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WATCHES AND LIKE HOROLOGICAL INSTRUMENTS

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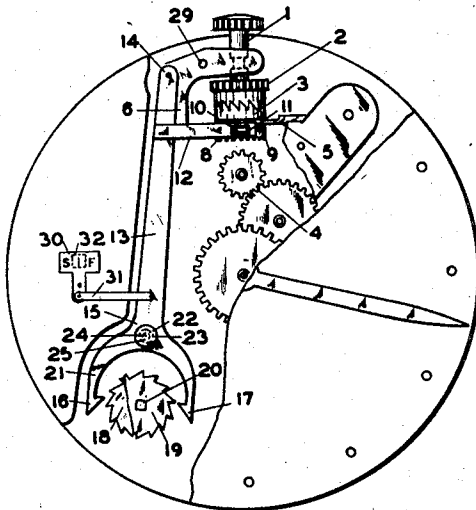


FIG. 1



FIG. 2

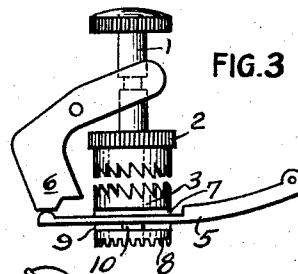


FIG. 3

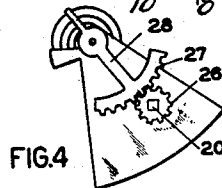


FIG. 4

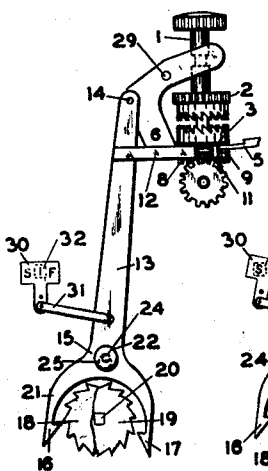


FIG. 5

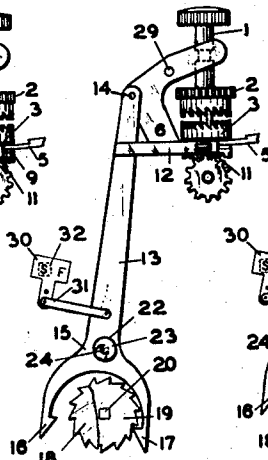


FIG. 6

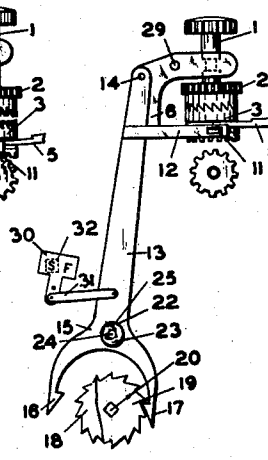


FIG. 7

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WATCHES AND LIKE HOROLOGICAL INSTRUMENTS

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This invention relates to mechanically operated horological instruments of the type which are provided with a speed regulator and is particularly applicable, to watches, chronometers, portable clocks and the like which are driven by a main spring.

The regulation of the speed of these types of instruments, even of the better type is not often wholly accurate when they are despatched from the factory and final adjustments have to be made by the owner, or someone employed by the owner for this purpose. The making of the adjustments is a tedious process and is largely effected by hit and miss methods, with the result that the instrument does not have an accuracy of which its movement is capable. Furthermore, there is no finality in the adjustment since the movement is affected by varying climatic conditions.

It is the object of this invention to provide means whereby the speed regulation of horological instruments may be effected by the normal movement used in resetting the hands of the instruments.

Watches are known in which the movement of resetting the hands is used to adjust the speed regulation of the watch. In watches of this known type it is always necessary to operate some auxiliary member or pull the winder stem out into a special position before making the adjustment so that the regulator adjustment is not naturally effected by the resetting of the hands. The invention is especially adaptable for application to a watch or other instrument in which the winding stem rotates about and is axially movable along an axis which extends transversely to the axis of the control element for the regulating mechanism and makes use of the conventional axial and rotary movement of the winding stem for appropriately adjusting the regulating mechanism.

Thus, in accordance with the invention, there is provided the lever swingable transversely to the axis of the control element so that drive means carried by the lever on diametrically opposite sides of driven means carried by the said control element may be alternately swung into engagement with the driven means and the lever is appropriately connected to the stem in a novel manner, whereby the rotation of the stem after the latter is axially displaced to its setting position may swing one or the other of said driving means into operative engagement with the driven means. A further independent connection or linkage between the stem and the lever moves the lever bodily transversely to the rotational axis of the control element responsive to axial movement of the stem whereby the ensuing movement of either of the said drive means in engagement with its cooperating driven means may produce rotary regulating movement of the driven means and the associated control element.

Thus, there is provided a novel mechanism of simpler construction than has heretofore been known, adapted especially for incorporation in watches, though capable of use in larger horological instruments.

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A further feature of the invention consists in so arranging the aforesaid mechanism that it may be controllable through appropriate manipulation of the winding stem to permit adjustment of either the regulating mechanism or the instrument setting mechanism independently of the other.

According to still further features of the invention the amount of movement of the regulator is effected in a keyless watch, through a connecting mechanism by the movement of the winding stem between the winding and handsetting positions, and the connecting mechanism may be disengaged from the speed regulating mechanism to prevent adjustment thereof, by suitably positioning the winding stem.

A preferred embodiment of the invention is illustrated in the accompanying drawings in which:

Fig. 1 illustrates the front of part of a watch movement with portion of the face removed to show part of the regulator adjusting mechanism, and with the stem in the winding position.

Fig. 2 is an elevation of the slip ring for the adjusting mechanism.

Fig. 3 illustrates the position of the slip ring in relation to the castle wheel and return lever.

Fig. 4 illustrates the modified regulator mechanism at the back of the watch, and

Figs. 5, 6 and 7, illustrate the movements of the regulator adjusting mechanism when the hands of the watch are set.

As shown in Fig. 1 the watch is provided with a normal type of winding and hand setting mechanism comprising an axially movable winding stem 1 fitted to a crown 2 and through castle wheel 3, the movement of the latter to engage either the crown wheel 2 or the minute-hand gear train 4 being effected by a return lever 5 and co-operating trigger 6 in the form of a bell crank lever.

The return lever 5 fits across the circumferential slot 7 in the castle wheel. Mounted in the slot 7 between the return lever 5 and the lower wall 8 of the slot 7 is a split ring 9 having a projecting tail piece 10 as illustrated in Figs. 2 and 3. The tail piece 10 fits through a slot 11 in a side arm 12 projecting from a lever 13. The one end 14 of the lever is pivoted to the trigger 6 or an extension thereof, and the other end 15 of the lever 13 is bifurcated and terminates in a pair of oppositely disposed pawls 16, 17.

Between the pawls 16, 17 is mounted a pair of concentric ratchet wheels 18, 19. The ratchet wheels 18, 19 are mounted on the same shaft 20 in close proximity. In the drawings portion of the top ratchet wheel 19 has been cut away to show the lower ratchet wheel 18. The arm 21 and corresponding pawl 16 is bent downwards a small amount so that the latter is on the same plane as, and will only engage the lower ratchet wheel 18. The pawl 17 is positioned to engage only the upper ratchet wheel 19. The lever 13 is located to hold the pawls 16, 17 in the planes of the corresponding ratchet wheels 18, 19 by a stud 22 the head 23 of which bears on the outer surface of the lever 13. The stem 24 of the stud 22 fits through an enlarged hole in the lever (indicated by dotted lines 25) thus allowing the lever 13 a limited longitudinal and transverse movement. In the normal central position of lever 13 (Fig. 1) neither pawl 16 nor 17 engages the ratchet wheels 18 or 19.

The shaft 20 on which the ratchet wheels 18, 19 are mounted projects through to the opposite side of the movement and has a small pinion 26 mounted on the projecting end as shown in Fig. 4. This pinion 26 meshes with an arcuate rack 27 secured to the end of the index 28 which forms part of the hairspring type of regulating mechanism,

With the watch set for normal winding as shown in Fig. 1, ring 9 rests loosely in the circumferential slot 7 in the castle wheel 3 so that it does not interfere in any way with the rotation of the stem 1 and crown and castle wheels 2, 3.

When the winding stem 1 is pulled out to the hand setting position, trigger 6 is rotated on its pivot 29 causing the lever 13 and pawls 16, 17, to advance towards the ratchet wheels 18, 19, and at the same time moves the return lever 5 to press the castle wheel 3 into engagement with the minute-hand gear train 4. It this position of the parts the slip ring 9 is pressed into frictional engagement with the wall 8 of the slot 7 in the castle wheel 3, as shown in Fig. 3. Thus any rotation of the winding stem 1 in either direction to set the hands will cause corresponding rotation of the castle wheel 3 and the ring 9.

The movement of the tail piece 10 of the ring 9 in the slot 11 presses the side arm 12 to one side or the other so that pawl 16 or 17 engages ratchet wheel 18 or 19.

With the parts in this position if the winder stem 1 is now pressed inwardly to move trigger 6 back to the winding position the lever 13 pivoted to the trigger 6 recedes from the ratchet wheels 18, 19 causing the pawl 16 or 17 engaging the one ratchet wheel 18 or 19 to rotate it. This in turn causes rotation of the pinion 26 and movement of the rack 27 and index 28 to reset the regulating mechanism.

The movement of the regulator adjusting mechanism will be clearly understood with reference to Figs. 5, 6 and 7 which illustrate the movements of the parts for retarding the position of the hands and automatically retarding the speed regulator.

In retarding the hands the winding stem 1 is first pulled out from the position shown in Fig. 1 to the position shown in Fig. 5. The corresponding movement of trigger 6 advances lever 13 towards the ratchet wheels 18, 19 without the pawls 16, 17 engaging either wheel 18 or 19, and the return lever 5 presses ring 9 into frictional engagement with castle wheel 3.

The winding stem 1 is then rotated in a clockwise direction to move the hands in the opposite direction. This movement causes the tail 10 of the ring 9 to move in a clockwise direction to press lever 13 away therefrom causing pawl 17 to engage ratchet wheel 19 as shown in Fig. 6.

With the rotational pressure still applied to the winding stem 1 it is pushed inwardly. This results in a return movement of the trigger 6, lever 13 and the pawl 17 which rotates the ratchet wheel 19 in an anticlockwise direction. The movement of the ratchet wheel 19, through the shaft 20, pinion 26, rack 27 and index 28, retards the speed regulating mechanism by a very small amount which is independent of the amount of movement of the hands in resetting them. The amount of movement of the index 28 depends on the diameter of ratchet wheels 18, 19 and the distance between pivot 29 and the point of attachment of lever 13 to trigger 6.

The maintenance of the rotational pressure in the stem 1 in moving it back to the winding position is usually a natural action and should normally require no conscious thought. If however, it is desired to reset the hands without making any adjustment to the regulator the rotational pressure in the winding stem 1 may be released prior to pushing it inwardly. In this case the lever 13 will move to the position shown in Fig. 5 and on inward movement of the stem 1, move to the position shown in Fig. 1 without the pawl 17 engaging the ratchet wheel 19. Conversely should it be desired to reset the regulating mechanism without resetting the hands the stem 1 is pulled out and a rotational pressure is applied thereto sufficient to move lever 13 to engage pawl 16 or 17 but insufficient to move the hands, and the stem 1 is then pressed inwardly to rotate the ratchet wheels 18 or 19.

If in effecting a normal adjustment of the hands an over-correction is made it is necessary to apply rotational pressure to the winding stem 1 in the original direction of

movement before pressing it back to the winding position so that an incorrect adjustment is not made to the regulator.

It will be clear from the above that the direction of adjustment of the regulator is independent of the direction of movement of the hands in re-setting them and depends solely on the direction of rotational pressure applied to the winding stem 1 against the normal back lash of the gear train 4, when said winding stem is moved from the hand setting to the winding position. Such rotational pressure will result in movement of the stem 1 and the amount of such movement which is permissible without moving the hands is that which is sufficient to take up the normal play in the gear train 4.

The movement of the ring 9 is limited by the limits of movement of the lever 13 so that if the winding stem 1 is rotated beyond the limit of movement of the ring 9 the castle wheel 3 will merely move in sliding engagement with ring 9. The latter thus acts as a form of slipping clutch to hold one or other pawl 16 or 17 in engagement with the corresponding ratchet wheel 18 or 19. If desired the position of the index 28 may be shown by a mark or other indication on the top ratchet wheel 19 and the face of the clock provided with an aperture through which the marked portion of wheel 19 is visible.

The position of the lever 13 to operate the regulating mechanism either to retard or advance the speed may be indicated by a pivoted plate 30 adapted to be oscillated by lever 31 connected to lever 13 and viewed through a window 32.

The invention is applicable to watches having time indicating means other than hands, for example, marked discs, to self winding watches and generally to horological instruments in which the movement of the time indicating means may be transmitted to the regulator to effect step by step adjustment thereof.

What I claim as new and desire to secure by Letters Patent is:

1. A horological instrument comprising a time indicating means, a gear train connected to said time indicating means for setting the same, a stem movable axially to engage and disengage said gear train, a regulator for controlling the speed of movement of the instrument, a connecting member between said regulator and stem for transmitting axial movement of the stem to the regulator, controlling means connected to said stem and movable to disconnect, and connect the connecting member to the regulator to control the direction of movement of the latter, a clutch connecting the stem to the controlling means which latter is operable by the positioning of said stem at either of the two extreme positions necessary to take up the normal play of the gear train.

2. A horological instrument comprising time indicating means, gearing connected to said time indicating means for setting the same, a stem movable axially to engage and disengage said gearing, a regulator for controlling the speed of movement of the instrument, a double ratchet connected to said regulator, a pair of pawls, a movable member supporting said pawls, a side arm on said member, a clutch connecting the side arm to the stem for positioning said member to move the pawls into disengagement or engagement with the ratchet on positioning of the stem at either of the two extreme positions necessary to take up the normal play of the gearing and means connecting the movable member to the stem for transmitting axial movement of the stem to the pawls.

3. A spring driven watch comprising time indicating means, gearing connected to said time indicating means for setting the same, a stem movable axially to engage and disengage said gearing, a regulator for controlling the speed of movement of the instrument, a rack secured to said regulator, a pinion meshing with said rack, a pair of superimposed disc shaped ratchets, a shaft connecting the ratchets to the pinion, a pair of pawls, a mov-

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able member supporting said pawls, a side arm connected to said member, a clutch ring loosely mounted on the stem, a return lever acting to press said ring into frictional engagement with said stem when the latter is moved axially to engage said gearing, a tailpiece on the ring engaging said side arm for positioning said member to move the pawls into disengagement or engagement with the ratchets on positioning of the stem at either of the two extreme positions necessary to take up the normal play of the gearing, and means connecting the movable member to the stem for transmitting axial movement of the stem to the pawls.

4. In a horological instrument, the combination comprising a regulating mechanism having a rotatable control element, driven means rotatable with said element about a common axis, a lever mounted on said instrument for lateral swinging movement transversely to said axis and longitudinal bodily movement transversely to said axis, a pair of drive means carried by said lever respectively on diametrically opposite sides of said driven means, a rotatable and axially movable winding stem carried by said instrument for rotation about an axis transverse to that of said control element, means operatively connecting said lever to said stem for selectively swinging either of said drive means into operative engagement with said driven means, depending on the direction of rotation of the stem, and means operatively connecting said lever to the stem for causing longitudinal bodily movement of the lever responsive to axial movement of the stem.

5. In a horological instrument having a rotatable winding stem axially movable between a winding position and a setting position, the combination comprising a regulating mechanism having a control element rotatable about an axis extending transversely to the axis of said stem, driven means fixed coaxially on said element, a lever mounted on said instrument for swinging movement transversely to the rotational axis of said driven means and for bodily movement generally radially to said driven means, drive means carried by said lever on diametrically opposite sides of said driven means and alternately movable with said lever into driving engagement with said driven means and operative respectively to rotate said driven means in opposite directions responsive to said radial bodily movement of the lever, means operatively responsive to rotation of said stem in either direction for swinging said lever to bring one of said drive means into operative engagement with said driven means, and means linking said lever to said winding stem for bodily movement radially to said driven means in response to axial movement of said stem.

6. In a horological instrument having a rotatable winding stem axially movable between a winding position and a setting position, rotatable setting mechanism and

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means establishing an operative driving connection between said stem and the setting mechanism when said stem is axially disposed in its setting position, the combination comprising regulating mechanism rotatable about an axis transverse to the rotational axis of said stem, a pair of ratchet wheels having relatively oppositely directed ratchet teeth coaxially fixed to said regulating mechanism, a lever mounted on said instrument for swinging movement transversely to the rotational axis of said wheels and for lengthwise bodily movement generally parallel to said stem, pawls carried by said lever respectively on diametrically opposite sides of said wheels for alternate driving engagement with the respective wheels, means operatively responsive to rotation of said stem in either direction for swinging said lever to bring one of said pawls into driving engagement with its respective wheel, and means connecting said lever to said stem for driving movement radially to the axis of said wheels and generally parallel to said stem responsive to axial movement of the stem.

7. A horological instrument comprising a time indicating means, a gear train connected to said time indicating means for setting the same, a stem movable axially to engage and disengage said gear train, a regulator for controlling the speed of movement of the instrument, a connecting member between said regulator and stem for transmitting axial movement of the stem to the regulator, means for controlling the movement of direction of the regulator, said controlling means connected to said stem and operable by the positioning of said stem at the two extreme positions necessary to take up the normal play of the gear train.

8. A horological instrument comprising a time indicating means, a gear train connected to said time indicating means for setting the same, a stem movable axially to engage and disengage said gear train, a regulator for controlling the speed of movement of the instrument, a connecting member between said regulator and stem for transmitting axial movement of the stem to the regulator, and means for controlling the direction of movement of the regulator and disconnecting the connecting member from the regulator, said controlling means connected to said stem and operable to move the connecting member to connect with the regulator by the positioning of said stem at the two extreme positions necessary to take up the normal play of the gear train, and to disconnect the connecting member from the regulator by the positioning of the stem between said two extreme positions.

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