(No Model.) 2 Sheets—Sheet 1.

F. TERSTEGEN.

SECONDS SETTING MECHANISM FOR TIME PIECES.

No. 379,833. Patented Mar. 20, 1888.

Fig: 1.

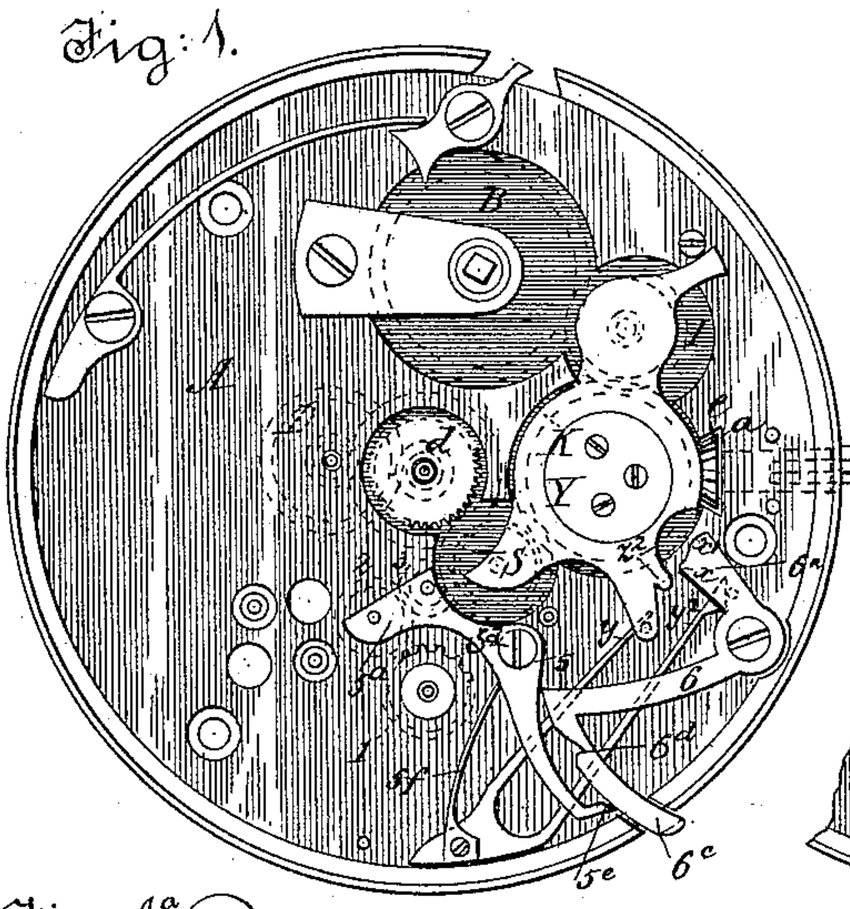


Fig: 2.

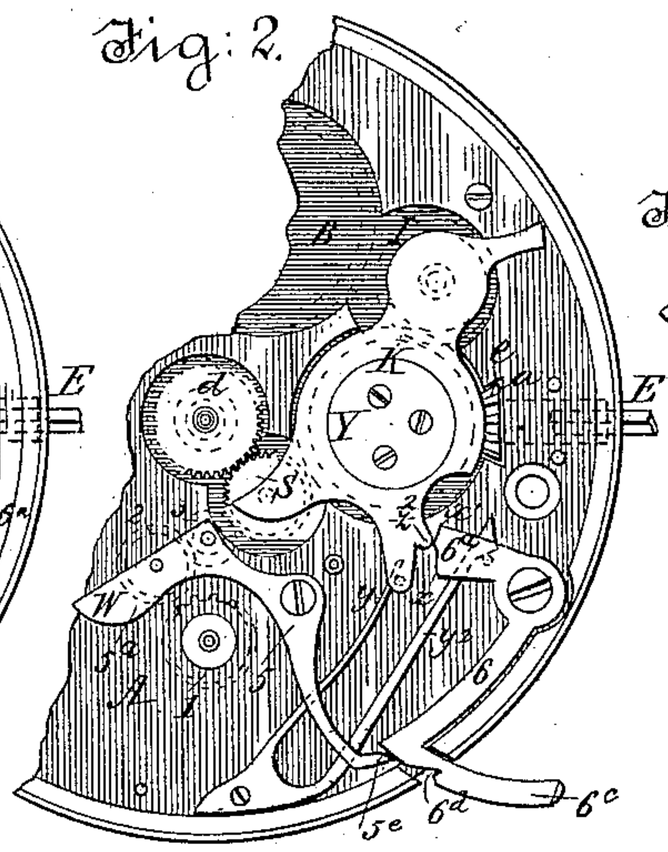


Fig: 1a.

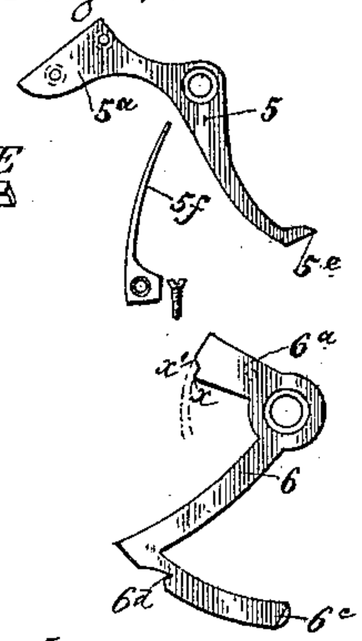


Fig: 4a.

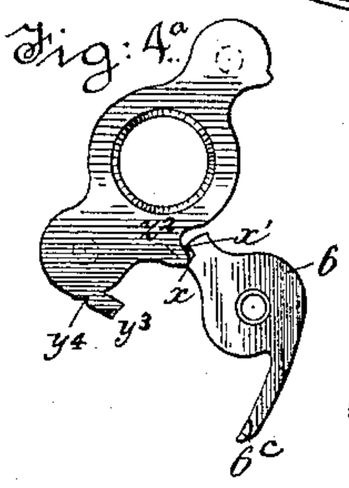


Fig: 3.

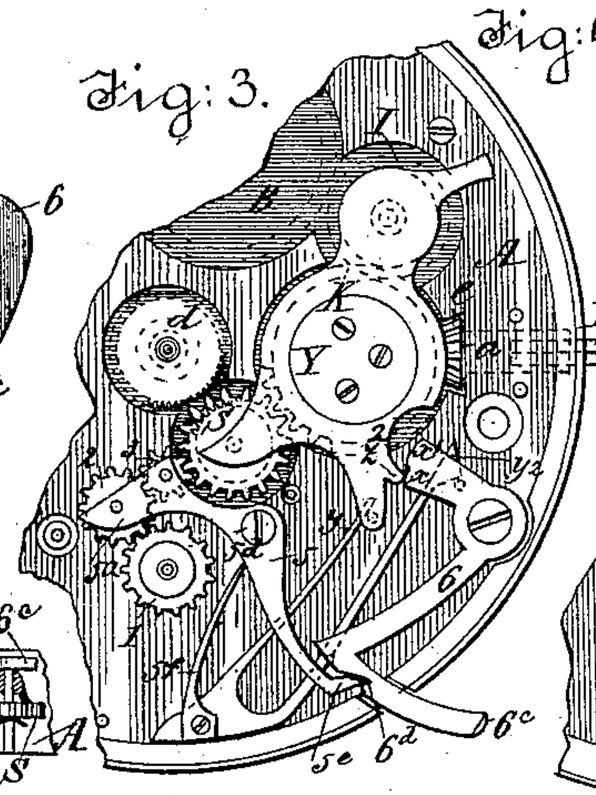


Fig: 4.

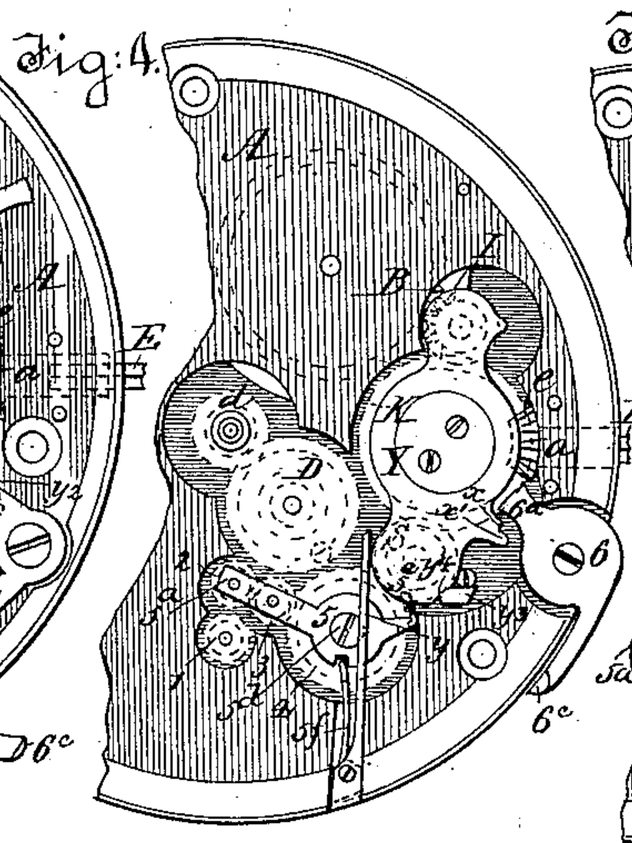


Fig: 5.

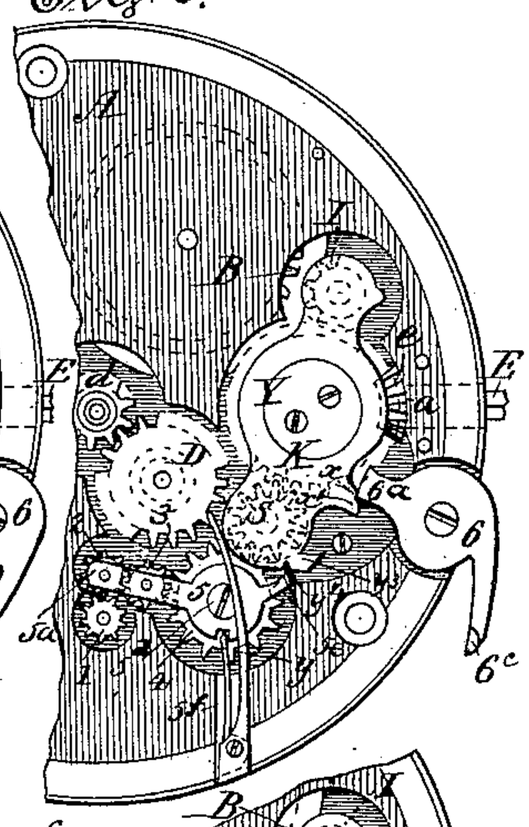


Fig: 8a.

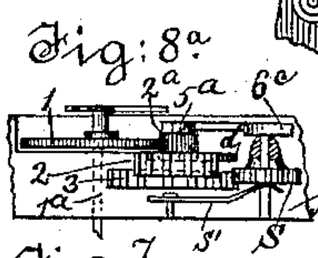


Fig: 7.

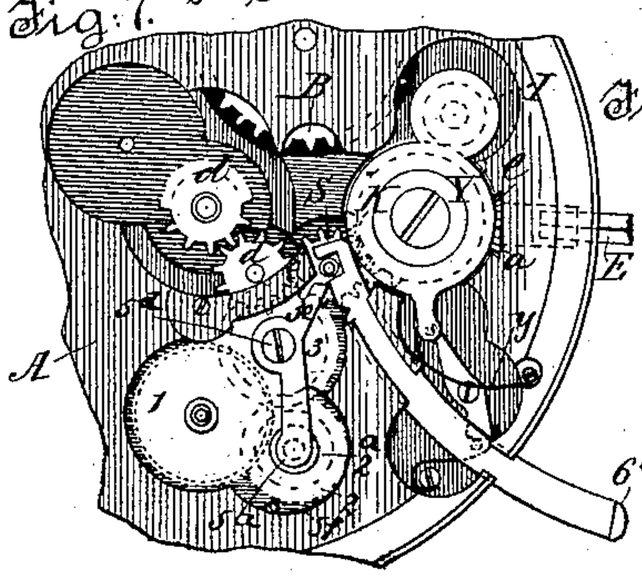


Fig: 8.

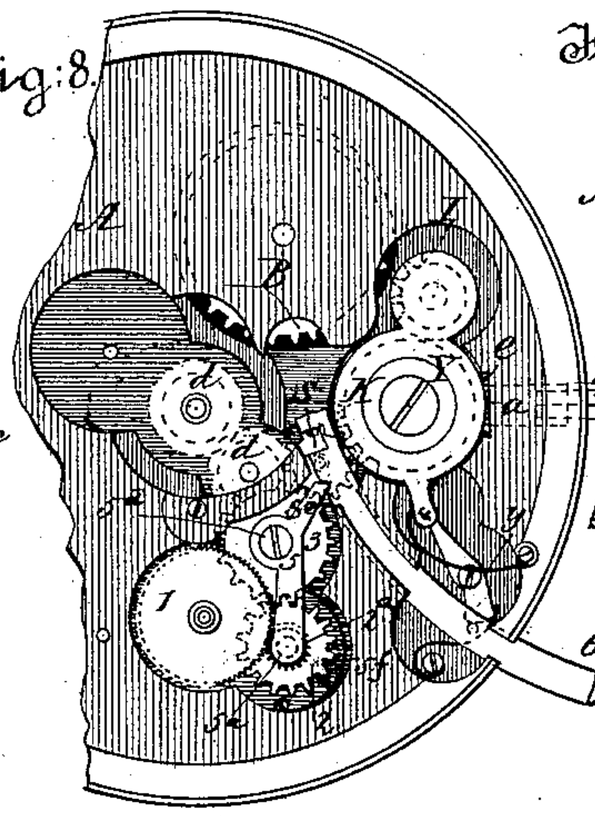
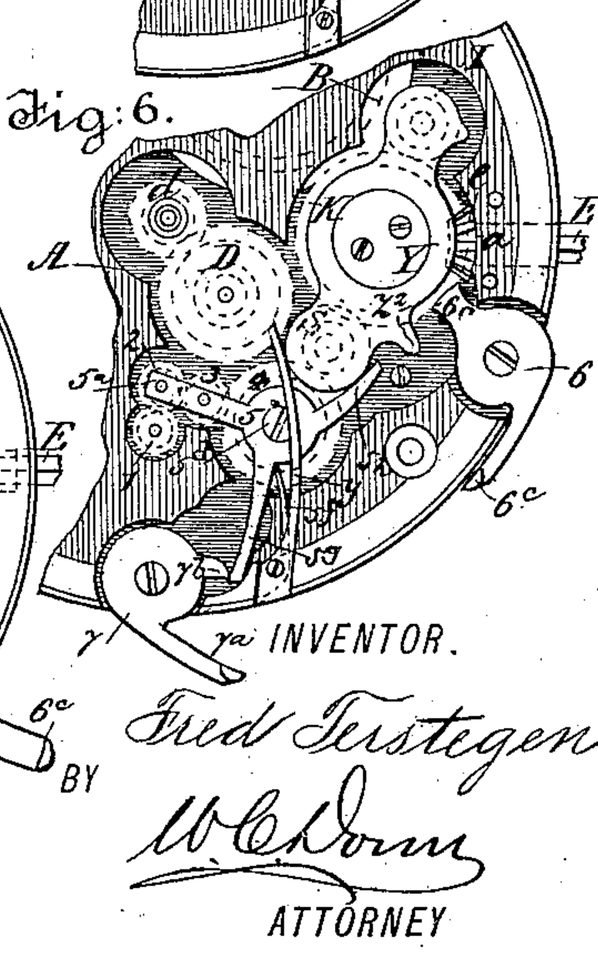


Fig: 6.



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INVENTOR.

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(No Model.) 2 Sheets—Sheet 2.

F. TERSTEGEN.

SECONDS SETTING MECHANISM FOR TIME PIECES.

No. 379,833. Patented Mar. 20, 1888.

Fig: 9.

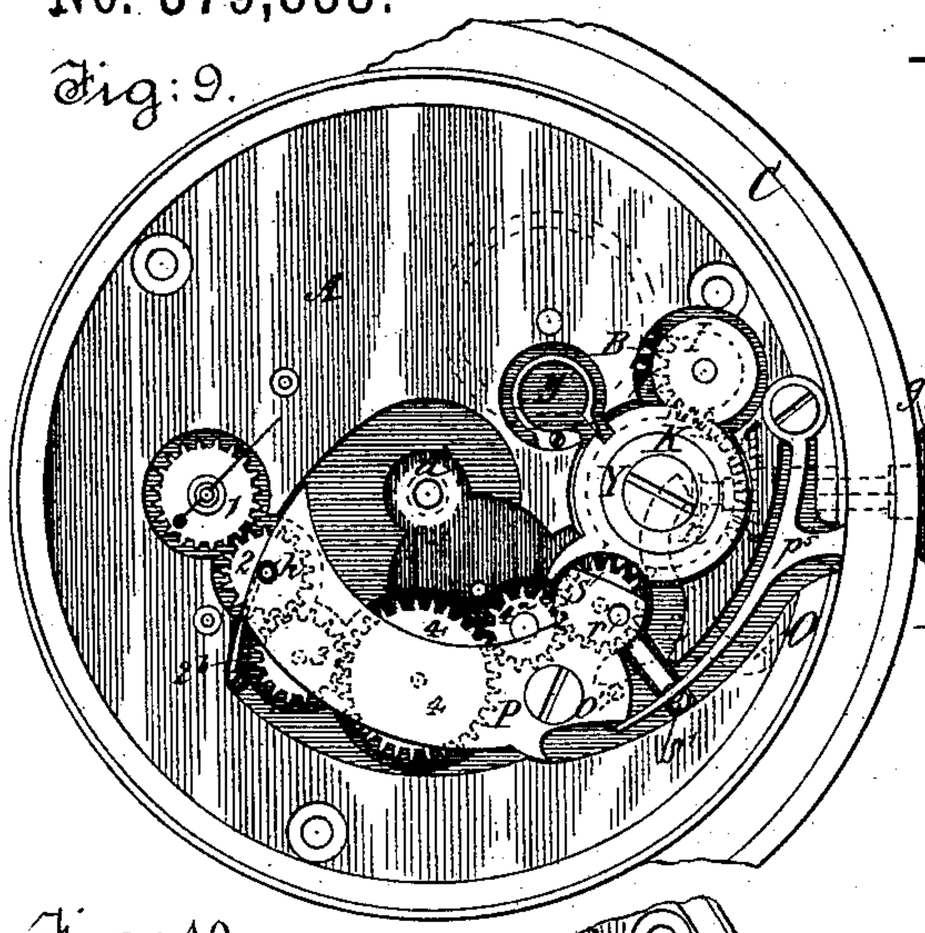


Fig: 9b.

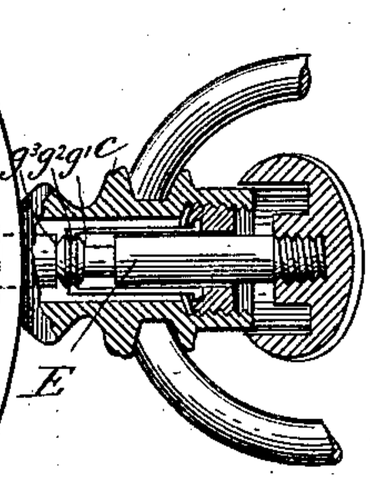


Fig: 16

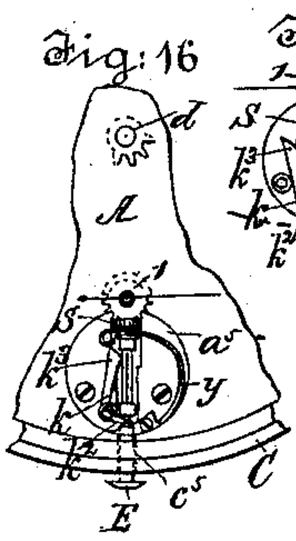


Fig: 16a.

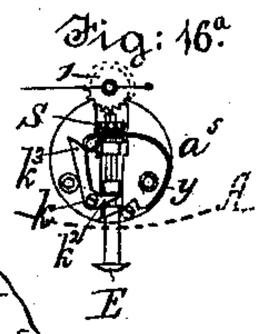


Fig: 10.

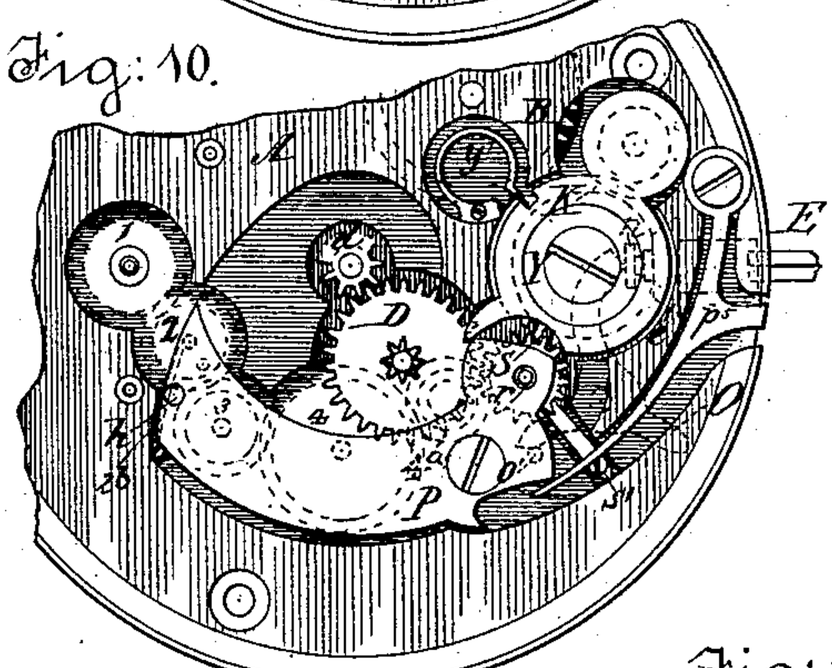


Fig: 11.

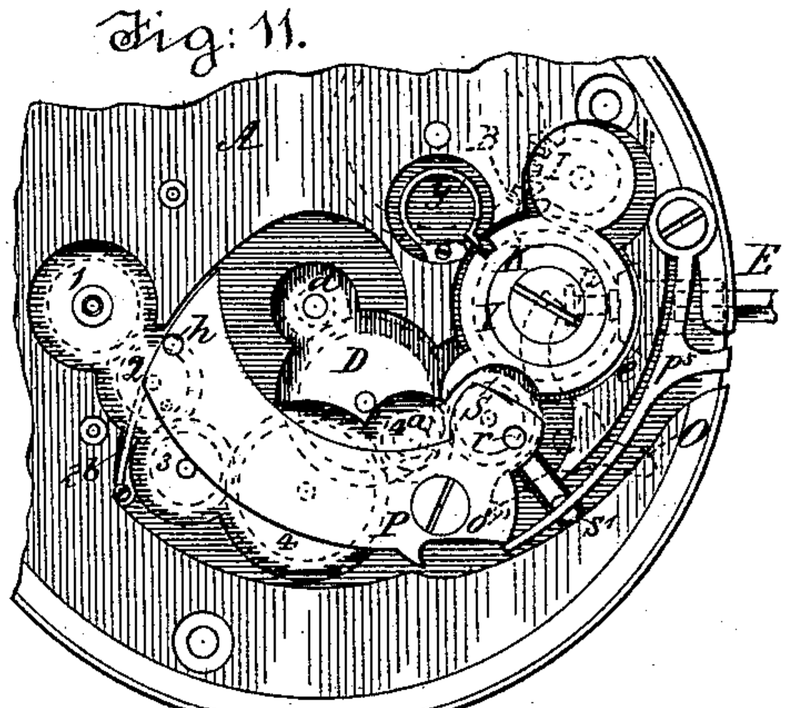


Fig: 9a

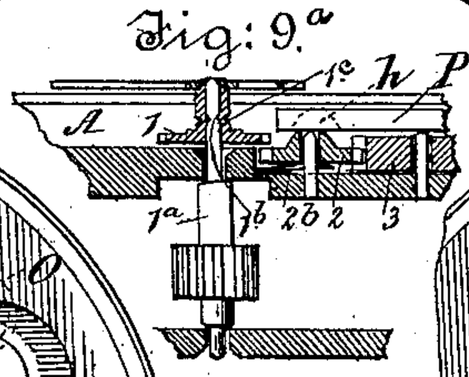


Fig: 12.

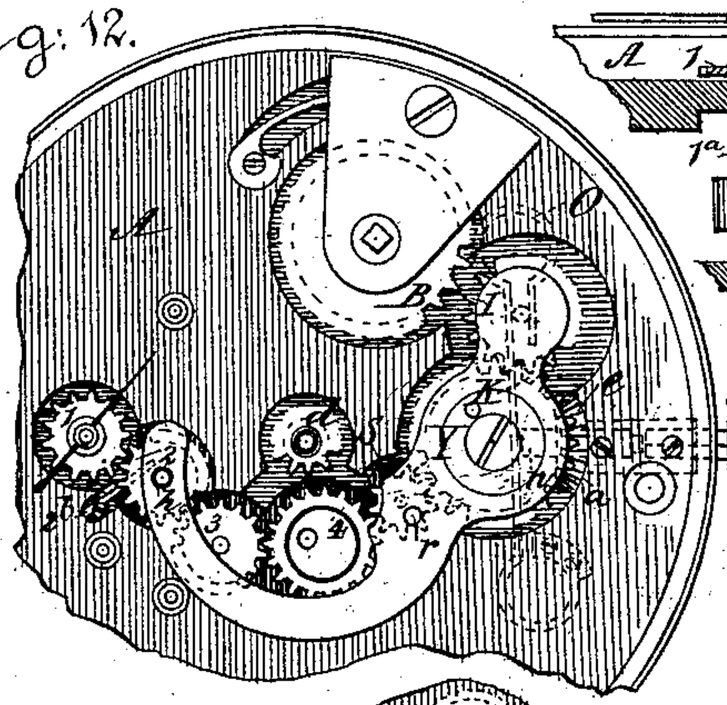


Fig: 13.

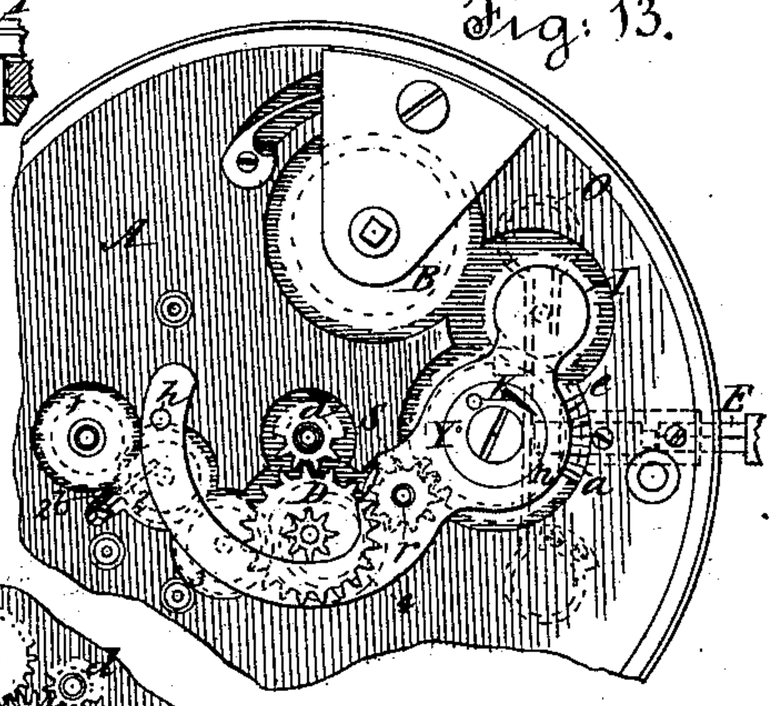


Fig: 15.

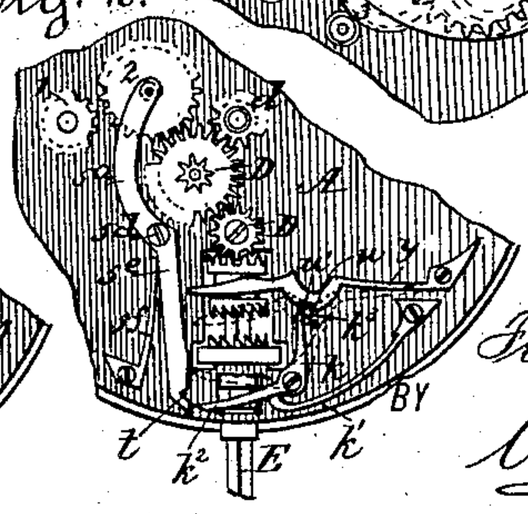
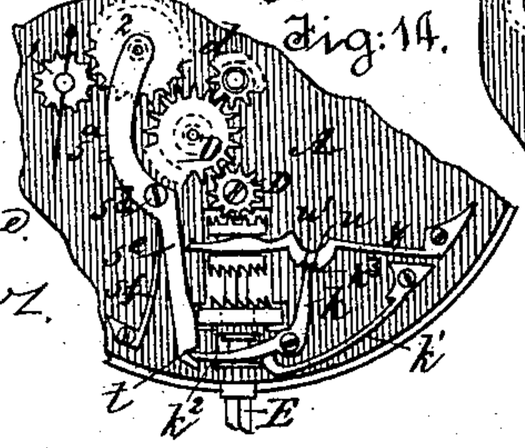


Fig: 14.



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FRED TERSTEGEN, OF ELIZABETH, NEW JERSEY.

SECONDS-SETTING MECHANISM FOR TIME-PIECES.

SPECIFICATION forming part of Letters Patent No. 379,833, dated March 20, 1888.

Application filed April 26, 1887. Serial No. 236,253. (No model.)

To all whom it may concern:

Be it known that I, FRED TERSTEGEN, of Elizabeth, in the county of Union and State of New Jersey, have invented a new and useful Seconds-Setting Mechanism for Watches and other Time-Pieces, of which the following is a specification.

My invention relates to watches and other time-pieces in which the time is shown by hours, minutes, and seconds, or any parts thereof; and it particularly relates to watches of fine adjustment, commonly provided with stem winding and setting mechanism which can be brought into the winding or setting position by means of various devices, of which the most common are the push-piece and lever-set devices. The push-piece is frequently placed near the stem or stem-key of the case, or inside the winding-pinion, acted upon by the stem, and called "pendant-set" watches, and by moving the same inwardly and outwardly the stem-driven train is either set to the winding or setting position, and when a stem-driven train is brought in either a winding or setting position by a lever watches of such construction are called "lever-set" watches.

The object of my invention is to move or set a seconds-hand from any one second to any other second or part thereof independently of the minute and hour hands.

My invention consists in a wheel placed on the pivot of the staff of a seconds-hand pinion, said pinion forming part of the time-train of the watch-movement, and mechanism for moving the seconds-hand from one second to any other second or part thereof in either direction through the said wheel on its pivot.

My invention further consists in mechanism interposed between a wheel on the pivot of the staff of a seconds-hand pinion of the time-train and a stem-driven train, said mechanism being susceptible of engagement with and disengagement from the said wheel for the purpose of connecting the seconds-hand with the stem-driven train to set the seconds-hand and disconnecting it therefrom to prevent the seconds-hand from being moved inadvertently.

My invention further consists in mechanism interposed between a wheel on the pivot of the staff of a seconds-hand pinion of the time-train and the mechanism by which the motion of a stem-driven train is communicated to the dial-wheels of the minute and hour hands, the said interposed mechanism being susceptible of engagement with the wheel on the pivot of the seconds-hand pinion when the stem-driven train is in its setting position, and when the mechanism which communicates the motion of the stem-driven train to the minute-hand is out of engagement with the dial-wheels, for the purpose of transmitting the motion of the stem-driven train to the seconds-hand independently of the hour and minute hands, and susceptible of disengagement with the said wheel on the pivot of the seconds-hand pinion of the time-train when the stem-driven train is in its winding position.

In the drawings are shown pendant set and lever-set watches in which a stem-driven train is brought to engage the minute-setting wheels, commonly called "dial-wheels," and the stem-driven train is disengaged from the winding or barrel-arbor wheel, and in which the stem-driven train is brought to engage the winding-wheel and to be disengaged from the dial-wheels, of which one or the other carries the minute-hand. This is no part of my invention.

To make my invention readily understood, I have shown it applied to both lever-set and pendant-set watches, which are of well-known construction, and the devices are well known by which the stem-driven train is brought from the winding to the setting position to engage a dial-wheel which moves the minute-hand. I have attached my novel "second-setting" mechanism to these watches, so as to clearly show how the seconds-hand can be adjusted and moved from one second to another or to any part thereof, forward or backward and independent of the minute-hand, and also that the seconds-hand can be moved or set before the minute-hand is set, and the minutes can be set separate and independent from the seconds-hand, and shows also that the seconds-hand can be moved or set after the minute-hand has been adjusted.

In the accompanying drawings, Sheet I represents my invention applied to lever-set watches. Figure 1 represents the stem setting and winding mechanism of a "Waltham" watch-movement and my independent seconds-setting mechanism applied thereto, the

stem-driven train being shown in its winding position. Fig. 1ª represents detail views of the seconds-setting lever and the ordinary setting-lever for the yoke as modified to adapt it to operate in connection with my invention detached from the watch-movement. Fig. 2 represents the stem-driven train disengaged from the winding-wheel and in its minute-setting position—that is, in gear with the minute-setting dial-wheel. Fig. 3 represents the same movement with the stem-driven train disconnected from the minute-setting dial-wheels and in position to set the seconds-hand—that is, in connection with a wheel on the pivot of the seconds-hand pinion. Fig. 4 also represents a Waltham movement with another form of lever-set setting and winding mechanism, the stem-driven train being shown in its winding position and the setting-lever for the yoke, with the yoke modified to adapt it to operate in connection with my independent seconds-setting mechanism. Fig. 4ª represents a modification of the yoke and lever of the movement shown in Fig. 4. Fig. 5 represents the movement shown in Fig. 4, with the stem-setting train in its seconds-setting position—that is, out of connection with the minute-setting dial-wheel and also out of connection with the winding-wheel B, and in connection with a wheel on the pivot of the seconds-hand pinion, in which position it is locked or held by the lever and its motion is communicated to the seconds-hand without moving the minute-hand. Fig. 6 represents the same movement as Fig. 4, with a separate lever for transferring the stem-driven train from its winding to its seconds-setting position and holding it therein—that is, disengaged both from the winding-wheel and the minute setting dial-wheel. Figs. 7 and 8 represent an "Elgin" lever-set movement with its stem-setting mechanism and my independent seconds-setting mechanism applied thereto, Fig. 7 showing the stem-driven train in its minute-testing position, and Fig. 8 showing the stem-driven train disconnected from the minute-setting dial-wheel and in connection with a wheel on the pivot of the seconds-hand pinion of the watch-train and therefore in position to set the seconds-hand. Fig. 8ª is an enlarged sectional detail view of the setting-wheel S of Fig. 8 and the mechanism by which the said wheel is put in connection with the wheel on the seconds-hand pinion, the setting-wheel S being shown out of connection with the dial-wheel *d* and in connection with the wheel by which the seconds-hand is moved.

Sheet II represents pendant-set stem winding and setting watch-movements with my independent seconds-setting mechanism applied thereto. Figs. 9, 10, and 11 represent Elgin movements, Fig. 9 showing the stem-driven train in its seconds-setting position—that is, in connection with the wheel on the pivot of the seconds-hand wheel—in which position the connection with both the winding-wheel and the minute-setting dial-wheels is broken. Fig. 10 shows it in its minute-setting position—that is, in connection with the minute-setting dial-wheels—where the connection with the winding-wheel and the seconds-setting wheel is broken. Fig. 11 shows it in its winding position. Fig. 9ª represents an enlarged sectional detail view of the wheel on the pivot of the seconds-hand pinion of the watch-train and the mechanism for putting the wheel 2 in and out of gear with the wheel by which the seconds-hand is moved. Fig. 9ᵇ represents the seconds-hand and the wheel which is placed on the pivot of the seconds-hand pinion of the watch-train, showing two modes of connecting the seconds-hand with the wheel. Figs. 12 and 13 represent pendant-set Waltham movements. Fig 12 shows the stem-driven train in its seconds-setting position—that is, in connection with the wheel on the pivot of the seconds-hand pinion of the time-train—and out of connection with both the winding-wheel and the minute setting dial-wheels, Fig. 13 showing it disconnected from the seconds-hand wheel and in connection with the minute-setting dial-wheels. Figs. 14 and 15 represent a pendant-set watch of Swiss construction provided with my seconds-setting mechanism, Fig. 14 showing the stem-driven train in position to set the seconds-hand, and Fig. 15 representing it in position to set the minute-hand independent of the seconds-hand. Fig. 16 represents an independent seconds-setting mechanism. Fig. 16ª represents the same mechanism placed on a plate so as to form a seconds setting attachment, which may be placed on and taken off a watch-movement at will.

Referring to the annexed drawings, A represents the pillar-plate of a watch-movement, which is fitted to and secured in the case C in the usual manner. Within the pendant *c* is journaled a stem-arbor, E, the inner end of which enters into and engages the tubular stem of a winding-pinion, *e*, that is journaled in a suitable bearing under the plate A and has a portion of its toothed periphery projecting through an opening, *a*, provided for it in said plate, and is thus caused to mesh with or engage the teeth of the crown-wheel K, journaled in the plate. This arrangement is of such a nature as to permit the crown-wheel to be rotated in either direction by means of the stem-arbor. The yoke Y is pivoted to a hub on the pillar-plate and held in place by a cap and screws, as usual.

At one end of the yoke is pivoted an intermediate winding-wheel, I, which, when the yoke is in its winding position, transmits the motion of the crown-wheel to the barrel-arbor wheel B.

D is the minute-wheel, and *d* the cannon-pinion, these wheels being called the "dial-wheels."

S is the intermediate setting-wheel for transmitting the motion of the crown-wheel to the dial-wheels when the yoke is in its setting position.

The above-described mechanism of a stem

setting and winding watch is of well-known construction and does not differ in operation from similar mechanisms found in other watches, except as modified in the manner hereinafter described by the mechanism and modes of operation peculiar to my invention.

I will now describe in detail my novel devices for setting the seconds-hand from any point or second to any other point or second in either direction by means of a stem-driven train.

The yoke Y is set from the winding position to the setting position by a setting-lever, 6, the arm 6^a of which moves the yoke and locks or holds the same in the setting position when the other arm, 6^c, is drawn or pulled out in the usual manner. This lever 6 has a notch, 6^d, into its arm 6^c, as shown in Fig. 1 and in detail, Fig. 1^a. Against the edge of the said lever-arm 6^c lies an arm, 5^e, of the lever 5, pivoted at 5^d, and another arm, 5^a, has on its under side and pivoted thereon wheels 2 and 3, which are always in gear, and the said wheel 3 is in gear with the setting-wheel S and turned thereby when the crown-wheel K is turned by the winding pinion and stem. The wheel 2 on the lever-arm 5^a is held out of gear with the seconds-setting wheel 1 when the lever-arm 5^e rests against the edge of the arm 6^c of the setting-lever, as shown in Figs. 1 and 2. The seconds set-wheel 1 is placed on the staff or pivot 1^a of the seconds-hand pinion ordinarily used in the watch mechanism and is held on the staff or pivot by friction, as will be hereinafter described.

In Fig. 1 the stem-driven train is in engagement with the winding-wheel on the barrel-arbor B, and the setting-lever 6 is held in its normal position by a spring, y^2, as shown. Against the edge of the lever-arm 6^c lies the arm 5^e of lever 5, and the position of the lever 5 is such that the wheel 2 on the arm 5^a is held out of gear with the wheel 1.

In Fig. 2 the stem driven train is brought into engagement with the dial-wheels *d* by drawing the setting-lever 6 out, whereby it turns the arm 6^a and step x' under the projection z^2 of the yoke Y, and the setting-lever 6 is held outwardly by the spring y^2 and the setting-wheel S engages the dial-wheel *d*. The edge of the lever arm 6^c lies against the arm 5^e of the lever 5, and the position of the lever 5 is such that the wheel 2 on the arm 5^a is held out of gear with the seconds set-wheel 1, as shown. The stem can now be turned and the minutes set.

In Fig. 3 the setting-lever 6 is held and pushed in slowly by means of its arm 6^c. By this movement the notch 6^d comes in contact with the lever-arm 5^e of the lever 5, which is pressed into the notch by a spring, 5^f, whereby the arm 5^a, with the wheel 2, is moved, and the said wheel 2 is brought into engagement with the seconds set-wheel 1, as shown. By pressing the setting-lever arm 6^c in slowly the arm and step *x* turn under the projection z^2 of the yoke Y, and thereby the yoke is permitted to turn until the setting-wheel S is out of engagement with the dial-wheel *d*, and the wheel I is still held out of gear with the winding-wheel on the barrel-arbor B, as clearly shown in Fig. 3. The stem-driven train is now in engagement with the seconds set-wheel 1, and the seconds can be set by the stem. When the spring 5^f is not used to force the lever 5 into the notch of the setting-lever, the lever-arm 5^a of the lever 5 may be made larger, so as to form a weight, W, as shown in Fig. 2. When the watch is held with its edge down and the stem is held in a horizontal position, the arm 5^a by its weight W turns the lever 5, when its arm 5^e comes in line with the notch 6^d on the setting-lever 6 and moves the said arm 5^e into the notch, and thereby turns the wheel 2 into gear with the seconds set-wheel 1. To disconnect the stem-driven train from the seconds-setting wheel 1, the lever 6 is released from the end of arm 5^e by pressing on the end of arm 6^c with sufficient force to cause the end of arm 5^e to ride up the inclined edge of notch 6^d, and thereby pass out of said notch and rest against the edge of the lever, whereupon the spring y^2 forces the lever into its normal position, as shown in Fig. 1, the point of arm 5^e sliding against the edge of the lever. The notch 6^d being V-shaped, the end of the arm rises out of it when sufficient pressure is applied to the lever to cause the edge of the notch to force the arm 5^e back. At the same time that the end of arm 5^e is forced out of the notch by the inward movement of the lever, and by the movement thus imparted to said arm, the lever 5 and its arm 5^a and wheel 2 thereon are turned and disengaged from the seconds set-wheel 1, as shown in Fig. 1, and the arm and step *x* on the setting-lever 6 are turned away from the projection z^2 of the yoke, which is returned to the winding position by the spring *y*, as shown in Fig. 1. If only the minutes are to be set, the setting-lever 6, by its arm 6^c, is entirely drawn out, as in Fig. 2, and the setting-wheel S is thereby connected with the dial-wheel *d*. If only the seconds are to be set, the setting-lever 6, by its arm 6^c, is only partially drawn out, as in Fig. 3, and only so far as to bring the notch 6^d thereon in line with the lever-arm 5^e of the lever 5, which will be turned and forced by the spring 5^f into the notch 6^d, and the lever-arm 5^a and wheel 2 thereon are turned and brought in gear with the seconds set-wheel 1. When the notch 6^d on the setting-lever is in position to be engaged by the lever-arm 5^e, the step *x* on the arm of the lever 6 presses against and upon the projection z^2 of the yoke. Thereby the yoke is turned and held in such a position that the setting-wheel S is out of gear with the dial-wheel *d*, and the wheel I is out of gear with the winding-wheel B, so that the stem-driven train is only in engagement with the seconds set-wheel 1, as shown in Fig. 3.

In Fig. 4 the stem driven train is the same as in the former figures, and the yoke is in the winding position. On the end of the yoke Y,

where the setting-wheel S is pivoted, a projection, y^3, is formed, which has a notch, y^4. Against the edge of this projection y^3 lies the lever-arm 5^e of the lever 5, which is forced against it by the pressure of the spring 5^f, and in this position, as the lever-arm 5^e rests against the edge of the projection y^3, the arm 5^a and its wheel 2 thereon are held out of gear with the seconds set-wheel 1. The wheel 2 on the lever arm is in gear with a wheel, 3, and this wheel 3 is in gear with a wheel, 4, which is placed on the pivotal bearing of the lever at 5^d, and in such a position as to gear always with the setting-wheel S, as shown. To turn the yoke out of the winding position and into the position for setting the seconds, the lever 6 is turned by the arm 6^e, and the other arm, 6^a, turning against the projection of the yoke, turns the yoke. The projection of the yoke has two steps, x and x', as shown. When the lever 6 is turned by its arm 6^e, as shown in Fig. 5, the other arm of the said lever is pressed onto the first step, x, of the projection of the yoke, and the latter being turned thereby, the wheel I is disconnected from the winding-wheel B, and the setting-wheel S is moved nearer but not in gear with the dial-wheel D. At the other end of the yoke, where the notch y^4 is placed into the projection y^3, the position of the said yoke is such that the said notch y^4 is brought in line with the end of the lever-arm 5^e, which is turned and forced therein by the pressure of the spring 5^f on the lever 5, and by this movement the arm 5^a is turned and its wheel 2 put in engagement with the seconds set-wheel 1, as shown in Fig. 5. When the lever-arm 6^e is turned against and onto the longer step, x', of the yoke, the latter will be turned to the setting position to connect the setting-wheel S with the dial-wheel; but by this further movement of the yoke the notch y^4 moves out of line with the end of the lever-arm 5^e of the lever 5 and causes the lever to turn, whereby its wheel 2 on the other arm, 5^a, is thrown out of gear with the seconds set-wheel 1, in the same manner as described in Fig. 2. To release the yoke, the lever 6 is pressed back, whereupon the yoke is turned to the winding position by the spring y, as in Fig. 4.

Fig. 4^a is a detail view of the yoke, showing the notch y^4 and the projection z^2 formed with one step. The setting-lever 6 has on its arm two steps, x and x', to give two movements to the yoke, as described in Figs. 1, 2, 3.

Fig. 6 shows a yoke commonly used in watches, without the projection y^3 and notch y^4, as the lever 5 is not moved thereby. The said lever 5 has a separate setting-lever, 7, which is set or turned by its arm 7^a, whereby a cam, 7^b, is pressed against the arm 5^g of the lever 5 and forms a stop. The arm 5^h of the lever 5 by this movement turns the yoke Y and the wheel I out of gear with the winding-wheel B, and the other arm, 5^a, of the lever 5 is turned and its wheel 2 is brought into engagement with the seconds set-wheel 1, as shown in Fig. 6. When the setting-lever 7 is pressed back, the lever 5 is turned by its spring 5^f, and the wheel 2 is brought out of gear with the wheel 1 and the yoke is turned back to its winding position by its spring y. By providing a separate lever, 7, for the seconds-setting mechanism the stem-driven train is put directly thereby into its seconds-setting position—that is, with the wheel I out of engagement with the wheel B and the setting-wheel S out of engagement with the dial-wheel D, which moves the minute-hand—the purpose being to make the movement of the stem-driven train and its connection with the seconds-setting wheel 1 direct and certain and independent of the lever 6, which in this case is used only for putting the stem-driven train in its minute-setting position in the usual manner.

Figs. 7 and 8 show a lever-set movement of the yoke Y, in which the setting-wheel S is pivoted to the watch-plate A. In Fig. 8 the lever 6^e slides in a slot formed in the pillar-plate A, and is partly drawn out, whereby a pin bearing against a lever turns the same, and thereby turns the yoke Y into the setting position in the usual manner. In the edge of the lever is a notch, 6^d, which is brought into line with the end of the arm 5^e of the lever 5, and by the spring 5^f the end of said arm 5^e is forced into the notch 6^d of the setting-lever, whereby the lever 5 is turned and the wheel 2^a is put in gear with the seconds set-wheel 1, as shown. The wheel 1 is here of a larger size than shown in the preceding figures, and has on its periphery very fine teeth, and the wheel 2^a, which meshes with wheel 1, having similar fine teeth, is much smaller than the wheel 1. This wheel 2^a is placed upon the wheel 2 with coarser gearing, as shown in section in Fig. 8^a. The wheel 2 gears with wheel 3, which is always in gear with the setting-wheel S, the latter being always in gear with the crown-wheel K. The said setting-wheel S has a hub, and is shiftable on a stud on a line perpendicular to its plane of rotation, and is pressed against the sliding lever 6^e by a spring, S'. When the setting-wheel S is held down by the sliding lever, which is partly drawn out, as in Fig. 8, and shown in Fig. 8^a, the setting-wheel is in gear with wheel 3, which turns wheels 2 and 2^a, and in engagement with the seconds set-wheel 1, and turns the same by the stem driven train; but when the sliding lever 6^e is entirely drawn out, as shown in Fig. 7, the notch 6^d is turned away from the end of the lever 5^e, and thereby the lever 5 is turned out of the notch and the wheel 2^a out of gear with the fine gearing of the seconds set-wheel 1, as shown in Fig. 7. When the sliding lever 6^e is entirely drawn out, as before stated, a recess, r, therein is brought into line with the hub of the setting-wheel S, which is forced upward by means of a spring, s', and in gear with the dial-wheels d, and the stem-driven train is in engagement with the dial-wheels, as shown in Fig. 7. By pushing the lever back into the slot of the pillar-plate the setting-

wheel S is pressed downward and forced out of gear with the dial-wheel by the pressure of the recess *r* of the said lever against the beveled sides of the hub of the setting-wheel S, and the edge of the lever 6ᶜ also holds the lever 5 in such a position that its wheel 2ᵃ is held out of gear with the seconds set-wheel 1, as described in the former figures, when the stem-driven train is in engagement with the winding-wheel B.

Sheet II.—Winding devices combined with minute-setting devices which can be brought into position and operated by a longitudinally-movable stem-arbor or stem-key or stem are common, and watches of such construction are called "pendant-set" watches. I have attached my novel seconds setting mechanism to such watches which are operated by a longitudinally-movable stem and to set a stem-driven train in the seconds-set position by the stem, the said stem being drawn out a short distance, by which operation the stem-driven train is brought into engagement with a seconds set-wheel, and when the said stem is drawn out entirely the stem-driven train is disengaged from the said seconds set-wheel and brought in gear with the minutes set-wheel, also called a "dial-wheel," and when the minutes have been set and the "seconds" are to be set the said stem is slowly forced in, and by this motion of the stem the stem-driven train is brought in engagement with the seconds set-wheel, whereby the seconds can be set, and when the said stem is pushed entirely in the stem-driven train comes in gear with the winding-gear of the mainspring and is brought out of engagement with the seconds set-wheel and out of engagement with the minute-wheel D in the following manner:

Fig. 9: In the pendant *c* of the case C is placed a case-sleeve carrying the stem-springs which catch the stem in the annular grooves g', g^2, and g^3, formed in the stem-arbor E. In the hollow winding-pinion *e* is inserted a sliding pin or push-piece, *n*, which rests against a lever, O, that turns the lever P by a pin, o', fastened to the said plate. When the stem E is drawn out a short distance until the stem-springs engage the groove g^2 of the stem and hold the same, the sliding pin *n*, the end whereof within the pinion *e* bears against the end of the stem, is caused to follow the motion of the stem by the pressure against it of the lever O, said lever being actuated by a pin, o', on the lever P, the said lever being turned on its pivot by the spring p^5, the movement of the lever being limited by the contact of the sliding pin with the end of the stem, and the lever P is in such a position that the stem-driven train is brought thereby in engagement with the seconds set-wheel 1, and the lever P in this position impinges on the yoke Y and turns the wheel I out of gear with the barrel-arbor wheel B, as shown in Fig. 9. In the lever P are two holes or recesses, *r* and *h*. The hole *h* is placed in line with the beveled hub of wheel 2. Said hub on wheel 2 is pivoted on a stud fastened to the pillar-plate A and is shiftable on said stud in a line perpendicular to its plane of rotation, being forced upward in the hole *h* in the lever P by means of a spring, 2ᵇ, when by the movement of the said lever on its pivot the said hole *h* is brought into line with the said hub, and the same with its wheel 2 is raised by the spring 2ᵇ, and the wheel 2 is brought into the plane of the seconds set-wheel 1, and connects the stem-driven train with the said seconds set-wheel 1. The wheel 2 is in gear with wheel 3, which gears in wheel 4, and wheel 4 gears in wheel 4ᵃ, and wheel 4ᵃ gears in the setting-wheel S, which gears with the crown-wheel K. The wheel 4ᵃ is placed below the plane of the dial-wheel D, as shown in Figs. 9 and 10. When the hole *h* in the lever P is in line with the hub of wheel 2, the said wheel is shifted by its spring into engagement with the seconds set-wheel 1 and the same can be turned by the stem-driven train. In this position of the lever P the hole *r* in the lever P is to one side of or a short distance away from the hub of the setting-wheel S, which is held down by lever P and below the plane of the dial-wheel, as shown in Fig. 9.

In Fig. 10 the stem-driven train is put in engagement with the dial-wheel D by the stem E being drawn out to the outermost limit of its motion—that is, until the stem-springs engage the groove g^3 of the stem and hold the same—whereby the sliding pin is permitted to move farther within the winding-pinion, and the lever moves and allows the lever P to turn on its pivot until the recess *r* is in line with the hub of the setting-wheel S, which is raised or shifted upward into the said hole *r* on its stud by means of spring s', and the said setting-wheel S is thereby brought into the plane of the dial-wheel D, and, engaging the same, can now be turned by the stem-driven train, and by the same movement of the lever P the other hole, *h*, is turned away from the hub of the wheel 2, which is forced down and out of engagement with the seconds set-wheel 1 by the pressure of the said lever P against the beveled side of the hub of wheel 2, as shown in Fig. 10 and in detail in Fig. 9ᵃ.

In Fig. 11 the stem-driven train is brought in engagement with the barrel-arbor wheel B by the stem E, which is pressed or pushed to the inner limit of its motion—that is, until the stem-springs engage the groove g' of the stem—whereby the sliding pin *n* is forced against the lever O and the latter turns against the pin o', and thereby turns the lever P until the hole *r* is moved away from the hub of the setting-wheel S, which is forced down and out of engagement with the dial-wheel D by the pressure of the said lever against the beveled side of its hub, when the said lever is turned on its pivot, and the hole *h* is also set aside or away from the hub of the wheel 2, which is held down and out of engagement with the seconds set-wheel 1, and the yoke Y is swung back by the yoke-spring *y* and the wheel I put in

gear with the barrel-arbor wheel B, as shown in Fig. 11. When the lever P is turned back, as in Fig. 11, the spring p^5 is retracted.

Figs. 12 and 13 represent a pendant-set watch without a lever P. In the yoke Y are formed the two recesses or holes, *h* and *r*. The wheel 2 is in gear with wheel 3, and wheel 3 gears in wheel 4, and wheel 4 gears with the setting-wheel S, which is in gear with the crown-wheel K. The wheel 4 is placed below the plane of the dial-wheel, as shown.

Fig. 12 shows the watch when the stem-driven train is in engagement with the seconds set-wheel 1. The stem E being drawn out until the stem-springs (not shown) engage the groove g^2, the sliding pin *n* in the winding-pinion *e* follows the movement of the stem, and the spring-lever O (shown in dotted lines) follows the sliding pin *n*, as heretofore described. The spring-lever, being in engagement with a stud attached to the yoke Y, causes said yoke to turn on its pivotal bearing, and the wheel I is disconnected from the barrel-arbor wheel B, and, the recess or hole *h* coming in line with the beveled hub on the wheel 2, said wheel 2, which is pivoted to a stud attached to the pillar-plate A, is shifted upward on the said stud by means of a spring, 2^b, and, the hub of wheel 2 slipping into the hole *h*, the wheel is raised and brought into the plane of the seconds set-wheel 1, and thereby the stem-driven train is brought into connection with the wheel 1, as shown, and the seconds can now be set by the stem-driven train. The position of the yoke Y is such that its wheel I is out of gear with the barrel-arbor wheel B, and on the other side the recess *r* in the yoke is set aside or away from the hub of the setting-wheel S, which is held down and below the plane of the dial-wheel D, as shown.

In Fig. 13 the stem-driven train is brought into engagement with the dial-wheel D by the stem E being drawn out to the outer limit of its motion, and the sliding pin *n* and the spring-lever O follow the motion of the stem. The said spring-lever, by means of the stud on the yoke, turns the yoke Y until the recess or hole *r* comes in line with the beveled hub on the setting-wheel S, when the said setting-wheel S, which is pivoted to a stud fastened to the pillar-plate, is shifted upward on its stud and into the recess *r* by means of a spring, whereby it is brought into the plane of the dial-wheel D, and, engaging the same, the stem-driven train is connected with a dial-wheel which moves the minute-hand. The position of the yoke Y is now such that its wheel I is carried farther away from the wheel B, and the recess or hole *h* in the yoke Y is set aside or away from the hub of the wheel 2, which is pressed down and held below the plane of the seconds set-wheel 1 by the pressure of the said yoke Y against the beveled side of the hub of wheel 2, when the said yoke is turned, as shown in Fig. 13. When the stem E is pressed to the inner limit of its motion, the stem presses the sliding pin against the spring-lever O, which moves and turns the yoke Y on its stud, and the wheel I in gear with the barrel-arbor wheel again in the usual manner. The two recesses or holes *h* and *r* in the yoke Y are moved aside or away from the hub of wheel 2, and the setting-wheel S and the stem-driven train are in engagement with the winding mechanism, as described.

Figs. 14 and 15 represent a pendant-set watch of Swiss construction. The seconds set-wheel 1 is engaged or disengaged by wheel 2, placed at one end of arm 5^a on the under side of a lever, 5, and the other arm, 5^e, is held against a lever-arm, k^2, of the lever *k*. The same arm, k^2, lies in an annular groove formed in the stem, which is drawn out and pushed in in the usual manner for the purpose of turning the lever *k*, so that its arms k^2 and k^3 shall assume several positions, as shown. In Fig. 14 is shown the wheel 2 in engagement with the seconds set-wheel 1 by the stem E being drawn out and forcing the lever *k* to turn on its axis, whereby the lever-arm k^3 is carried against and bends the spring *y* aside or toward the center of the watch, whereby the said spring *y* shifts the setting-wheel S into engagement with the dial-wheels D. At the same time the end of arm k^3 enters a notch, *u*, formed in a bend of the spring *y*, and is held thereby, and the end of the arm k^2, which normally bears against the edge of the lever-arm 5^e, as shown by the dotted lines in Fig. 15, slides along the edge of the lever-arm 5^e, and the lever 5 is pressed by its spring 5^f against the end of arm k^2 until the latter aligns with the notch *t* in arm 5^e, whereupon the lever 5 is turned until the end of the lever-arm k^2, entering the notch *t*, stops the further movement of the lever 5, and at this stage the wheel 2 is in engagement with the seconds set-wheel 1, as shown in Fig. 14. The wheel 2 gears in one of dial-wheels, and when the stem is rotated the setting-wheel S turns the dial-wheel, which turns the wheel 2, which is in gear with the seconds set-wheel 1, and the seconds can be set, which has to be done first in this setting device. By connecting the wheel 2 with a dial wheel the number of wheels which connect the stem-driven train with the dial-wheel 2 is lessened, and the wheel 2 can be moved in and out of connection with the seconds set-wheel, which moves the seconds-hand, and the seconds-hand can be set by the stem. When the seconds have been set to the proper time, the stem-driven train must be disengaged from the seconds set-wheel 1 in the following manner: The stem E being drawn out to the outer limit of its motion, as shown in Fig. 15, the lever-arm k^2, held in the groove of the stem by the motion of the stem, is turned, and its end k^2 thereby passes out of the notch *t* in the lever-arm 5^e and moves the said lever-arm 5^e. Thereby the lever 5 and its other arm, 5^a, are turned, and the wheel 2 is brought out of engagement with the seconds set-wheel 1, as shown. The edge of the lever-arm 5^e rests at this stage on the end of the lever-arm k^2, and

the other lever-arm, k^3, is pressed by the said outward motion of the stem out of the notch u into the notch u', formed in the spring y, and is held thereby. The stem-driven train is now in gear only with the dial-wheels D, and the minutes can be set independent and separate from the seconds set-wheel 1, as shown in Fig. 15. By pressing or pushing the stem E to the inner limit of its motion the lever k is turned, as usual, and the end of the arm k^2 is set on the other side of the notch t in the lever-arm 5^e of lever 5, as shown in dotted lines in Fig. 15, and the wheel 2 is thereby held out of gear with the seconds set-wheel 1. The other arm, k^3, is pressed out of the notches u' and u, formed on spring y, and the spring flies back to its normal position and carries thereby the setting-wheel S out of gear with the dial-wheels and into engagement with the winding wheel or pinion in the usual manner, as shown in dotted lines in Fig. 15. A spring, k', presses and turns the lever k, by which the lever-arm k^2, placed into the groove formed in the stem, holds the said stem in, as usual.

Figs. 16 and 16^a represent a seconds-setting mechanism independent of the watch-movement, which is designed for key-winders or other watches as a separate and independent seconds-setter that can be attached to the watch-plate and connected with the seconds set-wheel 1, by which the seconds-hand can be set to any point independent of the other hand and in the following manner: A stem, E, with a groove formed therein, as usual, is held by the spring-plate y on the plate a^5, and its stem is held in the watch-case C in a groove or in a hole, c^5, placed therein, and by its outer end is shiftable endwise longitudinally on the plate a^5. A setting-wheel slides loosely over the stem-arbor, that is preferably made square, and the said hole in the setting-wheel is of the same shape, so that the setting-wheel will fit and slide on the arbor as on stems of the usual construction. The lever k is pivoted to the plate a^5, and its arm k^2 is placed in the annular groove formed in the stem in the usual manner, and the stem being drawn out moves the arm k^2 and turns the lever k and the beveled end of the other arm, k^3, against the rounded end of the spring y, and the said spring is pressed and bent toward the center of the watch and slides the setting-wheel, passing through a groove of the said wheel S on the stem toward and in connection with the seconds set-wheel 1, which is placed on the pivot or staff of the seconds hand pinion of the watch mechanism, and the end of the arm k^3, passing under the rounded end of the spring y, is held thereby, and in turn fastens the spring y and locks the setting-wheel S in gear with the seconds set-wheel 1, as shown. By rotating now the stem in either direction the seconds set-wheel 1 can be turned and the seconds-hand placed thereon moved to any point independent of the other dial-wheel or minute-hand wheel D, as shown. To disengage the setting-wheel S from the seconds set-wheel 1, the stem being pushed to the inner limit of its motion, the lever k is turned by the groove in the stem, and by this motion of the stem its arm k^3 is turned from under the end of the spring y, which springs back and moves the setting-wheel S out of engagement with the seconds set-wheel 1, as shown in Fig. 16^a.

Fig. 16^a also shows the plate a^5 when detached from the watch-plate A, and shows the position of the plate a^5 relatively to the seconds set-wheel 1 when the said wheel 1 is placed on the seconds-hand pinion of the watch. The seconds-setting mechanism may be placed directly on the watch-plate A, by which the connection and disconnection is made with the seconds set-wheel 1, and by which the seconds-hand is moved, and it is not essential or necessary to place the said parts or mechanism on a separate plate. The main object in placing the parts of the setting mechanism on a separate plate is to furnish means by which a complete seconds-setting attachment can be manufactured independent of the watch-movement and as a separate article for the trade, like the watch-movement itself, and adapted to be fitted into a watch.

Fig. 9^a shows the seconds set-wheel 1, which forms the dial-wheel for the seconds-hand. The said wheel is placed on the pivot of the seconds-hand pinion, ordinarily used in watch-movements and forming part of the time-train. The wheel 1 is held by friction on the said pivot, and thereby prevented from turning except with the wheel, and it is fastened on the pivot in the following manner: The pivot is provided with an annular notch, 1^b, and the hub of the wheel with a corresponding contraction, 1^c, which, when the wheel is placed on the pivot, engages the notch by catching into it, the contraction acting as a spring.

Fig. 9^b shows the wheel 1 detached from the seconds-hand pinion of the time-train and the seconds-hand detached from the wheel 1. It also shows two ways of connecting the seconds-hand with wheel 1. In one the seconds-hand is provided with a collar, which is pressed on the hub of wheel 1 and held by friction. The other shows the usual way of connecting the hand with the pivot of the seconds-hand pinion of the time-train. In this case the seconds-hand post has a contraction, 1^c, which, when the post is placed on the pivot, engages the notch 1^b in the pivot and the hand is held and prevented from slipping off. The post is also pressed into the hub of the wheel 1 and is frictionally connected therewith, so that when the wheel 1 is turned the seconds-hand turns with it.

I claim—

1. In watches and other time-pieces having a seconds-hand, the combination, with the seconds-hand, of a wheel connected with the staff of the seconds-hand pinion, a stem, and suitable gearing interposed between the said stem and the wheel on the staff of the seconds-hand pinion, said gearing adapted to be set in and out of connection with the wheel on the staff

of the seconds-hand pinion, substantially as specified.

2. In watches and other time-pieces having a seconds-hand, the combination, with the seconds-hand, of a wheel connected with the staff of a seconds-hand pinion, a pinion journaled in the watch-plate, a stem for turning said pinion, and mechanism, consisting of one or more gear-wheels, interposed between the pinion and the wheel on the staff of the seconds-hand pinion, said interposed mechanism adapted to be thrown in and out of gear with the wheel on the staff of the seconds-hand pinion, substantially as specified.

3. The combination, with the seconds-hand of a time-piece, of a stem-driven train, a wheel placed on the seconds-hand pinion-staff, and mechanism, consisting of one or more wheels, interposed between the stem-driven train and the wheel on the staff of the seconds-hand pinion, said interposed mechanism being susceptible of adjustment by the yoke-adjusting mechanism in and out of gear with the said wheel, substantially as specified.

4. In a watch containing mechanism for marking time in hours, minutes, and seconds, the combination, with a stem-driven train and a seconds-hand, of a wheel placed on the seconds-hand pinion-staff, a shiftable wheel which is susceptible of being moved in and out of gear with the wheel on the seconds-hand pinion-staff, and gearing intermediate of said shiftable wheel and the stem-driven train, substantially as specified.

5. In a watch, the combination of a dial-wheel, a wheel on the staff of the seconds-hand pinion, a shiftable wheel that is movable in and out of gear with the wheel on the seconds-hand pinion-staff, a setting-wheel that may be moved in and out of gear with the dial-wheel, and a stem-driven train that is susceptible of separate adjustments to wind the watch, to set the minutes and hours, and to set the seconds independently of the minutes and hours through separate intermediate gearing, substantially as specified.

6. The combination, in a watch, of a stem-driven train which is shiftable by means outside of the watch-case, but in connection with the said train, into a winding, a minute and hour setting, and a seconds-setting position, the mechanism being adjusted to perform each operation separate and independent of the other operations, a system of gearing by which the said train is placed in gear with the dial-wheel to set the hour and minute hands after being disengaged from the winding-arbor, and another system of gearing by which the said train is placed in gear with a wheel on the seconds-hand pinion-staff while disconnected from the dial-wheel and the winding-arbor, substantially as and for the purpose specified.

In testimony that I claim the foregoing as my invention I have hereunto subscribed my name this 21st day of April, 1887.

FRED TERSTEGEN.

In presence of—
JAMES RIDGWAY,
WILTON C. DONN.