

Oct. 30, 1934.

R. H. WHITEHEAD ET AL

1,978,973

ELECTRIC CLOCK

Filed June 11, 1930

4 Sheets-Sheet 1

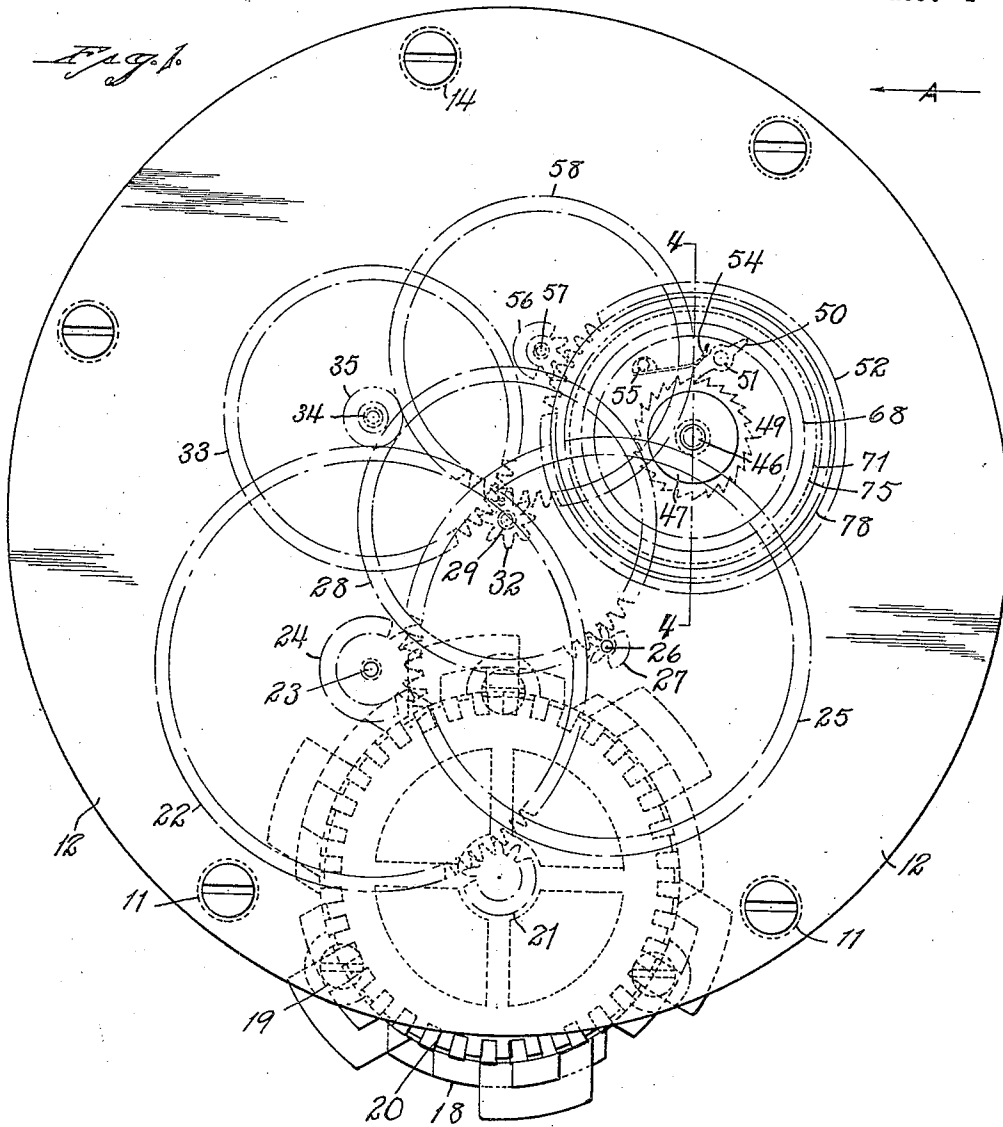
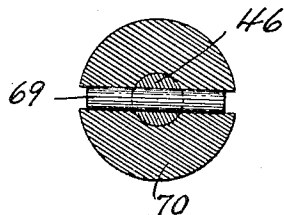


Fig. 6.



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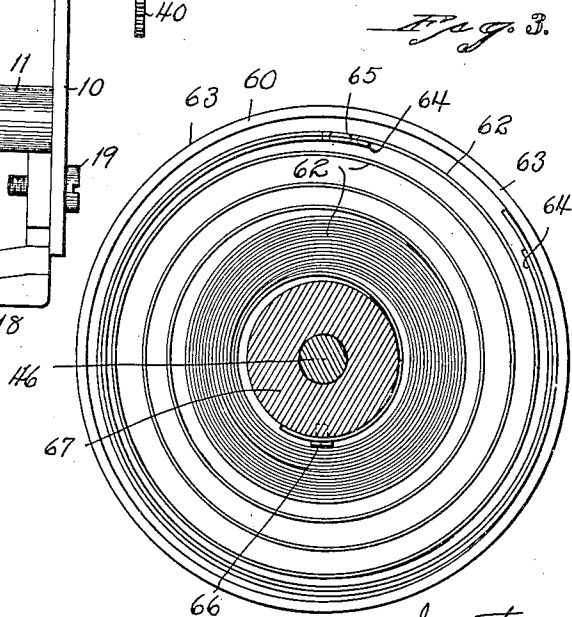
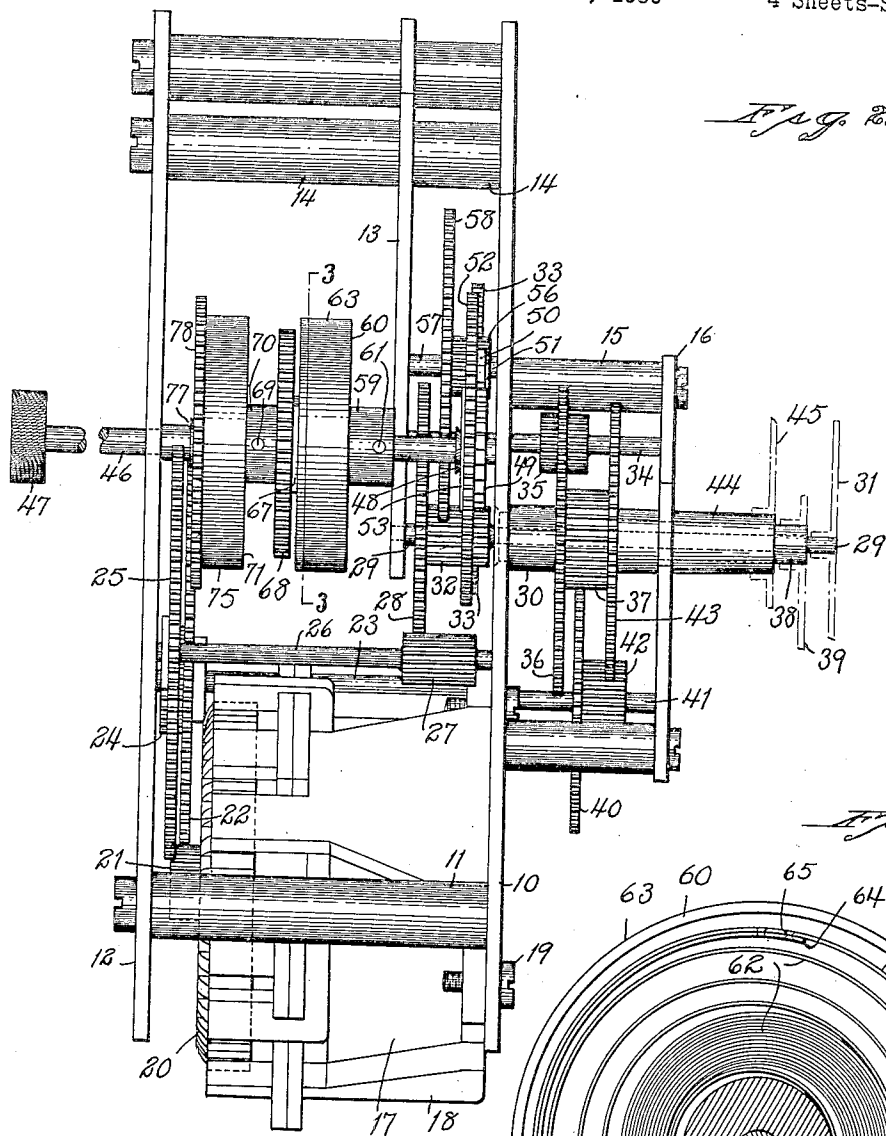
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4 Sheets-Sheet 2



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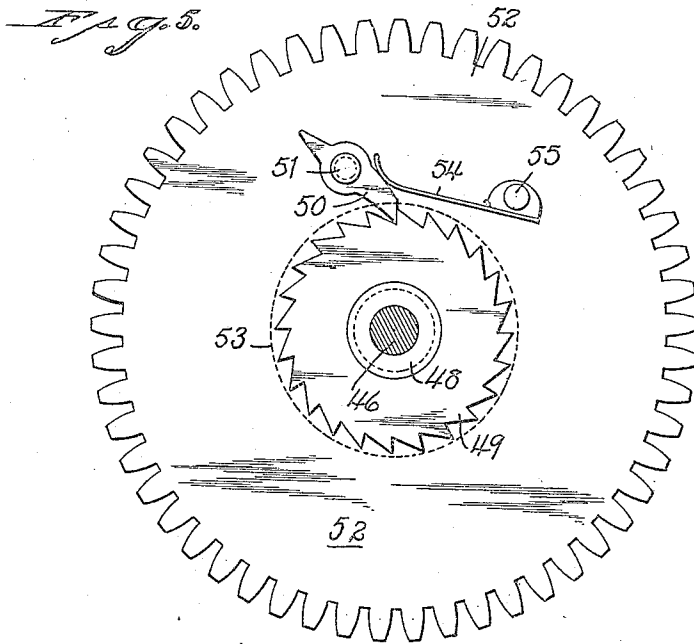
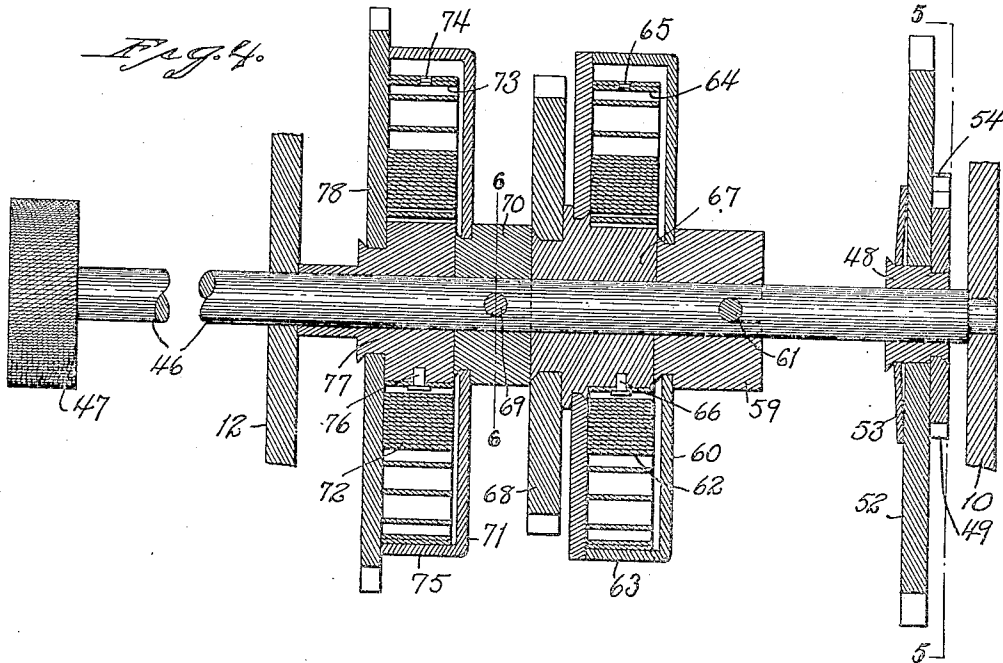
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4 Sheets-Sheet 3



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4 Sheets-Sheet 4

Fig. 7.

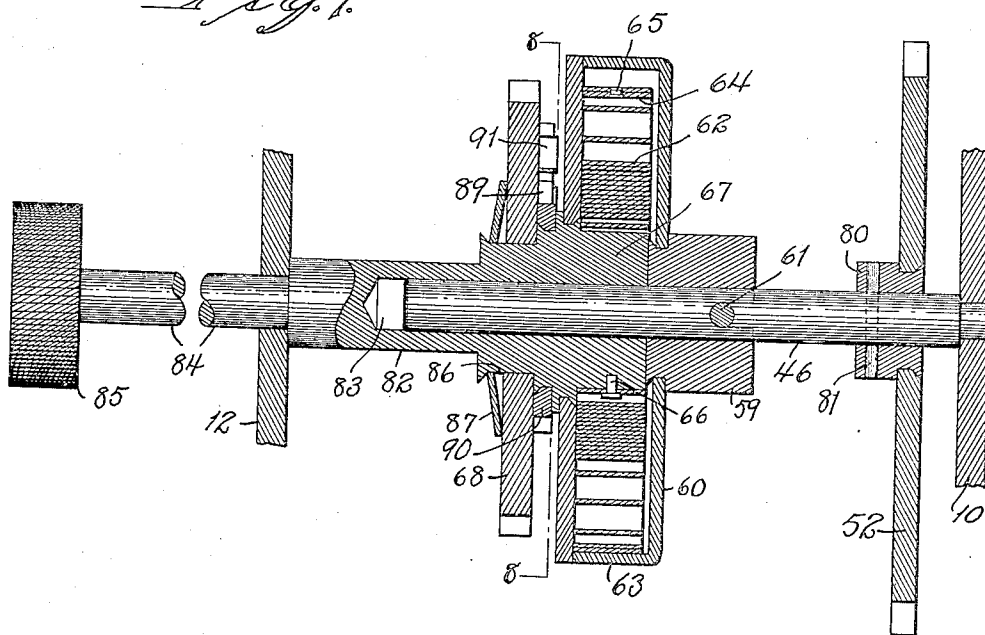
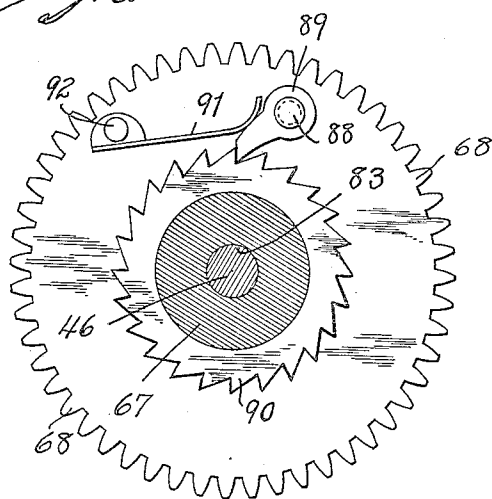


Fig. 8.



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UNITED STATES PATENT OFFICE

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ELECTRIC CLOCK

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3 Claims. (Cl. 58—40)

This invention relates to an improvement in electric clocks and particularly to electric clocks of the type in which one or more of its auxiliary features, such as a chime-mechanism, strike-mechanism, alarm-mechanism, or the time-indicating means itself, is driven by a rotary electric motor through the intermediary of an energy-storing spring.

The main object of this invention is to produce an electric clock of the type referred to in which the driving connection between the auxiliary feature and the rotary motor is of such character as will permit the manual winding of the energy-storing spring without necessitating the rotation of the motor, whereby, in the event that the motor has stopped for any reason, such, for instance, as by the failure of the electric current, the spring may be energized without waiting for the electric motor to perform that function.

With the above and other objects in view as will appear from the following, our invention consists in an electric clock of the type referred to, characterized by having two trains of time-indicating mechanism, one being driven directly by an electric motor and the other indirectly by the same motor through a slip-spring power-storage device, and having manually-operable means to energize the spring quite independently of the motor and without disturbing the running of the motor or of the one train of time-indicating mechanism directly coupled thereto.

Our invention further consists in an electric 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 an electric clock movement constructed in accordance with our invention;

Fig. 2 is an edge view thereof, looking in the direction of the arrow A of Fig. 1;

Fig. 3 is a detail sectional view taken on the line 3—3 of Fig. 2 but on a larger scale;

Fig. 4 is a broken detail transverse sectional view thereof, taken on the line 4—4 of Fig. 1 but on a larger scale;

Fig. 5 is a detail sectional view taken on the line 5—5 of Fig. 4;

Fig. 6 is a similar view taken on the line 6—6 of Fig. 4;

Fig. 7 is a broken detail transverse sectional view corresponding to Fig. 4 but showing a modified

train of driving parts between the winding-wheel and the driven-gear; and

Fig. 8 is a sectional view thereof taken on the line 8—8 of Fig. 7.

In the particular electric clock herein chosen for the illustration in Figs. 1 to 6 inclusive, we employ a front movement-plate 10 to which is secured in spaced relationship by means of suitable pillars 11, a rear movement-plate 12. Mounted between the upper portions of the said front and rear movement-plates 10 and 12 is an intermediate movement-plate 13 secured in spaced relationship with respect thereto by means of pillars 14. Mounted in spaced relationship forward of the front movement-plate 10 by means of pillars 15 is a bridge-plate 16.

Mounted between the front and rear movement-plates 10 and 12, near the lower ends thereof, is a synchronous electric motor which may be of any approved form, and in principle is so well understood in the art as to require no description other than to say that it includes a field coil 17, a field magnet 18 secured to the rear face of the front movement-plate by means of screws 19, and an armature or rotor 20.

The rotor 20 of the synchronous motor just above referred to carries a driving-pinion 21 meshing into and driving a gear-wheel 22 mounted upon an arbor 23 journaled at its respective opposite ends in the front and rear movement-plates 10 and 12 and carrying near its rear end a pinion 24 meshing into and driving a gear-wheel 25.

The gear-wheel 25 just above referred to is staked upon the rear end of an arbor 26 journaled at its respective opposite ends in the front and rear movement-plates 10 and 12 and carrying a pinion 27 meshing into and driving a second-wheel 28 staked upon the rear end of a second-arbor 29 which is journaled at its rear end in the intermediate movement-plate 13 and at about midway its length in a bushing 30 secured to and forwardly-projecting from the front movement-plate 10.

The second-arbor 29 carries at its projecting forward end a second-hand or pointer 31 indicated by broken lines in Fig. 2, and near its rear end just forward of the second-wheel 28, a pinion 32.

The pinion 32 meshes into and drives a gear-wheel 33 mounted upon an arbor 34 journaled at its respective opposite ends in the intermediate movement-plate 13 and the bridge-plate 16, and mounting a pinion 35 meshing into and driving a minute-wheel 36 which is provided in the usual

manner of time-trains with a cannon-pinion 37 and a forwardly-projecting minute-hand sleeve 38 rotating upon the second-arbor 29 and carrying at its forward end a minute-hand or pointer 39.

The cannon-pinion 37 meshes into and drives a dial-wheel 40 mounted upon an arbor 41 bearing at its respective opposite ends in the front movement-plate 10 and the bridge-plate 16 and also mounting a dial-pinion 42 meshing into and driving an hour-wheel 43 carrying a forwardly-projecting hour-hand sleeve 44 mounting at its forward end an hour-hand or pointer 45 and encircling the minute-hand sleeve 38 before referred to in the usual manner of clock-dial work.

The parts previously described constitute a synchronous time-train for indicating the time in consonance with the beat of an alternating current in the usual manner of synchronous-motor electric clocks, though as will be made plain herein, our invention is not limited to the employment of an electric motor of the synchronous type.

Now let it be supposed that it is desired to have the electric motor drive one or more auxiliary mechanisms also, such as both a strike- and a chime-mechanism in addition to the time-train above described, in which case, as herein shown in Figs. 1 to 6 inclusive, we employ a winding-arbor 46 journaled in the front and rear movement-plates 10 and 12 and carrying at its rear end a knurled finger-button 47 and having staked to its forward end a collet or hub 48 having in turn staked to its forward end a ratchet-wheel 49, the teeth of which are engaged by a pivotal pawl 50 pivotally mounted upon a stud 51 projecting from the forward face of a winding-wheel 52 which in turn is mounted, with freedom for rotation, upon the periphery of the hub or collet 48 before referred to, as clearly shown in Fig. 4, and held in place thereon by a spring-washer 53.

A pawl-spring 54 is secured by means of a rivet 55 to the front face of the winding-wheel 52 and serves to maintain the nose of the pawl 50 in engagement with the teeth of the ratchet-wheel 49, as clearly shown in Fig. 5 of the drawings.

The winding-wheel 52 is rotated clockwise for the purpose of similarly turning the winding-arbor 46 through the intermediary of the pawl 50 of the ratchet-wheel 49, by means of a pinion 56 mounted upon an arbor 57 journaled in the front and intermediate movement-plates 10 and 13 respectively and carrying a gear-wheel 58 which meshes into and is driven by the second pinion 32.

From the foregoing it will be seen that as the synchronous motor drives the hands 31, 39 and 45, it will also effect the rotation of the winding-arbor 46 through the intermediary of the pinion 32, gear 58, pinion 56, winding-wheel 52, pawl 50 and ratchet-wheel 49.

The winding-arbor 46 mounts near its forward end, a spring-barrel-hub 59 having staked to its rear end a cup-shaped spring-barrel 60 and secured to the said arbor for rotation therewith by means of a pin 61 (Fig. 4).

The spring-barrel 60 encloses a spiral-spring 62, the outer convolution of which frictionally engages the interior of the flange 63 of the said barrel and is reinforced or stiffened by means of a supplemental spring 64 secured thereto by means of rivets 65, as clearly shown in Fig. 3. The inner end of the spiral-spring 62 is coupled by means of the usual pin 66 to a hub 67 mounted

upon the winding-arbor 46 with freedom for rotation thereon and having staked to its rear end a driven-member or gear 68 which may constitute an element of an auxiliary feature of the clock, such, for instance, as the strike-mechanism thereof.

Coupled to the winding-arbor 46 by means of a pin 69 directly to the rear of the driven-gear 68 is a spring-barrel-hub 70 carrying a cup-shaped spring-barrel 71 which, like the spring-barrel 60 before referred to, houses a spiral-spring 72 having its outer convolution reinforced by a supplemental spring 73 corresponding to the part 64 of the spring 62 and secured to the said outer convolution by means of rivets 74.

The spring 72 just above described functions in exactly the same manner as the spring 62 previously described and like it has its outer convolution frictionally engaged with the flange 75 of its spring-barrel 71 and has its inner end coupled by means of a pin 76 to a hub 77 mounted upon the winding-arbor 46 with freedom for relative rotation thereupon. The rear end of the hub 77 has staked to it a driven-member or gear 78 which may constitute an element of an auxiliary feature of the clock, such as the chime-mechanism thereof.

In the operation of the particular clock herein chosen for the illustration in Figs. 1 to 6 inclusive, the electric motor effects the constant rotation of the time-indicating means including the pointers 31, 39 and 45 and also effects the constant rotation of the winding-arbor 46 which through the intermediary of the hubs 59 and 70 will effect the constant rotation of the spring-barrels 60 and 71 with the effect of respectively winding the spiral-springs 62 and 72 owing to the frictional engagement of the outer convolutions of the same with the flange of their respective spring-barrels.

The winding of the springs 62 and 72 will exert a rotary effort upon the hubs 67 and 77 with the result that the respective driven-members or wheels 68 and 78 secured thereto will be constantly urged to rotate, which rotation will be subject to the usual control-mechanisms employed in clocks for controlling strike- and chime-mechanisms.

When the springs 62 and 72 have been wound to a sufficient degree, the frictional grip of their outer convolutions upon the flanges of their respective spring-barrels will relax sufficiently to occasion a slippage which will prevent the overwinding of the said springs by the continuous rotation of their respective spring-barrels.

Let it be supposed that for some reason or other the motor has stopped and the driving-springs 62 and 72 are unwound, so that they no longer possess sufficient energy to drive the mechanisms with which they may be connected, and that it is desired to start the clock. It will be seen under the circumstances just set forth, that when the motor is re-started it would require a relatively-long length of time for the same to effect the winding of the springs 62 and 72 to a sufficient degree to enable them to propel the mechanisms with which they may be connected.

If, now, under the circumstances just above set forth, the operator of the clock, when starting the same, should rotate the winding-arbor manually by means of its finger-button 47, he may effect the initial winding of the springs 62 and 72 without interference from the motor and its train for the reason that the ratchet-wheel 49 may be clicked forward beneath the pawl 50 un-

til a sufficient tension has been applied to the said springs 62 and 72. Were it not for the interposition of the ratchet-mechanism comprising the ratchet-wheel 49 and pawl 50 between the winding-wheel 52 and the winding-arbor 46, it will be obvious that it would be impossible to manually wind the driving-springs 62 and 72 without requiring that the motor be also manually turned.

In the particular clock above described, the time-indicating means is driven directly by the electric motor and the latter automatically winds two driving-springs which may also be manually wound, but we wish to have it understood that our invention contemplates the driving of any auxiliary feature of an electric clock such as an alarm-mechanism, strike-mechanism, chime-mechanism, time-mechanism, etc., provided only that the motor is connected to the driven-member of the auxiliary feature through the intermediary of a driving-spring and to permit the manual winding of the latter without restraint from the said motor, as set forth in the claims appended hereto.

In Figs. 7 and 8 of the drawings, we have shown a slightly different arrangement of the train of driving parts interposed between the motor and the driven-gear or member of the auxiliary feature, though this form retains the characteristic features of the form shown in the preceding figures insofar as it embodies a driving-spring which is energized by the motor and a ratchet-mechanism interposed between the motor and the driven-member so that the spring may be manually wound without requiring the manual rotation of the motor.

In this form (Figs. 7 and 8) the winding-wheel 52, instead of being mounted with capacity for relative rotation with respect to the winding-arbor 46, is rigidly secured thereto by being staked upon a hub 80 which in turn is secured to the said arbor 46 by means of a transverse pin 81. The winding-arbor 46 mounts a unit corresponding to that shown in the preceding figures and including the spring-barrel-hub 59, spring-barrel 60, spiral-spring 62, corresponding either to the springs 62 or 72 and, like the former, having its inner convolution coupled to its hub 67 by means of the pin 66.

In this instance, however, the spring-hub 67 is formed integral with a relatively-long winding-sleeve 82 having a socket 83 in which the forward end of the winding-arbor 46 bears, and provided at its rear end with a rearward extension 84 carrying a finger-button 85. The winding-arbor 46 and the sleeve 82 may be rotated one with respect to the other, as will hereinafter appear.

The hub 67 is formed with an annular bearing-surface 86 upon which is mounted, with freedom for relative rotation, the driving-gear or member 68 which is held in place thereon by a resilient friction-washer 87.

Pivotaly mounted upon the front face of the driven-gear 68 by means of a stud 88, is a pawl 89 normally held in engagement with the teeth of a ratchet-wheel 90 by means of a pawl-spring 91 secured to the front face of the said wheel 68 by means of a rivet 92. The ratchet-wheel 90 is staked, as shown in Fig. 7 to the hub 67:

In the operation of the train of parts shown in Figs. 7 and 8, the wheel 52, as already described, is constantly rotated by the electric motor and in turn effects the rotation of the winding-arbor 46 and hence the rotation of the spring-

barrel 60 with the effect of winding the spiral-spring 62 until such time as its outer convolution is so contracted as to release its frictional grip upon the inner face of the flange 63 of the said spring-barrel, at which time slippage will take place as already described.

The tension thus applied to the spring 62 will serve to rotate its hub 67 and hence the ratchet-wheel 90 secured thereto. Now, owing to the engagement of the pawl 89 with the ratchet-wheel 90, the driven-gear or member 68 will be rotated to effect the movement of whatever clock feature is coupled thereto.

Now, when it is necessary or desirable to manually wind the spring 62, this may be accomplished by turning the winding-sleeve 82 by means of the finger-button 85, which will cause the ratchet-wheel 90 secured thereto to ride idly beneath the pawl 89, and since the inner convolution of the spring 62 is secured to the hub 67 forming a feature of the sleeve 82, the said spring will be wound by manual tension applied to its inner end rather than by tension applied mechanically to its outer end, as is the case when wound by the motor.

It will be understood by those skilled in the art that our invention may assume varied physical forms without departing from our inventive concept, and we, therefore, do not limit ourselves to the specific embodiments herein chosen for illustration, but only as indicated in the appended claims.

We claim:

1. An electric clock having: time-indicating means; strike-drive-means and an energy-storage spring having safety-slip friction-drive engagement therewith; chime-drive-means and an energy-storage spring having safety-slip friction-drive engagement therewith; an electric motor coupled to the time-indicating means to actuate the latter, and coupled to the energy-storage springs for storing energy in said springs; and a single manually-operable member coupled to both energy-storage springs to store energy in said springs without affecting the functioning of the time-indicating means.

2. An electric clock having: time-indicating means; strike-drive-means and an energy-storage spring having safety-slip friction-drive engagement therewith; chime-drive-means and an energy-storage spring having safety-slip friction-drive engagement therewith; an electric motor coupled to the time-indicating means to actuate the latter, and coupled to the energy-storage springs by a winding-arbor for storing energy in said springs; and a single manually-operable member coupled to said winding-arbor to store energy in said springs without affecting the functioning of the time-indicating means.

3. An electric clock having: time-indicating means; rotary strike-drive-means and an energy-storage spring having safety-slip friction-drive engagement therewith; rotary chime-drive-means axially aligned with said rotary strike-drive-means, and an energy-storage spring having safety-slip friction-drive engagement therewith; an electric motor coupled to the time-indicating means to actuate the latter, and coupled to the energy-storage springs for storing energy in said springs; and a single manually-operable member coupled to both energy-storage springs to store energy in said springs without affecting the functioning of the time-indicating means.

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