

H. HUBBELL.
SPEED INDICATOR.
(Application filed Oct. 24, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

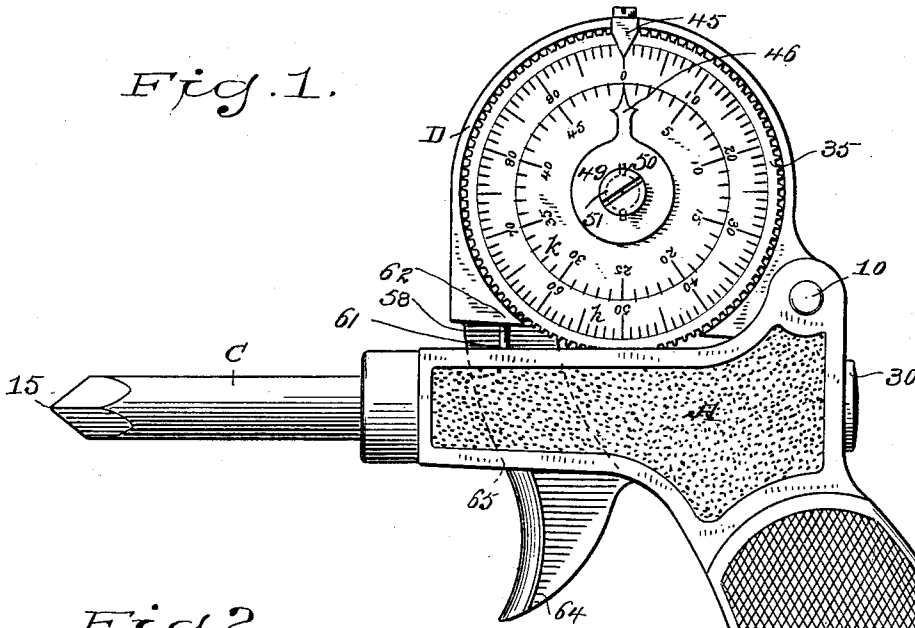
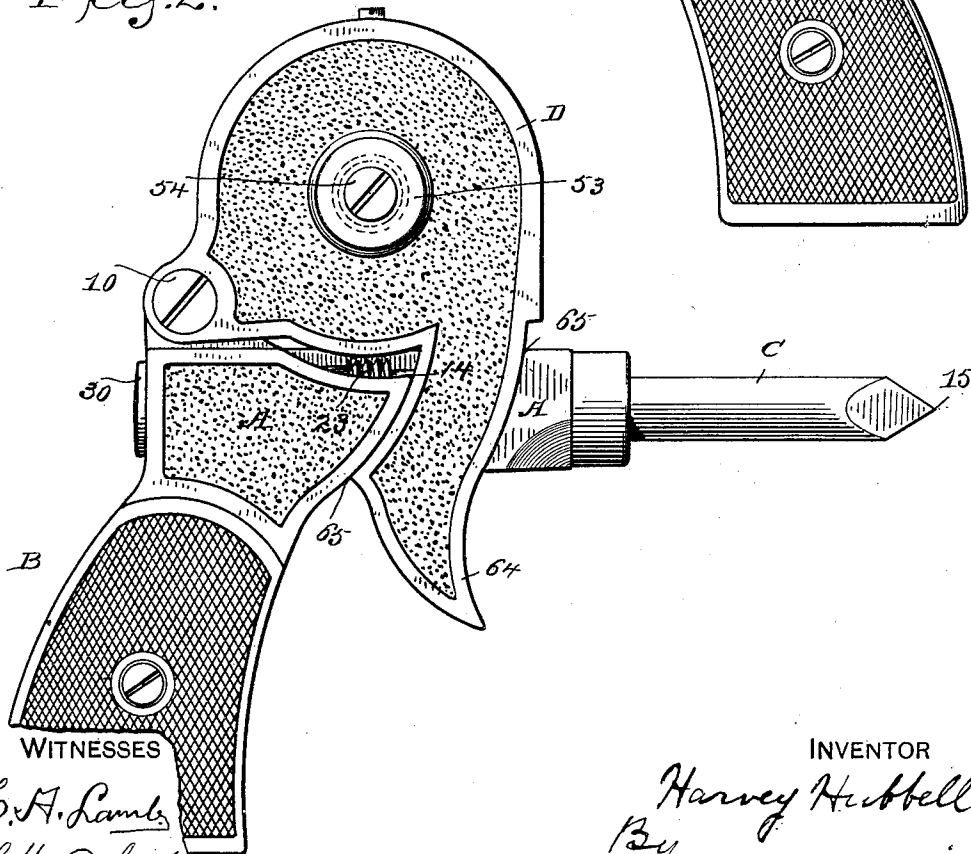


Fig. 2.



WITNESSES

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H. HUBBELL.
SPEED INDICATOR.

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2 Sheets—Sheet 2.

Fig. 3.

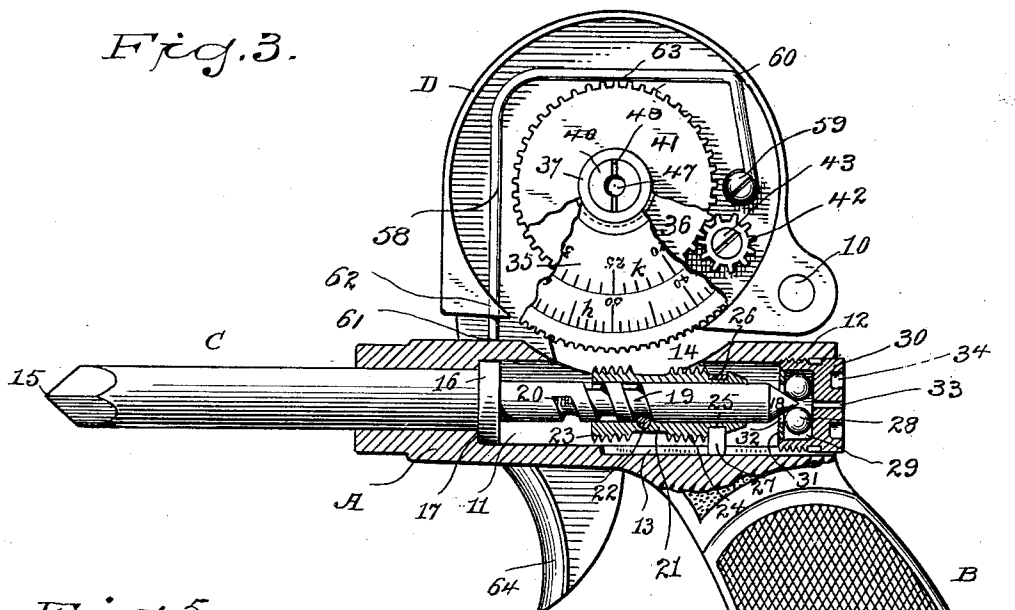


Fig. 5.

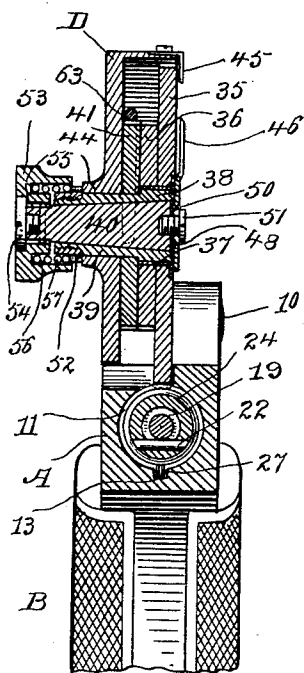
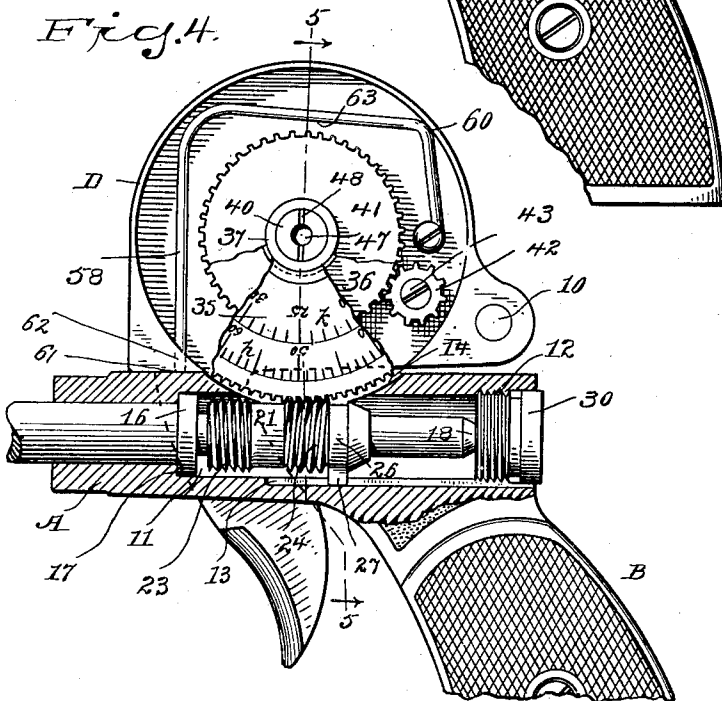


Fig. 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

HARVEY HUBBELL, OF BRIDGEPORT, CONNECTICUT.

SPEED-INDICATOR.

SPECIFICATION forming part of Letters Patent No. 650,465, dated May 29, 1900.

Application filed October 24, 1899. Serial No. 734,621. (No model.)

To all whom it may concern:

Be it known that I, HARVEY HUBBELL, a citizen of the United States, residing at Bridgeport, county of Fairfield, State of Connecticut,

have invented a new and useful Speed-Indicator, of which the following is a specification.

My invention relates to the class of speed-indicators illustrated and described in Patent No. 527,557, granted to W. T. Lintner October 16, 1894, and has for its object to greatly improve their construction and mode of operation, while at the same time the cost of construction shall be lessened rather than increased.

With this end in view I have devised the novel speed-indicator which I will now describe, referring to the accompanying drawings, forming part of this specification, and using reference characters to designate the several parts.

Figures 1 and 2 are opposite side elevations, on an enlarged scale, of my novel speed-indicator complete; Fig. 3, a sectional view, the dial-wheel being at its normal or inoperative position, the double worm-sleeve being at one extreme of its movement on the spindle and parts being broken away in order to clearly illustrate the internal construction of the instrument; Fig. 4, a similar view, the dial-wheel being at its operative position and the double worm-sleeve at the other extreme of its movement; and Fig. 5, a vertical section on the line 5 5 in Fig. 4.

A denotes the body; B, the handle; C, the spindle, and D the dial-case, which is pivoted to the body, as at 10. The body is provided with a central longitudinal opening 11, which is threaded near its rear end, as at 12.

13 denotes a groove in the body parallel with the central opening and extending inward from the rear end thereof, and 14 an opening in the top of the body, which is covered by the dial-case. The spindle is provided with an angular point 15 to adapt it to engage and receive motion from a shaft, with a collar 16 bearing against a shoulder 17 in opening 11, said shoulder receiving the forward thrust of the spindle at its rear end, with a cone-point 18, which has a ball-bearing, presently to be described, and with a spiral groove 19, the ends of which terminate in bearing-surfaces 20, one only of which is shown in the drawings.

21 denotes a double worm-sleeve which is adapted to move longitudinally on the spindle, to which it is keyed by a pin 22, which passes through the sleeve transversely and lies in the spiral groove. The engagement of this pin with either of the bearing-surfaces 20 determines the longitudinal movement of the sleeve on the spindle in that direction and communicates the motion of the spindle to the sleeve, as will be more fully explained.

23 and 24 denote worms on sleeve 21, one of which has a right-hand thread and the other a left-hand thread.

25 denotes a circular groove in sleeve 21, which receives a metallic friction-band 26, the ends 27 of which are bent outward at substantially right angles and engage groove 13 in the body. The bearing for the rear end of the spindle consists of a series of balls 28, which are engaged by cone-point 18 and lie in a socket 29 in a screw-plug 30, which engages thread 12 and closes the rear end of the central opening in the body. The balls are retained in the socket by a plate 31, having a central opening 32, through which the cone-point passes. The screw-plug is shown as provided with an oil-hole 33 and with holes 34 to receive a suitable tool for turning the screw-plug to place. In assembling, the double worm sleeve is passed on to the rear end of the spindle and is locked there by the pin 22, engaging the spiral groove, friction-band 26 is placed in the circular groove, and the spindle is passed into opening 11 from the rear, the ends of the friction-band engaging groove 13 and collar 16 engaging shoulder 17, after which the screw-plug is turned to place to retain the parts in position. It is obvious that a slight movement of the screw-plug in or out will tighten or loosen, as may be required, the bearing for the cone-point at the rear end of the spindle.

35 denotes the dial-wheel, which registers with opening 14 in the top of the body and is provided on its periphery with worm-teeth adapted to engage either of the worms on sleeve 21. Back of the dial-wheel and permanently secured thereto is a gear-wheel 36, having in the present instance forty-nine teeth. This gear-wheel I have shown as secured to the dial-wheel by means of a sleeve 37, upon which both wheels are placed with a drive fit. Sleeve 37 and with it the

dial-wheel and wheel 36 are adapted to turn on a collar 38 on a sleeve 39, which has its bearing in dial-case D, as at 44. This sleeve tapers outward toward the dial-wheel to correspond with a tapering shaft 40, which lies within the sleeve and may be turned independently thereof, as will be more fully explained. Back of gear-wheel 36 and rigidly secured to sleeve 39 is a gear-wheel 41, having in the present instance fifty teeth. 42 denotes an idler-pinion mounted to turn on a stud 43 in the dial-case, and which is engaged by gear-wheels 36 and 41. Owing to the difference in the number of teeth of these gear-wheels it is obvious that during each revolution of gear-wheel 41 gear-wheel 36 will gain one tooth, the purpose of which will presently be fully explained. Upon the outer face of the dial-wheel is a dial provided with concentric sets of graduations, the outer of which is indicated in the drawings by *h* and the inner of which is indicated by *k*.

45 denotes a pointer fixed to the dial-case and extending over the face of the dial, which, in connection with graduations *h*, registers revolutions of the shaft to which the instrument is applied up to one hundred, and 46 denotes a traveling pointer carried by shaft 40, which, in connection with graduations *k* upon the dial-wheel, registers hundreds of revolutions made by the shaft to which the instrument is applied up to fifty, there being thus fifty graduations in the inner set of graduation-marks denoted by *k*, which provides for registering without repeating five thousand revolutions of the shaft to which the instrument is applied. As a means of attachment of pointer 46 to shaft 40 I have shown the stud as provided in its outer end with a threaded hole 47 to receive a screw and a transverse groove 48. The hub 49 of the pointer is provided on its inner side with lugs 50, which may be formed from the metal of the hub and which engage grooves 48, the pointer being retained in place by a screw 51, which engages hole 47. Sleeve 39 is retained in place in its bearing by a flanged nut 52, which engages the threaded outer end of said sleeve and bears against the back of the dial-case. At the end of shaft 40, which extends through the back of the dial-case, is a knob 53, which is removably secured thereto by a screw 54 and is held against rotation on the stud by a cross-pin engaging grooves 55 in the knob. In the inner face of the knob is a recess 56, which receives a coil-spring 57, one end of which bears against the base of the recess, the other against the flange of nut 52. The action of this spring is to press the knob outward and to normally hold tapering shaft 40 closely in engagement with the tapering inner diameter of sleeve 39, so that shaft 40, the pointer, and the knob will turn with gear-wheel 41, which, as already stated, is rigidly secured to the sleeve. Whenever it is desired, however, to set pointer 46 back to zero on the dial, it is simply necessary to push the

knob inward against the power of the spring, which relieves the frictional engagement of shaft 40 with sleeve 39 and enables the operator to rotate the knob, shaft, and pointer independently of the dial-wheel and so place the pointer at zero. The instant the operator releases the knob the spring will draw the shaft inward again and lock it to the sleeve by frictional engagement, so that shaft, sleeve, and dial-wheel may all be rotated with the knob against the power of a brake-spring, presently to be described, and will all be rotated by the spindle, when the pressure of the brake-spring is relieved and the dial-wheel is placed in engagement with one of the worms, as will hereinafter be fully explained. The dial-case is normally held in such a position as to retain the dial-wheel out of engagement with either of the worms on sleeve 21 by means of a spring 58, which is secured to the inner side of the dial-case by a screw 59, is provided with a bearing 60, which engages the inner periphery of the dial-case, and with an end 61, which passes through a guide 62 in the dial-case and bears against the top of the body. In addition to its normal action of holding the dial-case in a raised position and keeping the dial-wheel out of engagement with the worms this spring performs the additional function of serving as a brake for gear-wheel 41, and thus retains said gear-wheel and the dial-wheel, sleeve, shaft, and pointer in any position in which they may be placed, either by rotation of the spindle or by means of the knob. In order to accomplish this result, I provide spring 58 with a braking portion 63, which in the normal position of the parts (see Fig. 3) is caused by the bearing portion of said spring to press firmly upon the periphery of said gear-wheel 41. In order that the dial-wheel may be instantly and conveniently placed in engagement with one of the worms upon sleeve 21, I provide the dial-case with a finger-piece 64, which extends into suitable position to be grasped by the finger of the operator when it is desired to engage the dial-wheel with one of the worms, as will be more fully described. In the drawings I have shown the body *A* as provided with a groove 65, in which the finger-piece slides, the surface of the body, dial-case, and finger-piece being in the same horizontal plane, as clearly shown in Fig. 2. This construction provides a compact and symmetrical instrument, which is always ready for use, it being understood, of course, that the drawing is enlarged from the actual size of the instrument. The action of spring 58 will be readily understood from Figs. 3 and 4. In the former view the action of this spring by means of bearing 60 is to lift the dial-case and parts carried thereby out of operative position and also to throw braking portion 63 into engagement with periphery of gear-wheel 41. Fig. 4 shows the position of the parts when the operator by means of a finger-piece 64 has placed the dial-wheel in operative position against the power of the

spring, end 61 of the spring acting when the dial-case is held in this position to disengage the braking portion from the periphery of gear-wheel 41 and retain it out of engagement therewith.

The operation of the instrument is as follows: The operator places the angular point of the spindle in engagement with the shaft whose speed it is desired to take. It does not make the slightest difference whether the shaft is rotating toward the right or the left, as the instrument will automatically and instantly adjust itself to either direction of rotation and the dial and traveling pointer will always move in the same direction without regard to the direction of the shaft. In Fig. 3 the double worm-sleeve is in the position it assumes when the shaft to which the instrument is applied is turning toward the right. The double worm-sleeve, through the engagement of pin 21 with the spiral groove in the spindle, moves to the extreme right—that is, until pin 22 engages the right bearing-surface 20, when the rotation of the spindle is communicated to the sleeve, the left worm, as seen in Fig. 3, being in position to be engaged by the dial-wheel. Suppose, however, that instead of turning toward the right the shaft whose speed it was desired to take had been turning toward the left. The instant the spindle commenced to rotate the double worm-sleeve would have traveled longitudinally thereon toward the left until pin 22 was in engagement with the left bearing-surface 20, as it is in Fig. 4, which will be perfectly obvious from Fig. 3, although the actual engagement of the pin with bearing-surface 20 does not appear in Fig. 4. When the double worm-sleeve has reached the extreme of its movement toward the left, the right worm on said sleeve will be in position to be engaged by the dial-wheel, it being understood, of course, that one of said worms has a right-hand thread and the other a left-hand thread, so that no matter which worm is in engagement with the dial-wheel the latter will always turn in the same direction. In other words, when the spindle is turning in one direction the action of the spiral groove and pin 22 is to automatically place a worm having a right-hand thread in position to be engaged by the dial-wheel, and when the spindle is turning in the opposite direction the spiral groove and pin 22 automatically place a worm having a left-hand thread in position to be engaged by the dial-wheel. This automatic adjustment of the double worm-sleeve to the direction of rotation of the shaft whose speed it is desired to take takes place so quickly that the time required cannot be considered. Before the operator can possibly have noted a starting-time with his watch the adjustment of the worm-sleeve will have been effected. The instant the seconds-hand of the operator's watch is in suitable position to commence a record the operator, by means of the finger-piece, places the dial-wheel in engagement with one of the

worms upon the double worm-sleeve and the registration of rotations commences. Each rotation of the spindle causes the dial-wheel to travel toward the left one point—that is to say, the first graduation to the right of the zero-mark of the outer set of graduations, which is indicated by h , will register with the fixed pointer 45. At the completion of one hundred revolutions of the spindle the dial-wheel will have made a complete revolution and the zero-mark of the outer set of graduations will again register with fixed pointer 45; but during this revolution of the dial-wheel traveling pointer 46, which has been traveling with the dial-wheel, will have lost one graduation in the inner set of graduation-marks upon the dial-wheel, which is indicated by k , or rather the dial-wheel will have gained one graduation-mark upon the traveling pointer, as will presently be more fully explained. The traveling pointer will now register with the first mark to the right of the zero-mark in the said inner set of graduations, thus registering the first one hundred revolutions, the single revolutions of the second one hundred being now indicated, as before, by means of the fixed pointer and the outer set of graduations. This gain of one graduation on the inner set of graduation-marks which has been made by the dial-wheel over the traveling pointer, although both have been traveling in the same direction, is owing to the fact that intermediate the dial-wheel and the shaft by which the pointer is carried are gear-wheel 36, having forty-nine teeth, which moves with the dial-wheel, and gear-wheel 41, having fifty teeth, which carries the sleeve, shaft, and pointer, both of said gear-wheels meshing with an idler-pinion. It will thus be seen that the fifty teeth of gear-wheel 41 correspond with the fifty graduations of the inner set of graduation-marks k upon the dial-wheel; but as said gear-wheel 41 is driven through the idler-pinion by gear-wheel 36, which moves with the dial-wheel and has but forty-nine teeth, it follows that while gear-wheel 36 and the dial-wheel are making a revolution the pointer will lose one graduation. In other words, as the dial-wheel moves with a gear-wheel having forty-nine teeth and the pointer is carried (intermediately) by a gear-wheel having fifty teeth, but driven by the gear-wheel having forty-nine teeth, the pointer will make forty-nine fiftieths of a revolution while the dial-wheel is making a revolution. Briefly, then, the revolutions of a shaft are registered as follows: Hundreds of revolutions up to fifty, making five thousand revolutions, are indicated by the traveling pointer in connection with the inner set k of graduations upon the dial-wheel, and single revolutions up to one hundred are indicated by the fixed pointer in connection with the outer set h of graduations upon the dial-wheel. Suppose that the shaft whose speed is being taken is making three thousand five hundred and fifty revolutions per minute. Upon remov-

ing the instrument from the shaft and releasing the finger-piece one minute after the engagement of the dial-wheel with one of the worms the traveling pointer will be half-way
 5 between the thirty-fifth and thirty-sixth graduation-marks of the inner set k , and the numeral "50" of the outer set of graduations h will register with the fixed pointer. The dial-wheel and the traveling pointer may both be
 10 set back at zero instantly and without any backward running of the instrument. To return the traveling pointer to the zero-mark of the inner set of graduations, the operator simply presses knob 73 inward against spring 57,
 15 which releases tapering shaft 40 from frictional contact with the tapering sleeve and leaves the shaft, and with it the traveling pointer, free to be turned in either direction. Having set the traveling pointer at zero, the
 20 operator releases the knob, and the spring acts to instantly place the tapering shaft in frictional engagement with the tapering sleeve again, so that the sleeve, shaft, pointer, and dial-wheel may all be rotated by the knob to
 25 place the zero-mark of the outer set of graduations in position to register with the fixed pointer, it being understood, of course, that while the bearing portion 63 of spring 58 bears upon the periphery of gear-wheel 41 with sufficient
 30 pressure to retain the gear-wheels, dial-wheel, sleeve, shaft, and pointer in any position in which they may be placed under all the conditions of use it is perfectly easy to turn said parts by means of the knob against
 35 the power of the spring to set the parts at any desired position.

Having thus described my invention, I claim—

1. In a device of the character described
 40 the combination with a spindle having a spiral groove, of a sleeve having right and left worms adapted to move longitudinally on said spindle and keyed thereto by a pin lying in the spiral groove, substantially as shown, for
 45 the purpose specified.

2. In a device of the character described the combination with a spindle having a spiral groove terminating at each end in a bearing-surface, of a sleeve having right and left
 50 worms and a pin which passes through the sleeve and lies in the groove and is adapted to engage either of the bearing-surfaces so that when the spindle commences to rotate the sleeve will move longitudinally thereon
 55 until the pin engages one of the bearing-surfaces when the spindle will carry the sleeve.

3. In a device of the character described the combination with a spindle having a spiral groove terminating at each end in a bearing-surface, of a sleeve having right and left
 60 worms, a pin which passes through the sleeve and lies in the groove and is adapted to engage either of the bearing-surfaces and a dial-wheel having peripheral worm-teeth adapted
 65 to engage either of the worms, so that when the spindle is rotated in one direction the left worm will be in position to be engaged by the

dial-wheel and when the spindle is rotated in the opposite direction the right worm will be in position to be engaged by the dial-wheel, the
 70 latter turning always in the same direction no matter in which direction the spindle is turning.

4. In a device of the character described the combination with a body having a longitudinal groove and a spindle having a spiral
 75 groove and a circular groove, of a sleeve having right and left worms, a pin passing through the sleeve and lying in the spiral groove and a metallic friction-band lying in the circular
 80 groove and having outwardly-turned ends adapted to slide in the groove in the body when the sleeve moves longitudinally on the spindle.

5. In a device of the character described
 85 the combination with the body having a groove 65, the spindle and the double worm-sleeve, of a dial-wheel adapted to engage the worm-sleeve, a dial-case pivoted to the body by which the dial-wheel is carried and which is provided
 90 with a finger-piece 64 lying in the groove in the body and a spring which normally holds the dial-case in such position that the dial-wheel is out of engagement with the worm-sleeve.

6. In a device of the character described the combination with the body, the spindle and the double worm-sleeve, of a dial-wheel adapted to engage the worm-sleeve, a dial-case in which the dial-wheel is pivoted and
 100 which is itself pivoted to the body and is provided with an integral finger-piece, and a spring which normally holds the dial-case raised so that the dial-wheel will not engage the worm-sleeve.

7. In a device of the character described the combination with the dial-wheel having a set k of graduations, of a gear-wheel 36 carried by the dial-wheel and having one less
 110 tooth than the number of graduations in set k , a gear-wheel 41 having a number of teeth corresponding to the number of graduations in set k , a pointer carried by gear-wheel 41, an idler-pinion engaged by both of said gear-wheels, and means for imparting motion primarily to the dial-wheel and through the gear-wheel 36 to the idler-pinion and to the gear-wheel 41 and the pointer, whereby when the dial-wheel has completed a revolution the pointer traveling in the same direction will
 120 have lost one graduation in the set k upon the dial-wheel.

8. In a device of the character described the combination with a stationary pointer, the dial-wheel having a set h of graduations
 125 which in connection with said pointer registers rotations and another set k of graduations, of a traveling pointer which in connection with set k of graduations registers hundreds of rotations, and mechanism for rotating said
 130 pointer in the same direction as the dial-wheel and at a speed that will cause the traveling pointer to lose one graduation in set k during each rotation of the dial-wheel, so that

in use the hundreds of rotations are registered by set k of graduations and the traveling pointer, and rotations up to one hundred are registered by set h of graduations and the fixed pointer.

9. In a device of the character described the combination with the dial-wheel having a set of fifty graduations, as at k , of a gear-wheel 36 carried by the dial-wheel and having forty-nine teeth, a gear-wheel 41 having fifty teeth, a pointer carried by gear-wheel 41, an idler-pinion engaged by both of said gear-wheels and means for imparting motion primarily to the dial-wheel and through the gear-wheel 36 to the idler-pinion and to the gear-wheel 41 and the pointer, whereby the pointer will make forty-nine fiftieths of a rotation during each rotation of the dial-wheel, substantially as shown, for the purpose specified.

10. In a device of the character described the combination with tapering shaft 40 and a sleeve whose internal diameter tapers to correspond with the shaft, of the dial-wheel mounted to turn on said sleeve, a pointer carried by said shaft and a spring which normally holds the shaft in frictional engagement with the sleeve so that when the shaft is rotated the sleeve and dial-wheel will be carried thereby and when the shaft is pushed inward against the spring the shaft and the sleeve will be disengaged and the shaft and pointer may be rotated independently.

11. In a device of the character described the combination with the dial-case, tapering sleeve 40, and a sleeve whose internal diameter tapers to correspond with the shaft and which is itself mounted to turn in the dial-case, of the dial-wheel mounted to turn on the sleeve, a pointer carried by the shaft, a sliding non-rotating knob at the outer end of the shaft and a spring acting to press the knob outward and to hold the shaft in frictional engagement with the sleeve so that all of said parts may normally be rotated together in the dial-case and when the knob is pushed inward against the spring the knob, shaft and pointer may be rotated independently.

12. In a device of the character described the combination with the body, the dial-case pivoted thereto, a tapering shaft 40, a sleeve whose internal diameter tapers to correspond with the shaft and which is itself mounted to turn in the dial-case and a spring acting to hold the shaft and sleeve in frictional engagement, of the dial-wheel and gear-wheel 36 which are mounted to turn together on the sleeve, gear-wheel 41 fixed to said sleeve, an idler-pinion meshing with both gear-wheels and a spring 58 whose normal action is to hold the dial-case raised and to bear upon gear-wheel 41 and serve as a brake therefor so that said gear-wheel and the shaft, pointer and dial-wheel will remain in any position in which they may be placed.

13. In a device of the character described the combination with the body, the dial-case

pivoted thereto, a tapering shaft 40, a sleeve whose internal diameter tapers to correspond with the shaft and which is itself mounted to turn in the dial-case and a spring acting to hold the sleeve and the shaft in frictional engagement, of the dial-wheel and gear-wheel 36 which are mounted to turn together on the sleeve, gear-wheel 41 fixed to said sleeve, an idler-pinion meshing with both gear-wheels, and a spring 58 which is secured to the dial-case is provided with a bearing-surface 60 which engages the dial-case to hold the latter in a raised position, a braking portion 63 which normally engages gear-wheel 41 and retains the parts in any position in which they are placed and whose end 61 bears upon the body so that when the dial-case is lowered against the power of the spring braking portion 63 will be removed from gear-wheel 41.

14. In a device of the character described the combination with the spindle, tapering shaft 40, a sleeve whose internal diameter tapers to correspond with the shaft and a spring acting to hold the shaft and sleeve in frictional engagement, of the dial-wheel having sets h and k of graduations, connections intermediate the dial-wheel and the spindle, gear-wheel 36 which is fixed to the dial-wheel, a gear-wheel 41 fixed to the sleeve, an idler-pinion meshing with both gear-wheels, a pointer carried by the shaft which in connection with set k of graduations registers hundreds of rotations of the spindle and a fixed pointer which in connection with set h of graduations registers single rotations of the spindle, said parts being adapted to be turned in either direction to cause the zero-mark of set h of graduations to register with the fixed pointer and by pressing the shaft inward, the shaft and pointer being free to be turned independently, to cause the latter to register with the zero-mark of set k of graduations.

15. In a device of the character described the combination with a spindle having a spiral groove terminating at each end in a bearing-surface, a sleeve having right and left worms and a pin which passes through the sleeve and lies in the groove and is adapted to engage either of the bearing-surfaces, of a dial-wheel having a set k of graduations, a pointer adapted to move in the same direction as the dial-wheel and driving mechanism intermediate the pointer and the dial-wheel which causes the pointer to lose one graduation in set k during each rotation of the dial-wheel, so that when the spindle is applied to a shaft the worm-sleeve will automatically adjust itself to the direction of rotation and when the dial-wheel is placed in engagement with the worm-sleeve it will always be turned in the same direction.

In testimony whereof I affix my signature in presence of two witnesses.

HARVEY HUBBELL.

Witnesses:

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S. W. ATHERTON.