July 4, 1939. R. H. WHITEHEAD ET AL 2,164,976

AUTOMOBILE CLOCK

Filed Aug. 10, 1936 2 Sheets-Sheet 1

Fig. 1.

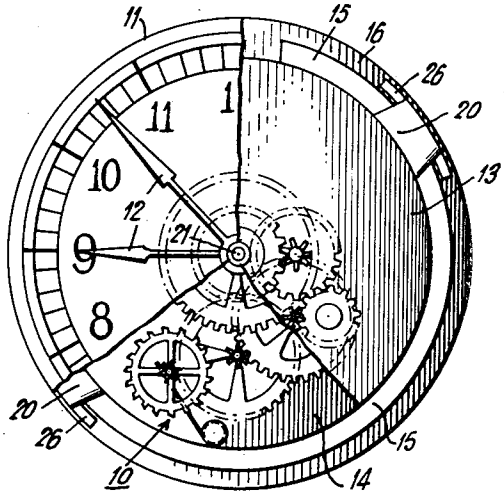

Fig. 2.

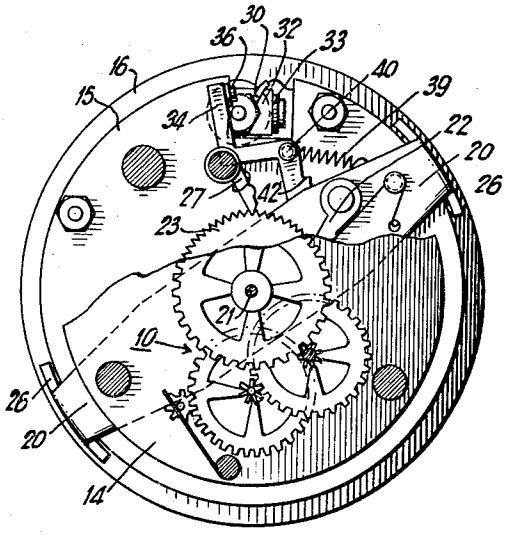

Fig. 3.

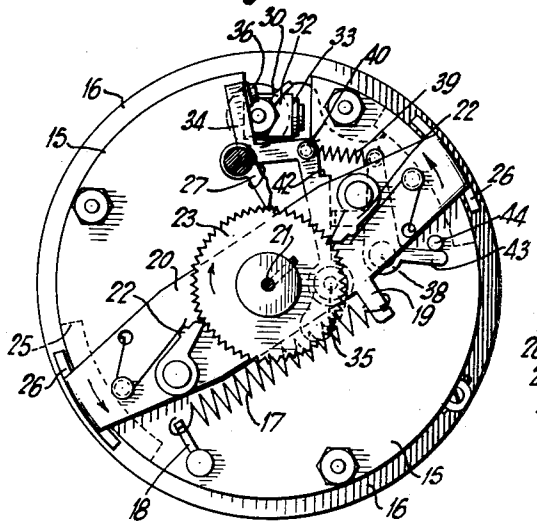

Fig. 4.

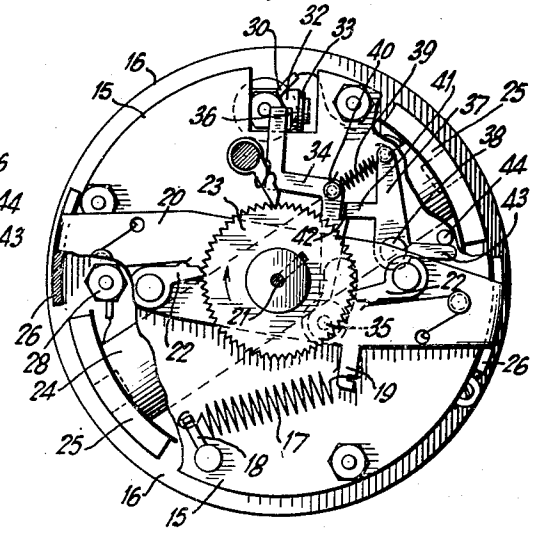

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Fig.5.

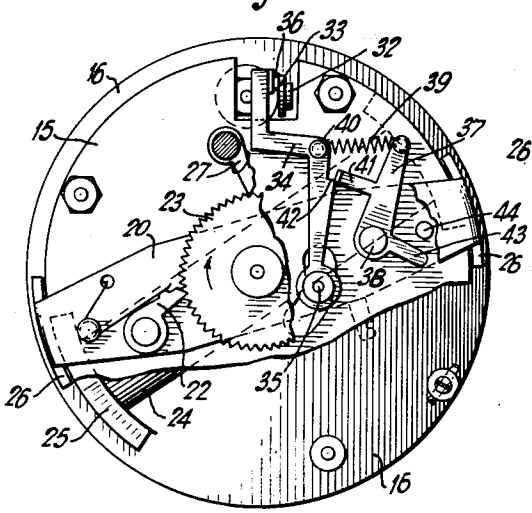


Fig.6.

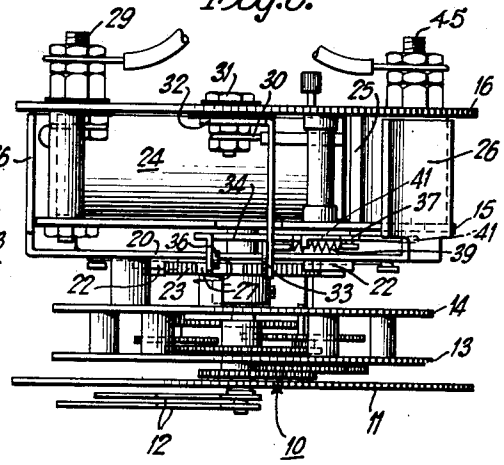


Fig.7.

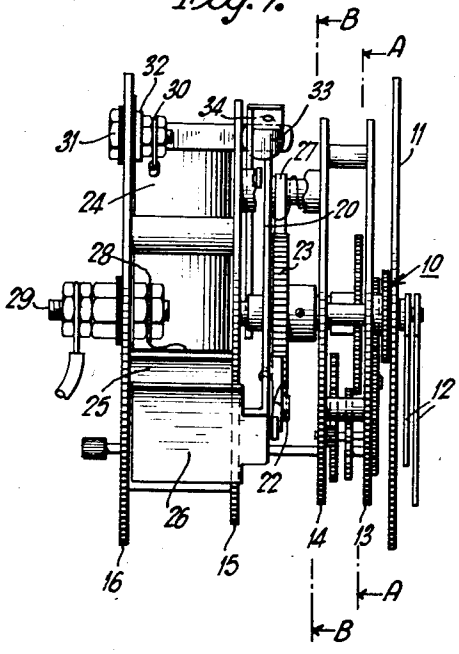
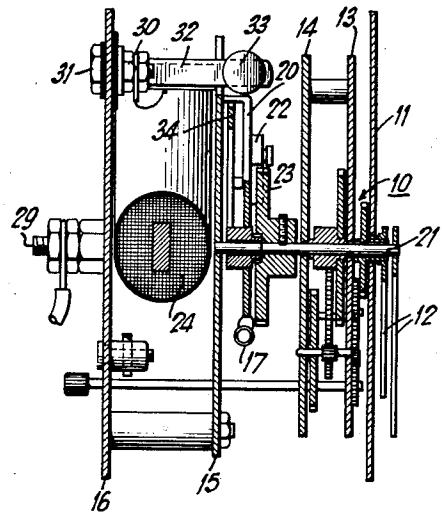


Fig.8.



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UNITED STATES PATENT OFFICE

2,164,976

AUTOMOBILE CLOCK

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Application August 10, 1936, Serial No. 95,074

14 Claims. (Cl. 185—40)

This invention relates to automobile clocks, that is to clocks intended to be periodically rewound by low voltage, direct current impulses.

It is an object of this invention to provide a new and improved mechanism by which such a clock can be reliably kept in continuous operation with a minimum of current consumption.

Clocks of this nature comprise generally an electromagnet in series with a switch mechanism and geared to a time train in such a manner that the time train controls the opening and closing of the switch which in turn controls the actuation of the magnet to wind the spring which operates the time train.

It is an object of this invention to provide a new and improved clock in which the switch controlled mechanism for driving the time train will require a minimum of power for actuation of the switch mechanism and thereby make available to the time train a large part of the total power available.

In any power mechanism for actuating such clocks, a greater amount of energy is required for operating the winding means at the point where the winding is substantially completed, than at the point where the winding commences. Such mechanisms have ordinarily been so coupled to the switch mechanism that the maximum power for actuation of the switch is required from the winding mechanism at the time when the resistance of the spring to the winding is already at its maximum.

It is an object of this invention to provide a clock in which the switch mechanism exerts little or no additional resistance to the winding mechanism at the time the winding mechanism is at the end of its winding operation.

It is a further object to provide a mechanism of the character described in which a minimum of pressure is required between the contact points of the switch in order to reduce the amount of power required to set the winding mechanism.

It is a further object to provide a clock in which the points are opened with a wiping motion, thereby insuring a more perfect contact between the points and in which the current is broken with a snap to prevent arcing and burning of the points.

It is a further object to provide a mechanism which will accomplish the foregoing results within the space and power available within the clock.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements, and arrangements of parts, which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description, taken in connection with the accompanying drawings, in which:

Figure 1 is a front elevation of a clock embodying this invention, the face being partly broken away to show the time train.

Figure 2 is a section parallel to the face along the line A—A of Figure 7 with the winding armature in the extreme winding position.

Figure 3 is a similar view along the line B—B of Figure 7.

Figure 4 is a view similar to Figure 3, with the winding mechanism in the extreme unwound position, but with the switch closed to start the winding movement.

Figure 5 is a similar view, but with the winding partially completed and just prior to the snapping open of the switch.

Figure 6 is a top plan view of the mechanism.

Figure 7 is a side elevation thereof.

Figure 8 is a central vertical section.

The clock comprises primarily a time train indicated generally at **10** supporting a face **11** and arranged to drive time indicating hands **12**. In the particular form illustrated this time train is carried by supporting plates **13** and **14** in which the gears of the train are journaled and it is in turn supported by a frame work comprising plates **15** and **16** by which the winding mechanism is carried.

The time train receives its power from a main spring **17** attached at one end to a lug **18** carried by the plate **15** and at the other end to an arm **19** upon an armature lever **20** journaled about the main shaft **21** of the time train. This lever **20** carries ratchet pawls **22** in position to engage a ratchet wheel **23** fixed upon the main shaft **21**, the direction of the parts being such that the armature lever **20** may be moved about the shaft **21** to tension the spring **17** while the pawls move freely over the ratchet wheel, but when the armature lever is released, the tension of the spring **17** urges the armature lever **20** and (through the medium of the pawls **22** and ratchet **23**), the main shaft **21** to rotate in a direction to operate the time train.

An electromagnet **24** is disposed symmetrically about the center of the shaft **21** and has pole pieces **25** at each end having cylindrical outer

surfaces and the armature lever 20 has armatures 26 in the form of cylindrical plates so disposed upon the lever that they may rotate into a position in close proximity with the pole pieces 25 against the action of the spring 17 whenever the electromagnet 24 is energized and may rotate in the opposite direction under the action of the spring 17 whenever the electromagnet 24 is de-energized, during which latter operation the rotary movement of the lever 20 is utilized to run the clock. A third pawl 27 carried by the plate 14 is spring pressed against the tooth of the ratchet wheel 23 to prevent reverse movement thereof while the armature lever 20 is being moved by the magnet 24.

The magnet 24 has one of its electrical terminals 28 connected to an insulated post 29 affording a terminal for connection to an outside battery and the other terminal of the magnet 30 is carried by an insulated post 31 which supports an L-shaped bracket 32 carrying a contact 33. Mounted upon the lever 20 is a Z-shaped arm 34 which is pivoted to the lever 20 at 35. A slot 35*a* is provided in the plate 16 to permit clearance of the pin 35 in its movement. This arm 34 carries at its other end a contact 36 in position, when permitted to do so, to make contact with the contact 33.

A lever 37 pivoted to the plate 15 at 38 carries at its outer end a tension spring 39 which is connected at its other end to a point 40 upon the Z-shaped arm 34, the tension of the spring 39 being such as to urge the contact 36 into engagement with the contact 33. The lever 37 has an outstanding arm 41 normally engaging the Z-shaped lever 34 at a point just above a shoulder 42 upon the latter and the lever 37 has an arm 43 extending outwardly in the other direction to engage a stop 44 upon the plate 15 to limit the movement of the lever 37.

The proportion of the parts and the position of the pivots 38 and 35 is such that the normal tendency of the spring 39 is to hold the contacts 33 and 36 in firm engagement. This represents the position of the parts in Figure 4 and it is the condition which the clock assumes when completely run down, if no energy be supplied from the battery.

Let us assume now that the clock is connected up to the battery, one terminal of the battery being connected to the post 29 and the other to a binding post 45 which is grounded to the plate 15. The contact 33 is connected to one side of the magnet and through the magnet coil to the post 29 which is insulated from the ground plates. The contact 36 is connected to the ground plates and through them to the post 45. As soon as the electrical connection is made, the contacts 33 and 36 being in engagement, the magnet 24 is energized, swinging the lever 20 about its pivot.

During the first part of this movement, the upward swing of the pivot 35 pushes the contact 36 upwardly over the face of the contact 33 while these parts are in contact with each other. During this time the shoulder 42 engages the arm 41 and rotates the lever 37 in a clockwise direction until a point is reached (see Figure 5) in which the arm 41 slips off the point of the shoulder 42, whereupon the lever 37, being no longer restrained, moves counter clockwise until the arm 43 engages the stop 44 and during this movement the arm 34 is snapped quickly to the left to break contact between 36 and 33. This opens the circuit to the electromagnet, but the armature lever is, notwithstanding that fact, carried on by its own momentum as well as by the time lag required by the magnetism to die out of the electromagnet. This brings the clock to the extreme wound position as shown in Figure 3 and it continues in that position to drive the time train until the position of the armature lever has again been restored to the position shown in Figure 4, by the running of the clock.

With the foregoing construction it will be clear that when the spring 17 is completely unwound, the magnetism of the electromagnet must have sufficient power to overcome the initial tension of the spring 17 and at the same time the tension of the spring 39. As the winding movement progresses, however, and the tension of the spring 17 gets stronger, the point 41 snaps beyond the shoulder 42 and the spring 39 is substantially released. Thus the energy for snapping the switch apart is stored up at a time when the resistance of the spring 17 is at a minimum. Moreover, by reason of the wiping contact between the points, it is not necessary to exert such pressure between them, and this further lightens the load which the electromagnet is compelled to carry and greatly reduces the strain and wear upon the mechanism.

A clock made in accordance with this invention will have, as can be readily seen from the foregoing, great reliability and long life because so little energy is required to operate the switch, and at the same time the character of the contact between the points is such that perfect connection is made without the necessity of very great pressure and there is no likelihood of the points burning because of the snap action by which the points are separated. Moreover, by reason of the fact that so little power is required to operate the switch mechanism, there is economy of battery, and notwithstanding this fact, a larger amount of energy is available for the actual driving of the time train.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

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

1. A device of the character described comprising in combination a frame, a magnet, carried by said frame, a driven shaft centrally disposed with regard to said magnet and said magnet having pole pieces terminating in the surface of a cylinder about said shaft, a lever oscillating about said shaft and having armature tips to cooperate with said pole pieces, a main spring for moving said arm in one direction, a contact point carried by said frame, a contact arm pivoted to said lever in position to engage said contact point as said contact lever swings about its own axis, a dog pivoted to said frame having an abutment in position to engage said arm when said lever is moved against said main spring, to force said arm away from said contact, a spring connecting said dog and said arm to urge said arm into contact with said contact point, and to urge

said abutment against said arm when said lever is moved against the main spring and having such leverage that said abutment may force the arm free from said contact point.

2. A device of the character described comprising in combination a frame, a magnet, carried by said frame, a driven shaft centrally disposed with regard to said magnet and said magnet having pole pieces terminating in the surface of a cylinder about said shaft, a lever oscillating about said shaft and having armature tips to cooperate with said pole pieces, a main spring for moving said arm in one direction, a contact point carried by said frame, a contact arm pivoted to said lever in position to engage said contact point as said contact lever swings about its own axis, a dog pivoted to said frame farther from said shaft than the pivot of said arm and having a lateral abutment thereon, said arm having a shoulder in its side facing away from its pivot and on the side toward said dog, said lateral abutment being normally in engagement with said arm beyond said shoulder. A spring for urging said dog toward said arm and urging said abutment against said shoulder whereby said dog is held from rotation by said shoulder and said shoulder being of such dimension that on rotation of said lever said shoulder will be forced beyond said abutment and will engage the edge of said shoulder to force said arm away from said contact.

3. A re-winding motor for clocks comprising a frame, a magnet on said frame, an armature pivoted to said frame near said magnet, a main spring connected to said armature urging it away from said magnet, said armature being connected to drive said clock, a contact lever pivoted to the armature, a contact carried by the frame in position to engage the contact lever when the latter extends in the direction of movement of the armature, a second lever pivoted to said frame, a second spring connecting said contact lever with said second lever, said second lever and spring comprising an element having two different linkages one of which causes said contact lever to bear against said fixed contact under pressure from said second spring at the end of the clock driving stroke of the armature and the other causing it to be held away from said fixed contact at the end of the magnet actuated stroke, a means upon one of said levers for preventing said change in linkage in either direction until the armature reaches substantially the end of its stroke.

4. A re-winding motor for clocks comprising a frame, a magnet on said frame; an armature pivoted to said frame near said magnet, a main spring connected to said armature urging it away from said magnet, said armature being connected to drive said clock, a contact lever pivoted to the armature, a contact carried by the frame in position to engage the contact lever when the latter extends in the direction of movement of the armature, a second lever, a second spring connecting said contact lever with said second lever, said second lever having an abutment for engaging said contact lever whereby the force of the said spring urges said contact lever away from said fixed contact and a stop on said frame engaged by said second lever as it approaches the end of the clock driving stroke to actuate said second lever whereby the force of the second spring urges said contact lever against said fixed contact and means for preventing movement of said contact lever in response to said second spring, snapable to release at substantially the end of the clock driving stroke of the armature.

5. A re-winding motor for clocks comprising a frame, a magnet on said frame, an armature pivoted to said frame near said magnet, a main spring connected to said armature urging it away from said magnet, said armature being connected to drive said clock, a contact lever pivoted to the armature, a contact carried by the frame in position to engage the contact lever when the latter extends in the direction of movement of the armature, a second lever pivoted to said frame, a second spring connecting said contact lever with said second lever, said second lever having an abutment for engaging said contact lever whereby the force of the said spring urges said contact lever away from said fixed contact and a stop on said frame engaged by said second lever as it approaches the end of the clock driving stroke to restrain the motion of said second lever whereby the force of the second spring urges said contact lever against said fixed contact, and means for preventing movement of said contact lever in response to said second spring, snapable to release at substantially the end of the clock driving stroke of the armature, and a stop movable by said armature for engaging said second lever at the end of the driving stroke for preventing movement of the second lever in response to said second spring whereby said contact lever is held in contact with the fixed contact until said movable stop is moved to a point to release said second lever.

6. A re-winding motor for clocks comprising a frame, a magnet on said frame, an armature pivoted to said frame near said magnet, a main spring connected to said armature urging it away from said magnet, said armature being connected to drive said clock, a contact lever pivoted to the armature, a contact carried by the frame in position to engage the contact lever when the latter extends in the direction of movement of the armature, a second lever pivoted to said frame, a second spring connecting said contact lever with said second lever, said second lever carrying an abutment for engaging the side of said contact lever whereby the force of said spring acting through said abutment urges said contact lever away from said fixed contact, said contact lever having a notch in the side thereof in position to be engaged by said abutment near the end of the clock driving stroke, a stop engageable by said second lever substantially at the end of the clock driving stroke and before said abutment engages said notch whereby said second lever is held from movement until said abutment slips into said notch to permit said contact lever to snap against said fixed contact.

7. A re-winding motor for clocks comprising a frame, a magnet on said frame, an armature pivoted to said frame near said magnet, a main spring connected to said armature urging it away from said magnet, said armature being connected to drive said clock, a contact lever pivoted to the armature, a contact carried by the frame in position to engage the contact lever when the latter extends in the direction of movement of the armature, a second lever pivoted to said frame, a second spring connecting said contact lever with said second lever, said second lever carrying an abutment for engaging the side of said contact lever, whereby the force of said spring acting through said abutment urges said contact lever away from said fixed contact, said contact lever having a notch in the side

thereof in position to be engaged by said abutment substantially at the end of the driving stroke, a stop engageable by said second lever substantially at the end of the driving stroke and before said abutment engages said notch, whereby said second lever is held from movement until said abutment slips into said notch to permit said contact lever to snap against said fixed contact, said notch being so positioned as to form a catch movable with said armature to prevent rotation of said second lever so as to prevent said abutment on said second lever from urging said contact lever away from said fixed contact until said abutment snaps away from said notch.

8. A clock mechanism comprising a magnet, a spring actuated armature adapted to be connected to drive a clock train and positioned adjacent to said magnet to be moved thereby against the action of said spring, a contact adjacent to said magnet, an arm articulated to said armature to move toward and away from said contact and to move with the movement of said armature independent of said first mentioned movement, a spring articulated to said arm by two separate systems of articulation, one of said systems being constructed and arranged to apply the force of said spring to open said contact after a magnet actuated movement of the armature and one of said systems being designed to close the contact at the close of the spring actuated movement of the armature including means to obstruct the movement of the arm toward the contact until the spring actuated movement of the armature is substantially completed, said spring being so disposed as to be tensioned during magnet stroke and to be partially released by the breaking of contact and further released during the making of the contact.

9. A clock mechanism comprising a magnet, a main spring actuated armature adapted to be connected to drive a clock train positioned adjacent to said magnet to be moved thereby against the action of said spring, a contact adjacent to said magnet, an arm articulated to said armature to move toward and away from said contact and to move with the movement of said armament independent of said first mentioned movement, means to constrain the movement of said arm to a pathway away from the contact to open the circuit during movement of the armature in response to the magnet, substantially parallel to said contact without engaging it for holding the circuit open until the movement of said armature in response to said spring is completed said means being adapted to release said arm to move toward said contact to close said circuit, said means including a spring for moving said arm through said complete pathway constructed and arranged to be tensioned while said arm slides in engagement with said contact from the end of said pathway to the beginning thereof.

10. A clock mechanism comprising a magnet, a spring actuated armature adapted to be connected to drive a clock train and positioned adjacent to said magnet to be moved thereby against the action of said spring, a contact adjacent to said magnet, an arm articulated to said armature to move toward and away from said contact and to move with the movement of said armature independent of said first mentioned movement whereby said arm may slide over said contact as said armature is moved by said magnet, a spring constructed and arranged to oppose said sliding movement and to urge said arm against said contact, means for constraining the movement of said arm under the action of said spring to a movement away from said contact after said sliding movement is completed, returning to a position opposite the point where said sliding movement began and then moving against said contact, said restraining means including means to suddenly release said arm to move away from said contact at the close of said sliding movement and suddenly to release said arm to move against said contact at the end of said return movement.

11. A device in accordance with the preceding claim in which the spring is so constructed and arranged as to remain at substantially the same degree of tension during the return movement, whereby the spring is tensioned during the magnet stroke both to open and to close said contact.

12. In an electric clock re-winding mechanism, a main spring for clock operation, a latch mechanism including a latch, a spring for operating said latch, means for tensioning said springs, said tensioning means including a magnet and an armature therefor, a set of contacts for closing a circuit through said magnet, the opening and closing of said contacts being controlled by said latch spring, the full tensioning of the main spring being accomplished partly electromagnetically and partly by inertia of said armature upon the energization of said magnet, the tensioning of said latch spring for both opening and closing said contact being effected substantially entirely electro-magnetically and concurrently with the initial tensioning of said main spring, whereby the power stored in the main spring is used exclusively for clock operation and practically none for contact operation, thus insuring a steady flow of power through the time train.

13. A mechanism in accordance with claim 12 in which the contacts are opened and closed with a snap action and the contact pressure is substantially the same up to the point of breaking.

14. A mechanism in accordance with claim 12 in which the tensioning means for the main spring and the latch spring include a system of levers inter-related to form a toggle having a moving fulcrum, one of said levers being pivoted on said armature and carrying one of the contacts at its free end, the other of said levers forming said latch and yieldingly held in sliding engagement with the armature lever through the functioning of the latch spring.

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