(No Model.)

C. HAHLWEG.

REPEATING TIMEPIECE.

No. 525,321. Patented Aug. 28, 1894.

Fig. 1.

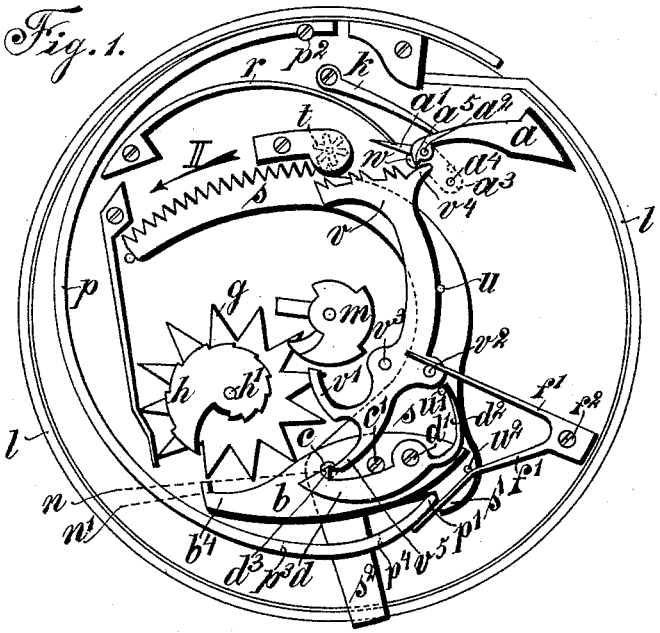


Fig. 3a.

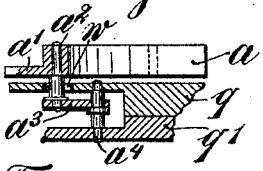


Fig. 3b.

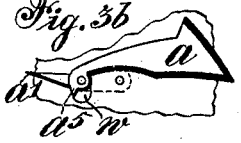


Fig. 4.

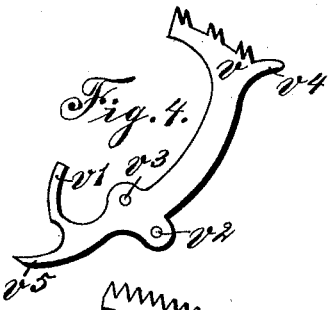


Fig. 2.

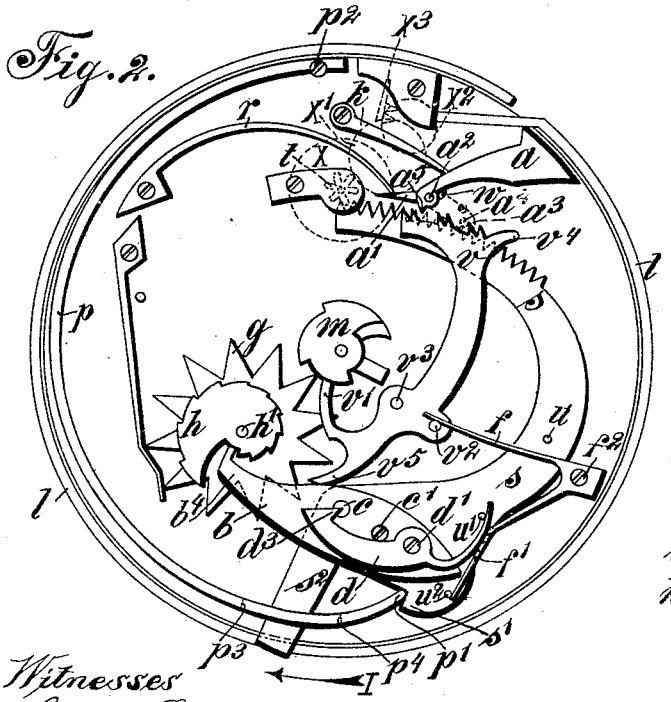


Fig. 5.

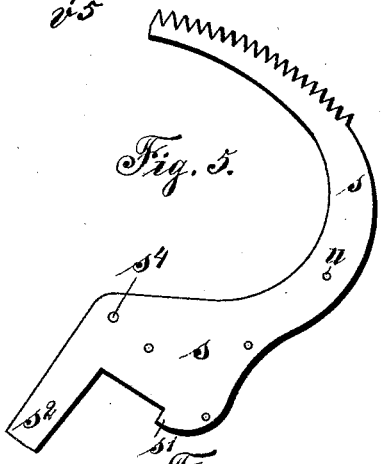
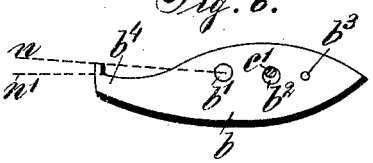


Fig. 6.



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UNITED STATES PATENT OFFICE.

CARL HAHLWEG, OF STETTIN, ASSIGNOR OF ONE-HALF TO MARC BLOCH, OF BERLIN, GERMANY.

REPEATING-TIMEPIECE.

SPECIFICATION forming part of Letters Patent No. 525,321, dated August 28, 1894.

Application filed April 24, 1894. Serial No. 508,857. (No model.) Patented in Germany June 1, 1893, No. 73,270, and in Switzerland June 6, 1893, No. 7,064.

To all whom it may concern:

Be it known that I, CARL HAHLWEG, watchmaker, a subject of the King of Prussia, residing at Stettin, Germany, have invented Improvements in Repeating-Movements for Timepieces, (for which I have obtained Letters Patent in Germany, No. 73,270, dated June 1, 1893, and in Switzerland, No. 7,064, dated June 6, 1893;) and I do hereby declare the following to be a clear and exact description of the invention.

My invention relates to a repeating movement for time-pieces. Such movements as at present in use, especially those used in watches, are open to objection on the ground of the complication of their construction, in consequence of which they are extremely costly and easily get out of order.

My improved movement is characterized by great simplicity and absolute certainty in its action.

The main feature of my invention, whereby such simplicity of the movement, compared with those previously in use, is attained consists in the employment of a single hammer and a single gong for fulfilling the function of repeating the full hours and the quarters, and in dispensing with a considerable number of parts such as the return lever and lifting piece with their delicate springs.

In the accompanying drawings, Figure 1 is a view showing the striking mechanism in the position of rest, that is to say, unwound. Fig. 2 is a view showing the same wound up, that is to say, in the position which it assumes when the winding lever is released to allow of the striking. Fig. 3^a is a section, and Fig. 3^b a plan of the hammer mechanism. Fig. 4 is a plan of the rack for striking the quarters, and Fig. 5 is a similar view of the rack for striking the full hours. Fig. 6 is a plan of the lever which serves as the striking lever for the hour rack and at the same time as a releasing lever for the quarter rack and of the striking mechanism.

The going train which is only indicated in dotted outline in Fig. 2 at x, x', x^2, x^3, with the anchor for regulating the speed of striking is connected to the pinion t which engages with the teeth of the hour-rack s. In the form of construction shown, the hour-rack is provided with nineteen teeth as shown in Figs. 1, 2 and 5 and the rack s turns on a pin c by means of its pivot hole s^4. Opposite the part of the rack just referred to is attached to it an arm s^3, which projects through a slot in the case of the movement and is intended to wind up the striking mechanism. A fixed spring p attached at p^2 has its free end p' located beneath a shoulder s' on the hour-rack and this spring serves to drive the striking mechanism.

The spring has at its lower end p' a slot or recess p^3 p^4 through which the arm s^2 of the rack passes. The rack s, however, actuates by means of its teeth on the one hand, the hammer a and on the other hand the going train, which latter limits the travel of the rack in the usual way as it returns and thereby brings about the regularity of the successive strokes. The two armed flat lever b lies flat upon the rack s and is provided as shown in Fig. 6 with two round holes b' and b^2, and the screw-hole b^3. By means of its hole b' the lever b turns upon the screw or pin c, while the screw c' passes through the hole b^2 and is securely screwed into the rack s, while its head prevents the lever b from leaving the rack. The screw c' has, as shown in Fig. 6, a certain amount of play so that the lever (owing to the size of the hole b^2) is able to execute a slight movement of rotation upon the screw c, with reference to the rack s. The extent of this movement is indicated by the dotted lines n n' in Fig. 6. A screw d' is firmly screwed into the screw hole b^3 of the lever b and serves as a pivot for the check lever d which is provided with a hook d^3 in front and a spring or part d^2 acting as such behind. This check lever partakes of the slight motion of the lever b by means of its pivot of rotation d' and its spring end abuts against the pin u' fixed in the rack s while the middle portion abuts on the screw c' which is likewise fixed in the rack s. The spring d^2 therefore acts, not upon the check lever only, but also simultaneously upon the lever b, and this too in such a way as to cause the hook d^3 of the check lever to be pressed in the direction of the quarter rack and the arm

b^4 of the lever b in the same direction toward the step-wheel or jumping cam h. In this position the check lever holds the quarter rack in check as shown in Fig. 1. The movement of the hook d^3 and arm b^4 occurs when as the striking train is wound up, these two parts together with the rack s are turned on the pivot c so far that the arm b^4 of the lever strikes upon the step-wheel h, and is arrested, while the rack continues to rotate to a short distance. The screw c', which is firmly screwed into the rack s, then presses the check hook d^3 back. In Fig. 2 these mechanisms are shown in the position which they take up at the end of this movement, in which the point of the check hook d^3 is pushed back to the mid point of the screw c and has released the quarter rack v, while the spring d^2 is placed in a state of tension. When the rack s is released, the spring d^2 drives the check hook d^3 and the lever b into their previous position of rest with reference to the rack s.

The quarter rack v turns on a pin v^3, and lies free upon the rack s at the same height as the check lever d. It is shown separately at Fig. 4. This rack possesses three pairs of teeth which like the teeth of the rack s, can lift the hammer a and thus give rise to two strokes in rapid succession, these double strokes announcing the quarters. When the stroke of the quarter is completed, the nose v^4 of the rack v which ascends gently and commences immediately after the teeth, lifts the hammer tooth a^5 out of the reach of the teeth of the rack, as shown in Fig. 1 and as I now will describe. In this latter movement of the rack v its arm v^5 strikes upon the check hook d^3, presses the latter back and is engaged by the hook so as to retain the quarter rack as shown in Fig. 1. The rack v is acted upon during the winding up by the spring f, which presses upon a lug or pin v^2 on the rack v, and causes the rack, as soon as the latter is released to turn in such a way that its arm v' strikes upon the step-wheel or jumping cam m, which causes the proper number of strokes to be given, as by known methods. The rack v receives its striking impulse from the hour rack s since it is caused to partake in the motion of the latter through the pin u. The hammer a is capable of rotation upon the pin a^2 and is of such a thickness that its tooth a^5 can engage in both of the racks s and v. The arm a', which is fixed to the hammer a, is, however, thinner than the hammer itself, so that the spring r, which drives the hammer against the gong l, may have its small nose extend over the arm a' of the hammer to prevent the latter from being lifted off from the pin a^2. The pin a^2 is not fixed in the plate q but upon a lever a^3 (Figs. 1, 3^a and 3^b) capable of rotation upon a pivot a^4. The pivot a^4 with its lever a^3 is placed between the lower surface of the plate q and the plate or block q' (Figs. 3^a and 3^b). The pin a^2 passes through the longitudinal hole w in the plate q, and allows the hammer to enter into and pass out of engagement with the rack. In the position shown in Fig. 1 the hammer is out of engagement with the rack and in Fig. 2 it is in engagement with the same. The movement from former into the latter position is effected by the spring r. The spring k serves as a counteracting spring for forcing back the hammer out of contact with the gong after each stroke to insure the production of a pure clear tone. The step-wheels for the hours and quarters are arranged in the usual way except that in the present arrangement the former is placed upon a fixed pin h'. The pinion t in the teeth of which the rack s engages, is not permanently connected to the wheel x of the going train, but is connected to it by means of a small ratchet mechanism movable in one direction.

The striking mechanism is wound up by pressing the arm s^2 of the rack in the direction indicated by the arrow I (Fig. 2) the pinion then turning loosely on the wheel x and the spring p being placed in tension. If it is desired that the striking should be effected, the winding up must be continued until the lever arm b^4 abuts against the step-wheel h and the check hook d^3 is pushed back as far as it is allowed by the amount of play of the screw c' in the hole b^2. The rack can then not be turned any farther, while the check hook d^3 releases the quarter rack v. This check hook under the action of the spring f springs back until its arm v' strikes upon the step-wheel m. In executing this movement the teeth of the quarter rack pass under the tooth a^5 of the hammer whereby the latter is raised after the manner of the pawl and ratchet mechanism by the teeth of the rack. Since the tooth a^5 is somewhat strongly pressed against the teeth of the rack by the spring r, the spring r must act proportionately strongly and requires to be specially adapted to its purpose in order that it may not unduly oppose the mechanism in the process of striking. The spring ff' is therefore as shown in Figs. 1 and 2 made with two arms like a fork and rotates at its foot on the screw f^2, while its arm f acts on the quarter rack v and its arm f' on the pin u^2, which is fastened to the hour rack s. The two spring arms f, f' have their distance from each other so regulated that in the resting position shown in Fig. 1, they are not in tension, so that the spring arm f exerts no pressure upon the quarter rack v. The spring is not thrown into tension until the striking mechanism is wound up when the pin u^2 which is moved in a circular path by the rack s, presses upon the spring arm f' and causes the latter to recede from the spring arm f, the effect of this being to put the spring arm f' in tension. Since, however, both spring arms interact in consequence of their common foot turning on the screw f^2, the spring arm f is also placed in tension and presses against the quarter rack v. In the

first third-part of the action of winding up, the spring $f\,f'$ is sufficiently placed in tension to bring it into action and from this point to the end of the process of winding up, the spring is only placed more in tension to a very small degree, because the end f' is so bent down that it almost coincides with the circular path which the pin u^2 has still to describe, as may be at once seen on reference to Fig. 2. The result of thus constructing the spring $f\,f'$ is, that it is capable of being placed in such a state of tension as to insure its driving back the quarter rack without offering any impediment to the mechanism in striking, since the tension of the spring f increases as the winding up is continued and diminishes as the mechanism runs down ceasing to exist altogether when the position of rest (Fig. 1) is reached. Thus this spring in contrast to the springs at present used for the same purpose, is not wound up by the power exerted by the going train when striking but is placed in tension by the act of winding up and involves no expenditure of energy on the part of the going train. As has been mentioned, the return of the rack v is effected when the mechanism is fully wound up the release of the going train mechanism to perform the act of striking being accomplished at the same time. For, so long as the quarter rack retains the position of rest shown in Fig. 1, its nose v^4 keeps the hammer tooth a^5 out of contact with the teeth of the rack, and the striking mechanism cannot act, even if it be partly wound up so that false striking is prevented and rendered impossible. Thus in order that striking may take place the mechanism must be fully wound up, the result being, as above described, that the hook of the check lever d^3 being pressed back, the quarter rack v is released and springing back allows the hammer tooth a^5 to engage with the teeth of the rack. This position is shown in Fig. 2. The mechansim is thus released and when the arm s^2 is set free strikes the hours in single strokes; and the quarter rack being made to partake of the motion of the hour rack by means of the pin u, the quarters are struck in double strokes. The quarter rack then lifts the hammer tooth a^5 out of engagement with the teeth of the rack by means of its nose v^4, while at the same time the rack arm v^5 presses back the check hook d^3, which latter engages the arm v^5 and holds the quarter rack firmly in this position. The action of the mechanism is therewith ended and the whole of its parts are in the position of rest as shown in Fig. 1. It has yet to be noted that while the hour rack is operating the hammer, the quarter rack, as regards its sector of teeth, is within reach of the hammer tooth a^5, but the latter always entering one of the larger intervals between the pairs of teeth is able to withdraw without hinderance.

With respect to the double stroke which serves to distinguish the quarters, it may be remarked that these latter are very clearly contrasted with the strokes which singly give the hours since the double strokes are given by single ones following so speedily one upon the other that they give the impression of being executed by two hammers, in addition to which, the single points of the double teeth are nearer together than the teeth of the hour rack, and the quarter rack being driven by a shorter lever from the pin u, its teeth have an accelerated motion, so that the single strokes which form the double one follow more than twice as quickly, one upon the other, as the hour strokes. Single strokes can, however, be used for the quarter strokes, since the pause which occurs between the hour strokes and those which mark the quarters is in itself sufficient to indicate the latter as such.

I claim as my invention—

1. In a repeating movement for time-pieces, a single hammer, means for operating the hammer to strike both the full hours and the quarter hours, and a movable axis of rotation for the said hammer, substantially as and for the purpose set forth.

2. In a repeating movement for time-pieces, the combination of an hour-rack, a quarter hour rack and a hammer arranged to be acted upon by both racks, with means for raising the hammer out of the way of one of the racks, substantially as set forth.

3. In a repeating movement for time-pieces, the combination of an hour rack and a quarter-hour rack with a hammer mounted upon a movable axis and adapted to be acted upon by both racks, the said quarter-hour rack being adapted to raise the hammer out of the path of the hour-rack, substantially as and for the purpose set forth.

4. In a repeating movement for time-pieces, the combination of a movable hammer, and an hour rack, with a quarter-hour rack provided with a nose immediately in the rear of its teeth, the said nose adapted to lift the hammer out of the reach of the teeth of the hour rack as soon as the striking of the quarters is completed, thus allowing a free passage of the teeth of the hour rack in winding up, substantially as set forth.

5. In a repeating movement for time-pieces, the combination of an hour rack, and a quarter-hour rack with a spring to act upon the quarter-hour rack and adapted to be tensioned by the hour-rack when the latter is wound up, all substantially as and for the purposes set forth.

6. In a repeating movement for time-pieces, the combination of an hour rack and a quarter-hour rack, with a forked spring, the foot of which is pivoted, one arm of the said fork engaging with the hour rack, and adapted to be tensioned by the winding up of the hour rack, the other arm of the fork engaging with the quarter-hour rack and adapted to be tensioned by the tensioning of the other arm and the turning of the foot of the spring, where-

by when the works are wound up the spring acts forcibly upon the quarter-hour rack, without offering any resistance to the works during striking, its force diminishing as that action proceeds.

7. In a repeating movement for time-pieces, the combination of step wheels for the hours and the quarter hours with an hour rack and a quarter-hour rack, in combination with a releasing mechanism for the quarter-hour rack comprising a lever so connected to the hour-rack as to have a certain amount of play, the said lever adapted to engage with the step wheel for the hours, and a check lever pivoted to the first lever and provided with a hook to engage the quarter-hour rack when the striking is completed, the said check lever adapted to be acted upon by the hour-rack, when the latter is wound up and makes the slight further movement after the first lever has been stopped by the hour step wheel, to release the quarter-hour rack, all substantially as set forth.

CARL HAHLWEG.

In presence of—
F. W. KICKBUSCH, Jr.,
F. W. KICKBUSCH.