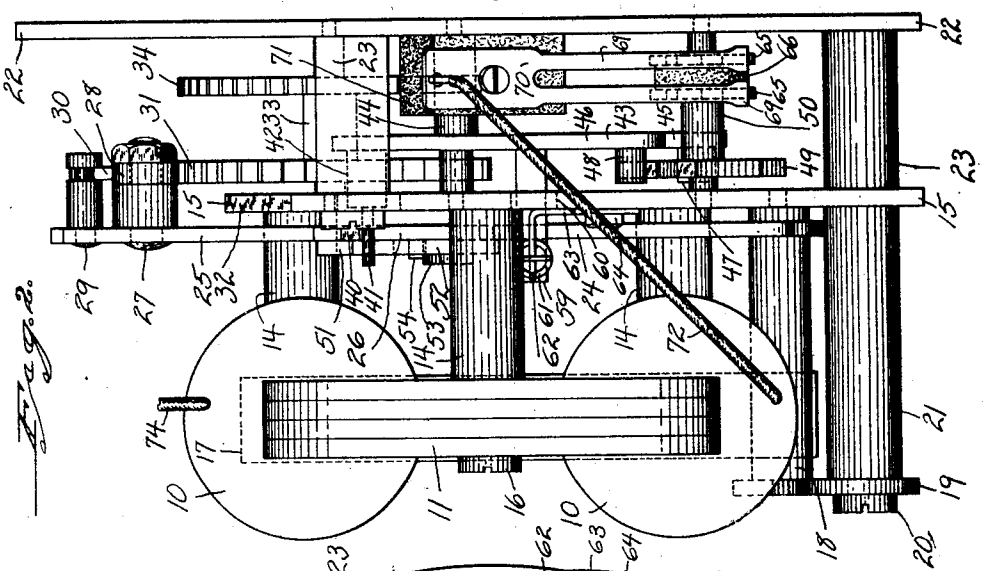


Fig. 2.

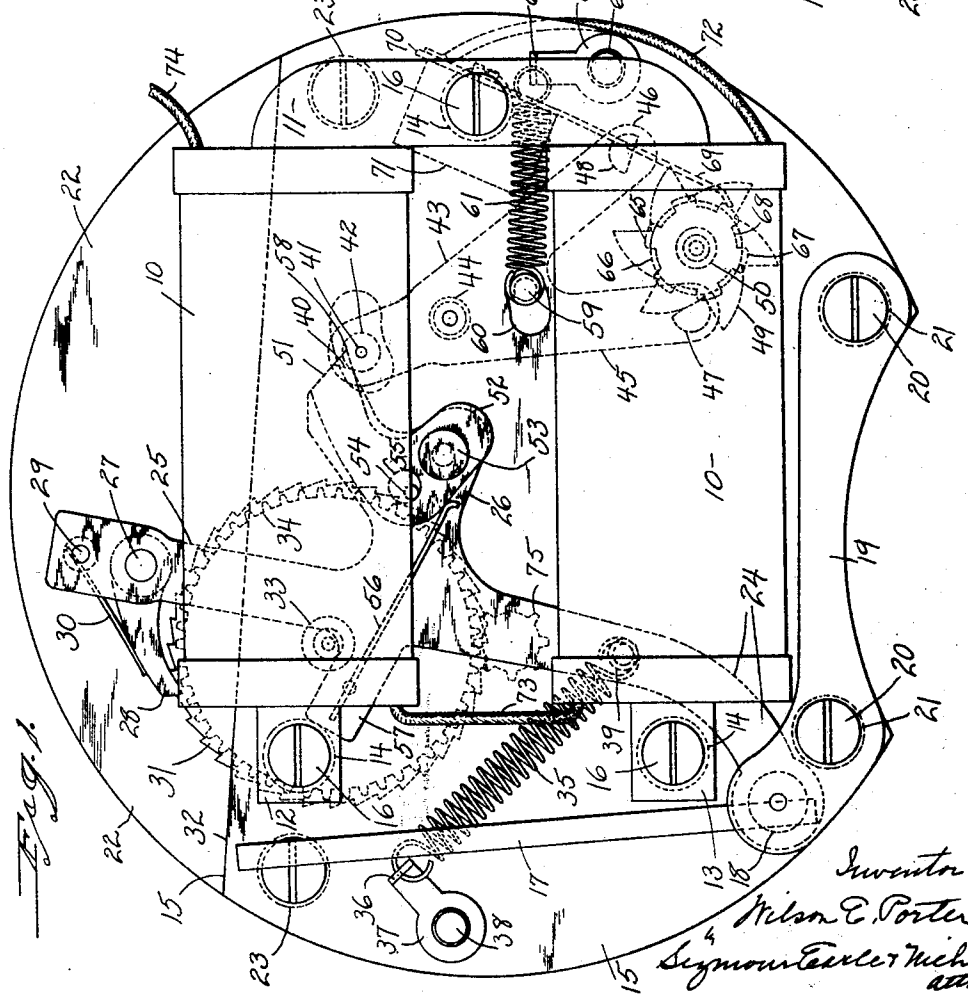


Fig. 1.

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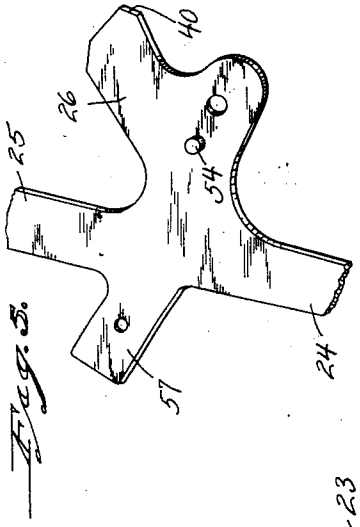


Fig. 5.

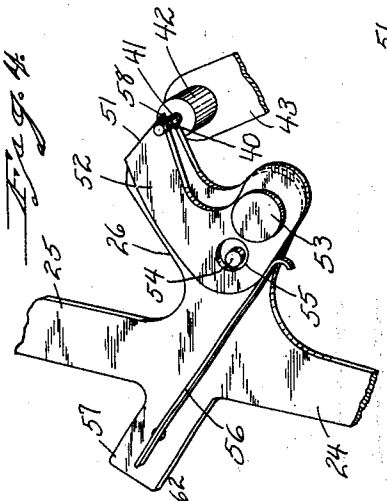


Fig. 4.

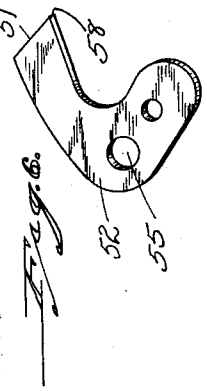


Fig. 6.

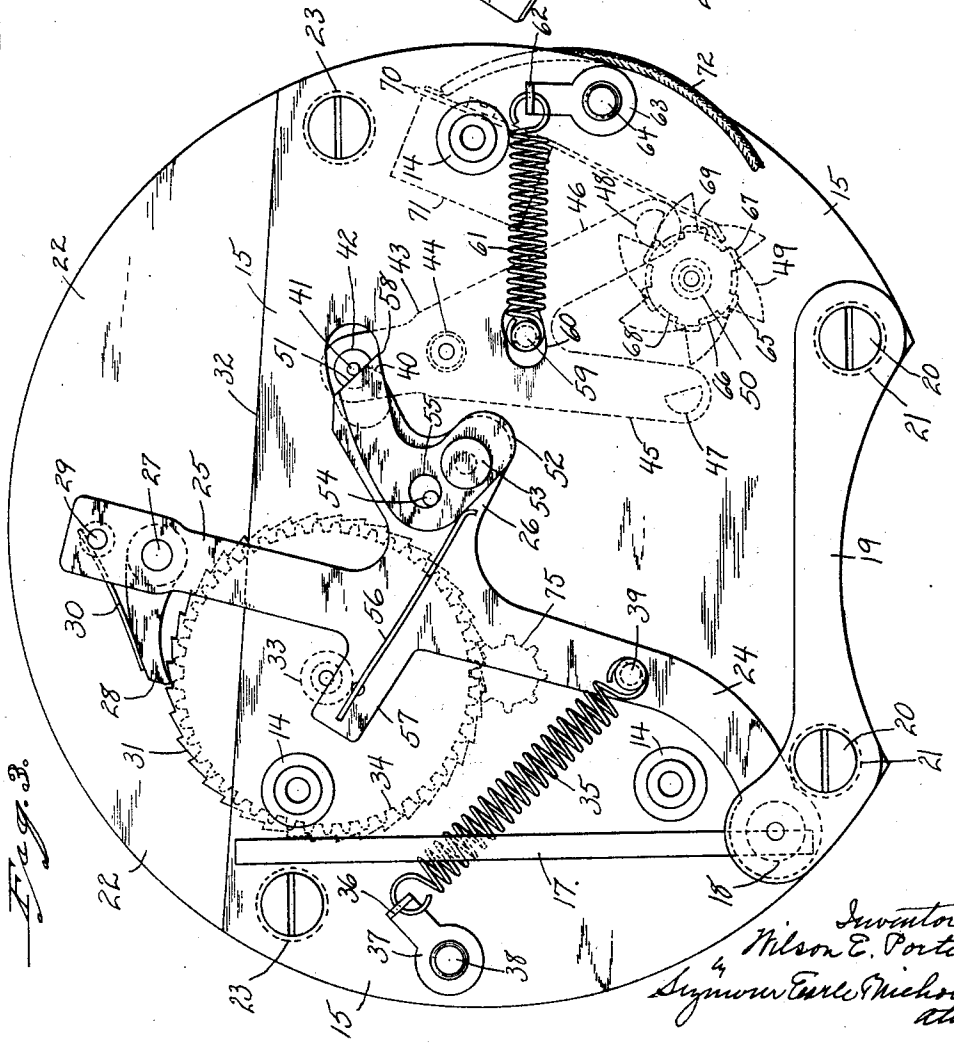


Fig. 3.

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Patented Oct. 18, 1932

1,882,891

UNITED STATES PATENT OFFICE

WILSON E. PORTER, OF NEW HAVEN, CONNECTICUT, ASSIGNOR TO THE NEW HAVEN CLOCK CO., OF NEW HAVEN, CONNECTICUT, A CORPORATION

ELECTRIC CLOCK

Application filed May 18, 1927. Serial No. 192,274.

My invention relates to an improved electric clock, the object being to produce an electric clock primarily designed to be used as an automobile clock, though not so limited, and constructed with particular reference to simplicity and fewness of parts and to stabilizing the periodicity of the energizing of their driving-springs by rendering them immune to derangement by shocks and vibrations to which all clocks used in automobiles are particularly subjected.

With these ends in view, my invention consists in an electric clock characterized by having a driving-spring, an electro-magnet for periodically energizing the said spring, a circuit for the said magnet, a switch-mechanism for controlling the said circuit, and locking-means for holding the said switch-mechanism in its circuit-breaking position during the time-interval between the periodic energization of the driving-spring.

My invention further consists in a clock characterized as above and having certain details of construction and combinations of parts as will be hereinafter described and particularly recited in the claims.

In the accompanying drawings:

Fig. 1 is a view in rear elevation of the electric elements of an electric clock embodying my invention, the parts being shown in the positions due to them at the instant the circuit is closed through the coils of the electro-magnet;

Fig. 2 is an edge view thereof;

Fig. 3 is a view corresponding to Fig. 1, save that the magnet has been removed and that the parts are in the positions due to them at the instant of breaking the circuit through the coils of the electro-magnet;

Fig. 4 is a detached broken perspective view of the central portion of the operating-lever, together with the switch-control dog carried thereby, the switch-actuating pin, and a portion of the switch-actuating member in which the said pin is mounted;

Fig. 5 is a detached perspective view of the central portion of the operating-lever; and

Fig. 6 is a similar view of the switch-control dog.

In the embodiment of my invention herein shown, my improved electric clock is provided with an electro-magnet comprising a pair of coils 10 and a core 11 terminating in pole-pieces 12 and 13, and mounted in spaced relation to the clock-movement by three pillars 14 projecting rearward from the rear movement-plate 15 thereof and entered at their rear ends by screws 16 passing from rear to front through parts of the said core 11. The said electro-magnet serves to operate a pivotal armature 17 secured at one end to a rock-shaft 18 journaled in the said rear movement-plate 15 and in a bridge 19 attached by screws 20 to the outer ends of two pillars 21 projecting rearwardly from the said plate 15. The front movement-plate 22 is organized with the rear movement-plate 15 in the usual manner by pillars 23 extending between them and spacing them apart.

The rock-shaft 18 carries, near its forward end, an operating-lever 24 having, at its upper end, a train-driving arm 25, and about midway of its length an offsetting switch-actuating arm 26, the said operating-lever 24 participating in all of the movements of the armature 17. The upper end of the train-driving arm 25 of the lever 24 carries a stud 27 mounting a pawl 28 and also a stud 29 mounting a pawl-spring 30. The said pawl co-acts with the teeth of a ratchet-wheel 31, a portion of which projects beyond the cut-away-edge 32 of the rear movement-plate 15. The said ratchet-wheel 31 is mounted upon the main-wheel arbor 33, which also mounts the main-wheel 34 of the clock-train. The ultimate power for driving the said main-wheel 34, and hence the time-train (not shown) of the clock, is supplied by means of a helical driving-spring 35, one end of which is attached to the upturned finger 36 of an adjustable tensioning-arm 37 secured to the rear movement-plate 15 by a rivet 38 on which the said arm may be swung as required, to properly tension the spring 35. The opposite end of the said spring 35 is secured to a rearwardly-projecting stud 39 in the operating-lever 24.

The outer end of the switch-actuating arm 26 of the operating-lever 24 is formed with an inclined cam-surface 40 for co-action with

a switch-actuating pin 41 projecting from the rear end of a post 42 mounted in the upper end of a bifurcated switch-actuating lever 43 mounted upon a rock-shaft 44 journaled between the front and rear movement-plates 22 and 15. The complementary arms 45 and 46, produced by bifurcating the lever 43, respectively carry, at their lower ends, driving-pins 47 and 48 having flattened faces set at different angles and alternately co-acting with the cam-like outer edges of the six arms of a star-wheel 49 carried by a shaft 50 located between and journaled in the movement-plates 15 and 22 aforesaid. The said lever 43 as thus constructed and arranged virtually straddles the shaft 50.

The switch-actuating pin 41 before mentioned co-acts not only with the cam-surface 40, as stated above, but also with an inclined locking-surface 51 formed at one end of a bowed switch-control dog 52 pivotally mounted upon a stud 53 in the switch-actuating arm 26 of the operating-lever 24. The rocking movement of the said dog is limited by a stop-pin 54 mounted in the arm 26 and entering a hole 55 in the dog larger in diameter than the said pin. A spring 56, mounted in an offsetting-arm 57 of the lever 24, engages with the dog 52 in position to exert a constant effort to swing the same clockwise, so as to keep its nose 58 projected beyond the cam-surface 40 of the switch-actuating arm 26 of the lever 24.

For moving the switch-actuating lever 43 in the direction required for closing the circuit, it is provided with a stud 59 rearwardly projecting from it through a clearance-slot 60 in the rear movement-plate 15. This stud provides for the attachment of a switch-actuating spring 61, the opposite end of which is connected with the rearwardly-turned finger 62 of an adjustable tensioning-arm 63 secured to the movement-plate 15 by a rivet 64 on which the said arm may be swung as required to properly tension the said spring 61.

The shaft 50 of the star-wheel 49 also mounts two corresponding rotary contact-wheels 65 spaced apart by an insulating fiber guard-disk 66 slightly smaller in diameter than the said wheels, which, as shown, are formed with six equally-spaced contact-lugs 67 separated by clearance-spaces 68. The said contact-lugs 67 of the respective contact-wheels 65 are concurrently engaged by the complementary yielding-fingers 69 of a contact-arm 70 secured to a fiber block 71 applied to the rear face of the front movement-plate 22. The said fiber guard-disk 66 interposed between the contact-wheels 65 prevents the inwardly-turned ends of the contact-fingers 69 from engaging with the bottom walls of the clearance-spaces 68 between the contact-lugs 67. The said contact-arm 70 has soldered to it the outer end of the terminal wire 72 of the coils 10 of the electro-magnet, these coils being connected together by a conductor 73. The other terminal of the coils 10 is formed by a wire 74.

In explaining the operation of my improved clock, reference may be first had to Figs. 1 and 2, which represent the parts of the clock in the positions due to them after the energy of the helical driving-spring 35 has substantially expended itself in driving the clock-train, with the result that the circuit has been closed through the coils 10 of the electro-magnet, with the effect of energizing the pole-pieces 12 and 13 thereof to attract the armature 17, whereby the operating-lever 24 is swung from left to right, the driving-spring 35 re-energized by being placed under greater tension, and the pawl 28 moved backward over two teeth of the ratchet-wheel 31. As described, the movement of the operating-lever 24 from left to right causes the cam-surface 40 of the switch-actuating arm 26 to act through the pin 41 carried by the switch-actuating lever 43 to rock the said lever clockwise, resulting in tensioning the switch-actuating spring 61. The described clockwise movement of the lever 43 causes the flat face of the driving-pin 48 to strike the cam-like outer edge of one of the teeth of the star-wheel 49, which is thus given a one-twelfth turn, whereby the correspondingly-positioned clearance-spaces 68 of the contact wheels 65 are brought into registration with the inwardly-turned ends of the contact-fingers 69 of the contact-arm 70, thus breaking the circuit through the magnet-coils 10 and de-energizing the core 11 of the magnet. The parts now occupy the positions shown in Fig. 3.

Having broken the circuit and so released the pull of the pole-pieces 12 and 13 upon the armature 17, as above described, the helical driving-spring 35 now asserts itself to pull the operating-lever 24 from right to left, causing the pawl 28 to drive the ratchet-wheel 31, which slowly yields under the control of the escapement (not shown) of the time-train. During the described slow movement of the lever 24 from right to left, carrying with it the switch-control dog 52, the locking-surface 51 thereof slowly rides under and sustains the pin 41, which is held against it by the tension of the switch-actuating spring 61 until the movement described has carried the nose 58 of the said dog into line with the upper edge of the said pin, which then moves from right to left beneath the said nose 58, thus permitting the switch-actuating lever 43 to be swung counter-clockwise under the influence of the switch-actuating spring 61, whereby the flattened face of the driving-pin 47 is smartly engaged with the cam-like outer edge of the adjacent tooth of the star-wheel 49, which is thus smartly rotated one-twelfth of a turn with the effect of bringing a comple-

mentary pair of the contact-lugs 67 of the contact-wheels 65 into engagement with the inwardly-turned outer ends of the contact-fingers 69 of the contact-arm 70, resulting in the instantaneous closing of the circuit through the coils 10 of the electro-magnet. The several parts described will now have the positions in which they are shown in Figs. 1 and 2.

The instant the circuit through the magnet is closed, as above described, the pole-pieces 12 and 13 thereof attract the armature 17, with the effect of returning the several parts to the positions shown in Fig. 3.

It will be seen from the foregoing that the interval of time between the making and breaking of the circuit is almost infinitesimal, while, on the other hand, the interval of time between the breaking and making of the circuit is measured by the length of time required by the driving-spring 35 to move the main-wheel 34 through a distance represented substantially by the distance between two teeth of the ratchet-wheel 31.

For the sake of convenience and clarity, the time-train of the clock has not been shown other than by the main-wheel 34 and the first pinion 75 into which it meshes. The time-train may, of course, be of any approved construction and arrangement.

It will be noted that under my improved construction, during the interval of time between the making and breaking of the circuit, the switch-lever 43 is positively held against being swung counter-clockwise by the spring 61, which, if permitted, would result in closing the circuit by the riding of the pin 41 upon the locking-surface 51 of the switch-control dog, thus making it impossible for any shock to prematurely close the circuit and thus vary the length of the intervals between the energization of the main-driving spring 35. Uniform time-keeping is thus assured by the stabilization of the periodicity of the energization of the driving-spring of the clock. For instance, if the clock is constructed and regulated to keep correct time when the driving-spring is energized once every minute, it is apparent that that object will be defeated if shock and vibration are permitted to disturb that time interval by prematurely closing the circuit which, in my improved construction, is guarded against, as described.

I claim:

1. In a contact-operating mechanism for electric clocks of the type in which an armature is moved in one direction by a driving-spring and in the opposite direction by an electro-magnet, the combination with a switch-mechanism, of an operating-member actuated by the armature of the clock and having a cam-surface for moving the said switch-mechanism into its circuit-breaking position, a spring normally tending to move the said switch-mechanism into its circuit-closing position, and a retireable locking-dog also carried by the said operating-member for bodily movement therewith in position to normally overlap the said cam-surface for positively holding the said switch-mechanism in its circuit-breaking position against the counter-urge of the said spring during the time-interval between the periodic energization of the driving-spring of the clock.

2. In a contact-operating mechanism for electric clocks of the type in which an armature is moved in one direction by a driving-spring and in the opposite direction by an electro-magnet, the combination with a switch-mechanism, of an actuating-lever for the said switch-mechanism of which it is electrically independent, an operating-member moved by the armature of the clock and having a cam-surface positioned to co-act with the said actuating-lever for moving the same into its potential circuit-closing position, a spring normally urging the said actuating-lever in a direction to effect the movement of the said switch-mechanism into its circuit-closing position, and a pivotal locking-dog also carried by the said operating-member for bodily movement therewith in position to normally overlap the cam-surface thereof for positively holding the said actuating-lever in its potential circuit-closing position against the counter-urge of the said spring during the time-interval between the periodic energization of the driving-spring of the clock.

3. In a contact-operating mechanism for electric clocks of the type in which an armature is moved in one direction by a driving-spring and in the opposite direction by an electro-magnet, the combination with a switch-mechanism, including a rotary contact-wheel and a star-wheel for turning the same; an actuating-lever having two arms respectively extending on opposite sides of the said star-wheel; an operating-member connected to the armature of the clock for movement thereby and having a cam-surface for moving the said actuating-lever into its potential circuit-closing position during the time-interval between the periodic energization of the driving-spring of the clock; a spring normally exerting an effort to move the said actuating-lever in a direction to effect the movement of the said contact-wheel into its circuit-closing position; and a pivotal dog also carried by the said operating-member for bodily movement therewith in position to normally overlap the said cam-surface for positively holding the said actuating-lever in its potential circuit-closing position against the counter-urge of the said spring during the time-interval between the periodic energization of the driving-spring of the clock.

In testimony whereof, I have signed this specification.

WILSON E. PORTER.