No 13,360 A.D. 1894

Date of Application, 10th July, 1894

Complete Specification Left, 10th May, 1895—Accepted, 22nd June, 1895

PROVISIONAL SPECIFICATION.

An Improved Clock.

I, WILHELM JERGER of Niedereschach in the Grand Duchy of Baden, in the Empire of Germany, Clockmaker do hereby declare the nature of this invention to be as follows :—

In clocks worked by springs and which require winding in longer or shorter intervals it is obvious that their movements will vary, being fastest when the driving spring is fully wound up, and slowest when nearly run down.

There have been invented devices which were to diminish or abolish altogether this difference in speed, particularly by placing a smaller spring between the driving spring and the balance wheel, but from certain defects they have not accomplished the object in question.

In my invention I place a small spring case not on the balance wheel spindle, but on a separate spindle which has this advantage that a winding up of the spring case by the main spring is only required after a number of revolutions of the balance wheel.

Consequently balance wheels with rapid movement may be employed, such as are necessary with quick motion ship's clocks and the like, whereas the arrangement of the spring case on the balance wheel spindle would be possible only with the slow motion pendulum clocks.

In order to construct a continuously correct going clock, it is necessary to prevent by all possible means the spring in the spring case running down to any extent, on the contrary it should be allowed to unwind only a few turns, always of equal number.

Now after the driving spring has run down to a fixed point, the spring case must not act any further on the balance wheel, because otherwise the spring in the spring-case would gradually become unwound.

In order to suspend all movements after the driving spring has run down and after the mechanism up to the spindle carrying the spring case has become stopped with it, an arm is fastened to the spindle carrying the spring case, and an eccentric to the spring case. This eccentric is provided with a pin which places itself before the arm whereby the spindle carrying the spring case and with it the arm, after the disengagement of one of two special pins, cannot be moved any longer by the unwound driving spring.

The position of the arm is naturally to be made so that the first pin cannot get within its reach until after the disengagement of one of the other two pins and after having passed through a semi-circle.

The power necessary for winding the driving spring exerts a re-action on the mechanism of the clock so that upon a pin disk fastened to the spindle carrying the spring case a reverse motion may be exerted, and with it also upon the spring case itself; in connection with which an unwinding of the spring in the spring case would take place.

This retrogade movement is made impossible by placing a loose lever arm on a third spindle, which swings freely in a downward direction, in order to admit of the free passage of the two pins before mentioned, but which is prevented from moving in an upward direction by a short arm striking against a stop.

Now in case the disk pin receives an impulse to a retrogade movement, when the

clock is being wound, one of the two pins before mentioned places itself against the lever arm and motion is stopped.

By these means the spring in the spring case continues to retain the same strain and a reduction of its turns is made impossible.

The eccentric attached to the spring case also actuates a fork, which has its fulcrum on a fourth spindle, to which another lever is fastened, which is thus brought to a rocking motion. This lever is provided at its off end with a hook, which arrests one of the two pins previously mentioned until the arrested pin slides off the hook by the lever swinging either right or left.

A wheel loose on the spindle but attached to the spring case gears with a wheel fastened to the balance wheel spindle.

The balance wheel is connected by one of the ordinary escapements to the balance.

The spindle carrying the spring case and its attachments, is connected by a wheel with the ordinary clock mechanism, by which it is actuated from time to time, thus winding the small spring in the spring case.

Dated this 10th day of July 1894.

S. S. BROMHEAD,
97, Newgate Street, London, E.C., Agent for Applicant.

COMPLETE SPECIFICATION.

An Improved Clock.

I, WILHELM JERGER, of Niedereschach, Baden, in the Empire of Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

Clocks running for eight days or for a longer time, and also chronometers running for an equal length of time have the defect that they cannot keep accurate time, as with the full power of the mainspring, that is to say when the spring is under full tension, the clock regulates differently from what it does when for instance the spring is under mean or lower tension until it has run down. Accordingly the clock, in the course of a period such as for example eight days, will have a period of advance and a period of retardation, since an absolutely regular movement cannot be achieved.

The present clock has new arrangements and devices which act in such a manner that the balance wheel, or its motive power is rendered independent of the greater or less tension of the mainspring or the driving power of the clockwork. The new arrangement is particularly designed for chronometers, but may of course be also employed for any other clock. In the accompanying drawing the new arrangement, in order to be readily understood, is supposed to be used in connection with a simple clockwork, it may however also be applied to any other suitable construction of the clock or of the escapement. The power of the mainspring a, by means of the customary ratchet a^1, spring wheel a^2, pinion b, wheel b^1, pinion c, bottom wheel c^1, and pinion d, is transmitted to a newly added spring box in such a manner that the latter will be "wound up" in a certain short period, for instance after every minute, while through the same the balance wheel e, will be operated. This small spring box d^1 is firmly connected with a toothed wheel d^2 (Fig. 2) and the two, d^1 d^2, are loose upon the arbor d^3. In the spring box d^1, is arranged a spiral spring d^4 (Fig. 3) put under suitable (mean) tension, one end of the spring being secured to the wall of d^1 at d^5, and the other end directly to the arbor d^3 or to a collar d^6 firmly held upon d^3 at d^7.

With the pinion d fixed upon the arbor d^3 is connected a disc d^8, which is therefore also fixed upon d^3. This disc d^8 (Fig. 4) carries at diametrically opposite points, but differently placed in the radial direction, two adjusting pins d^9 d^{10}.

With the spring box is firmly connected the eccentric d^{11} arranged on the cover of the same and embraced by a fork f which has its fulcrum on the arbor f^1.

Upon the arbor f^1 is moreover provided a lever f^2 (Fig. 2) to which therefore a pendulum motion is imparted by the turning movement of the eccentric d^{11} through the intervention of the fork f. The lever f^2 possesses at its end a hook f^3 (Fig. 5) which arrests one of the pins d^9 d^{10} until the pin held slides from the end of the lever swinging to the right or left. The wheel d^2 engages with the pinion e^1 actuating the balance wheel e.

This balance wheel e is connected by one of the known escapements, shown in this case by Clements hook g with the balance h.

As will be readily seen, the spring d^4 in its tendency to unwind, actuates the spring box d^1 and the wheel d^2 connected with d^1 in the direction of the feathered arrow, so that the balance wheel e and the balance h are operated in the usual manner.

In this rotation of the spring box d^1 the spring d^4 is of course unwound to a corresponding extent.

The power of the mainspring a which acts upon the wheelwork a^1 a^2 b b^1 c c^1 d, is however in the first place checked during this operation, because the last wheel, the pinion d together with the arbor d, is stationary owing to the fact that the disc d^8 connected with d is held by the hook f^3 passing to the front of the pin d^{10}. With the spring box d^1 turned by the spring d^4 is also turned the eccentric d^{11} which causes the fork f and lever f^2 to oscillate, until the latter reaches the position I (Fig. 4.), wherein f^3 slides from d^{10}. At once the mainspring a exerts its power and acting momentarily sets the arbor d^3 in rotation by means of the pinion d in the direction of the unfeathered arrow (Figs. 1. 3.) until the pin d^9, being placed in a different position from d^{10} in the radial direction, has been put in front of the lever hook f^3 now swinging back, whereby the wheelwork arranged between d and a is caused to stop again. In the aforesaid rotary movement of the arbor d the spring d^4 has been wound up again, as much as it had run down previously by the movement of the spring box.

After the spring box d^1 has then turned round so far that the eccentric d^{11} has moved the lever f^2 to the other position II the described operation is repeated, inasmuch as now the pin d^9 slides from the hook f^3 of the lever f^2. The wheelwork of the clock from a^1 to d^8, therefore makes its movement at greater intervals, while the wheels d^2 e^1 e make the customary movement controlled by the balance h.

By the wheel b^1 the jumping motion is transmitted by the wheel i to the inner arbor i^1 for the minute hand i^2. The hour hand i^3 is moved by the well-known wheelwork. As the balance wheel e has a period of stoppage and a period of motion, the arrangement may be such that the winding up of the spring box d^1, takes place during the former period, thereby obviating in any case a gradual unwinding of the spring d^4, which in the other case might happen in course of time.

As shown in the drawing, the small spring box d^1 is here arranged, not upon the axis of the balance wheel, but upon the arbor d^3 situated in front of the balance wheel e. This presents the advantage that the winding up of the spring box d^1 is necessary only after the repeated rotation of the balance wheel e. Accordingly use may be made of balance wheels having a rapid motion, such as is requisite in the case of quick moving chronometers and the like, while the arrangement of the spring box d^1 upon the axis of the balance wheel would be possible only in the case of the slow movement of pendulum clocks.

In order to produce a clock running for a long time it is necessary at all events to prevent the spring d^4 of the spring box d^1 from running down partly or wholly, indeed it should be kept at the same number of windings, that is to say the spring d^4 should always be wound up as much as it has run down in its regular movement.

If therefore the mainspring a has run down to the limit assigned to it, the spring

box d^1 must not actuate the balance wheel e any further, because the spring d^4 would otherwise be completely unwound in course of time.

In order to completely stop the clock after the running down of the spring a and the stoppage of the wheelwork from a^2 to d, an arm or an adjusting screw d^{13} is fixed upon the arbor d^3 or upon an adjusting ring thereon, Figs. 6 and 7, and upon the eccentric d^{11} is provided a pin d^{12} which passes to the front of the arm d^{13} when the arbor d^3 and consequently the arm d^{13} after the disengagement of one of the pins d^9 d^{10} can no longer be set in rotation by the mainspring a which has run down. The position of the arm d^{13} will of course have to be such that the pin d^{12} could come within its reach only after the disengagement of one of the pins d^9 d^{10} and after turning in a semicircle.

In the winding up of the mainspring a the power necessary for winding the spring reacts upon the wheelwork of the clock, so that a turning movement of the pin disc d^8 and consequently of the arbor d^3 in the opposite direction to that of its normal movement can take place, which would cause the unwinding of the spring d^4 in the spring box d^1.

Such a backward movement is here rendered impossible by providing on an arbor n a loose lever arm n^1 which can swing downwards in order that the pins d^9 d^{10} will slide past it, but which is prevented from making a movement in the other direction upwards, by the projection n^2 bearing against a stop o.

If thus the pin disc d^8 receives the impulse for a backward movement during the winding up of the clock, the corresponding pin d^9 or d^{10} will bear against the lever arm n^1, and the movement is stopped.

Owing to these arrangements the spring d^4 of the small spring box is therefore kept at the same tension, and a decrease of its windings is rendered impossible.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is :

First. A clock in which a special spring box d^1 is added on a separate spindle between the mainspring a of the works and the balance wheel e, the spring d^4 of the said box actuating the balance wheel e, this spring d^4 being automatically wound up, by the mainspring a after having run down to a certain extent, in short periods of time as herein described and set forth.

Second. A constructional form of the clock described in the first claim, in which the spring in the box now added is wound up again because the eccentric d^{11} connected with the spring box, by means of the fork f, moves the stopping lever f^2 from a pin d^9 or d^{10} on the disc d^8 in connection with the clockwork, whereby the driving work heretofore stopped will be disengaged, and will now wind up the spring d^4 again, as herein described and set forth.

Third. The clock described in the first claim, in which the stoppage of the said clock after the running down of the mainspring a, is effected by a pin d^{12} arranged on the eccentric d^{11} passing to the front of the stopping arm d^{13} on the arbor d^3, when the latter can no longer be turned by the run-down mainspring a, as herein described and set forth.

Fourth. The clock described in the first claim, in which the reaction of the power employed for winding up the mainspring a, acting upon the spring box d^1, is neutralized by one of the pins d^9, d^{10} of the pin disc d^8 which will in the return movement bear against the lever arm n preventing a continuance of this movement, said arm however permitting the passage of the pins d^9 d^{10} in their movement in the proper direction, as herein described and set forth.

Dated this 10th day of May 1895.

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97, Newgate Street, London, E.C., Agent for Applicant.

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Fig. 1.

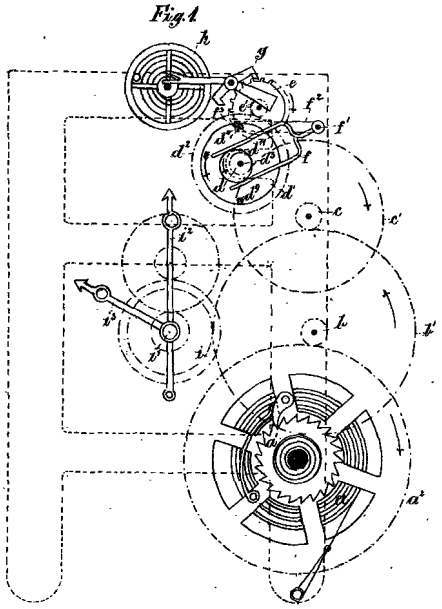

Fig. 2.

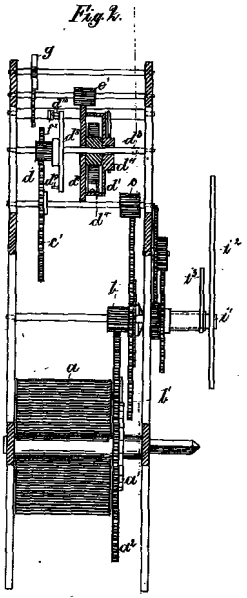

Fig. 6.

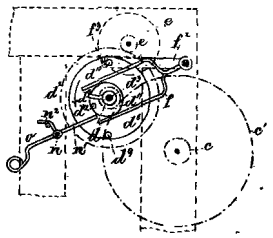

Fig. 7.

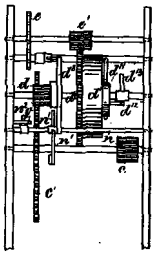

Fig. 3.

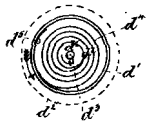

Fig. 4.

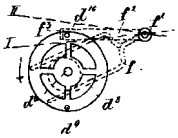

Fig. 5.

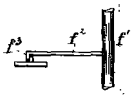

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Fig. 1.

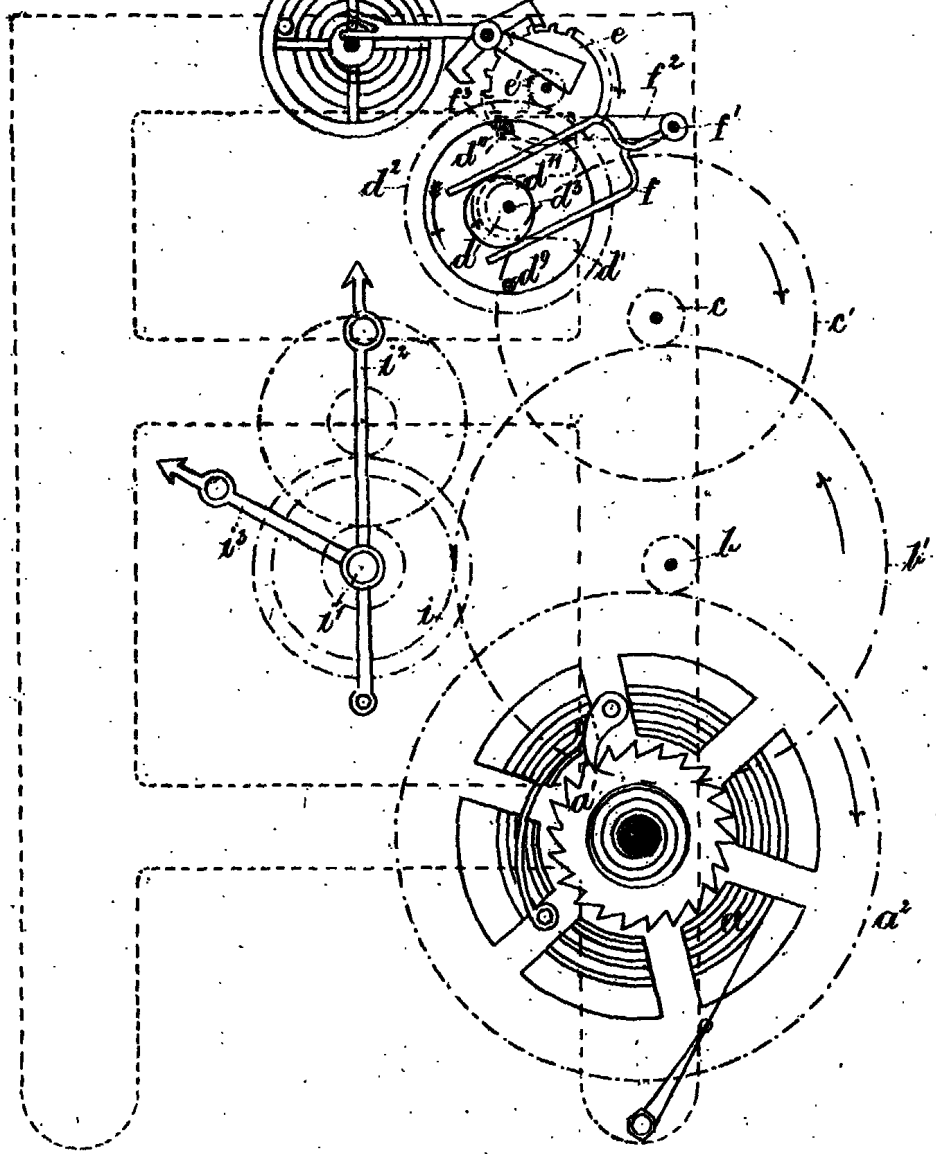


Fig.

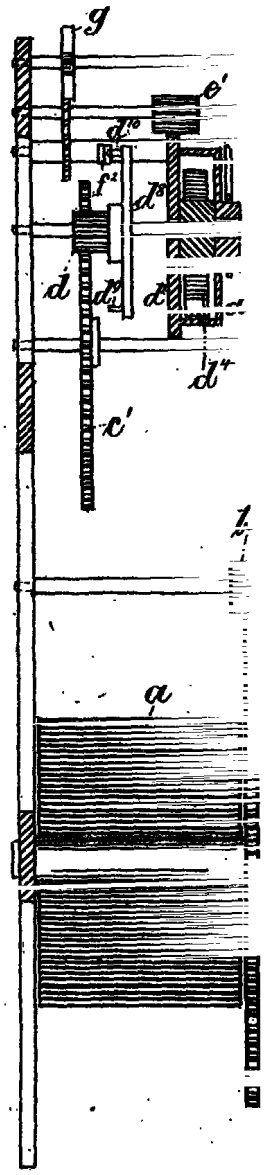


Fig. 3.

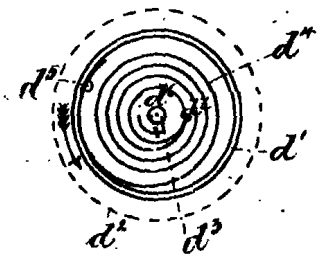
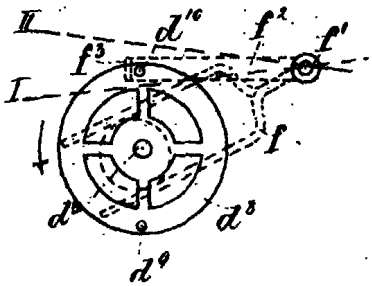
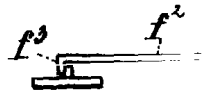


Fig. 4.





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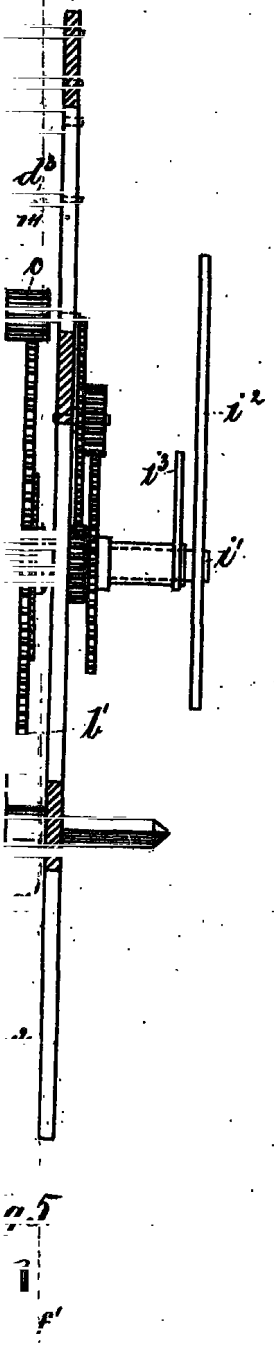


Fig. 6.

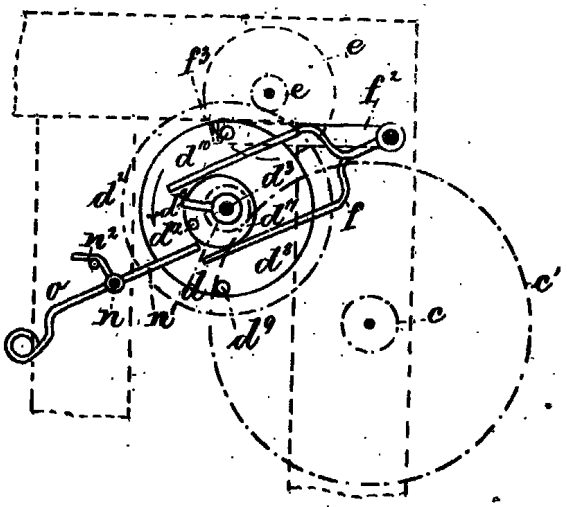
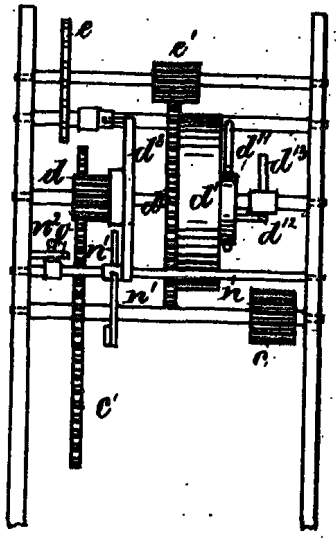


Fig. 7.



[This Drawing is a reproduction of the Original on a reduced scale]

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