(No Model.) 2 Sheets—Sheet 1.

F. W. LETMATE.

WINDING ATTACHMENT FOR CLOCKS.

No. 261,003. Patented July 11, 1882.

Fig. 1

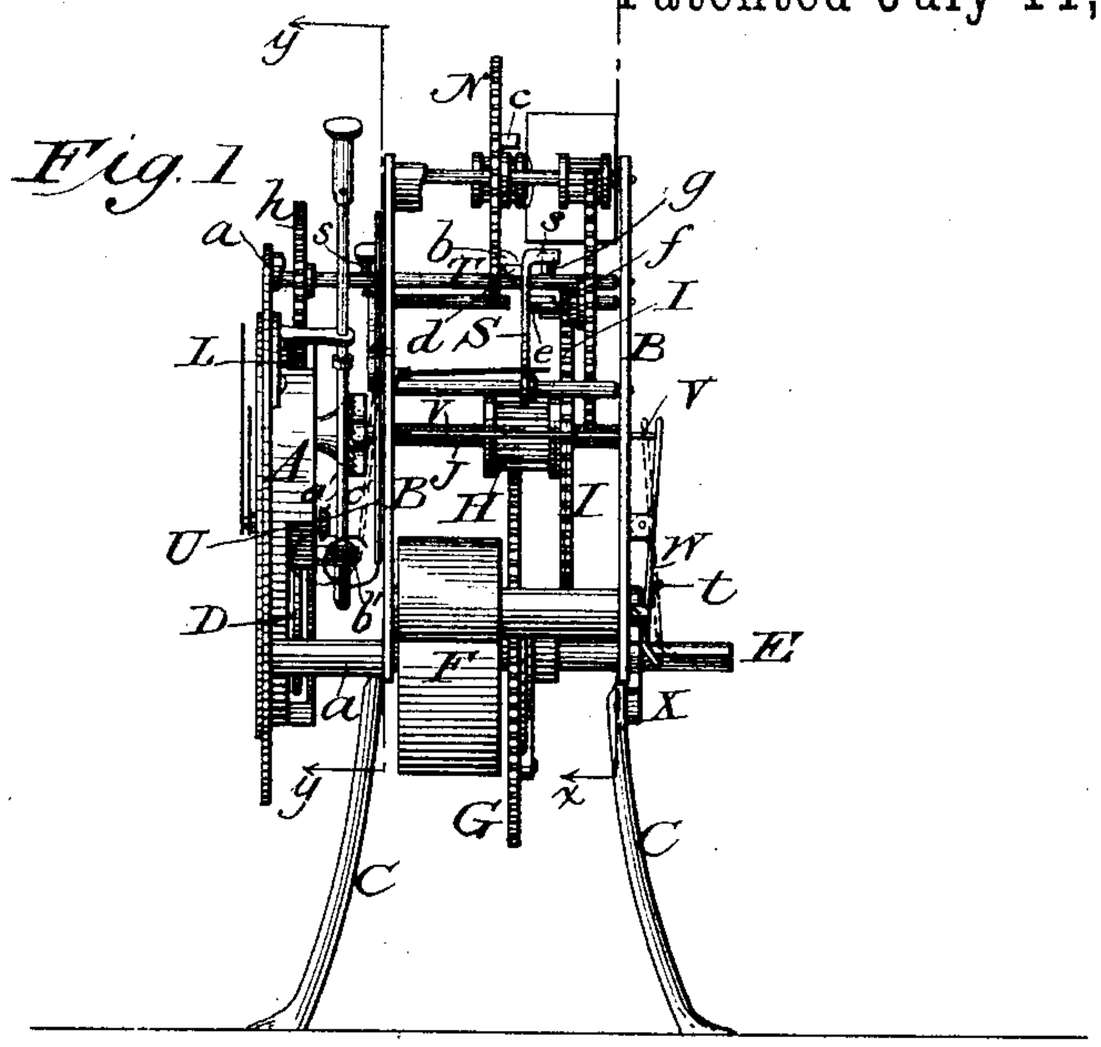


Fig. 2.

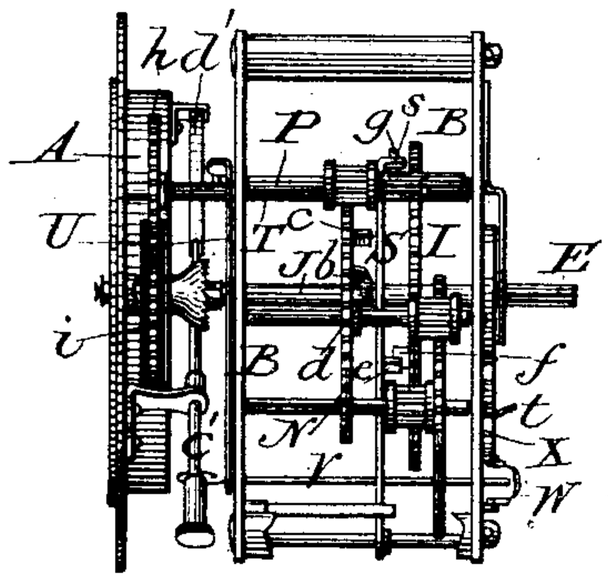


Fig. 3.

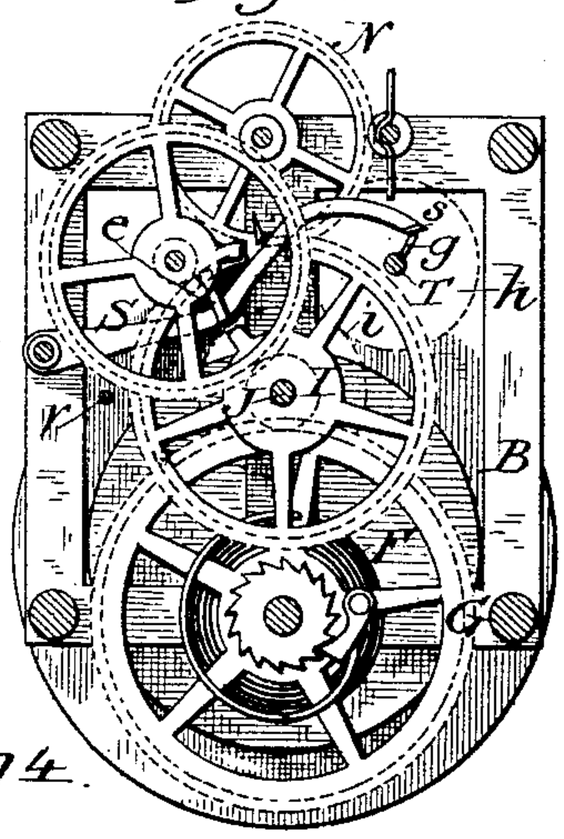
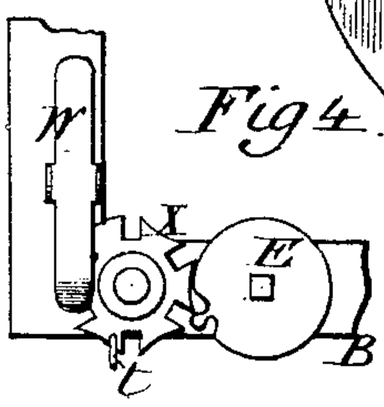


Fig 4.



Attest.

Sidney P. Hollingsworth.

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Philip T. Dodge

(No Model.) 2 Sheets—Sheet 2.

F. W. LETMATE.

WINDING ATTACHMENT FOR CLOCKS.

No. 261,003. Patented July 11, 1882.

Fig. 5

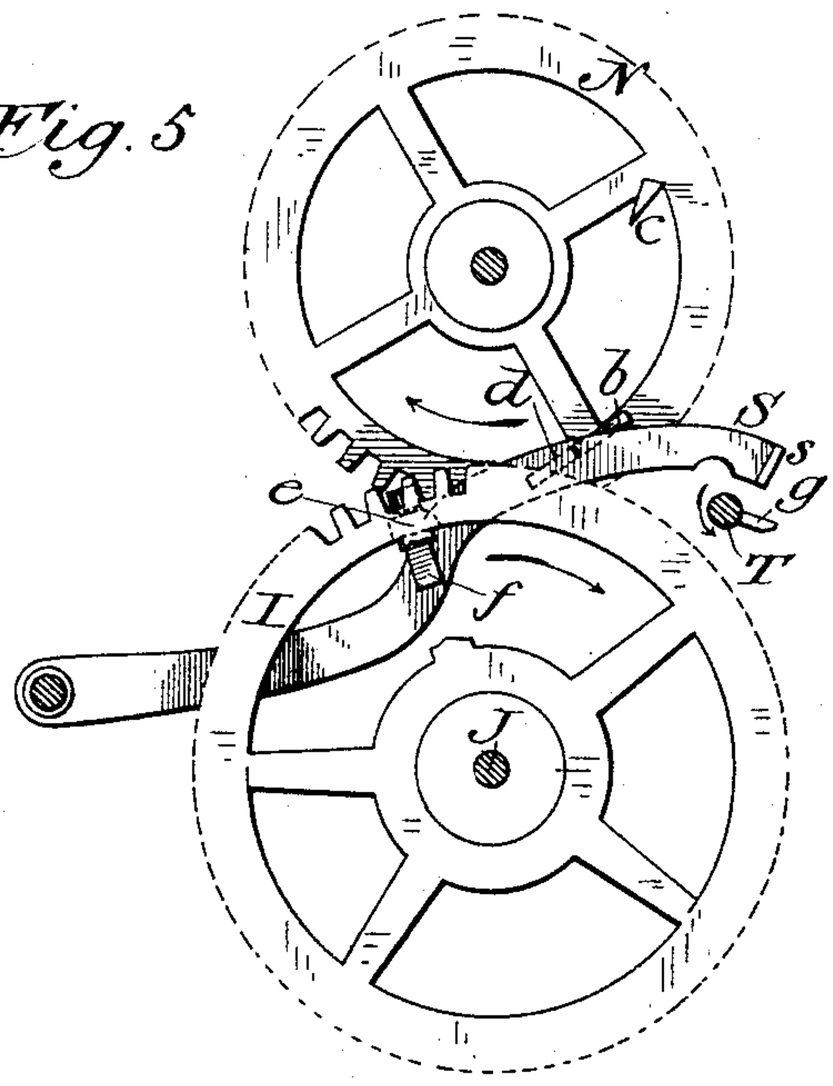


Fig. 6.

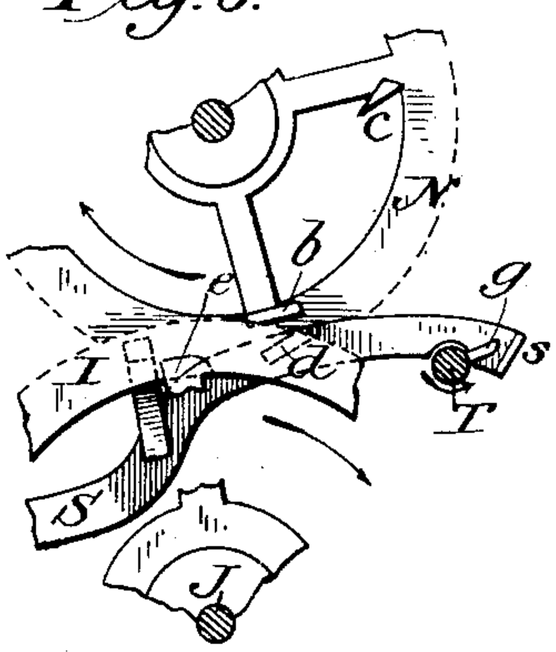
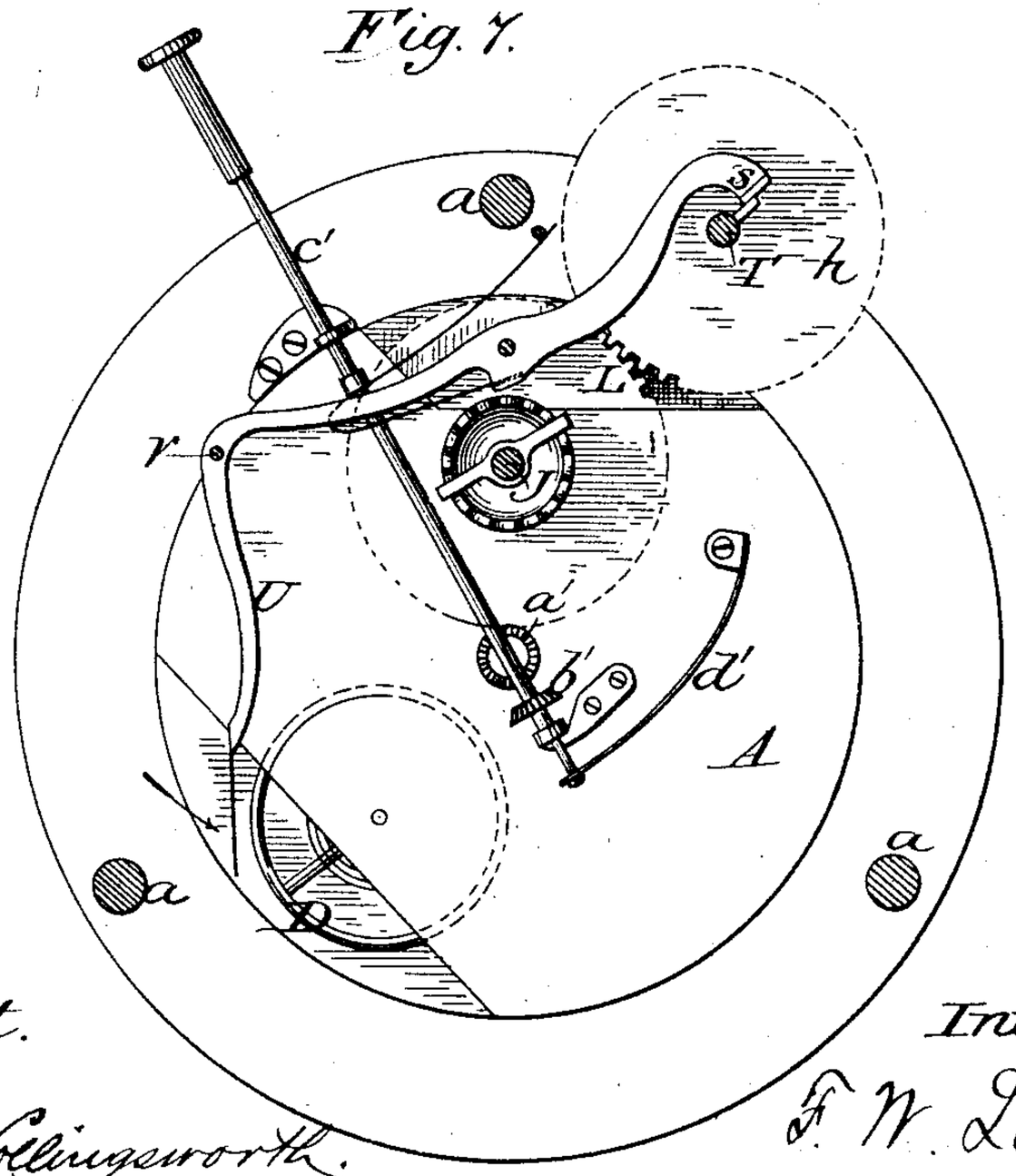


Fig. 7.



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By his Attys

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UNITED STATES PATENT OFFICE.

FREDERICK W. LETMATE, OF WASHINGTON, DISTRICT OF COLUMBIA.

WINDING ATTACHMENT FOR CLOCKS.

SPECIFICATION forming part of Letters Patent No. 261,003, dated July 11, 1882.

Application filed September 1, 1881. (No model.)

To all whom it may concern:

Be it known that I, F. W. LETMATE, of the city of Washington and District of Columbia, have invented certain new and useful Improvements in Time-Keepers, of which the following is a specification.

My invention relates particularly to that class of time-keepers which are driven by a spring and governed by a balance; and its object is to produce a time-keeper of this class which will run accurately and uniformly for a week or more with a single winding—a result which has up to the present time never been accomplished in practice.

It is well known to those skilled in the art that when a time-piece going with a balance and driven by a spring is made to go longer than a day without rewinding it becomes very inaccurate in its movement. This defect is due to the fact that the mainspring, acting with great force just after rewinding, constantly diminishes in force as it runs down. In practice it is found that in a time-piece designed to be driven but a single day the variation in the force of the spring is so great as to materially impair its accuracy. In constructing a clock to be driven more than a day this evil is greatly exaggerated, for the reason that in order to drive the movement for a great period of time it is necessary to so proportion the spring that when first wound it will exert a very great excess of power over and beyond that which is required to impart motion to the mechanism, this excess being many times greater than that which is required in a movement to run but a single day.

It is to overcome this evil by causing the application of a substantially uniform power to the time-movement that my invention is designed.

To this end it consists in combining with a time-movement, which may be of ordinary construction, or of the same character as ordinary time-pieces that go with a balance having its own driving-spring, a second movement, which I denominate the "winding-movement," this second movement being provided with a large powerful driving-spring, and being applied and controlled by intermediate devices in such manner that it will wind the mainspring of the time-movement at regular intervals.

I construct the spring of the winding-movement of such size and strength that it will continue to operate the winding-movement for a period of at least one week, thereby causing it in turn to effect the winding and the consequent operation of the time-movement for an equal length of time.

In practice I have found that many difficulties are to be overcome in properly applying the powerful winding-movement in such manner as to prevent it from acting with such violence as to destroy the other members of the organization when it is first wound. I find that in order to safely apply a winding-movement of sufficient power to operate for a period of a week or more it must have what is commonly known as a "complete train of wheels"—that is to say, a train containing such number of wheels and pinions that, although subjected to the full power of their actuating-spring, they will run down steadily and smoothly. I also find that it is preferable that the devices by which the action of the winding-movement upon the spring of the time-movement is controlled shall operate upon the winding-movement at an intermediate point in its train, as otherwise the detent devices will be destroyed by the violent shock to which they are subjected in stopping the motion of the winding-movement. I have therefore devised the arrangement or mechanism represented in the accompanying drawings, which may, however, be modified in various respects, which will be readily understood after an examination of the following description and the drawings to which it refers.

I am aware that many attempts have been made to equalize the force with which the mainspring acts upon the time-movement, and that among other arrangements thus employed upon a movement designed to run but a single day was that of having the mainspring wound through the medium of a second and stronger spring, the barrel of which was provided with stops acted upon by a detent at intervals of a few moments to check its motion. This arrangement I find in practice to be inoperative and worthless, for the reason that a winding-spring sufficient to act for a single day gives to the parts an action so violent as to destroy the detent mechanism. For this reason the arrangement named is impracticable for use in a movement designed to run a week or more.

The invention consists substantially in combining with the time-movement and its spring a winding-movement adapted to operate for a period of a week or more, and devices located intermediate in the winding-train, whereby it is thrown into action at regular intervals to effect the winding of the spring of the time-movement.

The invention also consists in the peculiar construction and arrangement of the automatic devices; and, also, in means for stopping the balance, when both springs are nearly run down, in such position that it will start automatically when released; and, also, in means for releasing the balance when the spring of the winding-train is wound.

Referring to the accompanying drawings, Figure 1 is a side elevation of my time-keeper. Fig. 2 is a top plan view of the same. Fig. 3 is a vertical section on the line *x x*. Fig. 4 is an outside face view of the winding-stop. Figs. 5 and 6 are vertical sections on the line *x x*, showing the detent mechanism by which the action of the winding-train is controlled. Fig. 7 is a vertical section on the line *y y*, Fig. 1.

The mechanism represented consists of an ordinary watch-movement complete in all its parts, having its winding-arbor coupled to an ordinary gear-train, such as is commonly used in clocks designed to run one or more days, this gear-train being driven by a mainspring of sufficient size and power to effect the repeated winding of the time-movement spring for a period of at least one week.

A represents the time-movement, connected by studs *a* to the front of the main gear-frame B. The time-movement A being constructed as usual, need not be described in detail herein. It consists in substance of a train of gears, a mainspring for driving the same, and a balance-wheel, D, for controlling the motion.

The winding-train consists of a main or winding arbor, E, provided with a strong driving-spring, F, and with a gear-wheel, G, from which latter motion is transmitted through the intermediate pinions and wheels, as usual, to a fan-shaft, by which the speed of the train is governed during the winding action. The winding-train connects with the winding-arbor of the time-movement by means of a shaft, J, connected by a clutch or ratchet-coupling, Z, with said winding-pinion. The clutch is carried upon the end of one of the intermediate shafts in the winding-gear, the same shaft carrying the pinion H, which is driven by the primary wheel G of the winding-movement. When the winding-movement is permitted to run, its mainspring F, through the intermediate devices, imparts motion to the shaft J, which in turn rotates the winding-arbor P of the time-movement, thereby winding up the mainspring of the latter.

As the spring of the time-movement runs but a short length of time after each winding, while the winding-train continues in action for a far greater period of time, I provide devices for controlling the action of the winding-movement, so that it is permitted to operate and wind the time-movement at stated intervals only. The stopping devices which are used to thus control the action of the winding-movement are plainly represented in Figs. 1, 2, 3, 5, and 6. The gear-wheel N, from which the fan-shaft of the winding-movement is driven, is provided on one side with a rectangular stud, *b*, and with an inclined or beveled stud, *c*, in the relations represented in Figs. 2, 5, and 6. A lever, S, mounted in the main frame, is provided with a shoulder, *d*, to engage with the studs *b* and *c* successively in order to stop the motion of the winding-train. The lever S is provided on its opposite side with a shoulder, *e*, which is acted upon and elevated by a shoulder, *f*, on a wheel, I, of the gear-train. The shoulder *f*, acting against and elevating the shoulder *e*, thereby elevates the lever S and holds the same in such position that the stud *d* of the lever will engage with the shoulder *b* of the wheel N, and thereby hold the gear at rest, as represented in Fig. 5, this being the position of the parts during the time that the winding-movement is at rest. The release of the winding-movement that it may operate is secured by elevating the lever S, this elevation being effected by means of a tappet or arm, *g*, mounted on a transverse shaft, T, which is provided with and driven by a gear-wheel, H, secured upon its forward end and engaging with the wheel L on the drum or mainspring-barrel of the time-movement, as in Figs. 1, 2, 3, and 7. The two wheels H and I are substantially of the same diameter, so that the shaft T is driven at the same speed as the barrel, and its tappet *g* caused to lift the lever and unlock the winding-movement once during each revolution of the barrel.

The parts stand normally, when the movement is at rest, in the position represented in Fig. 5, the stud *d* of the stop-lever S bearing against the stud *b* of the wheel N, the lever being sustained in position to keep the lugs in contact by means of the lug *f* on the lower wheel bearing beneath the stud *e* on the lever. The parts remain at rest in this position until the mainspring of the time-movement has nearly run down, at which time the arm *g*, which has been kept in gradual motion by the time-movement, is brought in position to act upon the lever S and elevate the same. As the lever rises its stud *d* disengages from the stud *b*, whereupon the winding-train turns slightly forward until the stud *c* of the wheel encounters the stud *d* upon the lever. The parts remain in this second position until the arm *g* passes from under the end of the lever S and permits the same to fall, whereupon the lever descends to the position represented in Fig. 6, with its stud *d* below the path of the studs *b* and *c*. The parts are now released and the winding-train turns forward under the action of the spring F until the mainspring of the time-movement has been wound to the re-

quired extent. As this winding operation is completed the wheel I completes its first revolution, and its stud *f*, acting against the stud *e*, elevates the locking-lever to its original position, thereby relocking the parts and bringing the winding-movement to a rest.

The function of the beveled stud *c* is to hold the parts temporarily at rest until the tripping-arm *g* is in such position that the stop-lever S may fall to carry its stud *d* below the path of the studs *b* and *c*. This dropping of the stud *d* below the device is necessary in order to permit the wheel N to make a number of revolutions, as required, before being again stopped. Were it not for the stud *c*, the stop-lever would be held in an elevated position by the tappet *g* so long as to permit the winding-movement to operate beyond the desired limit of time.

It will be observed that under the above arrangement the winding of the mainspring F of the winding-movement causes the latter to effect the repeated winding at regular intervals of the time-movement spring.

It will also be observed that the detaining devices by which the winding-movement is controlled engage with said movement at an intermediate point in its train.

In practice I find that under the above-described arrangement I am enabled to use with safety and without fear of breakage or of unnecessary shock or strain upon the parts a spring of such power and length as to actuate the winding-train for a period of a week or longer without being rewound. By applying the winding-train adapted to run for the long period stated to the winding of the time-movement, as described, I produce a time-keeper which will run for the period of a week or longer with extreme accuracy, inasmuch as the power applied to the time-movement is substantially uniform, notwithstanding the fact that the power of the primary spring F has a wide range of variation.

It is manifest that by varying the relative size of the wheels *h* and L the winding-movement may be thrown into action at longer or shorter intervals, and thus the winding of the time-movement effected with greater or less frequency, as desired.

The spring F of the winding-movement, running down, leaves the spring of the time-movement wound, so that the time-movement continues its motion until its own spring is unwound after the winding-movement has ceased to act. In order that the balance may start automatically upon winding the spring F, after the clock has been at rest, I employ devices to stop the balance-wheel just before the spring of the time-movement has finished running down, thus leaving the spring with sufficient tension to start the balance-wheel when the latter is again released. The device for stopping the balance I connect with the winding device of the mainspring F, so that when the spring F is wound the stop is automatically removed from the balance, permitting the time-movement spring to start the balance and also operate the detent devices of the winding-movement automatically.

In order to enable the winding-movement to effect the release of the balance and the starting of the time-movement when the winding-movement is wound, I make use of a starting-lever, U, (shown in Figs. 1, 2, and 7,) and connected by a horizontal pivot to the front of the main frame, and provided at its lower end with a delicate spring to act against and stop the balance. This lever is vibrated by means of an arm or tappet, *s*, on the shaft *t*, which carries the previously-mentioned trip-arm *g*, the tappet serving to move the lever and carry its spring ordinarily past the balance without touching the same. As the spring end of the lever U need act upon the balance only when the primary driving-spring F has run down and the time-movement has nearly run down, the end of the lever is pushed laterally into position to encounter the balance by means of a sliding pin, V, moved by a lever, W, which is in turn moved by a stud, *t*, on one of the winding-stops, X, of the winding-movement. The wheel X is provided with a series of teeth and co-operates with a single-toothed wheel in the arbor E, the two wheels constituting what is commonly known in the art as a "Geneva winding-stop." The stop-wheels turn with the arbor as the spring F unwinds, and as the unwinding action approaches its end the stud *t*, operating the lever W, causes the pin V to push the starting-lever U sidewise, as indicated in dotted lines in Fig. 1, so that if the lever be then moved upon its pivot by the tappet *s* the spring upon its lower end will act against and stop the balance. This arrangement of the stopping-lever, so that it will operate upon the balance only when the spring F has run down, is necessary in order to prevent the balance from being stopped each time that the starting-lever is moved by the tappet *s*, which occurs at frequent intervals.

As a convenient means of setting the hands of the time-movement, the center arbor is provided on its rear end with the beveled gear *a'*, operated by a corresponding gear, *b'*, on a spindle or shaft, *e'*. This shaft is mounted in bearings on the back of the time-movement and arranged to slide endwise, being provided at its upper end with a milled head or thumb-piece by which to turn it, and being connected at its lower end to a spring, *d'*, as plainly represented in Fig. 7. On drawing the spindle *e'* upward the wheels *a'* and *b'* are engaged, so that the rotation of the spindle will impart motion through the center pinion or arbor to the hands. Any equivalent means may be used for the purpose of adjusting the hands.

While it is preferred to employ, in connection with the winding-movement, the stopping mechanism represented, the details may be modified as desired, provided substantially the same mode of operation is retained.

It is to be understood that I have made use of watch and clock movements of ordinary form, as herein represented, simply as a matter of convenience, and in constructing my timepiece for the market both the time and winding movements will be constructed with special reference for use in connection with each other, being simplified and modified to this end as far as possible.

Having thus described my invention, what I claim is—

1. In a time-keeper, the combination of a time-movement provided with a mainspring and balance, a winding-movement provided with a mainspring adapted to drive the same one week or longer, and automatic stop devices, substantially as shown, operated by the time-movement and engaging with the winding-train, whereby the winding-movement is caused to wind the mainspring of the time-movement at frequent intervals and stand at rest during the intermediate periods.

2. In a time-keeper, the combination of the following elements: a time-movement driven by a spring and governed by a balance, a winding-movement propelled by a spring and adapted to run a week or more by a single winding, a connection between the winding-arbor of the time-movement and one of the intermediate wheels and stop devices, substantially as shown, actuated by the time-movement and operating upon the winding-movement to permit its action at stated intervals only.

3. In a time-keeper, the combination of a time-movement provided with a mainspring and balance, a winding-train coupled to the winding-arbor of the time-movement and provided with a spring, whereby it may be driven to wind the time-movement for a week or more, a stop-lever acting in connection with the gear train of the winding-movement, and a rotary shaft provided with an arm to trip said lever and actuated by the time-movement, as shown.

4. The combination, in a time-keeper, of the following elements: a winding-train containing a driving-spring and a sufficient number of gear-wheels to run down steadily under the action of the spring, a time-movement provided with a balance and a mainspring, a connection between the winding-train and the winding-arbor of the time-movement, and stop devices connecting with the time-movement and the winding-train to permit the movement of the latter at stated intervals.

5. In combination with the time-movement and its spring, the winding-train connected at its middle with the time-movement and at one end with the driving-spring F, the lever S, operating intermittently from the time-movement, and the stops *b*, *d*, and *e*, applied to the winding-train, as described and shown.

6. In a stop device for a winding-train, the combination of the wheel provided with the stud *e*, the wheel I, provided with the studs *d* and *f*, and a device, substantially as shown, for elevating and then releasing the lever.

7. In combination with the time-movement and the winding-train, substantially as shown, automatic starting devices such as shown, connected with the winding-train, whereby the winding of the spring of the winding-train is caused to insure the starting of the movement.

8. In combination with the time-movement, the winding-train, the stop mechanism for the time-movement, and the starting devices therefor, connected with and operated by the stop devices of the winding-train, substantially as described and shown.

9. In combination with the winding-movement and the intermediate detent mechanism, the starting-lever moved in one direction by the detent mechanism and in another direction by the winding-stop of the winding-train.

10. In combination with the balance D, the lever U, capable of movement in two directions, as described, the lever W, and stud T, applied to the winding-stop.

FREDERICK W. LETMATE.

Witnesses:
ANSON S. TAYLOR,
S. T. LUCKETT.