

June 26, 1934.

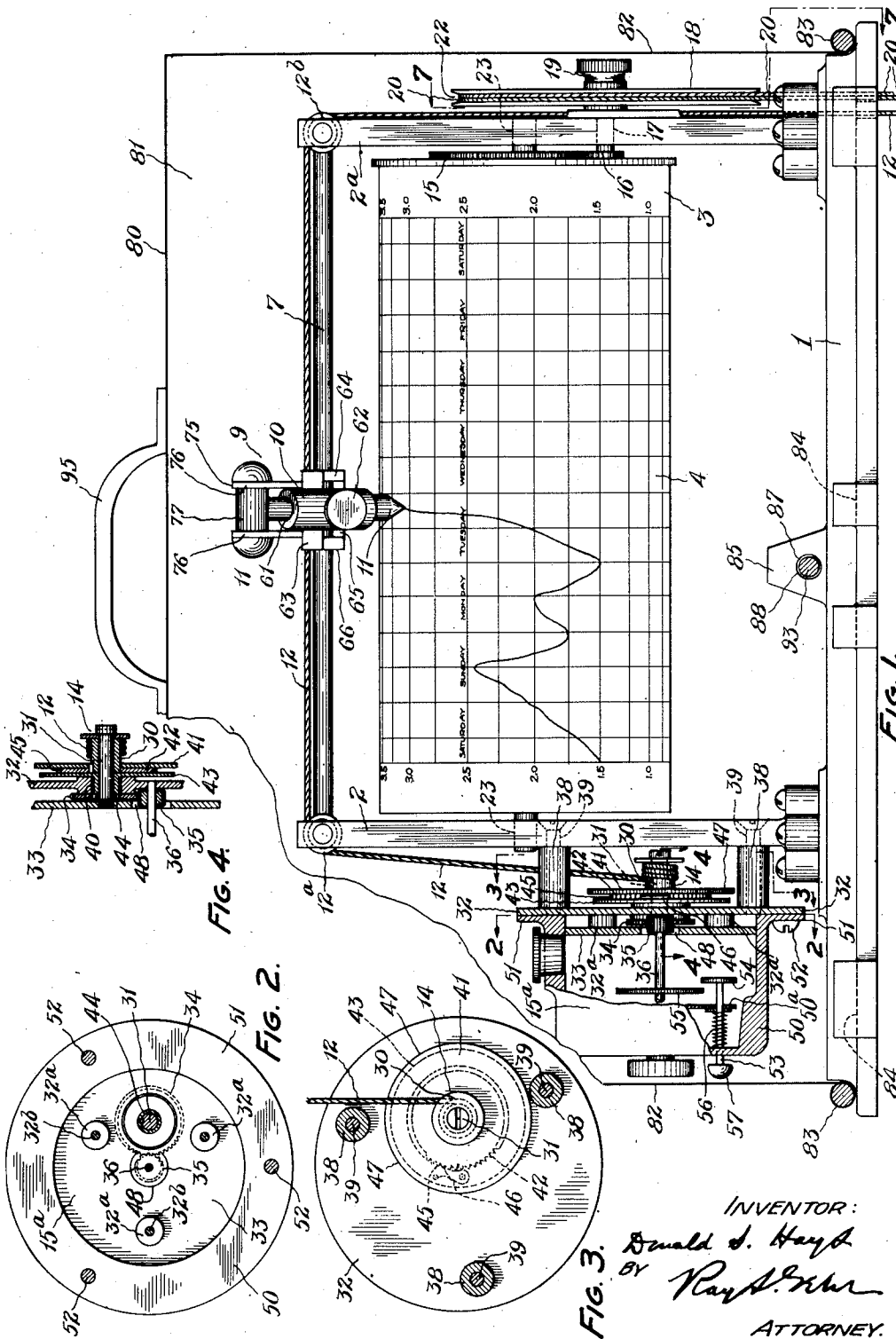
D. S. HAYS

1,964,632

RECORDING INSTRUMENT

Filed Nov. 24, 1926

4 Sheets-Sheet 1



June 26, 1934.

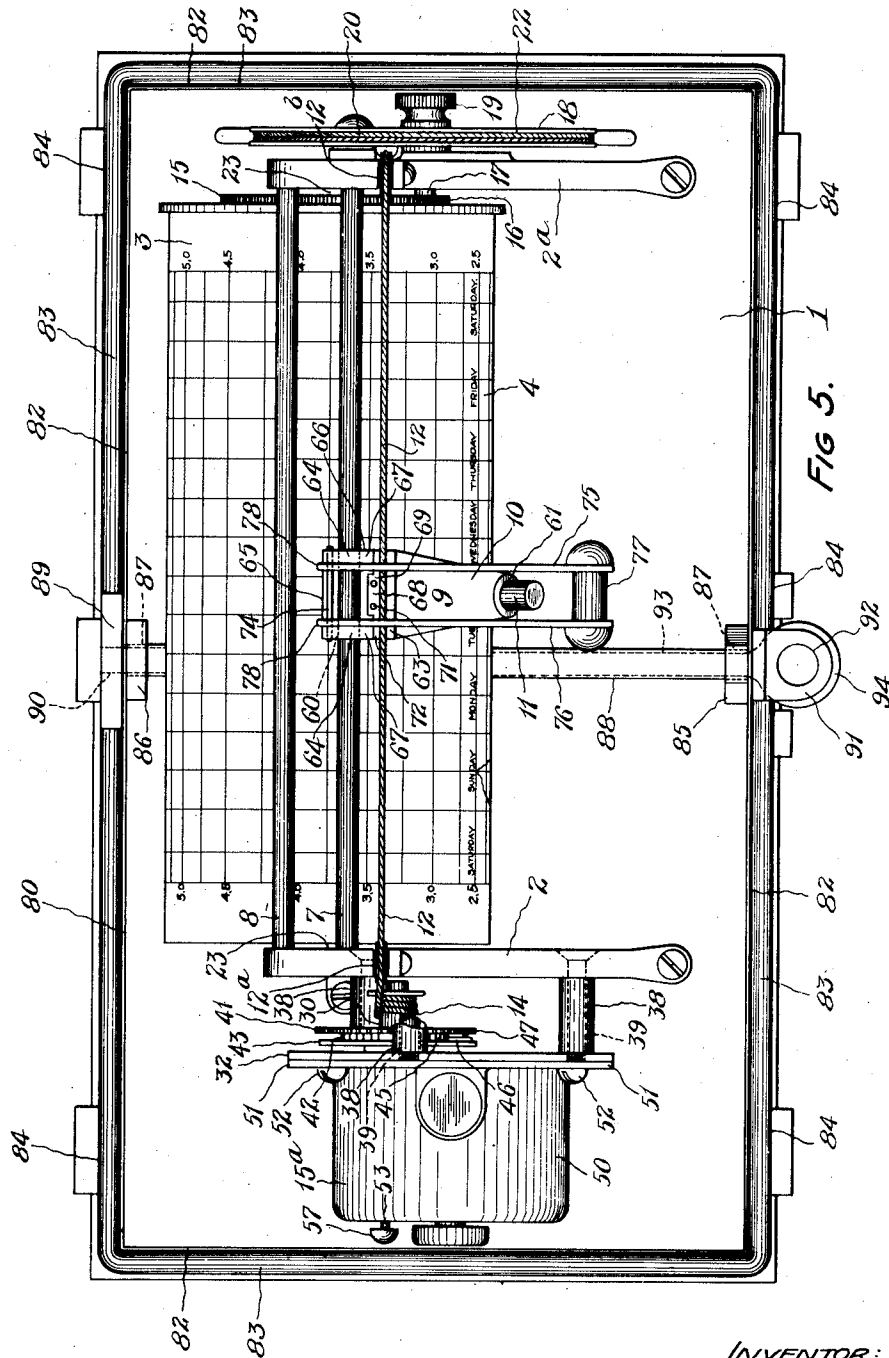
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Filed Nov. 24, 1926

4 Sheets-Sheet 2



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RECORDING INSTRUMENT

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4 Sheets-Sheet 3

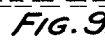


FIG. 8.

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June 26, 1934.

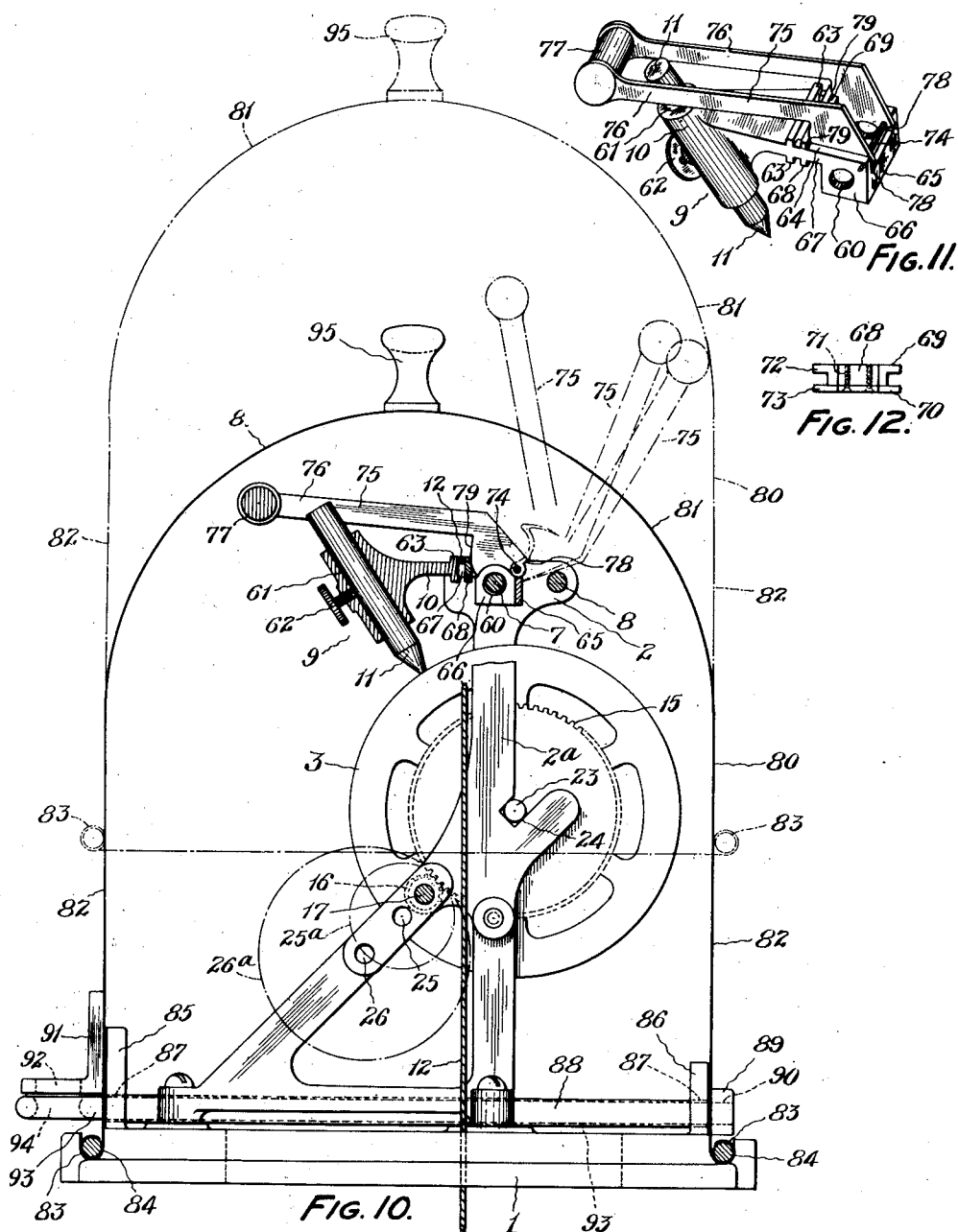
D. S. HAYS

1,964,632

RECORDING INSTRUMENT

Filed Nov. 24, 1926

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

1,964,632

RECORDING INSTRUMENT

Donald S. Hays, Sacramento, Calif.

Application November 24, 1926, Serial No. 150,451

22 Claims. (Cl. 234—10)

This invention relates to recording instruments such as are adapted to record the movement of a particular body over a certain period of time, such as the varying levels of a body of liquid or the like.

Devices of this character generally comprise two essential parts, namely, the record sheet carrier, and the stylus which rests on the record sheet during operation. Both the record sheet and the stylus move relative to their fixed support and to each other, one of the movements corresponding to lapse of time, and the other to the movement of the body to be measured.

The invention has for one of its objects the provision of an improved mechanism for controlling the movement of the stylus, and an improved means for resetting certain parts of this mechanism at the end of any desired period and also an improved manner of mounting certain parts of this movement-controlling mechanism on a fixed support.

The invention has for a further object the provision of an improved stylus mechanism which has an improved means associated therewith for connecting and disconnecting the stylus with its movement-controlling mechanism, and at the same time effectively controlling the engagement and disengagement of the said stylus with the record sheet.

A further object of the invention is the provision of an improved means for automatically starting the operation of the device.

A further object of the invention is the provision of an improved mounting for the recording drum which is readily detachable and will cause a master gear which is mounted on the recording drum to be held automatically in mesh at all times with the operating gears by means of gravity.

A further object of the invention is the provision of an improved driving connection between the movable body and the drum so that the drum can be turned at different rates in relation to the movement of the said body.

Still another object of the invention is the provision of a highly compact device of the character in question with an improved housing means, so that the device may be easily transported from place to place.

Further objects more or less incidental or ancillary to the foregoing will appear in the following description in connection with the accompanying drawings which show a preferred embodiment of the invention.

As will be understood from the foregoing state-

ments, the invention has various applications. However, it has been developed in connection with devices for recording the varying stages of a body of water and in the accompanying drawings, I have shown the improvements embodied in such a water stage recorder. The apparatus comprises a revolving drum with a record sheet thereon and whose movement is effected by the rise and fall of a float which rests on the surface of a liquid. The stylus is mounted to move transversely of the record sheet, and the said movement is controlled by a clock mechanism. The record sheet is an ordinary piece of graph paper ruled with longitudinal and transverse lines. It will be easily understood that the curve which is traced on the record sheet will represent the movement of the body to be measured over a period of time. It is also readily understood that in many respects, the movement of the record sheet might just as well be controlled by the time mechanism and the stylus by the body to be measured.

In the drawings:

Fig. 1 is a front elevation of my recording device, certain portions thereof being shown in section, and some of the parts being broken away.

Fig. 2 is a vertical section taken on line 2—2 of Fig. 1, looking in the direction indicated by the arrows.

Fig. 3 is a vertical section taken on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary horizontal section taken on line 4—4 of Fig. 1.

Fig. 5 is a top plan view of my device with the cover removed.

Fig. 6 is an end elevation showing certain parts in section.

Fig. 7 is a fragmentary end view of my device showing the relationship of the different sized reduction gears with the recording drum.

Fig. 8 is a fragmentary sectional view taken on line 8—8 of Fig. 7.

Fig. 9 is a view of my device on a reduced scale, showing the operative relation of some of the parts.

Fig. 10 is a view similar to Fig. 6 but showing certain of the parts in section and broken away, also illustrating the relationship of the several positions of the stylus controlling lever with respect to the cover.

Fig. 11 is a perspective view of the stylus mechanism.

Fig. 12 is a side elevation of the sliding connecting plate.

Referring specifically to the drawings, it will

be seen that I have provided a base 1 which is of any suitable material and has mounted thereon standards 2 and 2a. These standards support a rotatable drum 3 which carries on its outer face a record sheet 4. This record sheet is an ordinary piece of graph paper with transverse and longitudinal lines marked thereon. As can be seen from an examination of Fig. 1, the transverse lines indicate height divisions and the longitudinal lines indicate time divisions. The movement of the drum 4 is controlled by means of the rise and fall of the float which rests on the surface of a liquid. The float 5 is shown as resting on the surface of a body of water or other suitable liquid 6 in Fig. 9. This float controls by means of intermediate connections the movement of the drum 3. The standards 2 and 2a are connected at their upper ends by means of spaced bars 7 and 8. These bars are parallel to the axis of the drum. The bar 7 is cylindrical in form and pivotally and slidably supports the stylus mechanism 9. This stylus mechanism comprises a carrier 10 and the stylus 11. The stylus 11 is adapted to rest on the surface of the record sheet during the operation of the device. This stylus is adapted to move transversely of the record sheet and its movement is controlled by means of an axially movable cord or equivalent flexible element 12. For convenience I will use the term cord as applicable to any such flexible element. The cord 12 is arranged parallel to the bar 7 and is connected by means of intermediate connections 14 to the clock mechanism 15a. This cord 12 is movably supported on the standards 2 and 2a by means of the pulleys 12a and 12b. It will be easily understood that as the record sheet drum is rotated back and forth according to the varying levels of the liquid 6, and as the stylus point is controlled in its transverse movement by means of the clock mechanism, that the curve thus traced on the record sheet will represent the varying levels of a body of water over a certain period of time.

Secured to one end of the drum 3 and coaxial therewith is a master gear 15. This gear meshes with a reduction gear 16 which latter is secured to a shaft 17 which shaft is journaled in the standard 2a. This shaft carries at its other end a pulley 18. The pulley 18 is secured to the shaft 17 by means of a suitable detachable connection such as a clamping nut as shown at 19. The cord 20 is passed around the pulley 18 one and one-half times and has one end connected to the float 5 and its opposite end connected to a weight 21. As the surface of the liquid rises and falls, the float moves up and down and, with tension in the cord caused by the weight 21, the cord is wound on and off of the pulley 18 with resultant rotation of the pulley and of the drum 3 with which the pulley is operatively connected. The pulley 18 has its peripheral groove 22 formed with flat bottom and inclined sides of sufficient width at its bottom to receive two passes of the cord, as can be seen from an examination of Fig. 1. By wrapping the cord one and one-half times around the pulley it is given a very strong frictional grip thereon, thus obviating slippage with resultant inaccuracy in transmitting the movement of the float to the drum. Furthermore, with a maximum of two passes of cord on the periphery of the pulley one pass is always winding off the pulley while the other is winding on so that there is no possibility of the pass that is winding on being crowded outward away from the bottom of the

pulley groove and caused to wind upon the outer side of another pass of the cord, with resultant inaccuracy incident to the varying diameters upon which the cord is wound.

The drum 3 is rotatably supported in the standards 2 and 2a by means of the centrally arranged trunnions or shafts 23 which rest in the aligned bearings 24 located in the standards 2 and 2a. These bearings are in the form of downwardly inclined slots having open ends for the reception of the drum shafts 23. It will thus be seen that I have provided a mounting for the drum which provides for its rotating movements, and at the same time will permit the drum to be easily detached from the standards. As the slots 24 are inclined towards the reduction gear 16 (as shown in Figs. 7 and 10) the weight of the drum will automatically maintain the master gear 15 in mesh with the reduction gear 16 by means of gravity. The standard 2a which supports the shaft 17 is provided with spaced apertures 25 and 26. These apertures are adapted to receive shafts similar to 17 and carrying different sized reduction gears (not shown) so that the drum 3 can be revolved at different rates of speed. The shaft 17 as can be seen from examination of Fig. 8 is easily detachable by means of the clamping screw 19 from the standard 2a and another shaft carrying a larger sized gear can be inserted in either the aperture 25 or 26 as is desired by the operator. The substituted gears are diagrammatically shown at 25a and 26a in Fig. 7.

As was stated above, the stylus mechanism is controlled in its movement across the record sheet by the cord 12. This cord 12 is connected at one end to a winding drum 30 which drum is rotatably mounted on a supporting shaft 31. The said shaft extends through the supporting plate 32 and has its end rigidly secured in the guiding plate 33 (see Figs. 1 and 4). The winding drum is connected to a pawl and ratchet means and this pawl and ratchet means is connected by means of gears 34 and 35 to a clock shaft 36. The cord 12 is connected at its other end to a weight 37. As the clock shaft rotates due to the movement of the clock it will permit the cord 12 to unwind from the drum 30, and the weight 37 will draw this cord away from the drum 30. As the stylus mechanism is connected to the cord 12, the stylus will consequently be drawn across the record sheet 4.

The supporting plate 32 is connected to the standard 2 by some suitable connection such as spacing sleeves 38 and bolts 39. This supporting plate 32 has an aperture 40 eccentrically arranged thereon and which is adapted to receive the supporting shaft 31. Arranged lengthwise on the shaft 31 and adjacent to each other are three rotatable discs 41, 42 and 43. The discs 41 and 42 are rigidly secured to each other and to the drum 30 which drum is rotatably mounted on the shaft 31. The disc 43 has a boss 44 formed thereon which is rotatably supported by the shaft 31 and extends through the aperture 40 in the stationary plate 32. A gear 34 is fixedly secured to the boss at its outer end. The boss 44, gear 34 and the disc 43 constitute a unit rotatably mounted on the supporting shaft 31. It will thus be seen that the discs 41 and 42 are connected by means of the drum 30 and cord 12 to the stylus mechanism and that the disc 43 is connected by means of the boss 44, and gears 34 and 35 to the clock shaft 36. The outer periphery of disc 42 has notches 45 formed thereon. These notches are adapted to receive the end of a pivoted pawl lever 46 which lever is mounted on the disc 43.

The periphery of the disc 41 is knurled as is shown at 47 so that it can be grasped by the hand of the operator. The drum 30 can thus be rotated in a movement opposite to the clock shaft movement without interfering with the said clock shaft movement, by virtue of the pawl and ratchet mechanism just described.

The plate 33 is rigidly supported by the plate 32 and in spaced relation thereto by any suitable means such as the spacing sleeves 32a and screws 32b. The outer periphery of plate 33 is circular in formation and of sufficient thickness to form a guiding and supporting shoulder for the housing 50 of the clock mechanism. A circular opening 48 is formed in the center of the plate 32, which is of sufficient size to permit the clock shaft 36 with the gear 35 thereon to be inserted therethrough. The clock mechanism is indicated in its entirety by the reference character 15a. The detail mechanism has not been shown, as it can be of any ordinary construction, and does not form a part of this invention. The showing of the clock shaft will suffice to make clear the operation of my device. A housing 50 encloses the clock mechanism and has a circular inner periphery which is adapted to closely fit the outer periphery of the guiding plate 33. This housing has flanges 51 formed thereon, whereby the housing can be rigidly secured to the supporting plate 32 by any suitable means such as the screws 52. The clock shaft 36 is arranged centrally of the housing 50 so that its gear 35 will be coaxial with both the inner periphery of the said housing and the outer periphery of guiding plate 33. It will be seen that the clock mechanism can be easily attached in operative position on the supporting plate 33. The housing 50 carrying the interior mechanism and the shaft 36 is grasped by the hand and slipped on the outer periphery of the guiding plate 33. Should the teeth on the gear 35 not be angularly positioned to move into mesh with the teeth on gear 34, the housing may be turned slightly until the two sets of teeth are in proper intermeshing alignment, and then the said teeth are placed in mesh by merely pushing the housing 50 with its flange 51 against the plate 32. The housing is then secured to the plate 32 by screws 52 and the clock mechanism is in position to operate the stylus mechanism. Thus, when the clock is removed for adjustment or the like and then replaced, it can at any instant be quickly and easily replaced on its support with its gear in proper mesh with the gear mounted on the support, without interfering in the least with the timing of the clock or with the position of the stylus.

It will be observed from the above description that the hand operated ratchet device provides for the rewinding of the cord 12 on the drum at the end of any desired period. This operation might result (inadvertently) in an over winding of the cord on the drum causing one convolution of the cord to overlap another. Should this happen it would result in an improper movement of the stylus. It is therefore desirable that some means be provided which will permit rotation of the drum in either direction to wind and unwind the cord so that the overlapping of the convolutions may be rectified before starting the operation of the device. To this end I have provided on the clock shaft a toothed gear 55. This gear 55 is adapted to be rotated by a second toothed gear 54, which is mounted on a slidable shaft 53 journaled in a clock frame 50a. The gears 54 and 55 are held out of operative engagement by

means of the spring 56 urging the shaft 53 and the gear 54 towards the right of Fig. 1. The projection 57 is provided on the shaft 53 at the exterior of the housing 50 so that this mechanism can be controlled by the hand of the operator. The operation of the mechanism is effected by grasping the projection 57, pulling the shaft 53 outwardly to effect mutual engagement of the gears 54 and 55 and then rotating the shaft in a direction to permit unwinding of the cord 12 from its drum 30, whereupon the drum can be turned in the reverse direction (either by actuating the shaft 53 to turn the clock shaft 36 or by turning the drum manually relative to the clock shaft) to rewind the cord so that its convolutions on the drum are even.

Referring now to Figs. 10, 11 and 12 in detail, it will be seen that I have provided an improved stylus mechanism. As was stated above, this mechanism is indicated in general by the reference character 9 and is composed of carrier 10 and stylus 11 supported thereon. This carrier is pivotally supported between its ends by means of its bearings 60 on the circular guide rod 7. The stylus 11 which can be either a pen, pencil, a steel point, or any suitable marking means, is detachably mounted in the opening 61 of the carrier. This stylus member 11 is secured in place by means of the set screw 62. The carrier 10 has an abutment 63 formed thereon. The side plates 64 extend rearwardly from this abutment at each side thereof and are connected at their ends by means of a backing member or abutment 65. The vertical sides 66 of these plates have the journals 60 formed therein for the reception of the rod 7. The parts 67 of these plates 64 are in the form of guides ways and are adapted to receive a slidable plate 68 which plate is adapted to move to and from the said abutment 63. The plate 68 is shown in detail in Fig. 12 and comprises an upper member 69 and a lower member 70. These members are secured together by means of the screws 71. The member 69 has a projecting flange 72 formed thereon. This flange 72 and the outer edge of the plate 70 form the sides of recesses 73 of the sliding plate. These recesses are adapted to receive the connecting parts 67 of the carrier. Arranged above the backing member 65 of the carrier is a rod 74 which supports a pivoted lever 75. This pivoted lever is composed of two spaced apart parallel plates 76 which are pivotally supported at one end on the rod 74 and connected together at their free end by means of a weight 77. This pivoted lever is L-shaped and has at its lower end at one side thereof shoulders 78 formed thereon which are adapted to strike the backing member 65 when the lever is thrown towards the right of Fig. 10. The cam surfaces 79 are formed on the lever on the side opposite to the shoulders 78. These cam surfaces are adapted to engage the sliding plate 68 and move the same towards the abutment 63 on the carrier. The cord 12 rests on the carrier 10 between the abutment 63 and the sliding plate 68 (Fig. 10) and thus by movement of the sliding plate can be clamped to the carrier.

The rod 8 acts as a stop for the pivoted lever when it is in its extreme right hand position. This operation of the stylus mechanism is controlled by the pivoted lever 75. When the lever is in the position shown in full lines in Fig. 10, the stylus is resting on the record sheet and the cam surfaces 79 are firmly clamping the cord 12 between the sliding plate 68 and the abutment 63. As the cord moves toward the right of Fig. 1

the stylus mechanism will then be carried with it. Should, however, it be desired to stop the operation of the stylus mechanism, the lever is thrown towards the right of Fig. 10. This movement releases the carrier from the cord. A further movement of the lever towards the right will cause the shoulders 78 on the lever to engage the backing member or abutment 65 on the carrier and cause the backing member 65 to move downwardly due to the weight 77. This downward movement will cause a corresponding upward movement of the stylus and disengage the same from the record sheet. The several positions of the pivoted lever are shown in dotted lines in Fig. 10. The stylus has not been shown in its disengaged position, as it would tend to confuse. It is believed that the above description will clearly point out its movement. To start the operation, the lever 75 is thrown towards the left to the full line position shown. This will connect the cord to the carrier and permit the stylus to move downwardly and engage the record sheet. When the stylus mechanism is in inoperative position, the carrier 10 can be freely moved along the guide rod 7 so as to place the stylus at any desired position on the record sheet.

I have provided an improved cover 80 for my device. This cover has a curved upper surface 81 formed thereon for a purpose which will be presently described, and has depending sides and ends 82 which terminate in the lower rolled edges 83. These edges 83 rest on the base 1 and are received in the recesses 84 which are formed at the outside edge of the base member. The cover is provided with the curved surface 81 so that if the attendant should forget to lower the stylus to operative position, as the cover is placed on the base this curved surface will strike the lever 75 and throw the same towards the left of Fig. 10 and thereby start the operation of the device.

The base 1 has projecting lugs 85 and 86 formed thereon at the front and the back thereof respectively. These lugs have aligned apertures 87 formed therein. A guide sleeve 88 is placed between the lugs 85 and 86 so that the opening in this guide sleeve will be in alignment with the apertures 87. The cover 80 has a lug 89 formed thereon at its back. This lug also has aperture 90 which is adapted to be in alignment with aperture 87 when the cover is in closed position. The cover has a securing lug 91 formed on its front. This secured lug has an opening 92 therein. The bar 93 is adapted to be inserted through the aperture 87, sleeve 88 and aperture 90, thereby securely holding the cover 80 in position on the base 1. This bar has an opening 94 at its exterior registering with the opening 92 in the lug on the cover. A padlock (not shown) may be inserted in the openings 94 and 92, thereby locking the bar 93 in position. I have provided a handle 95 on the cover so that when the cover is locked in position on the base 1, the entire device can be readily transported.

It will be readily seen that the pawl and ratchet mechanism described above provides an efficient means for rewinding the cord on the drum 30 without interfering with the operation of the clock mechanism.

The auxiliary mechanism for winding and unwinding the cord from the drum independently of the stylus adjustment affords an efficient means for insuring the proper rate of speed of the stylus across the record sheet. It will be readily understood that this movement is manu-

ally effected without interfering with the normal operation of the clock mechanism, except while the manual movement is being effected.

In constructing the guiding plate 33 with a circular shoulder on its outer periphery which is coaxial with the interior of the clock shaft housing and clock shaft gear, I have provided an efficient means for detachably mounting the clock shaft housing on the supporting plate which will insure the easy replacement of the clock on the supporting plate with the proper operative connection between the clock mechanism and the stylus and without interfering with the timing of the clock or with the position of the stylus.

It will also be seen that the pivoted lever on the stylus mechanism provides an efficient means for controlling the stylus mechanism, and will, while in one position, permit the stylus to engage the record sheet and simultaneously connect the carrier with the movable cord. During the first part of the movement of the lever towards the opposite position, the carrier will be released from the movable cord, and the further movement of the lever will cause the stylus to be raised from the record sheet. This provides in effect a lost motion connection between the lever and the stylus mechanism which is highly desirable.

In constructing the cover with its curved upper surface, I have provided an efficient means for automatically starting the operation of the recording device, thus obviating the possibility of the cover being replaced and the recorder inadvertently left without operatively connecting the stylus with the clock mechanism.

In constructing the standard 2a with the series of openings therein for the reception of different sized reduction gears, I have provided an improved means for changing the rate of rotation of the record sheet drum. The flat bottom groove located in the periphery of the pulley 18 is sufficiently wide to accommodate two thicknesses of the cord, thereby allowing the cord to be wrapped one and one-half times around the pulley. This arrangement provides an efficient means for controlling the movement of the pulley and prevents any slipping action between the cord and pulley.

The aligned bearings in the form of open ended vertically inclined slots which are located in the supporting standards provide an efficient means for detachably connecting the record sheet drum to the standards, and automatically maintains the master gear in mesh with the reduction gears by the weight of the drum. At the same time this manner of supporting the drum permits it to be freely lifted from its bearing supports, thus contributing to the ease with which the record sheets can be changed on the drum, and also permits rotational adjustment of the drum and record sheet relative to the float by simply lifting the drum slightly in its bearing to disengage the gear teeth.

The base supporting the entire mechanism, with a cover for the same which is secured to the base and has a handle thereon, provides a highly compact unit which can be easily handled and transported from place to place.

In the instrument illustrated and above described, I present the preferred form of construction but it is to be understood that various modifications can be made without departing from the invention, the scope of the invention being indicated by the appended claims.

What I claim is:

1. In recording mechanism, a record sheet; means for moving said sheet in a given direction;

a cord movable axially transversely to the record sheet movement; a stationary guide parallel to the said cord and spaced therefrom; a carrier supported on said guide; a stylus mounted on the
 5 said carrier and adapted to engage the said record sheet; and means movably mounted on said carrier adapted when moved to connect the said carrier to the said movable cord and simultaneously to move said stylus into engagement with
 10 the said record sheet.

2. In recording mechanism, a record sheet; means for moving said sheet in a given direction; a cord movable axially transversely to the record sheet movement; a stationary guide parallel to the said cord and spaced therefrom; a carrier
 15 supported on said guide; a stylus mounted on the said carrier and adapted to engage the said record sheet; and means movably mounted on said carrier adapted when moved to one position to connect the said carrier to the said movable cord
 20 and simultaneously to move the said stylus into engagement with the said record sheet and when moved to another position to disconnect the said carrier from the said cord and lift the stylus
 25 from the record sheet.

3. In recording mechanism, a record sheet; means for moving said sheet in a given direction; a cord movable axially transversely to the record sheet movement; a stationary guide parallel to the said cord and spaced therefrom; a carrier
 30 mounted on the said guide; a stylus mounted on the said carrier and adapted to engage the said record sheet; and means associated with the said carrier adapted when moved to one position to connect the said carrier to the said cord and
 35 when moved to another position to disconnect the carrier from the cord and lift the said stylus from the record sheet.

4. In recording mechanism, a record sheet; means for moving said sheet in a given direction; a cord movable axially transversely of the record sheet movement; a stationary guide arranged parallel to the said cord and spaced therefrom; a carrier supported on the said guide; a stylus
 40 mounted on the said carrier and adapted to engage the said record sheet; and means mounted on the said carrier adapted when moved to one position to connect the said carrier to the said cord and simultaneously to move the said stylus
 45 into engagement with the record sheet, and when moved to another position to lift the said stylus from the record sheet.

5. In recording mechanism, a record sheet; means for moving said sheet in a given direction; a cord movable axially transversely of the record sheet movement; a stationary guide arranged parallel to the said cord and spaced therefrom; a carrier supported on the said guide; a stylus
 50 mounted on the said carrier and adapted to engage the said record sheet; and means mounted on the said carrier adapted when moved to one position to connect the said carrier to the said cord and simultaneously to move the said stylus
 55 into engagement with the record sheet and when moved to another position to disconnect the said carrier from the said cord.

6. In recording mechanism, a record sheet; means for moving said sheet in a given direction; a cord movable axially transversely to the record sheet movement; a guide parallel to the said
 70 cord; a carrier slidably mounted on the said guide; a stylus mounted on the said carrier and adapted to engage the said record sheet; means mounted on the said carrier for clamping the said cord to the said carrier; and means pivotally
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mounted on the said carrier adapted when moved to one extreme position to effect the said clamping connection and when moved towards an opposite position to disengage the said clamping connection and when moved fully to said opposite position to raise the said stylus from the record sheet. 80

7. In a recording mechanism having a movable record sheet, the combination of a cord movable axially transversely to the movement of the record sheet; a guide arranged lengthwise of said
 85 cord; a carrier mounted to slide on said guide; a stylus mounted on the said carrier and engaging the said record sheet; and means pivotally mounted on said carrier for disengageably clamping the said movable cord against the said carrier so as to effect a movement of the said stylus transversely of the record sheet movement. 90

8. In a recording mechanism having a movable record sheet, the combination of a cord movable axially transversely to the movement of the record sheet; a guide arranged lengthwise of said
 95 cord; a carrier mounted on said guide; a stylus mounted on the said carrier and engaging the said record sheet; and means pivotally mounted on said carrier for disengageably clamping the said cord to the carrier whereby the stylus is moved transversely to the record sheet movement. 100

9. In recording mechanism, a record sheet; means for moving said sheet in a given direction; a guide spaced from and arranged transversely to the said record sheet movement; a carrier pivoted between its ends on said guide and adapted to be moved longitudinally thereof; a stylus supported at one end of the said carrier and adapted detachably to engage the record sheet; a shoulder
 105 formed on the opposite end of the said carrier; an abutment on the said carrier; a plate movable toward and from said abutment; an axially movable cord arranged parallel to said transverse bar and between the said plate and abutment; means for so moving said cord; a lever pivoted on the said carrier above the said shoulder and having
 110 a cam surface on one side for engaging the plate when moved to one position to clamp the said cord to the said carriage; and an abutment on the opposite side of the said lever for engaging the said shoulder, when moved to an opposite position, thereby lifting the stylus from the record sheet. 115

10. In recording mechanism having a movable record sheet, the combination of a cord movable axially transversely to the record sheet movement; means for so moving the cord; a guide parallel to the said cord; a carrier mounted for movement on said guide; a stylus mounted on the said
 120 carrier; a pivoted lever mounted on the said carrier; an abutment formed on the said carrier and disposed at one side of the said cord; a plate mounted on the carrier to slide toward and from said abutment and disposed on the opposite side of the said cord; a cam on the pivoted lever adapted to engage the movable plate and press the same toward the said abutment and thereby disengageably clamp the cord to the carrier and effect movement of the stylus transversely of the record sheet movement. 125

11. In recording mechanism, a record sheet; means for moving said sheet in a given direction; a cord movable axially transversely of the record sheet movement; means for so moving said cord; a guide extending parallel to the said cord; a carrier mounted for movement on the said guide; a stylus movably mounted on the carrier so as to be moved into and out of engagement with the said record sheet; means on said carrier for di- 130

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rectly clamping the cord and thereby securing the carrier to the cord; and a lever pivoted on said carrier with a limited movement in relation thereto for actuating the said clamping means and lowering and raising the said stylus to and from operative position.

12. In recording mechanism, a record sheet; means for moving said sheet in a given direction; a guide; a carrier mounted on said guide; a stylus mounted on said carrier; means for effecting a movement of said carrier transversely of the record sheet movement; mechanism associated with said carrier for disengageably connecting said carrier with its moving means; and a movable cover for the device having a part adapted to engage the said connecting mechanism to automatically start the operation of the device when the cover is moved to closed position.

13. In recording mechanism, a record sheet; means for moving said sheet in a given direction; a guide; a carrier mounted on said guide; a stylus mounted on said carrier and detachably engaging the said record sheet; means for effecting a movement of said carrier transversely of the record sheet movement; mechanism associating with said carrier for moving the stylus into engagement with the record sheet and for disengageably connecting said carrier with its moving means, thereby starting the operation of the device; and a movable cover for the device having a part adapted to engage and automatically actuate the said connecting mechanism to move the stylus into engagement with the record sheet and connect the carrier with its moving means.

14. In recording mechanism of the type comprising two relatively movable elements on one of which the record is made by the other, the combination of a support; means rotatably supported thereby for controlling the movement of one of the two relatively movable elements of the device, said means comprising a toothed gear; a clock casing; a clock shaft projecting through the casing; a toothed gear on the projecting part of the shaft adapted to mesh with the other gear; circular cooperating means on the said support and the clock casing, respectively, both concentric with the axis of one of said gears for positioning the two gears in operative intermeshing relation to each other; and means for detachably securing the clock casing to the said support.

15. In recording mechanism of the type comprising two relatively movable elements on one of which the record is made by the other, the combination of a plate-like support; a plate having a circular guide surface and a central opening therein carried by and spaced from said plate-like support; means for controlling the movement of one of the two relatively movable elements of the device comprising a shaft supported at one of its ends by the said plate and extending through an opening in the said plate-like support, and a gear mounted on said shaft at one end thereof and between the said plate and plate-like support; a clock comprising a shaft, a gear on said shaft adapted to pass through the central opening in the said plate and to mesh with the other gear, and a clock housing having circular guide means concentric with the said clock shaft and adapted to fit the circular guide surface on the said plate to position the clock gear in operative intermeshing relation to the other gear; and means for detachably securing the clock housing to the said plate and plate-like support.

16. In recording mechanism, the combination

of a supporting base; a gear wheel; means on the base for rotatably supporting said gear wheel; means for rotating the said gear wheel; a rotatable drum adapted to afford on its periphery the sole operative support for a record sheet to be marked by a stylus; a stylus operatively supported in relation to the drum; a gear wheel secured to one end of the drum coaxially therewith; and a plurality of bearings carried by the base for rotatably supporting the drum with its gear wheel in mesh with the other gear wheel, said gear wheels being separable from each other on lines radial to the drum axis and the drum-supporting bearings, in conjunction with the weight of the drum, being adapted to maintain the drum in operative position with the two gear wheels in mesh and, together with the other parts of the device, being adapted to permit the free removal of the drum from its bearing supports for change of the record sheet.

17. In recording mechanism, the combination of a supporting base; a gear wheel; means on the base for rotatably supporting said gear wheel; means for rotating the said gear wheel; a rotatable drum adapted to afford on its periphery the sole operative support for a record sheet to be marked by a stylus; a stylus operatively supported in relation to the drum; a gear wheel secured to one end of the drum coaxially therewith; and means for rotatably supporting the drum with its gear wheel in mesh with the other gear wheel, said gear wheels being separable from each other on lines radial to the drum axis and said supporting means comprising trunnions projecting from the ends of the drum and standards on the base formed with open ended bearing slots to receive the trunnions, the said bearing slots and the other parts of the mechanism being formed and arranged so that the weight of the drum maintains it in operative position with its gear in mesh with the driving gear and so that the drum can be freely lifted from the bearing slots to permit change of the record sheet.

18. In recording mechanism, the combination of a supporting base; a standard on the base having a plurality of apertures therein adapted alternatively to hold supporting shafts of driving gears of different diameters; one such driving gear mounted in one of said apertures; a rotatable drum adapted to afford on its periphery the sole operative support of a record sheet to be marked by a stylus; a stylus operatively supported in relation to the drum; a gear wheel secured to one end of the drum coaxially therewith and adapted alternatively to be driven by any one of the said driving gears; and a plurality of bearings carried by the base for rotatably supporting the drum with its gear wheel in mesh with the driving gear, said gears being separable from each other on lines radial to the drum axis and the drum supporting bearings, in conjunction with the weight of the drum, being adapted to maintain the drum in operative position with its gear wheel in mesh with any one of the alternative driving gears and, together with the other parts of the device, being adapted to permit the free removal of the drum from its bearing supports for change of the record sheet.

19. In recording mechanism, the combination of a supporting base; a standard on the base having a plurality of apertures therein adapted alternatively to hold the shafts of driving gears of different diameters; one such driving gear mounted in one of said apertures; a rotatable

drum adapted to afford on its periphery the sole operative support of a record sheet to be marked by a stylus; a stylus operatively supported in relation to the drum; a gear wheel secured to one end of the drum coaxially therewith and adapted alternatively to be driven by any one of the said driving gears; and means for rotatably supporting the drum with its gear in mesh with the aforesaid driving gear comprising trunnions projecting from the ends of the drum and bearing supports on the base formed with downwardly inclined, open-topped bearing slots for said trunnions, said drum gear and driving gear being separable from each other on lines radial to the drum axis and said drum supporting bearings, in conjunction with the weight of the drum, being adapted to hold the latter in operative position with its gear wheel in mesh with any one of the alternative driving gears and, together with the other parts of the device, being adapted to permit free withdrawal of the drum from its bearing supports for change of the record sheet.

20. In a water level recording device having relatively movable elements adapted to form a graphic record of changing water levels, the combination of a movable support for one of the graph-forming elements; of means for moving said support in opposite directions proportionately to the rise or fall of the water level comprising a pulley disposed with its axis horizontal and having a flat bottomed groove in its periphery, a cord extending around the pulley in said groove approximately one and one-half times, a combined weight and float attached to one depending end of the cord so as to enter the water,

and a weight attached to the other depending end of the cord, the said groove of the pulley being of sufficient width to permit the overlapping parts of the said cord at the upper side of the pulley to lie side by side therein.

21. In recording mechanism having a movable record sheet; a stylus adapted to engage the said record sheet; and means for moving the said stylus transversely of the record sheet movement including a movable cord connected to the said stylus, a rotatable drum adapted to receive a plurality of convolutions of the said cord, and a shaft for controlling the rotation of the drum; the provision of operative connections between the drum and shaft adapted to permit manual turning of the drum in one direction independently of the shaft in combination with means for manually turning the shaft and drum in the opposite direction.

22. In recording mechanism having a movable record sheet; a stylus adapted to engage the said record sheet; and means for moving the said stylus transversely of the record sheet movement, said means including a movable cord connected to the said stylus, a rotatable drum adapted to receive a plurality of convolutions of the said cord, and a shaft for controlling the rotation of the drum; the provision of operative connections between the drum and shaft adapted to permit manual turning of the drum in one direction independently of the shaft in combination with means for detachably engaging the shaft to manually turn said shaft and drum in the opposite direction.

DONALD S. HAYS. 110

CERTIFICATE OF CORRECTION.

Patent No. 1,964,632.

June 26, 1934.

DONALD S. HAYS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 7, after "described." insert the following as a part of the paragraph: This arrangement provides a means for rewinding the cord 12 on the drum 30 at the end of any desired period of operation such as a week, at which time the stylus mechanism is disconnected from the cord in a manner which will be presently described, the record sheet changed, and the drum 30 revolved in a direction opposite to the clock shaft movement until the said drum is filled with the cord one layer deep.; page 6, line 31, claim 13, for "acuate" read actuate; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 7th day of August, A. D. 1934.

Leslie Frazer

(Seal)

Acting Commissioner of Patents.