Oct. 17, 1961 O. R. PETTERS 3,004,382

STEM WINDING AND SETTING WATCH MOVEMENT

Filed June 3, 1959 4 Sheets-Sheet 1

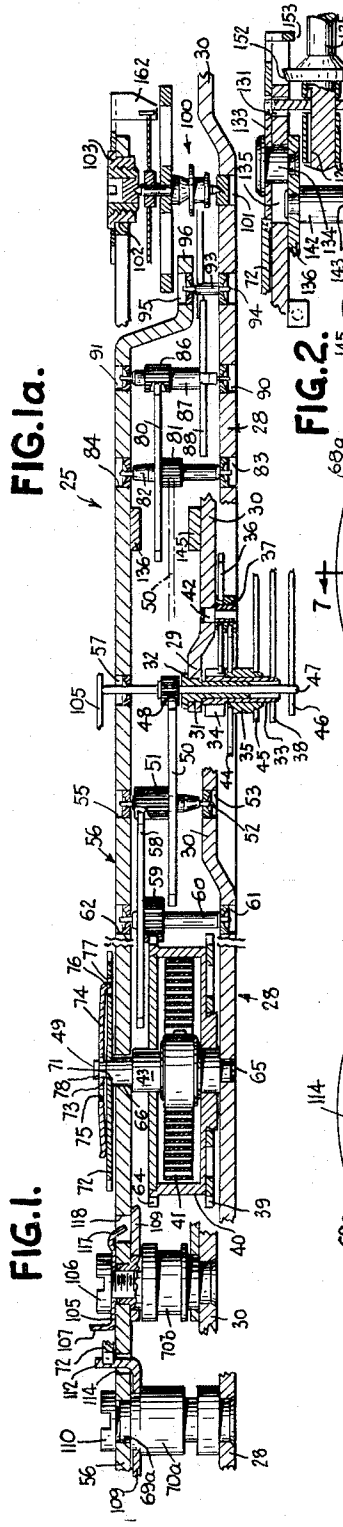


FIG. 1a.

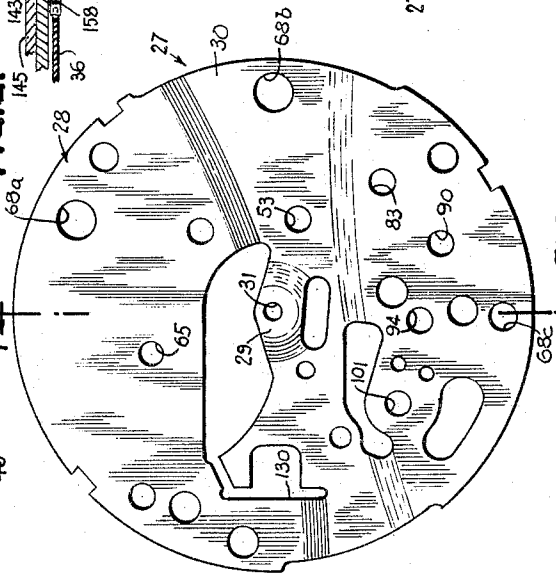


FIG. 2.

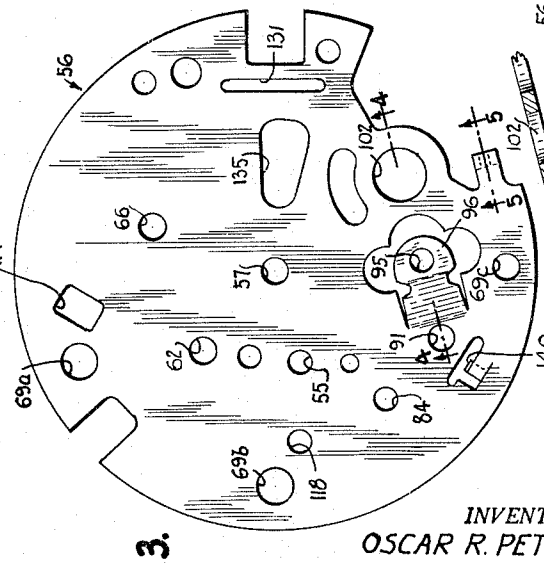


FIG. 3.

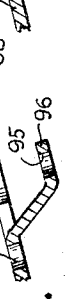


FIG. 4.

FIG. 5.

FIG. 6.

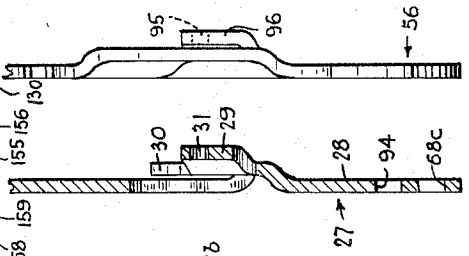


FIG. 7.

FIG. 8.

INVENTOR.
OSCAR R. PETTERS
BY
Percy Freeman
ATTORNEY

Oct. 17, 1961 O. R. PETTERS 3,004,382

STEM WINDING AND SETTING WATCH MOVEMENT

Filed June 3, 1959 4 Sheets-Sheet 2

FIG. 9.

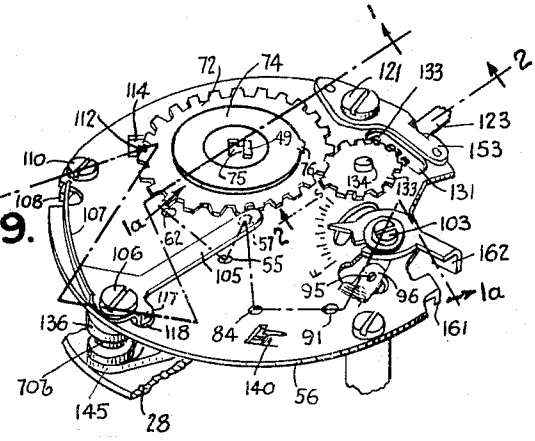


FIG. 10.

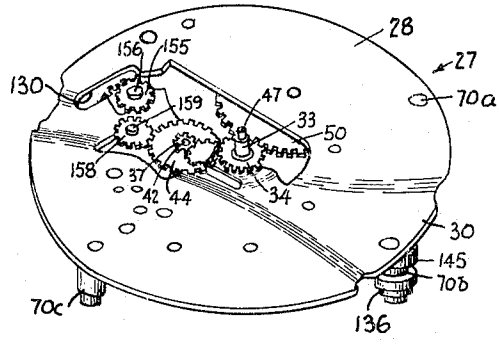
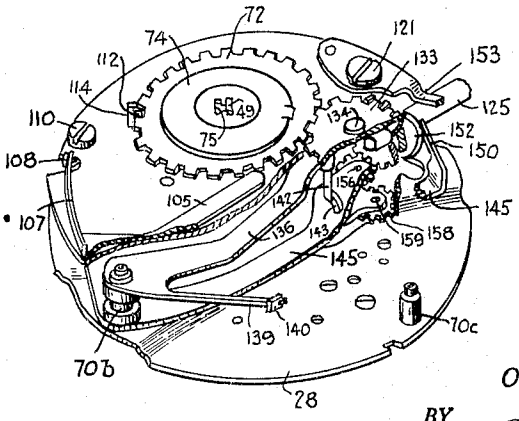


FIG. 11.



INVENTOR.
OSCAR R. PETTERS.

BY Percy Truman

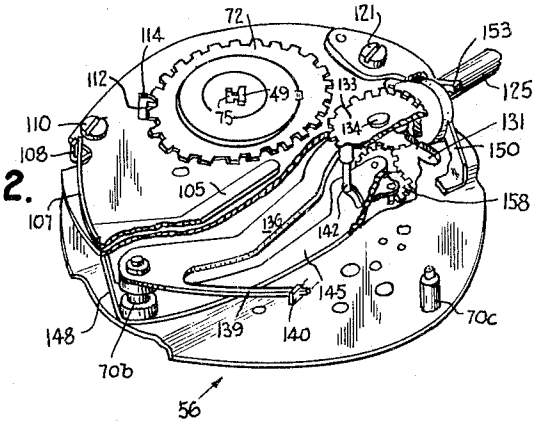
ATTORNEY.

Oct. 17, 1961 O. R. PETTERS 3,004,382

STEM WINDING AND SETTING WATCH MOVEMENT

Filed June 3, 1959 4 Sheets-Sheet 3

FIG. 12.



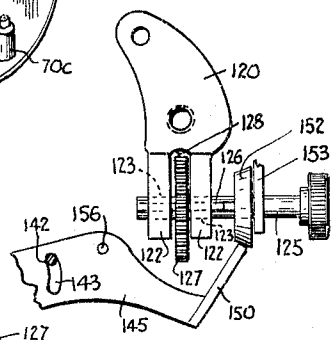
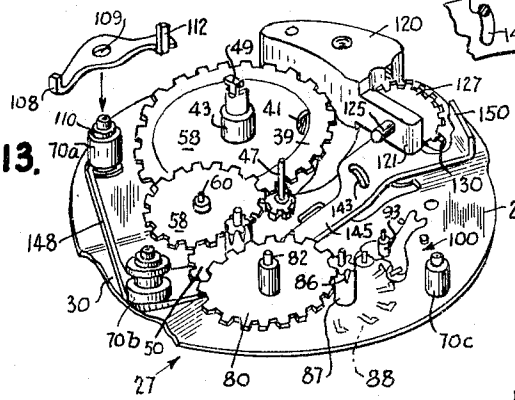


FIG. 16.

FIG. 13.



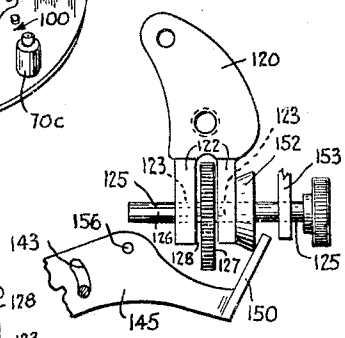


FIG. 17.

FIG. 14.

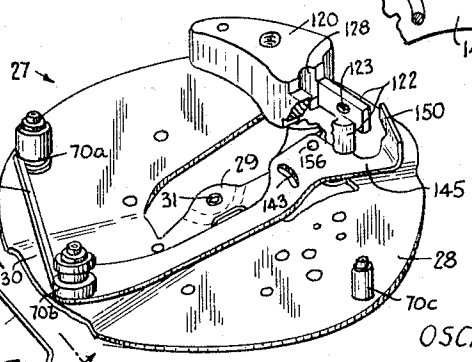


FIG. 15.

INVENTOR.
OSCAR R. PETTERS.

BY Percy Freeman

ATTORNEY.

STEM WINDING AND SETTING WATCH MOVEMENT

Filed June 3, 1959 4 Sheets-Sheet 4

FIG. 18.

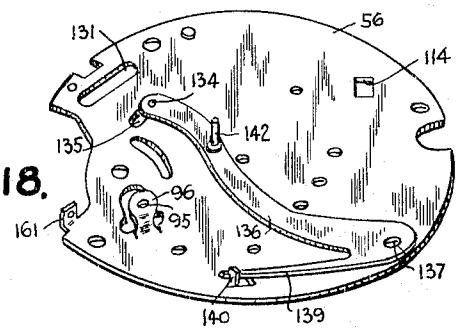
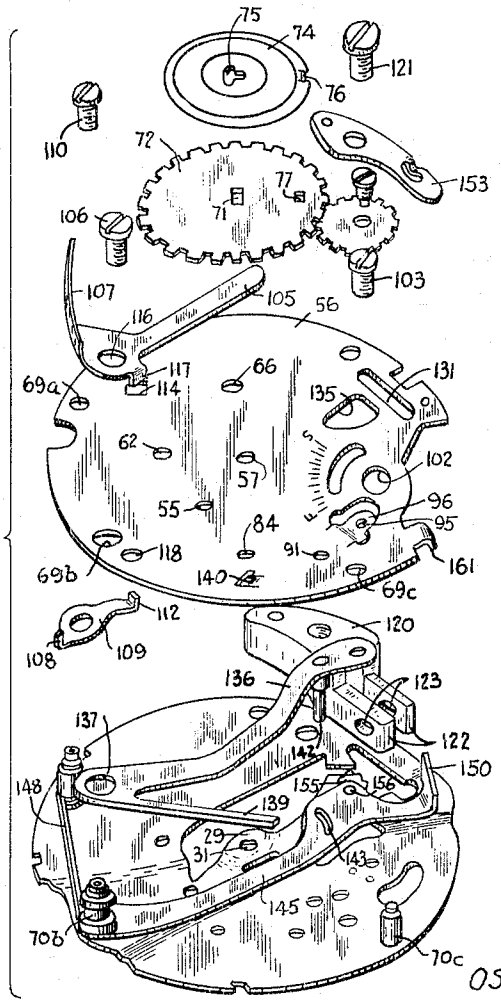


FIG. 19.



INVENTOR.
OSCAR R. PETTERS.

BY Percy Freeman

ATTORNEY.

United States Patent Office 3,004,382 Patented Oct. 17, 1961

3,004,382

STEM WINDING AND SETTING WATCH MOVEMENT

Oscar R. Petters, Columbia, Pa., assignor to Precision Time Corporation, New York, N.Y., a corporation of New York

Filed June 3, 1959, Ser. No. 817,750
7 Claims. (Cl. 58—68)

This invention relates to time pieces and, more particularly, to an operating mechanism therefor.

Ordinarily, the large number of parts and assembly operations add considerably to the cost of manufacture of time pieces, such as watches, especially in the manufacture of the low price type of time pieces. It is, therefore, an object of the present invention to provide an operating assembly for time pieces that is extremely simple in construction, includes a fewer number of parts than conventional mechanisms, and which may be more economically assembled, to reduce the overall cost of manufacture thereof.

Another object of the present invention is to provide a setting mechanism for time pieces having a reduced number of parts which are of basically simple construction and can be manufactured by means of economical processes and manufacturing techniques.

An additional object of the present invention is to provide mounting plates for time pieces of the type described that can be manufactured by progressive dies, and which will eliminate all profiling and recessing operations.

All of the foregoing and still further objects and advantages of this invention will become apparent from a study of the following specification, taken in connection with the accompanying drawing, wherein:

FIG. 1 is an enlarged panoramic cross-sectional view taken along line 1—1 of FIG. 9, showing the relationship between many of the operating parts of the present invention.

FIG. 1*a* is a view similar to FIG. 1, taken along line 1*a*—1*a* of FIG. 9.

FIG. 2 is an enlarged fragmentary cross-sectional view taken along line 2—2 of FIG. 9.

FIG. 3 is an enlarged top plan view of a train plate forming a part of the present invention.

FIG. 4 is an enlarged fragmentary cross-sectional view taken along line 4—4 of FIG. 3.

FIG. 5 is an enlarged fragmentary cross-sectional view taken along line 5—5 of FIG. 3.

FIG. 6 is a bottom plan view of a face plate forming another part of the present invention.

FIG. 7 is a transverse cross-sectional view taken along line 7—7 of FIG. 6.

FIG. 8 is a fragmentary end elevational view of the face plate shown in FIG. 6.

FIG. 9 is a fragmentary perspective view of a time piece operating mechanism made in accordance with the present invention.

FIG. 10 is a fragmentary bottom perspective view of other parts of the assembly shown in FIG. 9.

FIG. 11 is a view similar to FIG. 9, with parts broken away to show details of construction, showing the parts in a normal spring winding relationship.

FIG. 12 is a view similar to FIG. 11, showing the stem and other operating parts in a hand-setting position.

FIG. 13 is a view similar to FIG. 12, with the train plate removed.

FIG. 14 is a view similar to FIG. 13, with the gear train removed.

FIG. 15 is a fragmentary end view, taken along line

15—15 of FIG. 14, showing the contour of the face plate.

FIG. 16 is an enlarged fragmentary plan view of certain parts of the present invention, with the parts in a hand-setting position.

FIG. 17 is a view similar to FIG. 16, with the stem and related parts in a winding position.

FIG. 18 is a bottom plan view of the train plate and winding lever associated therewith.

FIG. 19 is an exploded perspective view of the various operating parts with the gear train and main spring removed.

In accordance with the present invention, a time piece operating assembly is provided that includes a dial plate and a train plate supported in spaced apart parallel relationship, and between which a gear train is operatively supported which includes a main spring at one end and a set of time-indicating hands at the opposite ends. A manually operated stem and associated winding and setting levers are provided for alternately winding the main spring and setting the hands, as may be desired. However, as will be more fully explained, all of these functions are attained by an assembly having a relatively few number of parts and which may be assembled by means of low cost manufacturing techniques.

Referring now to the drawing, and more particularly to FIGS. 1 to 8 thereof, an operating assembly 25 made in accordance with the present invention is shown to include a dial plate 27 of generally circular configuration having various cutouts and openings for accommodating other associated parts of the time piece. This dial plate 27 is formed into three different levels, a main level 28, an offset level 29, and an intermediate level 30. The offset level 29 includes a central opening 31 through which a pinion post 32 extends. A sleeve 33 is rotatably supported upon the pinion post 32 and has a cannon pinion 34 which is in meshing engagement wtih a minute wheel 36 carried upon a minute wheel shaft 42 from the intermediate level 30 of the dial plate, together with a pinion 37. A minute hand 38 is secured to the outer end of the sleeve 33 for rotation by the minute wheel 36 acting through the cannon pinion 34.

A barrel wheel 39 is frictionally supported upon the barrel 40 of a main spring 41 to form a slip coupling therewith, the barrel 40 being rotatably carried upon the barrel arbor 43. The barrel wheel 39 is in meshing driving engagement with the cannon pinion 34 for operating the minute wheel 36 under the driving action of the main spring, the speed of which is controlled by an escapement gear train, as will be hereinafter more fully described. The driving of the minute wheel 36 drives the hour wheel 44 through the pinion 37, and thus rotates the hour hand 45 carried upon the hour hand sleeve 35 with the minute hand 38, at a ratio of one to twelve.

A sweep second hand 46 is secured to the outermost end of a sweep second hand shaft 47 that is rotatably supported within the pinion post 32 and has a sweep second pinion 48 in meshing engagement with a third wheel 50 carried upon the third wheel shaft 52 together with the third pinion 51 upon the intermediate level 30 of the face plate. This third wheel shaft 52 is journalled in jewels or other bearings within an opening 53 in the intermediate level 30 of the face plate and with an aligned opening 55 in the train plate 56.

As is more clearly shown in FIG. 3 of the drawing, the train plate 56 is also provided with an opening 57 which is in alignment with the opening 31 of the offset level 29 of the face plate and mounts a jewel within which the opposite end of the sweep second hand shaft 47 is rotatably supported.

With further reference now more specifically to FIGS. 1, 1*a*, and 13 of the drawing, it will be noted that a cen-

ter wheel 58 is mounted upon a center shaft 60 with an associated pinion 59 by means of jewels disposed within aligned openings 61, 62 in the dial and train plates, the pinion 59 being in meshing engagement with the barrel gear 64, while the center wheel 58 is in meshing driving engagement with the pinion 51 of the third wheel 50. The third wheel 50 is in meshing engagement with the sweep second pinion 48 and the pinion 81 of the fourth wheel 80 that is mounted upon a shaft 82 within bearings carried within aligned openings 83, 84 in the dial and train plates. The fourth wheel 80 is, in turn, in driving engagement with an escapement pinion 86 carried upon the shaft 87 with an escapement wheel 88, upon bearings mounted within lined openings 90, 91 in the dial and train plates. The escapement wheel 88 is, in turn, engaged with the pallet pinion 93 which is journalled within aligned openings 94, 95 in the dial plate and an inwardly offset tab 96 of the train plate. The speed of rotation of the escapement wheel 88 is controlled by a balance unit 100 mounted within openings 101, 102 in the dial and train plates, a jewel screw 103 being provided for adjusting the end shake of the balance unit 100 during the assembly of and later adjustment of the time piece. The escapement mechanism thus controls the rate of rotation of the barrel 40 by the main spring 41 which, in turn, limits the speed at which the barrel wheel 39 rotates the cannon pinion 34 and the minute and hour hands.

It will also be recognized that the balance unit and escapement, control the speed at which the barrel gear 64 is permitted to rotate the sweep second hand 46, directly, through the engagement of the third wheel 50 with the sweep second pinion 48. However, the barrel wheel 39 meshes with the cannon pinion 34 to supply the driving action to the minute and hour hand 38, 45, under the control of the escapement and balance unit, through the connection of the center wheel pinion 59 with the barrel gear 64.

The dial and train plates are provided with three stake holes 68*a*, 68*b*, 68*c*; 69*a*, 69*b*, 69*c*, for receiving the opposite ends of individual stakes 70*a*, 70*b*, 70*c*, respectively, which maintain the plates in spaced apart parallel relationship. The barrel 43 is rotatably received within aligned openings 65, 66 in the dial and train plates. A ratchet wheel 72 having a non-circular central opening 71 that slidably receives a correspondingly shaped terminal portion 49 with a flat 73 at one end of the barrel 43, is mounted upon the barrel at the exterior side of the train plate by means of a spring plate 74 having a T-slot 75 which fits over and lockingly engages a shoulder 78 formed in the non-circular end of the barrel 43. A depending tab 76 at the outer periphery of the spring plates 74 is received within an opening 77 in the ratchet wheel 72, thus releasably locking the spring plate 74 in overlying assembled relationship with the ratchet wheel 72.

As is more clearly shown in FIG. 9 of the drawing, a click and sweep second pinion spring 105 is mounted upon stake post 70*b* by means of a bolt 106 which extends through an opening 116 in the spring. The free end 107 of the spring portion yieldably engages behind a detent 108 of a click 109 that is pivotally mounted upon a shoulder 110 of stake post 70*a* (see FIG. 13). The detent 112 at the opposite end of the click 109 extends upwardly through an opening 114 in the train plate 56 and is in ratchet engagement with the ratchet wheel 72, thus preventing backward rotation of the ratchet wheel 72 when the main spring 41 is wound. The free end of the click and sweep second pinion spring 105 overlies the adjacent end of the pinion shaft 47, and thus tends to damp the uneven or vibrating movement of the sweep second shaft as the sweep second hand is rotated. A depending lug 117 of the click and sweep second pinion spring 105 is received within an opening 118 in the train plate, thus locking the spring portion 107 and the sweep second pinion spring 105 against pivotal movement about the bolt 106.

With further reference now to FIGS. 13 through 19 of the drawing, a stem block 120 is shown to be mounted between the facing sides of the dial and train plates by means of a bolt 121. One end of the stem block 120 is bifurcated and includes a pair of spaced apart parallel arms 122 that have aligned openings 123 within which a stem 125 is rotatably and slidably supported. A drive pinion slidably carried upon a flat 126 of the stem 125 is rotatably supported within the slot 128 between the bifurcated arms 122. Because of the non-circular opening through the drive pinion 127 and the correspondingly shaped flat portion 126 of the stem, the stem may be moved axially, while being drivingly connected to the drive pinion. Both the dial and train plates are provided with aligned slots 130, 131 through which the diametrically opposite sides of the drive pinion 127 are received.

A winding wheel 133 rotatably supported upon a shaft 134 that extends through an arcuate slot 135 in the train plate is carried upon the free end of a winding lever 136 that has an opening 137 at its opposite end for rotatably receiving one of the stake posts 70*b*. This winding lever is mounted on the inetrior side of the train plate and a winding wheel 133 is normally urged into meshing engagement with the ratchet wheel 72 by a spring extension 139 that abuts against a downwardly struck stop portion 140 of the train plate. Also, the adjacent side of the drive pinion 127 is in constantly meshing engagement with the winding wheel 133, whereby rotation of the stem 125 in the normal winding position shown in FIG. 17, will effect rotation of the winding wheel 133 and the ratchet wheel 72 to wind the spring 41, when the stem 125 is rotated in the winding direction illustrated by the arrow shown in FIG. 9. Back winding of the stem 123 is permitted by an arcuate slot 143 in a setting lever 145 that slidably receives the free end of a winding lever pick up pin 142. Thus, when the stem 123 is backwound, the inability of the ratchet wheel 72 to rotate in a reverse direction allows the winding lever 136 to move against the action of the associated spring portion 39 in a direction away from the ratchet wheel 72, such movement being accommodated by the slot 143 into which the pin 142 is extended.

The setting lever 145, having a spring portion 148, is also pivotally mounted upon the stake post 70*b* adjacent to the inside surface of the face plate 27. The free end of the setting lever 145 is provided with a follower tip 150 that is in sliding engagement with a circular cam 152 secured upon the stem 125. Thus, as the stem is retracted from the normally inwardly extending winding position shown in FIG. 17 to the outwardly extended time setting position illustrated in FIG. 16, the cam 152 engages the follower tip 150 and rotates the setting lever 145 against the action of the spring portion 148 that is in abutment at its free end with another stake post 70*a*. During this movement, a setting wheel 155 rotatably carried upon a shaft 156 of the setting lever 145 is drawn into meshing engagement with an intermediate setting wheel 158 carried upon the shaft 159 and which is in constantly meshed engagement with the minute wheel 36. Thus, because of the slippage between the barrel-wheel 39 and the barrel 40, rotation of the stem 125 in the outwardly extended time-setting motion shown in FIG. 16, permits the setting wheel to rotate the intermediate setting wheel 158 to effect rotation of both the minute and hour hands through the minute wheel pinion, 37, the cannon pinion 34, and associated minute and hour wheels 36, 34. Outward movement of the stem 125 is limited by a stop cock 153 carried upon the train plate and projecting into the path of movement of the cam 152.

The train plate is also provided with a terminal 161 for one end of the hair spring associated with the balance unit 100, and with a pivotally mounted time ad-

justment plate **162** connected to the opposite end of the hair spring, in a well known manner.

It will now be recognized that the winding wheel **133** carried upon the winding lever **136** is normally maintained in meshing engagement with the winding ratchet wheel **72**, while the setting wheel **155** is normally maintained out of meshing engagement with the intermediate setting wheel **158** by the spring action of the associated spring arm **148** of the setting lever **145**. However, when the stem **125** is moved from a normally inwardly extended position to the outwardly extending time-setting position, the cam **152** acting against the follower tip **150** urges the setting lever **145** toward the intermediate setting wheel **158**, thus effecting the meshing engagement of the setting wheel **155** with the intermediate setting wheel **158**. Simultaneously, the pin **142** engaged with the end of the slot **143**, is drawn in the same direction, thus disengaging the winding wheel **133** from the winding ratchet wheel **72** of the spring assembly.

Because of the various levels of each of the face and train plates, additional shim blocks, forming, or adjustment are unnecessary to obtain the proper gear levels for the entire gear system. Also, the entire gearing may be assembled upon the face plate immediately prior to the attachment of the train plate, after which, the enlarged bushing **103** permits the balance unit **100** to be inserted and adjusted.

While this invention has been described with particular reference to the construction shown in the drawing, it is to be understood that such is not to be construed as imparting limitations upon the invention, which is best defined by the claims appended hereto.

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

1. A time piece comprising, in combination, a dial plate, a train plate, spacer posts securing said dial and train plates in spaced apart parallel relationship, a gear train mounted between said plates, a spring mounted between said dial and train plates having a set of spring winding gears drivingly engaged with said gear train, a set of hands mounted outwardly upon said dial plate having a set of hand setting gears drivingly connected to said gear train, a manually operable stem carried by said plates selectively engageable with said gear train to actuate one of said set of spring winding gears and said hand setting gears, selector means disconnecting said manually operable stem from one of said set of gears in response to connection of said manually operable stem with the other of said set of gears, said selector means comprising a winding lever and a setting lever pivotally supported at one end between said plates, a drive pinion secured upon said stem, a winding wheel rotatably carried upon the opposite end of said winding lever in meshing engagement with said drive pinion, spring means urging said winding wheel into meshing engagement with said spring winding gears, a setting wheel rotatably carried upon the opposite end of said setting lever in meshing engagement with said drive pinion, and spring means normally urging said setting wheel out of meshing engagement with said hand setting gears.

2. A time piece as set forth in claim 1, wherein said winding gears are disposed adjacent to said train plate, and said setting gears are disposed adjacent to said dial plate, said winding lever being pivotally supported upon said train plate, and said setting lever being pivotally supported upon said dial plate.

3. A time piece as set forth in claim 2, wherein said stem is supported for axial movement between a normally inwardly extended position and an outwardly displaced position, a cam carried upon said stem, and a follower carried upon said opposite end of said setting lever, said cam in response to axial movement of said stem from said inwardly extended position to said outwardly disposed position acting upon said follower to effect engagement of said hand setting wheel with said hand setting gear.

4. A time piece as set forth in claim 3, further comprising an interlock between said winding lever and said setting lever displacing said winding lever to yieldably disengage said winding wheel and said spring winding gears in response to movement of said setting lever by said cam to effect engagement of said setting wheel and said hand setting gears.

5. A time piece as set forth in claim 4, wherein said winding lever and said setting lever are in spaced apart parallel relationship, and said interlock comprises a pin carried at one end by said winding lever and a slot defined by said setting lever, said slot slidably receiving the opposite end of said pin, said slot slidably accommodating reciprocating movement of said pin during back winding movement of said winding lever by reverse winding rotation of said stem, and one end of said slot abutting with said pin to rotate said winding lever and said winding wheel out of engagement with said spring winding gears in response to movement of said setting lever and said setting wheel into meshing engagement with said hand setting gears by said cam acting upon said follower.

6. A time piece as set forth in claim 5, further comprising a stop cock mounted upon said train plate in the path of outward movement of said stem mounted cam, said stop cock abutting and limiting outward axial movement of said cam and stem.

7. In a time piece, a set of mounting plates comprising, in combination, a dial plate, a train plate, spacers supporting said dial and train plates in spaced apart parallel relationship, each of said dial and train plates having uniformly spaced apart main levels rotatably supporting a spring actuated gear train, said dial plate having a cannon pinion supporting level offset inwardly from said main level of said train plate and an intermediate winding lever and setting lever supporting level offset inwardly toward said main level of said train plate, said train plate having a pallet shaft supporting level offset inwardly toward said main level of said dial plate, a torsion spring mounted between said main levels of said dial and train plates, a spring winding gear connected to said spring and rotatably mounted upon the outside of said main level of said train plate, a set of hands supported upon the exterior side of said cannon pinion supporting level of said dial plate, the hand setting gear connected to said set of hands and rotatably supported upon the exterior side of said intermediate level of said dial plate, a winding lever pivotally supported upon said train plate, a winding wheel rotatably supported upon said winding lever, a setting lever pivotally supported upon said dial plate, a setting wheel pivotally supported upon said setting lever, a stem slidably and rotatably supported between said dial and train plates, a drive pinion connected for rotation with and axially slidably mounted upon said stem in constant driving engagement with said winding and setting wheels, and interlock means acting between said stem and said winding and setting levers alternately engaging and disengaging said winding and setting wheels with said respective winding and setting gears in response to sliding movement of said stem from one extreme position to the other.

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