H. K. WOOD.

ELECTRIC TIME CONTROLLER.

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912,347.

Patented Feb. 16, 1909.

Fig. 1.

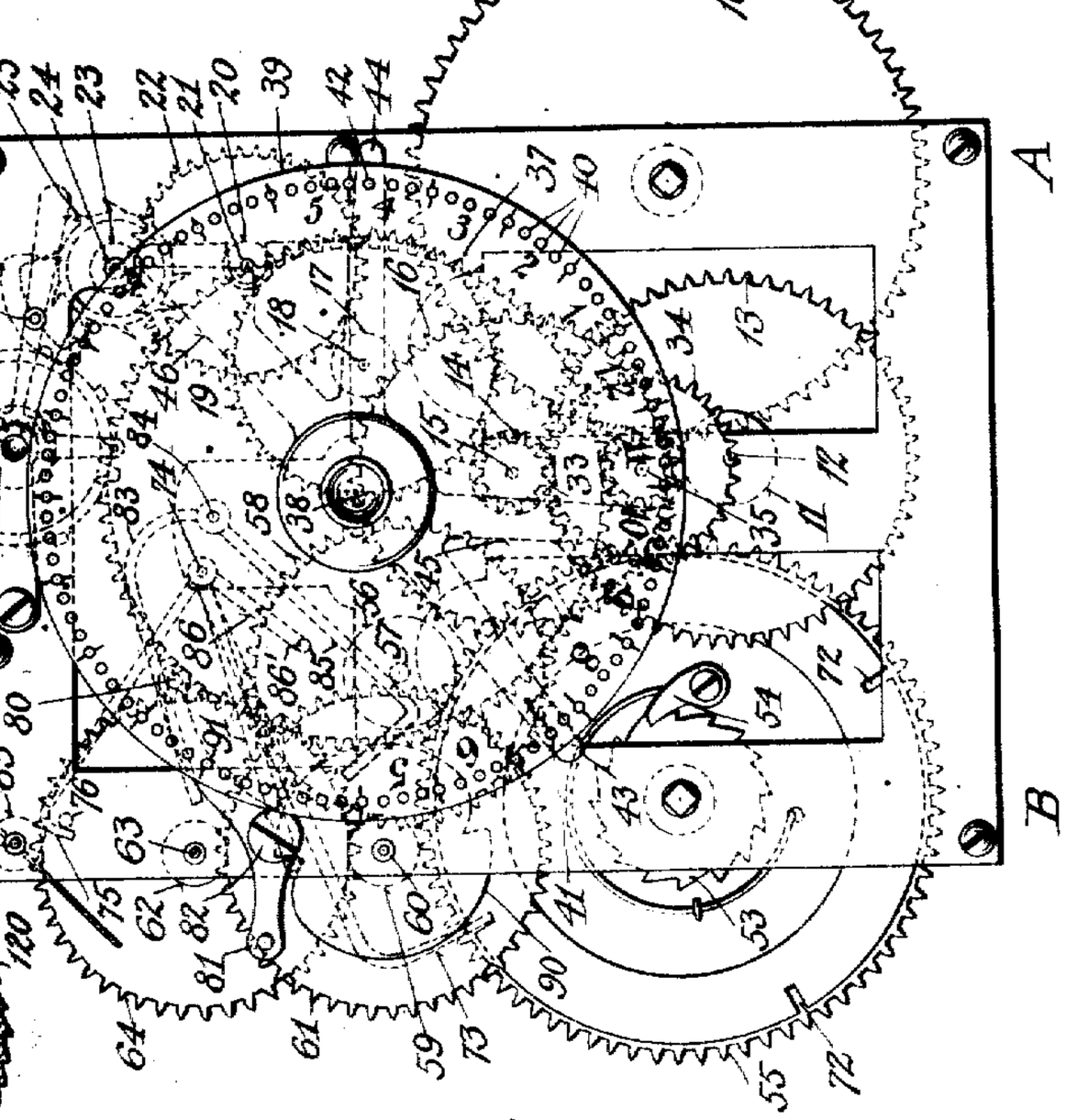


Fig. 2.

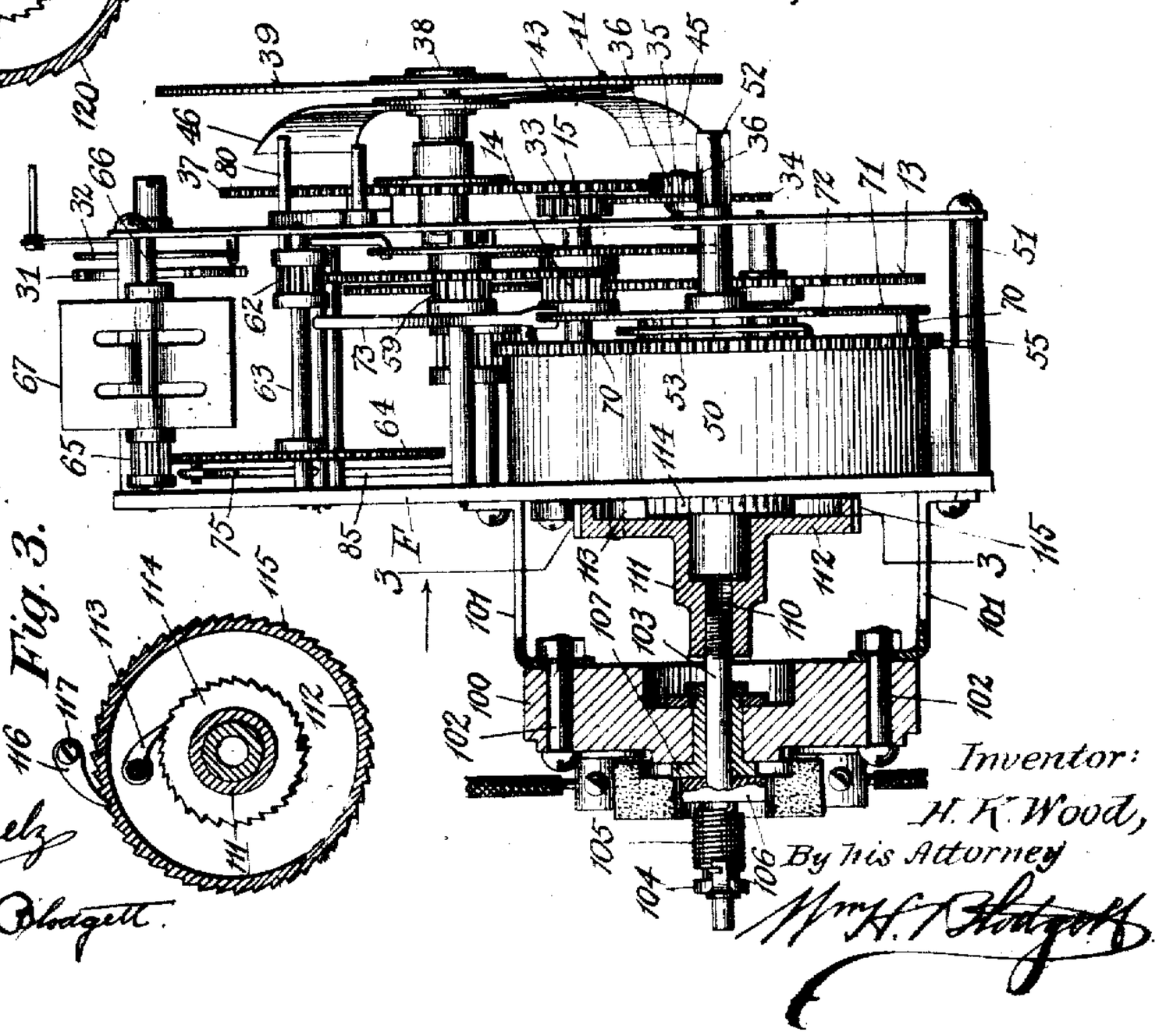


Fig. 3.

Fig. 4.

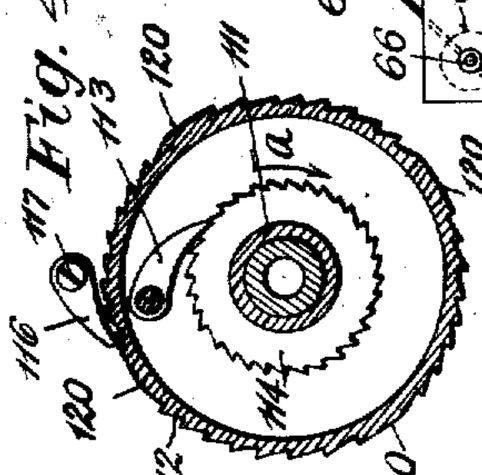
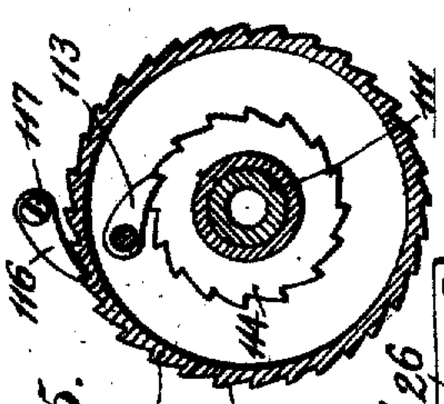


Fig. 5.



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UNITED STATES PATENT OFFICE.

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ELECTRIC TIME-CONTROLLER.

No. 912,347. Specification of Letters Patent. Patented Feb. 16, 1909.

Application filed November 5, 1903. Serial No. 179,915.

To all whom it may concern:

Be it known that I, HUBERT K. WOOD, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Electric Time-Controllers, of which the following is a specification.

This invention relates to switches employed for automatically closing and opening electric circuits at predetermined times, and comprising clock-mechanism for rotating a member for controlling the switch-operating devices.

One object of the invention is the provision with clock-mechanism of an electric switch whereby one of the actuating arbors of the clock-movement (preferably the arbor of the striking-movement spring) will act directly on the switch without the intervention of gears and spindles.

A further object of the invention is the provision of a device whereby the initial point of movement of the switch may be maintained, so that no matter how far the switch-operating spring may be wound the switch-arbor will be under the same initial tension as will be hereinafter described.

A further object of the invention is the provision of means for directly connecting the arbor of the spring of the striking-movement with the switch, so that liability of torsion will be avoided.

Further objects of the invention will be hereinafter stated.

In the drawings, in which similar characters denote similar parts. Figure 1 is a front view of one form of clock-mechanism with which my invention may be employed. Fig. 2 is a side view thereof, and illustrates the coöperative relationship of my invention therewith. Fig. 3 is a fractional vertical section on line 3, 3 of Fig. 2. Fig. 4 is a view similar to Fig. 3 illustrating a modification; and Fig. 5 illustrates another construction of the mechanism shown in Fig. 3.

Although any suitable clock-mechanism may be employed I have shown an ordinary marine-movement comprising time and striking-trains, the latter controlling the switch, which is to be automatically actuated.

In the illustrations given the time-train is designated in a general way by A and the striking-train by B, and these trains are of usual construction. The time-train comprises a spring-actuated gear 10 in engagement with a lantern pinion 11 on an arbor 12, which carries a gear 13. Meshing into the gear 13 is a pinion 14 on an arbor 15 having a gear 16 driving a pinion 17 on arbor 18, the movement of which is transmitted, through a gear 19 and pinion 20, to an arbor 21 carrying a gear 22 in mesh with a pinion 23 on a spindle 24. This spindle carries an escapement-wheel 25 with which the usual pawl 26 alternately engages,—said pawl being secured to an arbor 27 carrying an arm having a segment 28 meshing with a spur-wheel 29 on a spindle 30, on which the balance-wheel 31 is mounted,—said wheel being controlled by a spring 32 (see Fig. 2) in the usual way.

Mounted on the arbor 15 above mentioned is a pinion 33 in engagement with a gear 34, which is journaled on a stationary stud 35 and actuates a pinion 36 meshing with the dial-gear 37, the organization of the mechanism thus far described being such as to rotate the gear 37 once during each period of 24 hours, and with it the arbor 38 carrying the dial or disk 39, the face of which is divided into twenty-four equal parts, each representing one hour, and sub-divided into four equal sections to correspond with quarter hours. At the sub-division marks the dial 39 is provided with perforations 40 adapted to receive lock-pins 41, 42 on arms 43, 44, of tripping devices 45, 46, respectively, one of which will actuate the switch mechanism to establish the electric current, while the other device 46 will actuate the switch for the purpose of opening the circuit.

Any suitable form of switch may be employed and the mechanism for actuating said switch shown in the drawings comprises the spring 50 of the striking-train, one end of which is held on a rod 51 forming a part of the framework, and the other end of which is secured to an arbor 52, carrying a ratchet 53 rotatable therewith. The power of the spring 50 is transmitted through a pawl 54 in engagement with the ratchet 53, to a gear 55 which meshes with a pinion 56 on an arbor 57 having a gear 58

driving a pinion 59 on an arbor 60. Secured to the pinion 59 and rotating therewith is a gear 61 meshing with a pinion 62 on a spindle 63 which also carries a gear 64 to drive the pinion 65 secured upon an arbor 66, upon which the usual fan 67 is mounted.

Secured to the main gear 55, by posts 70, is an index-disk 71, having in its periphery a series of radial slots 72 preferably four in number, to permit a feeler 73 to drop thereinto and rock a spindle 74 sufficiently to bring the free end of a stop-arm 75, into the path of a pin 76 carried by the gear 64 above mentioned, thus locking said gear and, consequently, the entire gear-train, against further action. The mechanism is released by the time-train in the following manner: The tripper 45 raises, during its revolution around the axis 38, a pin 80 which is secured to an arm 81, pivoted at 82, and which, in turn, engages a lever 83 secured to a spindle 84 which carries a stop-lever 85, the free end of which is bent upward and adapted to project into the path of the pin 76 above referred to. During its rising movement the lever 85 comes into contact with the rearwardly-bent end 86′ of a lever 86 secured to the spindle 74, which latter will then be rocked sufficiently to withdraw the feeler 73 from the index-disk 71; and furthermore, to disengage the stop-arm 75 from the pin 76, so that now the spring 50 may actuate the entire gear-train, until the pin 76 abuts against the stop-lever 85, whereby the train-movement is again arrested, and at which time a cam 90 rotatable with the arbor 60 will be so positioned as to maintain a lever 91, which is secured to the spindle 74, in raised position, and thus prevent the stop-arm 75 from falling into the path of the pin 76. As soon as the tripper 45 has passed from underneath the pin 80, the arm 83 may drop back to its normal position, thus causing the stop-arm 85 to release the pin 76, and hence the entire gear-train, which will be stopped again as soon as the feeler 73 enters the next succeeding notch 72 and thus brings the stop-arm 75 into the path of the revolving-pin 76.

While the above described mechanism is not novel, my invention comprises as one of its features the combination, with such a mechanism, of a switch, generally known as a "snap switch" in such a manner that all loss of movement on account of back-lash in the usual gearing will be avoided, the organization being such as to operate the switch-arbor directly from the main-spring arbor of the actuating mechanism without gears.

The switch shown in the drawings comprises a base 100, shown held on the back frame-plate F by legs 101 and screws 102, although it may be otherwise supported. The switch-arbor is designated by 103, and carries an arm 104 for engaging one end of a torsional snap-spring 105, the other end of which is secured to a contact maker 106 normally held against rotation by a locking-member or ratchet 107, the organization and operation of the several parts being well known. The forward end of the arbor 103 is screw-threaded to engage a similarly-threaded aperture 110 of a hub 111 forming a part of a disk 112, the axis of both the switch-arbor 103 and the hub 111 being in alinement with that of the striking-spring arbor 52. Carried by the disk 112 is a pawl 113 in engagement with a ratchet 114 the hub of which enters a chamber in hub 11 and is secured to the arbor 52, and which thus rotates the disk 112, and hence the switch-arbor 103, for an amount equal to one-fourth of a turn or 90 degrees, at every release of the switch-actuating mechanism.

In order to prevent any backward movement of the switch arbor while the spring-arbor is rotated to wind the spring, the disk 112 may be provided with serrations or teeth 115 which engage a pawl 116, pivoted at 117 to the frame F. When the teeth 115 are continuous around the periphery of the disk 112, as shown in Fig. 3, care must be exercised when winding the spring 50 not to disarrange the proper relationship of the switch-arbor 103, and the spring-arbor 52, for the following reason: viz—By referring to Fig. 1 it will be seen that the ratchet 53 of the winding-arbor 52 is provided with sixteen teeth, and that, consequently, the arbor 52 and said ratchet 53, when actuated by a key or otherwise, must be rotated for an arc equal to 22½ degrees in order to permit the pawl 54 to engage the next succeeding tooth of said ratchet. During the winding-operation the disk 112 is held stationary by the pawl 116 which engages the teeth 115, and the ratchet 114 will be rotated backward beneath the pawl 113, as will be readily understood. Now, inasmuch as the ratchet 114 has thirty-two teeth it follows that when the winding-ratchet 53 is rotated one tooth, the ratchet 114 must necessarily be rotated two teeth, thus leaving the disk 112, and hence the switch-arbor 103 undisturbed, the spring 50 only having received more winding-tension. However, since when winding the mechanism it cannot be expected that the winding-arbor will always be turned exactly 22½ degrees or a multiple thereof, there is liability of disarranging the relationship between the parts in the following manner. Supposing that the arbor 52 should be rotated only about 15 degrees, the ratchet 114 will have been turned backward sufficiently to cause its next succeeding tooth to engage the pawl 113, while the winding-ratchet 53 has not, however, been sufficiently rotated to bring its next succeeding tooth into engagement with the pawl 54 when the arbor 52 is released

from winding-pressure. Therefore, the arbor 52 will simply be returned to its original position by the spring 50, but during this return movement another tooth of the ratchet 114 will engage the pawl 113 and turn the disk 112 until the winding-arbor has again arrived at its original position, at which time the disk 112 will have been advanced a distance equal to the space of one tooth of the ratchet 114, or 11¼ degrees, so that now the switch-arbor is 11¼ degrees in advance of pawl 54, as are also the gear 55 to which the ratchet-wheel 53 is attached, and the index-disk 71. It is, of course, evident that if this same operation should be repeated, the switch-arbor 103 would be rotated intermittently and by degrees, provided the strength of the spring 50 exceeds that of the switch-actuating spring 105, and without in any way changing the original position of, or releasing, the switch-actuating mechanism.

As above stated, my invention has for one of its objects the provision of a device whereby the proper relationship between the initial point of movement of the switch-arbor 103 relative to the actuating mechanism or more specifically speaking, to the indexing-disk 71 shall be constantly maintained, and in Fig. 4 of the drawing there is shown a construction whereby the objectionable feature above explained will be overcome, the disk 112 having in its periphery alternate toothed and plain sections, and operating as follows: As stated, the switch snap-spring 105 is always under tension, and hence it is evident that when the winding-arbor 52 is rotated, the ratchet 114 will move in the direction of arrow *a*, and, inasmuch as the tension on the snap-spring 105 tends to throw the switch-arbor and consequently the disk 112 in a similar direction, it follows that said disk will move with the ratchet 114 until the pawl 116 engages the peripheral teeth 115 of the disk, after one of the blank-portions 120 has passed beneath said pawl. The blank-sections are four in number to correspond with the angular movements of 90 degrees each of the switch-arbor, and the length of each blank-section is such as to permit the disk 112 and its pawl 113 to follow the movement of ratchet 114; this backward movement of the disk 112 being arrested just about the time when the ratchet 52 has been turned sufficiently to permit the pawl 54 to engage the next tooth. Hence, the relative position of the pawl 113 and the ratchet 114 has not in any way been altered; while, on the other hand, the position of the disk 112 relative to index-disk 71 has been slightly varied and the initial working tension of the spring 105 is proportionately less than before. Again supposing, that the winding-arbor 52 and the ratchet 53 are rotated for an amount less than one tooth, then the disk 112 will move backward without reaching the limit of such movement as controlled by the length of the blank-section 120 in its periphery, the pawl 116 then riding on the blank-portion 120, and upon the release or return of the arbor 52 to its original position, the disk 112 will, due to the excess of power in the spring 50 over the spring 105, be advanced against the action of said spring 105, until it also has arrived at its former position, and the original relationship of the disk 112 and the index-disk 71 remains consequently unchanged.

It will be apparent that I provide indexing means in connection with time-controlled mechanism and with switch mechanism to assure a definite relation between said mechanisms and the mutilated toothed periphery disk 112 in conjunction with the pawl 116 presents a simple and convenient form of such indexing means.

In Fig. 5 I have illustrated a construction whereby all variation in the relationship between the indexing-device and the switch-arbor at the commencement of the switch-actuating operation is entirely avoided, and it is evident that such a result may be accomplished by providing the same number of teeth in both of the ratchets 53 and 114, in which case the engagement of the pawls 54 and 113 with said ratchets, respectively, will take place simultaneously, and no advancing-action on the part of the disk 112 can take place unless the actuating-mechanism is released and the spring 50, therefore, becomes active in revolving the pawl 54 and hence in rotating the arbors 52 and 103.

It will be clear from what has been hereinbefore stated that I provide two coaxial coöperating devices one of which is operable with the time controlled mechanism, preferably by being rigidly fastened to an arbor thereof while the other is operative with the switch mechanism preferably by being rigidly connected with the arbor thereof. These devices are of such character that when the time controlled mechanism is moved in one direction they are effective for transferring motion or power while when said time-controlled mechanism is moved in the opposite direction they are ineffective as power-transmitting factors. One of said devices may consist of a ratchet such as 114 while the other may consist of the disk 112 in combination with the pawl 113 carried thereby, the said disk and pawl constituting in effect so far as the transference of power is concerned a unitary device.

Changes may be made in the manner of directly connecting the switch-arbor and the winding-arbor of the spring, and other kinds of electric-switches may be employed without departure from the invention. So too, other kinds of clock-movement may be substituted for the marine-movement shown, and the power-controlled spindle for di-

rectly-actuating the switch may be actuated by different means, and may be changed in location, if desired.

Having thus described my invention, what I claim is:

1. The combination of time-controlled mechanism, a switch, and a pair of coaxial, rotary devices for transferring the effect of the time-controlled mechanism to said switch when said time-controlled mechanism is moved in one direction, said pair of devices being ineffective when the time-controlled mechanism is moved in the opposite direction.

2. The combination of time controlled mechanism having an arbor, a ratchet-wheel fastened to said arbor, switch mechanism having an arbor, a disk fastened to said last mentioned arbor, and a pawl mounted on the disk and engaging the teeth of the ratchet-wheel, the latter when the time-controlled mechanism is moved in one direction serving to operate the pawl and thereby the disk and switch-mechanism arbor and being ineffective to cause such operation when the time-controlled mechanism is moved in the opposite direction.

3. The combination of time-controlled mechanism having an arbor, a ratchet-wheel fastened to said arbor, a switch having an arbor, and a pawl connected with the last mentioned arbor and engaging the teeth of said ratchet wheel.

4. The combination of time-controlled mechanism, a switch, and mechanism for transferring the effect of the time-controlled mechanism to the switch, including a pair of coaxial, rotary devices effective when the time-controlled mechanism is moved in one direction and ineffective when said time-controlled mechanism is moved in the opposite direction, said transferring mechanism also having associated therewith means for obtaining a definite relation between the time-controlled mechanism and switch.

5. The combination of time-controlled mechanism, a disk provided with peripheral teeth and with plain portions, a pawl carried by the framework for engaging the peripheral portion of said disk, a switch operable by the disk, and means for transferring the effect of the time-controlled mechanism to said disk.

6. The combination of time-controlled mechanism having an arbor, a ratchet-wheel fastened to said arbor, a disk having peripheral toothed and plain portions, a pawl on the framework, for engaging the peripheral portion of said disk, a second pawl carried by said disk and engaging said ratchet-wheel, and switch mechanism operable by said disk.

7. The combination of time-controlled mechanism, a switch, a rotary member for operating said switch, having plain and toothed portions, a pawl coöperative with said plain and toothed portions, a ratchet-wheel operable by the time-controlled mechanism, and a pawl mounted on said rotary member and operable by the ratchet-wheel when the time-controlled mechanism is moved in one direction and inoperable thereby when said time-controlled mechanism is moved in the opposite direction.

8. The combination with time-controlled mechanism comprising time and striking trains, and means for controlling the striking train by the time train, said striking train having an arbor, of a switch, and a pair of coöperative devices for transferring the effect of said arbor to said switch when said arbor is moved in one direction, said pair of devices being ineffective when the arbor is moved in the opposite direction.

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

HUBERT K. WOOD.

Witnesses:

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