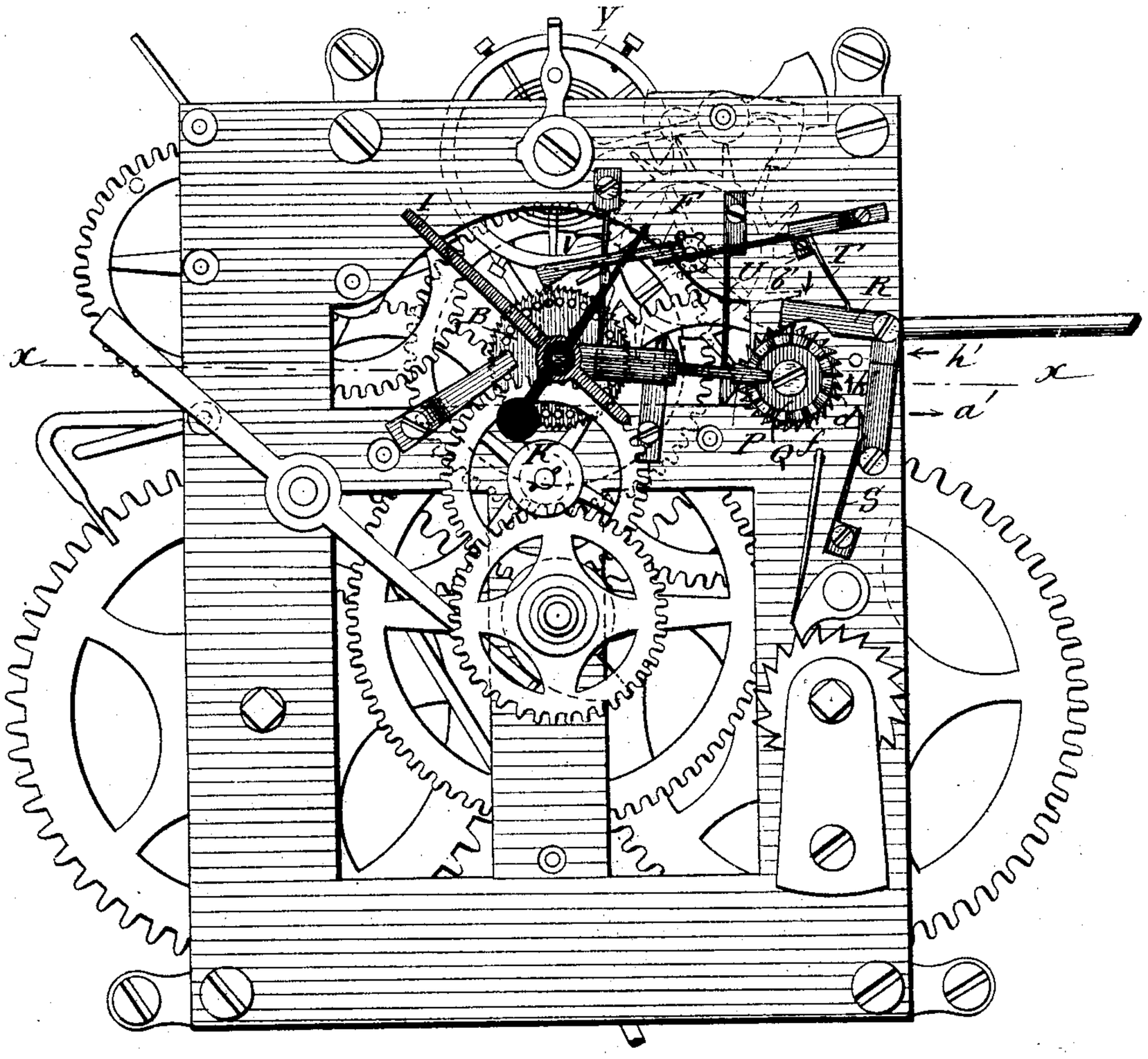
2 Sheets—Sheet 1.

A. BONZON.

Second-Hand Attachment for Clocks and Watches.

No. 224,635. Patented Feb. 17, 1880.

Fig. 1



WITNESSES:

C. Neveux

E. Sedgwick

INVENTOR:

A. Bonzon

BY Munn & Co

ATTORNEYS.

2 Sheets—Sheet 2.

A. BONZON.

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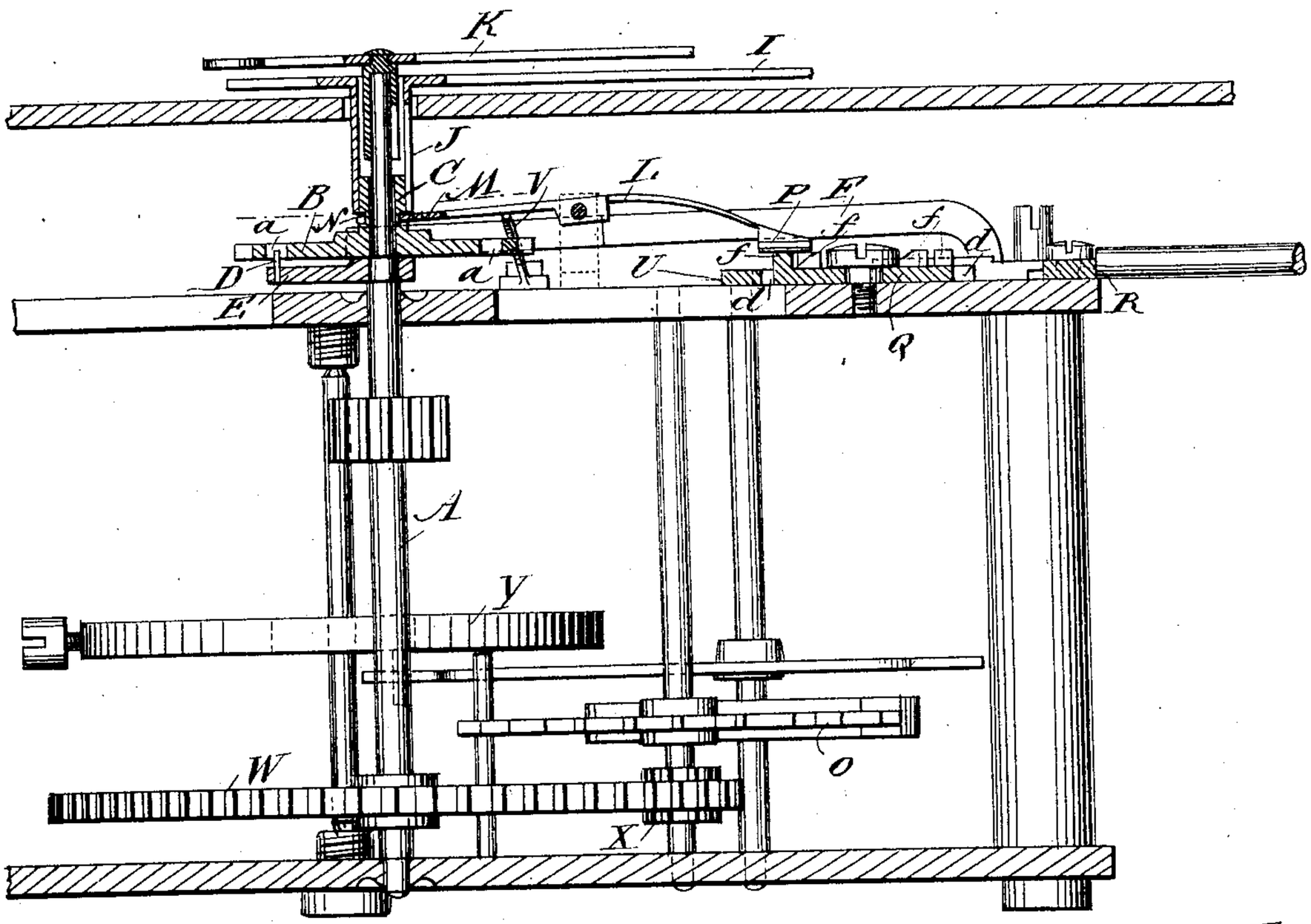
Fig. 2



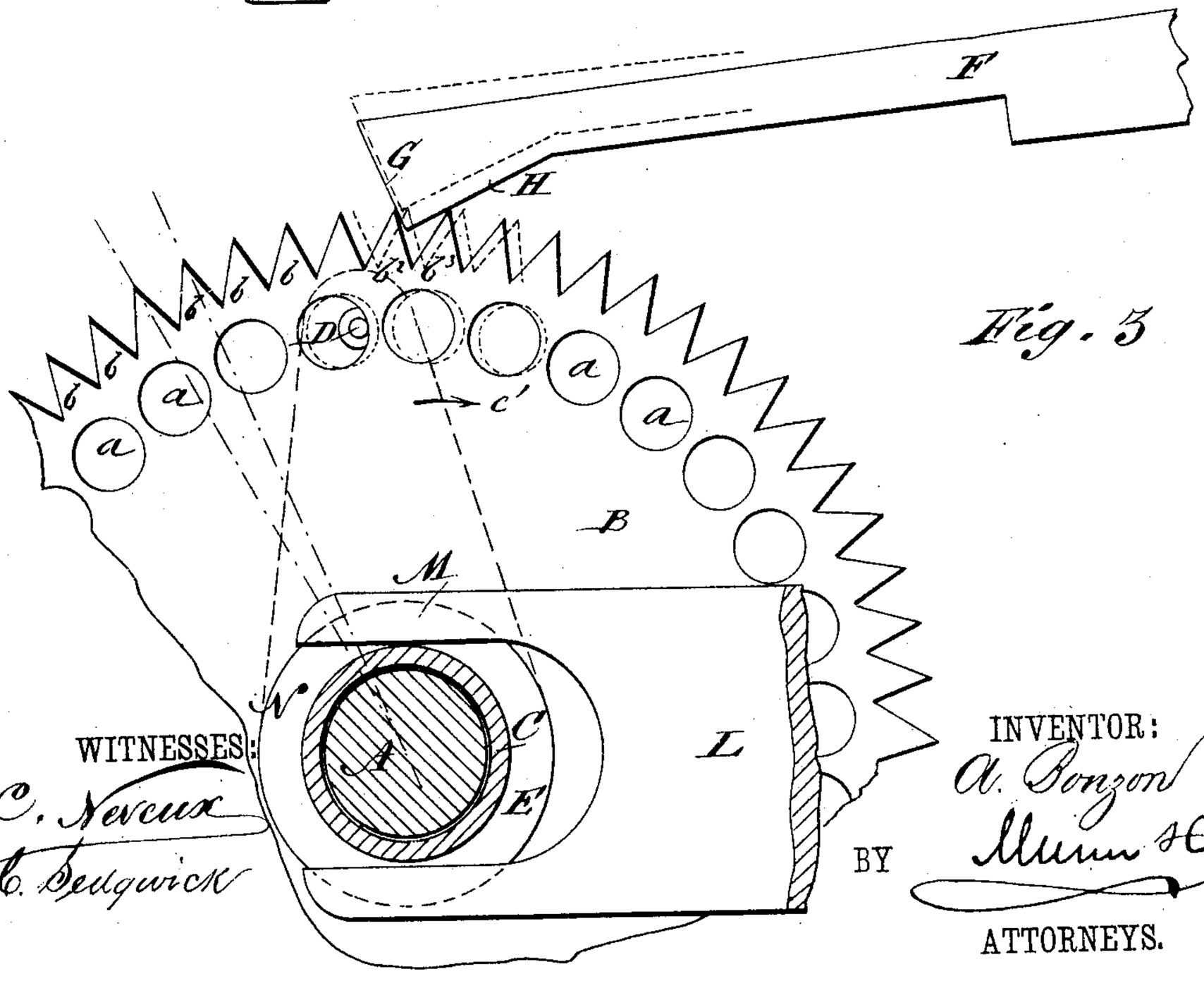


Fig. 3

WITNESSES:

C. Nexsen

C. Sedgwick

INVENTOR:

A. Bonzon

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

ALBERT BONZON, OF SANTIAGO, CUBA.

SECOND-HAND ATTACHMENT FOR CLOCKS AND WATCHES.

SPECIFICATION forming part of Letters Patent No. 224,635, dated February 17, 1880.

Application filed January 14, 1880.

To all whom it may concern:

Be it known that I, ALBERT BONZON, of Santiago, Cuba, have invented a new and Improved Second-Hand Attachment for Clocks and Watches, of which the following is a specification.

In all clocks and watches provided with a second-hand, but not with an independent second-hand movement, made heretofore, the second-hand does not beat sixty times per minute, but from one hundred and eighty to three hundred and sixty times, and consequently does not indicate seconds but fractions of seconds.

The object of my invention is to provide a new and improved attachment for the second-hand shaft of clock or watch works which will cause the second-hand to beat seconds, and which is so arranged that these beatings of the second-hand can be interrupted or started at any desired moment.

The invention consists in a perforated ratchet-wheel acted upon by a locking-spring and loosely mounted on the second-hand shaft of a clock or watch work, to which second-hand shaft an arm is rigidly fastened immediately below the ratchet-wheel, and has a small pin at its end, which pin engages in one of the perforations of the ratchet-wheel.

The invention further consists in a forked spring-lever embracing the collar of the ratchet-wheel and acted upon by some suitable device for raising and lowering the other end of the same, whereby the ratchet-wheel may be engaged with or disengaged from the pin on the arm of the second-hand shaft.

In the accompanying drawings, Figure 1 represents a plan view of a clock-work provided with my improved second-hand attachment. Fig. 2 is a partial cross-sectional elevation of the same on the line *x x*, Fig. 1. Fig. 3 is a detail view of the perforated ratchet-wheel, the locking-spring, and the forked lever.

Similar letters of reference indicate corresponding parts.

Upon the second-hand shaft A of a clock-work a ratchet-wheel, B, provided with one or more perforations, *a*, and a recessed collar, C, is loosely mounted. The teeth *b b* of the ratchet-wheel B do not have the shape of an isosceles triangle, but one side of the triangle should, preferably, always be steeper than the other side; or the teeth may be replaced by other similar-shaped teeth.

The perforations *a*, which, if there are more than one, must be arranged in a concentric circle, may be circular or longitudinal, but must always be larger than the pin D, which projects upward and is fastened on the end of the arm E, which is rigidly secured to the second-hand shaft A immediately below the ratchet-wheel B.

A spring, F, is secured to the frame of the works in some suitable manner, and its forward end is beveled and engages in the teeth *b* of the ratchet-wheel B. The bevel of the end side, G, of the spring F must always form an angle with the right side of the tooth *b*, against which it rests, and the end H of the spring is inclined more or less, according to the material of which the end of the spring is made, for if the same is liable to wear off the distance from the point of the ratchet-tooth to the lower end of the bevel must be larger and the inclination of the side H must be greater. For instance, if a ruby end of the spring be used, the inclination of the side H can be reduced considerably, but for steel would have to be nearly as represented.

A second-hand, I, provided with a sleeve, J, is mounted on the collar C of the ratchet-wheel B, and a smaller second-hand, K, is mounted on the second-hand shaft A, as shown in Figs. 1 and 2. The above-described parts are required if a second-beating watch or clock only is desired, the ratchet-wheel in this case being provided with a single perforation. But if it is desired to stop the second-hand at will a spring-lever, L, provided with a fork, M, which passes into the annular recess N in the collar C, must be pivoted on the frame of the works in such a manner that its other end, P, can be acted upon by some suitable device, by means of which it can be raised or lowered at will.

In the case here represented the end P of the forked lever L rests on a ratchet-wheel, Q, provided with the horizontal teeth *d* and one-half the number of vertical teeth *f*, which wheel is mounted on the frame of the clock-work in some suitable manner, and is acted upon by a hinged bell-crank pawl, R, one end of which is pressed in the direction of the arrow *a'* by

the spring S, and the other arm of which is pressed in the direction of the arrow *b'* by the spring T. A spring, U, prevents the ratchet-wheel Q from rotating backward, and a spring, V, acts upon the forked end of the spring-lever L, pressing the same upward.

The operation is as follows: The teeth of a cog-wheel, W, mounted on the second-hand shaft A, take in a pinion, X, on the shaft of the escapement-wheel O. For every oscillation of the balance Y a tooth of the escapement-wheel is released and the second-hand shaft A is rotated a very small distance. The second-hand shaft is to make one revolution every minute, but the balance-wheel must oscillate from three to six times each second, as with a slower movement of the same the balance-spring would be too weak and the clock would stop. As the arm E is rigidly attached to the second-hand shaft A it rotates with the same, and as the pin D of the arm E passes into one of the apertures *a* of the ratchet-wheel B the latter would rotate in small jerks, the same as the shaft A, were it not for the spring F. The wheel B has sixty teeth, *b*, formed as described heretofore. Assuming that the balance-wheel beats four times in each second, the object to be attained will be to release one tooth of the wheel B for every four beats of the balance-wheel. If the pin D is in the position shown in Fig. 3, the first beat of the balance-wheel will cause the wheel B to rotate in the direction of the arrow *c'*. The point of the tooth resting against the bevel G of the spring F will glide down the bevel and cause the spring to rise to the point of the tooth, as shown in dotted lines. As the wheel B is loosely mounted on the shaft A the pressure of the spring F will force it forward the moment the latter has been raised to the top of the tooth, which, as we have seen, is done by the first beat, with greater rapidity than that of the pin D, the spring immediately dropping into the position shown in relation to the next tooth. The next three beats of the balance will bring the pin up against the side of the perforation again, and the above operation is repeated—that is, the first beat of the balance-wheel raises the spring, which jumps into the next space and forces the wheel B forward, and the other three beats are required to bring the pin D up against the edge of the perforation *a* again. As there are sixty teeth in the wheel B, and the balance-wheel beats two hundred and forty times per minute, and four beats are required to move the wheel B the distance of one tooth, it is evident that the latter will beat seconds. If the balance beats more or less times per minute, the inclination of the end G of the spring F must be varied accordingly. In this case the distance from the radial line passing through the tooth b^2 to the end of the incline G is one-fourth of the distance from the point of one tooth to the point of the next tooth. If the balance-wheel beats six times per second, the proportion of the above distance would have to be as 1 is to 6.

It is evident that by changing the inclination of the end G the proportion of the above distances is also changed.

The wheel B need have only one perforation if the above-described device only is applied; but it may be desirable to apply the interrupting device, which operates as follows: If the bell-crank pawl R is moved in the direction of the arrow *h'* by some suitable device, it will rotate the wheel Q in the direction of the arrow *k'*, which raises the end P of the spring-lever L, the teeth *f* being beveled. If the end P of the lever L is raised, the forked end will be pressed downward, so that the pin D can pass into one of the perforations *a a*, which are arranged in a concentric circle, so that if the pin D does not pass into a perforation immediately the next beat of the balance-wheel will bring it into one. Care must be taken not to make the spring in the lever L too strong, as it might otherwise press the wheel B against the pin D with sufficient force to stop the movement of the works.

To stop the beating of the wheel B, the bell-crank pawl R is again moved in the direction of the arrow *h'* by some suitable device. The wheel Q rotates in the direction of the arrow *k'*, and the tooth *f* glides from under the end P of the lever L, causing the end P to descend, and the fork M, embracing the collar C of the wheel B, to ascend, thus disengaging the wheel B from the pin D. The spring V keeps the wheel B raised until the wheel Q is again moved. As there are twice as many horizontal teeth on the wheel Q as vertical teeth it will require two movements of the bell-crank pawl R to move the wheel Q the distance of one vertical tooth.

The above-described devices can be applied on any clock or watch, in combination with or without the ordinary second-hand, and may be arranged in various different ways in regard to size and position of the hands and in regard to the device for operating the spring-lever L.

The perforations in the wheel B may be replaced by recesses or notches, and the respective functions of the wheel B and arm E may be interchanged.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A second-hand attachment for clocks and watches, made substantially as herein shown and described, and consisting of a perforated ratchet-wheel loosely mounted on the second-hand shaft, and acted upon by a pin attached to an arm of the second-hand shaft and by a locking-spring, whereby the perforated wheel beats seconds, as set forth.

2. The combination, with the wheel B, having one or more openings, *a*, and mounted upon the second-hand shaft, of a spring beveled at the end, substantially as herein shown and described.

3. In a clock or watch, the construction of the wheel B, substantially as herein shown and described, with inclined teeth and a con-

centric circle of perforations or recesses, as set forth.

4. The combination, with the wheel B, of the pin D and the spring F, substantially as herein shown and described, and for the purpose set forth.

5. The combination, with the wheel B, having one or more perforations, *a*, and the pin D, fixed to the second-hand arbor, of the forked spring-lever L, substantially as herein shown and described, and for the purpose set forth.

6. The combination, with the wheel B, having one or more perforations, *a*, and the pin D, fixed to the second-hand arbor, of the spring-lever L, and a device for operating the same, substantially as herein shown and described, and for the purpose set forth.

7. In a clock or watch, the construction of the spring F, with two bevels, G and H, at the end, substantially as herein shown and described, whereby the spring is raised by the action of one tooth on one bevel, and drives a ratchet-wheel forward by the action of the other bevel on the same tooth, as set forth.

ALBERT BONZON.

Witnesses:
OSCAR F. GUNZ,
C. SEDGWICK.