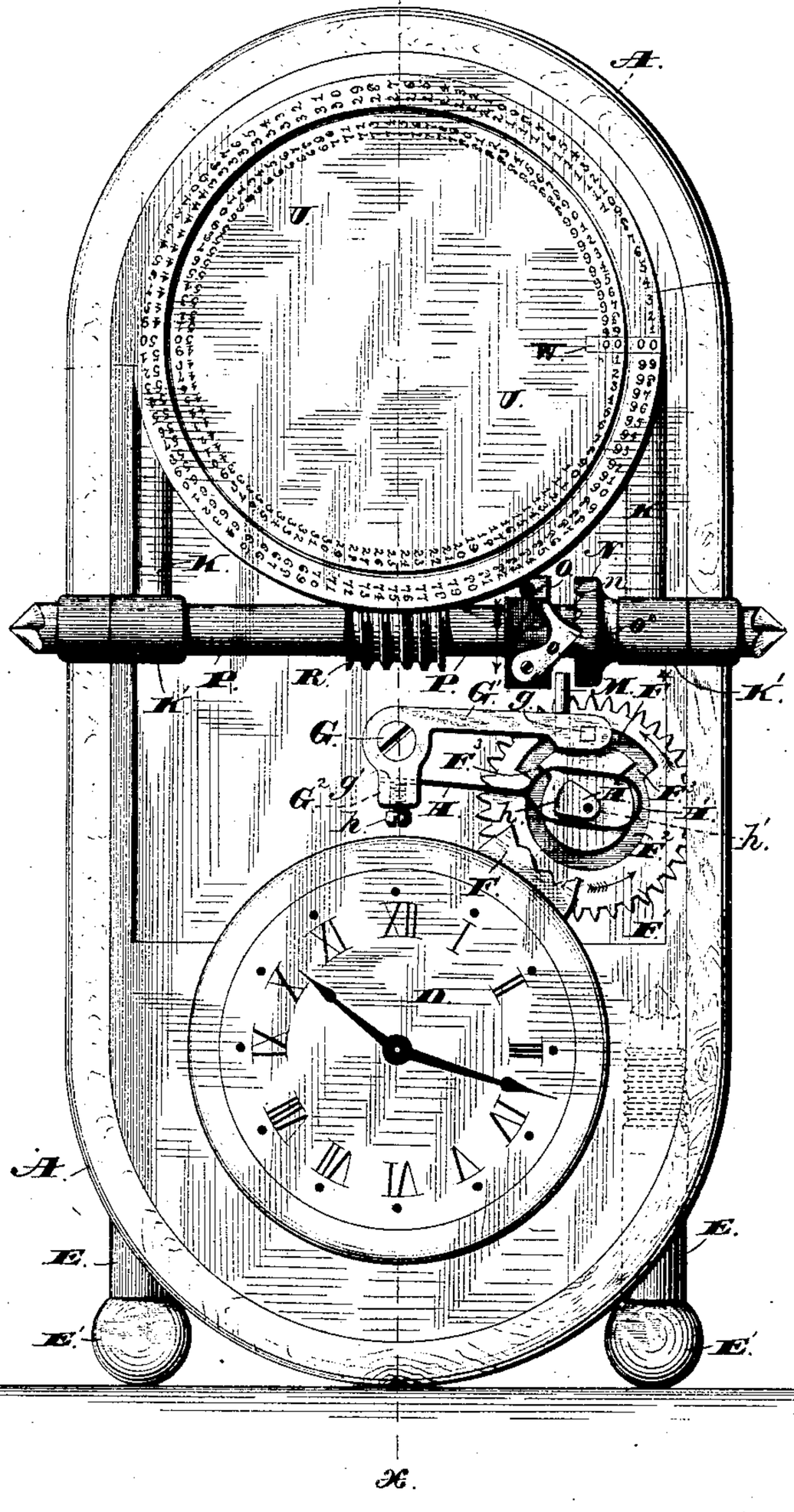
(No Model.) 2 Sheets—Sheet 1.

O. SMITH.

SPEED INDICATOR FOR SHAFTING.

No. 310,092. Patented Dec. 30, 1884.

Fig. 1.



Witnesses:
Jas. E. Hutchinson.
Henry L. Hazard.

Inventor.
Oberlin Smith
by Prindle and Russell
Attorneys.

(No Model.) 2 Sheets—Sheet 2.

O. SMITH.

SPEED INDICATOR FOR SHAFTING.

No. 310,092. Patented Dec. 30, 1884.

Fig. 2.

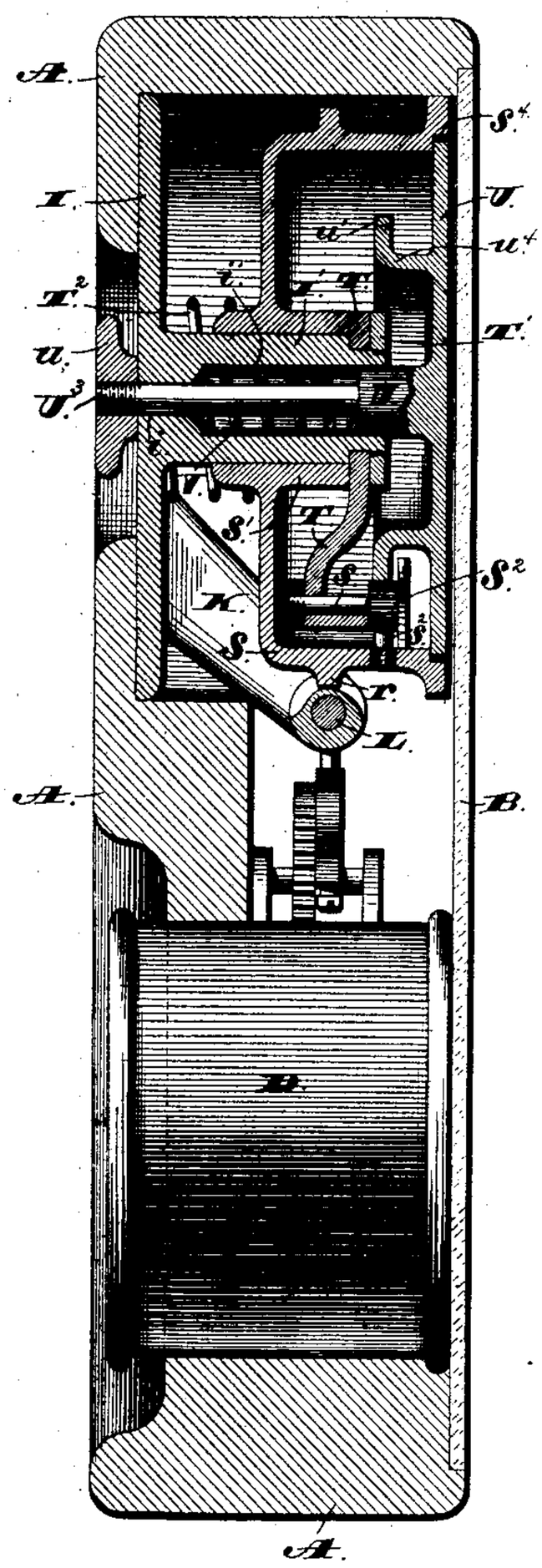


Fig. 3.

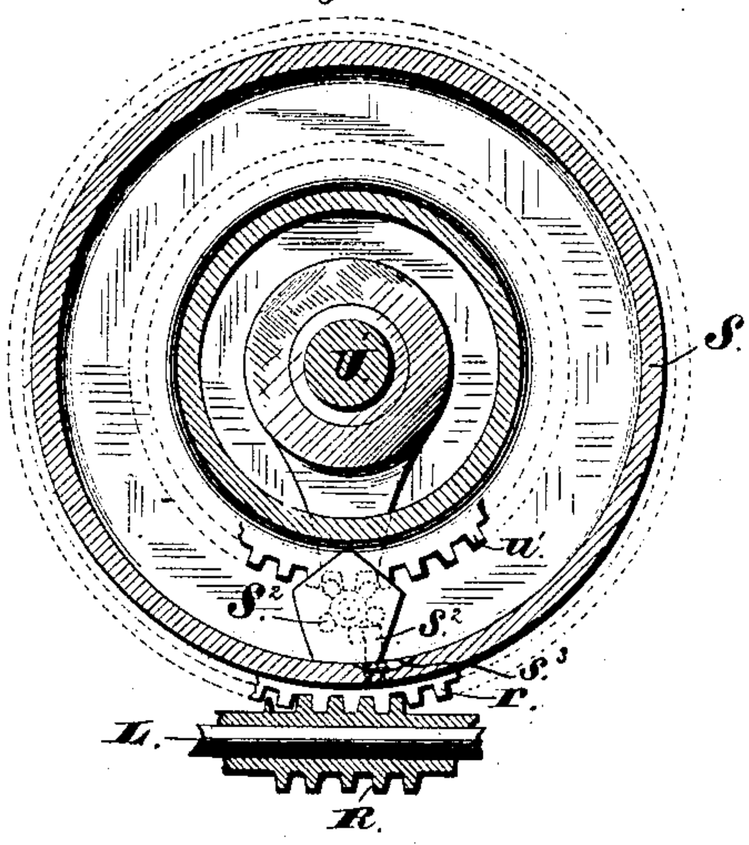
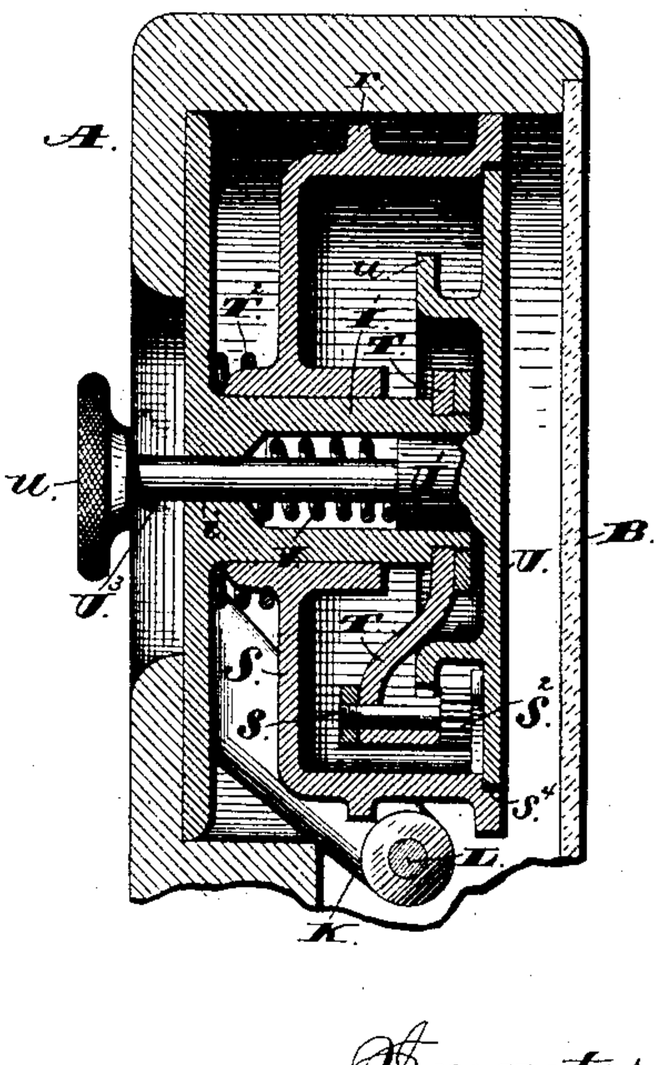


Fig. 4.



Witnesses:
Jas. E. Hutchinson.
Henry C. Hazard.

Inventor.
Oberlin Smith
by Prindle and Russell
Attorneys

UNITED STATES PATENT OFFICE.

OBERLIN SMITH, OF BRIDGETON, NEW JERSEY.

SPEED-INDICATOR FOR SHAFTING.

SPECIFICATION forming part of Letters Patent No. 310,092, dated December 30, 1884.

Application filed June 11, 1884. (No model.)

To all whom it may concern:

Be it known that I, OBERLIN SMITH, of Bridgeton, in the county of Cumberland, and in the State of New Jersey, have invented certain new and useful Improvements in Speed-Indicators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 shows a view in front elevation of my indicator; Fig. 2, a vertical central section on line *x x* of Fig. 1; Fig. 3, a detail sectional front view showing the registering mechanism; and Fig. 4, a detail sectional view on line *x x* of Fig. 1, showing the registering mechanism with the parts in position, as when being set back to zero.

Letters of like name and kind refer to like parts in each of the figures.

The object of my invention is to provide an improvement in speed-indicators; and to this end it consists in the construction, arrangement, and combination of parts, as hereinafter set forth.

In the drawings, A designates the case, which can be made of wood, metal, or any desired material. I prefer, however, to make it of wood, as indicated in the drawings. It is rounded at its upper and lower ends, and in its front face a plate of glass, B, is set, through which can be seen the registering and time mechanism contained within the case, as hereinafter described. In the lower part of the casing is a cylindrical recess, in which is contained and held the clock-movement D, of the ordinary lever-escapement form. This movement has the usual hour-dial and hands, so that it can, when the indicating mechanism is not being operated, be used as an ordinary clock to show the time of day. Two center punches, E E, to be used in indenting the shaft to be tested for the proper engagement therewith of the end of the spindle of the indicator are, when not being used, screwed into the lower end of the case on each side of the center of the case end, so that their heads E′ E′ will act as feet to keep said case upright.

The clock-movement has the common form of permanent winding and setting means, not requiring a detached key or any opening or removal of the clock-case.

Journaled in the standards F F, within the indicator-case, is the gear-wheel F′, connected with the time mechanism of the clock, so that it will revolve once in a minute and a half.

I have not shown any particular form of gearing for so driving the wheel F′, as such connection can be made in several ways, as will be clearly understood by any one familiar with clock and watch movements. On the front face or side of this wheel is the concentric groove F^2, extending two-thirds around the wheel. From the ends of this extend outward the short radial grooves F^3 F^3, connecting with the ends of the concentric groove F^4, which extends through one-third of a circle. Above the clock-movement is a horizontal forwardly-extending pivot pin or screw, G, upon which is pivoted a lever, G′, which extends over and parallel with the face of wheel F′ in such position that a pin, *g*, at or near its end engages the groove F^2 F^3 F^4 in the wheel-face. The lever G′ has an arm, G^2, extending downward below its pivotal point. This arm is provided with an opening or slot, *g′*, into which is inserted the end of the spring H. A set-screw, *h*, serves to clamp this end in the slot and hold it firmly, with the body or main portion of the spring extending out below and parallel to the main end of the lever. The outer free end of the spring is looped at H′, within which loop rotates, and with which engages the cam H^2, having the concentric surfaces *h h′*. If desired, the outer end of the loop H′ can be removed so as to form a fork. This cam is so arranged on the wheel-arbor that its portion of greatest radius will, as the wheel rotates, bear upon the lower or upper side of the loop in the spring as the radial portions of the groove in the wheel come successively into line with the pin on the lever.

With the parts situated as in Fig. 1, if the wheel F′ continues to revolve in the direction indicated by the arrow, the eccentric will obviously bear down upon the lower side of loop H′, so as to bend the spring downward. When, then, the radial groove connecting with the end of the groove F^4 comes into line with the pin on the lever, the latter will be thrown down quickly by the force of the spring, so that the pin will be in position to enter and

engage the inner concentric groove, F^2, as the wheel continues to revolve. When the end of groove F^2 is reached as the wheel revolves through two-thirds of a revolution, as it does in one minute, the eccentric will bear against the upper side of the loop, and the spring will be bent upward, so that when the radial groove comes into line with the pin *g*, the lever will be thrown quickly up again into its first position, with its pin on a line with the outer concentric groove, F^1. The looped spring can be made of a single spring-arm with a loop at its end, or of a single spring strip bent to form the loop, and having its parallel ends brought together and fastened in any desirable way to form a single spring-arm.

In the upper part of the case A is the registering mechanism, which is supported upon or from a metal back plate, I. This plate is, as shown, fixed to the inner back side of the case, and is preferably round or disk-shaped. At its center it is formed with the hollow cylindrical forwardly-extending stud I', having the small opening or bore *i* at its rear end extending also through the plate I and the enlarged bore *i'*. From the side of the plate there extend downward and forward the arms K K', provided at their lower ends with sleeves K' K', standing in line with each other. Their axial line is in the same vertical plane with but above the lever G'. In these sleeves is journaled the spindle-shaft L, sharpened at both ends. Usually in speed-indicators the points of the spindle are made polygonal in transverse section, so that angles or sharp edges shall be formed which will engage the sides of the indentation made in the end of the shaft whose speed is to be measured.

Instead of making the points so that they are regular polygons in section, I shape the points, as shown in the drawings, so that the engaging portions will be ratchet-shaped. One side of each angle or edge is made radial or abrupt. I find that with the points so shaped the engagement with the indentation in the shaft is more positive and certain, and requires less pressure to insure it. The abrupt face of the angle or engaging ridge is of course on the side opposite to that in which the shaft and spindle revolve.

Projecting upward from the lever G' is the pin M, of such length and so situated that its upper end stands between the fixed sleeve N on the spindle and the short cylinder or disk O on the sleeve P, which is journaled to turn loosely on the shaft, but is prevented from having any longitudinal movement thereon. The face of the sleeve N which is toward the disk O is, as shown, formed with teeth or serrations *n n*.

On the cylinder or disk O is pivoted the pawl *o*, which is forced over by spring *o'*, so that with its sharp or angular portion o^2 it normally engages the teeth on the sleeve N. On each side of the engaging-tooth or angular portion the pawl is, as shown, formed with an inclined or sloping side. When the lever G' is up in the position shown in Fig. 1, with the pin M between the sleeve N and disk O, as the spindle-shaft and sleeve P, with its disk, revolve in the direction indicated by the arrow, the inclined side of the pawl will come into contact with the pin, and said pawl will be swung back, so that it will pass out of engagement with the teeth on sleeve N. The spindle and its attached sleeve will then continue revolving, but the sleeve P and disk O will be stopped and held stationary. As soon as the lever G' drops, or is thrown down, as described hereinbefore, the pin M being withdrawn the pawl will fly into engagement with the serrations on the revolving sleeve N, so that the sleeve P will be rotated again with the shaft. Upon said sleeve P, at its middle point, is a worm, R, which engages the teeth *r r* on the side of the dish-shaped wheel S, journaled upon the stud I'. This wheel is, as shown, formed with the hub S', rotating and capable of longitudinal movement on the stud. The outward or forward movement of said hub is limited by the fixed arm T, which is held onto the forward end of the stud by the nut T', screwed thereon, as shown. A spring, T^2, surrounding the stud and inner end of the wheel-hub, is compressed between the wheel and plate I, and serves to force the wheel forward on the stud, so that the forward end of the wheel-hub will normally bear against the arm T. The teeth *r r* on the wheel will then be in engagement with the worm R. The front rim of the wheel S is provided with a series of numbered graduations, one hundred in number, the place of the one-hundred mark being taken by two ciphers, as usual in registering devices. The teeth *r r* are one hundred in number, so that the wheel will make one revolution for every one hundred revolutions of the worm R. The lower end of the fixed arm T is turned at a right angle to stand parallel with the inner face of the lower side of the wheel S. The horizontal shaft or arbor *s* of pinion S' is journaled in the arm T near its lower end. This pinion is preferably provided with five teeth, as shown, adapted to be engaged successively by the pin s^2, extending inward from the dish-wheel S. Every time the latter wheel revolves then this pin will engage one of the teeth on the pinion and turn said pinion through the distance of one tooth.

To keep the pinion from accidental turning before the pin engages it, there is attached to its front face a pentagonal disk or plate, one of whose sides is always in engagement with the inner face of the dish-wheel side.

To allow the pinion with its attached plate to turn when the pin s^2 engages one of the pinion-teeth, the inner face of the wheel is cut away or recessed, as shown at s^3.

The inner edge of the flat graduated and numbered rim of the dish-wheel S is, as shown, formed with the annular recess or rabbet s^4, within which fits loosely the edge of the disk

U, which is, like the rim of wheel S, graduated and numbered from 1 to 100, but in the opposite direction, as shown in Fig. 1. The graduations, as shown, are made radial on both the wheel and disk.

On the rear side of the disk U is a cylindrical stud U′, which projects into and is journaled in the end of the hollow stud I′. From the inner end of this stud U′ there extends the shank or shaft U^3, which, at its rear end where it extends through the plate I, is provided with a thumb wheel or head, *u*, by which it can be pulled back and turned, as desired. Upon its rear side the disk U is formed with the annular flange u^4, upon which are the teeth *u*′, one hundred in number, meshing with pinion S′ when the parts are in their normal position, as in Fig. 1. A spiral spring, V, surrounds the shank U^3 within the enlarged portion of the bore of stud I′, and, pressing at one end against the bottom of such enlarged portion, and at the other against the end of the stud U′, keeps the said stud and disk U forced forward into the position shown in Fig. 1, such forward movement being limited by the thumb nut or piece *u* bearing against the plate I. If desired, a metal or opaque plate of other material may be used to close the front of the case instead of the glass plate described. Openings will then be provided to enable the clock-face and the numbers on the register-disk and wheel to be seen. Where a glass plate is used, an index mark or point is put on the case at the point marked W. Where an opaque plate is used, a slot or opening is made at that point so that the numbers on the wheel-rim and disk which come to that point may be seen.

The operation of my indicator is as follows: An indentation is made by one of the center punches in the end of the shaft whose speed is to be tested. One of the pointed and toothed ends of the spindle-shaft is then pressed into the indentation, so that the spindle will rotate with the shaft in the direction indicated by the arrow in Fig. 1. As the spindle is pointed on both ends, either end can be applied to the shaft, so that the spindle can be caused to rotate in the proper direction, whichever way the shaft tested runs. The clock-movement being in operation, the minute-and-a-half grooved wheel will rotate in the direction indicated by the arrow in Fig. 1. When the radial short groove at the end of the outer eccentric groove comes in line with the pin on the lever, said lever will, by the stress of its spring, as hereinbefore described, be thrown quickly down, so that the pawl-operating pin on it will be disengaged from the pawl, which will immediately fly into engagement with the serrations on the rotating sleeve or collar fixed on the spindle. The sleeve carrying the worm will then, by this, be caused to rotate with the spindle. The lever will, by the engagement of the pin on its side, with the inner concentric groove on the minute-and-a-half wheel, be kept down, so that the pawl-shifting pin is out of the path of the pawl until the wheel has revolved through two-thirds of a revolution, which it obviously does in one minute, when, by the lever-spring, which has been meantime put under stress, as described, the lever will be thrown quickly up again, its side pin passing up the short radial groove to the outer concentric groove. The pawl-pin will then come in the path of the pawl, and, striking its inclined side, will swing it back out of engagement with the serrated collar on the spindle. The worm-carrying sleeve will thus be brought at once to a stop.

The number of revolutions of the sleeve and worm during the one minute while the lever is held down by the engagement of its pin with the groove on the wheel will be indicated by the registering mechanism, which is capable of registering any number of revolutions up to ten thousand. Each revolution of the worm with the spindle-shaft turns the dish-wheel one tooth and brings a new number opposite the reading-point. Each successive complete revolution of the dish-wheel, which indicates one hundred revolutions of the worm, will bring the pin on its inner side into engagement with one of the teeth of the pinion s^2, and thereby cause the pinion to rotate and turn the disk-wheel U through the distance of one of the graduations on its face. The disk-wheel U will obviously be turned in a direction opposite to that of the rotation of the wheel S, and the graduation-numbers therefore run in direction opposite to that of those on wheel S.

With the construction and operation of parts as indicated above the entire number of the revolutions of the worm and spindle-shaft will be indicated by the figures on the disk and wheel, which are brought into a radial line, with the reading-point at the side of the registering mechanism.

The numbers on the rim of the dish-wheel show the units and tens figures, and the numbers on the disk the hundreds and thousands, so that the whole number of revolutions of the shaft during one minute can be read off directly without calculation. The half-minute delay, during which the pawl is disengaged from the revolving serrated collar, gives plenty of time to read the indication, and, if desired, to set the registering-wheels back to zero. This setting back is accomplished by grasping the thumb-piece or milled head on the shank U^3 and pulling it back. This will pull the disk U backward against the stress of spring V, and, as the disk comes into contact at its edge with the bottom of the annular rabbet in the dish-wheel, said wheel will also be pulled back against the stress of the spring between it and the back supporting-plate. Such backing movement of the wheel S carries its gear-teeth out of engagement with the worm, so that the wheel is free to be turned backward. By rotation of the thumb-piece and shank the disk is then turned back, and the dish-wheel S will be rotated with it, because of the friction between said wheel and disk, un-

til the pin on the inner face of the wheel strikes the horizontal arm at the lower end of the fixed arm T. This it will do when the zero-point on the wheel comes in line with the reading-point described above. The backward rotation of the disk is then continued independently of the wheel until its zero-point is also brought to the reading-point. The thumb-piece or head is then let go, and the springs return the registering-wheel and disk to their normal positions, as indicated in Figs. 1 and 2. If desired, an electric connection may be provided between the clock and indicating mechanism to throw the latter into and out of operation at the desired time.

Having thus fully set forth the nature of my invention, what I claim as new is—

1. In a speed-indicator, the rotary spindle adapted to be rotated by the shaft whose speed is to be measured, registering mechanism, connecting means between it and the spindle adapted to be thrown into and out of engagement, and means for operating such connecting means automatically, to throw the registering mechanism into connection with the spindle and disconnect it therefrom at fixed periods of time, all in combination, substantially as and for the purpose described.

2. In a speed-indicator, the registering mechanism, the revolving spindle, suitable clutch mechanism between the spindle and registering mechanism, and means for operating the clutch to connect and disconnect the spindle and register automatically at certain intervals of time, all combined substantially as and for the purpose described.

3. In a speed-indicator, in combination with the registering mechanism and the revolving spindle, a spring-clutch device adapted to normally connect the two, and a suitable clutch-shifting device operated by a time-movement to allow the clutch to remain in action during a fixed period of time to throw the clutch out of action, and then, at the end of another fixed period of time, to throw it into action again, substantially as shown and described.

4. In a speed-indicator, in combination with the rotary spindle having the serrated collar fixed thereon, the loose sleeve on the spindle carrying the worm for driving the registering mechanism, the collar on the sleeve carrying the spring-operated pawl, adapted to engage the serrations on the collar fixed on the spindle, the lever carrying a pin, and means for moving said lever to bring the pin into and out of the track of the pawl at fixed intervals of time, to disengage it from or to allow it to engage with the spindle-collar, substantially as and for the purpose described.

5. In a speed-indicator, the combination of the spindle, serrated collar fixed thereon, sleeve journaled on the spindle and carrying a worm for turning the registering mechanism, and a spring-pawl engaging the serrations on spindle-collar, the pivoted lever having the looped spring, a pin on the lever adapted to be brought into and out of the path of the pawl as the lever is raised and lowered, the wheel rotated in a minute and a half by suitable time mechanism, and provided with the concentric groove extending two-thirds around its face, and the outer concentric groove connected at its ends with the other by radial grooves, a pin on the lever engaging the grooves, and an eccentric on the wheel-shaft engaging the spring-loop, substantially as and for the purpose described.

6. In a speed-indicator, in combination with the clock mechanism, the wheel driven therefrom so as to revolve in a minute and a half, the inner concentric groove extending around two-thirds of its face, the short radial grooves extending out from the ends thereof and connecting with the outer concentric groove extending over one-third of the wheel-face, the pivoted lever provided with a pin engaging the groove in the wheel, and clutch-shifting mechanism, a clutch device connecting the rotary spindle with the registering devices, adapted to be thrown out of action by the shifting mechanism on the lever, when said lever is raised and its pin is in the outer groove on the wheel; and a spring for throwing the lever quickly up and down, so that its pin passes from one concentric groove to the other, substantially as and for the purpose described.

7. In a speed-indicator, the combination of the spindle L, serrated collar or sleeve N, fixed thereon, the sleeve P, journaled on the spindle and provided with a collar or disk, O, carrying pivoted spring-pawl *o*, adapted to engage serrations on collar N, the worm on sleeve P, meshing with teeth of register-wheel, the lever G′, pin M, looped spring H, minute-and-a-half wheel F′, driven by suitable clock mechanism, and provided on its face with grooves F^2 F^3 F^4, engaged by pin on the side of the lever, and the eccentric on the shaft or arbor of the wheel H engaging the loop in the spring, substantially as and for the purpose described.

8. In combination with the fixed pivot-stud carrying on its forward end a fixed arm in which is journaled a pinion, the dish-shaped wheel with graduated rim journaled on the stud and held forward thereon by a spring, so that the teeth on its outer side mesh with the driving-worm, and the projection on its inner side will strike the pinion-teeth as the wheel revolves, the numbered disk revolving within the annular rabbet on the inner edge of the dish-wheel rim, provided on its rear side with an annular flange having teeth meshing with those of the pinion, a stud journaled in the end of the frame-stud, a sliding shank connected therewith and passing back through the fixed stud and plate, and provided on its rear end with a thumb piece or head, and a spring surrounding the shank and pressing the disk normally outward and forward, so that its teeth engage the pinion, substantially as described.

9. The dish-shaped register-wheel, having teeth on its outer side meshing with a driving-worm, and a pin or projection on its inner side engaging a pinion carried on a fixed portion of the frame, in combination with a register-disk fitting at its edge within a rabbet in the dish-wheel rim, and on its back provided with a flange having gear-teeth meshing with those of the pinion, means for pulling back the disk and the dish-wheel against which it bears, so that the teeth of the disk and wheel will pass out of engagement with the pinion and worm, respectively, and for rotating the disk, and, by frictional contact with it, the wheel, and springs adapted to keep the disk and wheel normally forward into position, so that their teeth engage the pinion and worm, substantially as shown and described.

10. A case adapted for a speed-indicator, having one or more of its feet formed of a center punch inserted in a recess in the casing, substantially as shown and described.

11. A case adapted for a speed-indicator, having one or more of its feet formed of a center punch having a screw-threaded portion and screwed into a recess in the casing, substantially as and for the purpose described.

In testimony that I claim the foregoing I have hereunto set my hand this 26th day of May, A. D. 1884.

OBERLIN SMITH.

Witnesses:
JAMES J. REEVES,
WALTER H. BACON.