No. 648,629. Patented May 1, 1900.

E. E. NEAL.

CYCLOMETER.

(Application filed May 16, 1898.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

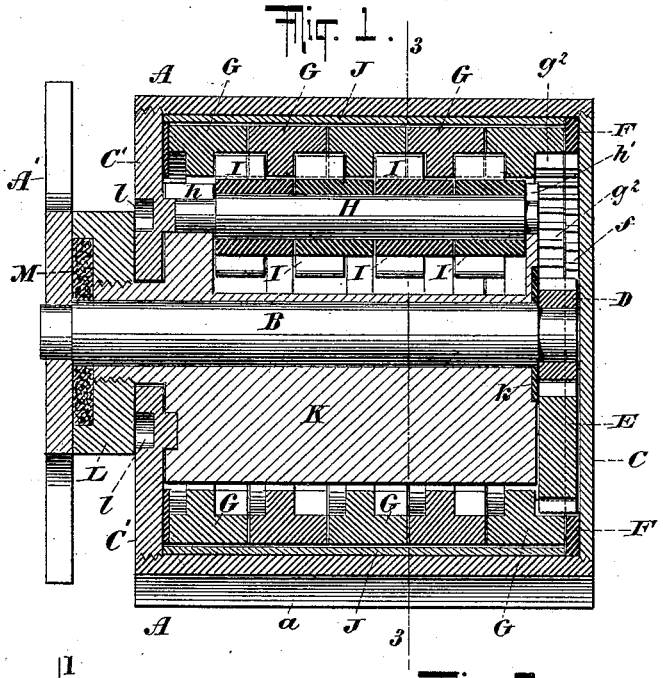


Fig. 2.

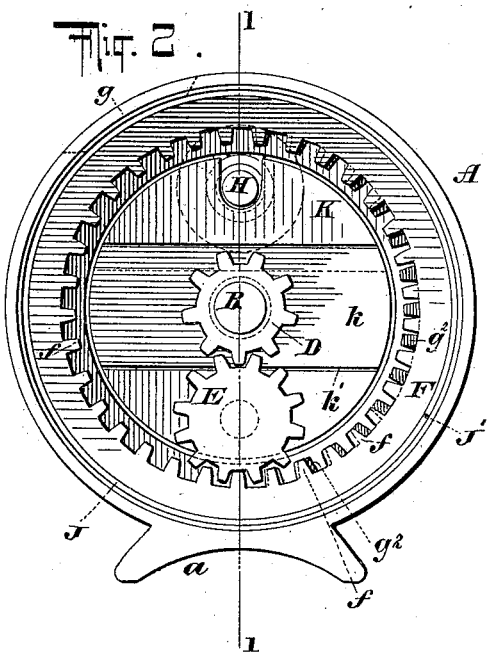
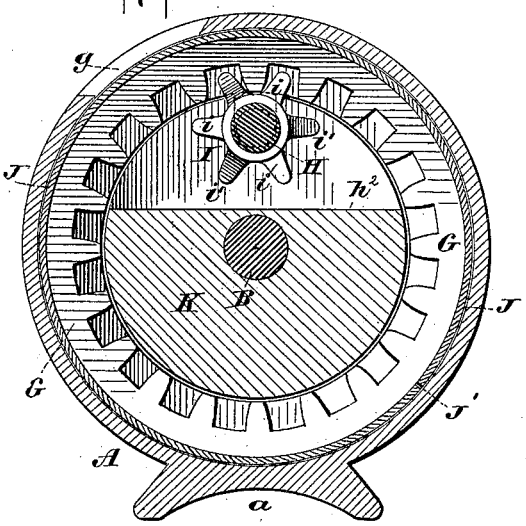


Fig. 3.



WITNESSES:

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No. 648,629. Patented May 1, 1900.

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CYCLOMETER.

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(No Model.) 4 Sheets—Sheet 2.

Fig. 4.

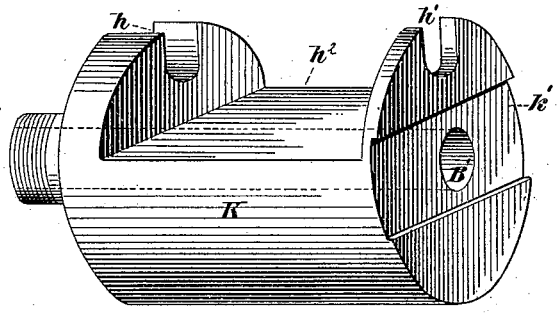


Fig. 5.

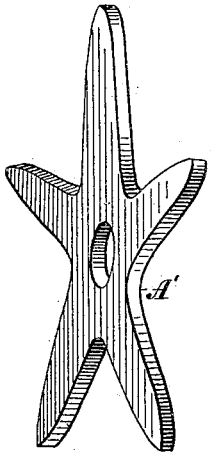


Fig. 6.

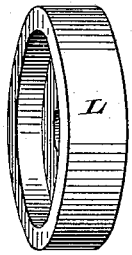


Fig. 7.

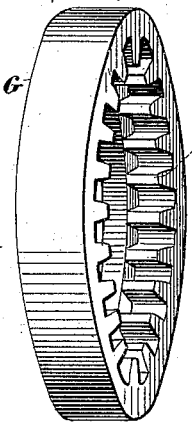


Fig. 8.

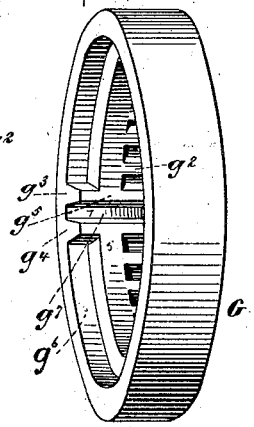


Fig. 9.

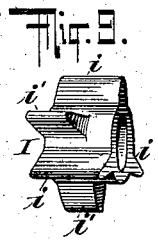
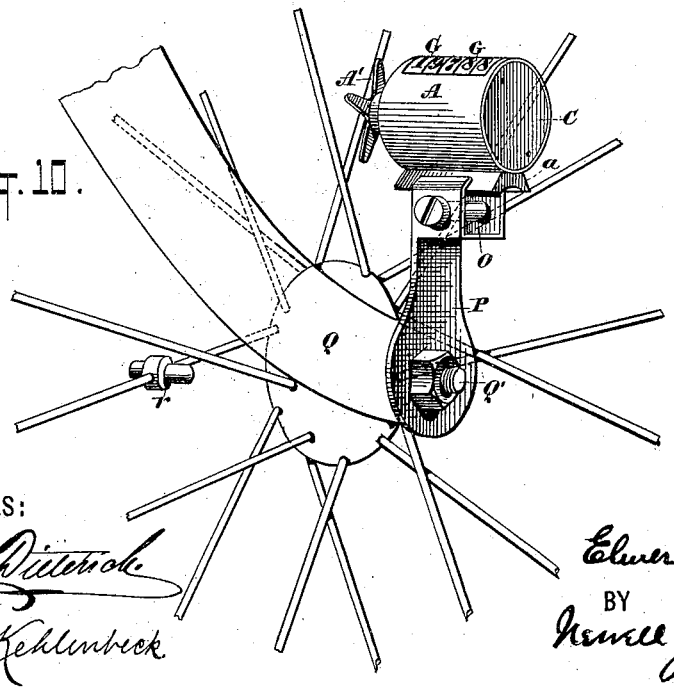


Fig. 10.



WITNESSES:

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Fig. 11.

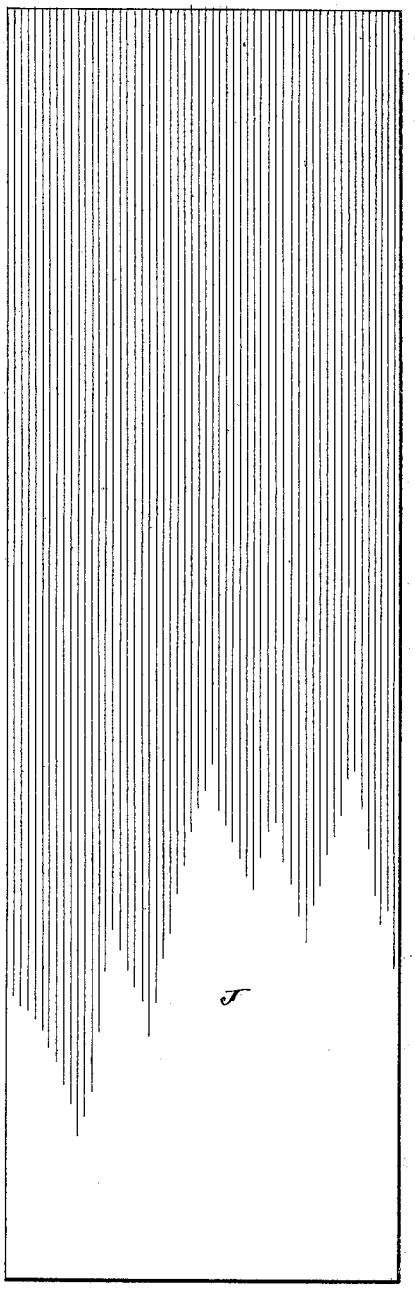


Fig. 13.

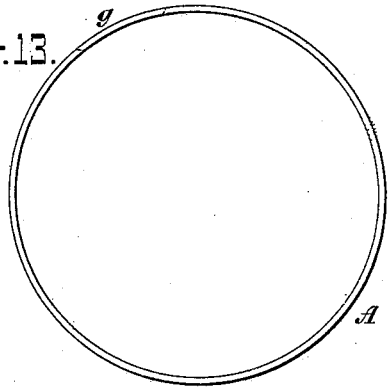


Fig. 12.

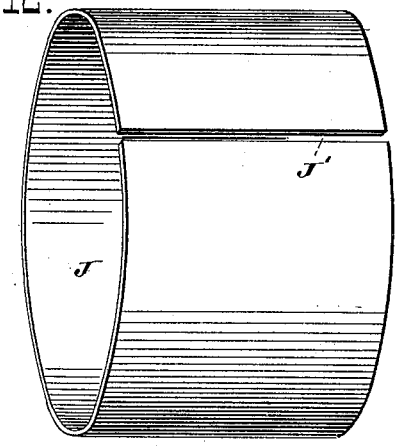
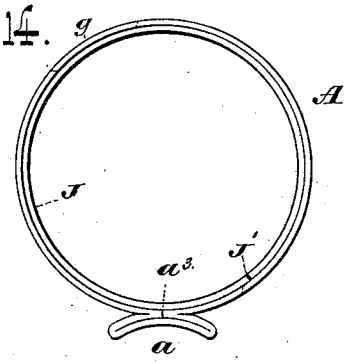


Fig. 14.



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No. 648,629. Patented May 1, 1900.

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CYCLOMETER.

(Application filed May 16, 1898.)

(No Model.) 4 Sheets—Sheet 4.

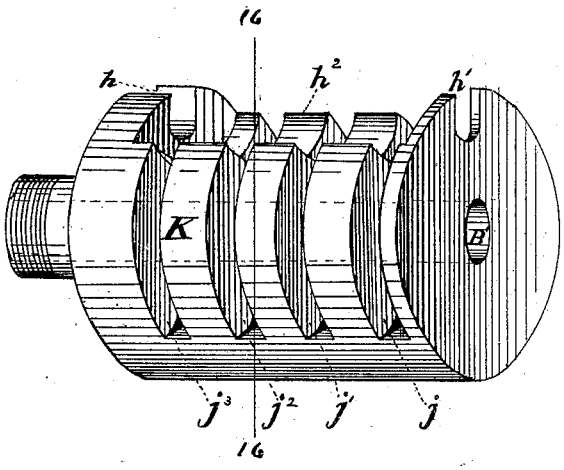

Fig. 15.

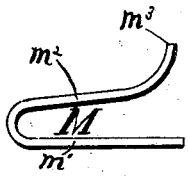

Fig. 17.

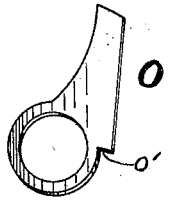

Fig. 18.

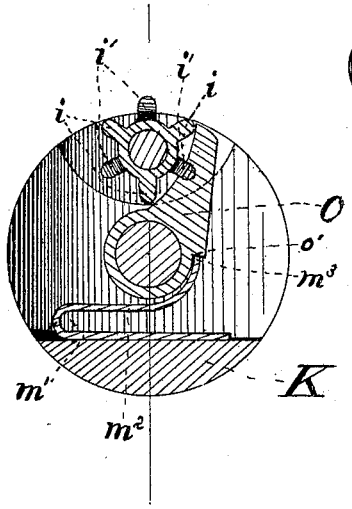

Fig. 16.

WITNESSES:

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BY

Merrill & Jennings

ATTORNEYS

UNITED STATES PATENT OFFICE.

ELMER E. NEAL, OF BRISTOL, CONNECTICUT, ASSIGNOR TO THE NEW DEPARTURE BELL COMPANY, OF SAME PLACE.

CYCLOMETER.

SPECIFICATION forming part of Letters Patent No. 648,629, dated May 1, 1900.

Application filed May 16, 1898. Serial No. 680,771. (No model.)

To all whom it may concern:

Be it known that I, ELMER E. NEAL, of Bristol, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Cyclometers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates generally to improvements in devices for registering and numbering and counting distances, weights, &c.; but it more particularly relates to improvements in what are called "cyclometers" for use in registering the distances traveled by wheeled vehicles.

The drawings illustrate a particular form of embodiment of the invention which is adapted especially for use in connection with velocipedes or bicycles to count, register, and indicate the number of miles and parts of a mile which the bicycle travels.

The development of the art and the tremendous increase in the use of bicycles, together with the accompanying desire for a distance-measuring instrument in connection therewith, have led to the creation of a demand for the manufacture and distribution of cyclometers possessed of certain requisites which it has been attempted by this invention to satisfy.

To this end this invention consists in the production of a cyclometer small in size, of a construction compact and simple, so arranged as to exclude dust and dirt from the operating parts, positive in action, accurate in results, and very simple and inexpensive in manufacture.

A cyclometer of the form which it is attempted to illustrate must be carried upon the frame or axle of the bicycle contiguous to the revolving bicycle-wheel and in such relation thereto as that a trip secured to some part of the revolving wheel may strike a star-wheel located at one end of the cyclometer. The star-wheel is fixed upon the end of a shaft which extends through the cyclometer, and thus forms the actuating mechanism. The case for the cyclometer is a small cylinder, preferably of metal, and is provided about the surface of its internal circumference with a strip of transparent membrane, which is fitted to the case in such a way that its ends butt against each other. It is of such width that the heads of the cyclometer butt against the edges of said membrane, and thus is formed an air-tight interior. The mechanism consists of index-rings with appropriate figures upon their external circumference. They are provided with internal gears on one side. On the other side of each is a groove continuous about the circumference, with the exception of two interior teeth placed in the path of the groove. Within the index-rings is provided means to support a shaft carrying a series of pinions, said pinions upon one side engaging the internal gear of the corresponding index-ring and on the other side having alternate teeth cut away, so as to be locked from turning by engagement with the internal plane of the adjacent ring. By means of the peculiar reducing mechanism hereinafter to be described the first index-ring is caused to revolve slowly and continuously and to indicate the fractions of a mile traveled by the machine. Through the broad and narrow teeth of the pinions each index-ring is caused to revolve one-tenth of its circumference upon the complete revolution of the index-ring before it.

The form of improved construction illustrated in the drawings will be fully described hereinafter with reference thereto.

Reference is made to the accompanying drawings and the letters marked thereon, the same letters designating the same parts or features wherever they occur.

Figure 1 is a longitudinal sectional view of the cyclometer, taken on the line 1 1 of Fig. 2, a small part on the upper right corner showing the gears in elevation. Fig. 2 is an end view of the cyclometer with the head removed and represents the actuating-pinion, gears, and spring. Fig. 3 is a view of the cyclometer in cross-section on the line 3 3 of Fig. 1. Fig. 4 is a perspective view of a core constituting a means to support the shaft carrying the pinions. Fig. 5 is a perspective view of the star-wheel. Fig. 6 is a perspective view of the chambered nut. Fig. 7 is a perspective view of one of the index-rings

viewed from the posterior side of the cyclometer. Fig. 8 is a similar view of an index-ring viewed from the anterior side of the cyclometer. Fig. 9 is a perspective view of one of the index-ring-actuating pinions. Fig. 10 is a perspective view of the cyclometer in position upon the bicycle-wheel. Fig. 11 represents the sheet of transparent membrane. Fig. 12 is a perspective view of the transparent membrane prepared for insertion in the case. Fig. 13 is a view in cross-section of the metal tubing out of which is formed the case. Fig. 14 is a view in cross-section of the case after having been drawn into form with the membrane inserted therein. It is of course manifest that the scale of the drawings of said Figs. 11 to 14 is not entirely uniform with the scale of the other figures, some of the figures having been enlarged to show the parts more plainly. Fig. 15 is a perspective view of the core prepared to receive means for positioning the pinions. Fig. 16 is a sectional view of the core on line 16 16 of Fig. 15. Fig. 17 is a side elevation of one of the springs within the core. Fig. 18 is a side elevation of one of the latchets.

A is a cyclometer-case made, preferably, as above stated, of metal and, as represented in the drawings, cylindrical in form.

C and C′ are heads which inclose the ends of the cyclometer and protect the parts from the intrusion of air and dust.

J is a membrane (transparent, of course) formed into shape and forced into the interior of the case, with the ends butting tightly together, as shown plainly in Fig. 3 at J′. The membrane, which I find can conveniently be made of celluloid, is cut to such a size as that the heads or end-inclosing means of the cyclometer-case butt tightly against its edges around the circumference. In this way a perfectly-tight lining is formed for the interior of the cyclometer, forming a smooth internal circumferential surface and having joints perfectly tight where the ends come together and where the edges meet the heads or means for inclosing the ends of the cyclometer.

K is the body part of an interiorly-grooved core, illustrated plainly in Fig. 4 as a means for supporting the shaft H. The upper portion is milled out, as here illustrated, leaving a plane surface, which is marked h^2. The shaft B provides a means for actuation between the star-wheel A′, fixed upon its anterior end, and the mechanism for operating the index-rings. A chambered nut or washer L is screwed upon a projection of the core between the star-wheel and cyclometer-head. In the chamber of the nut is placed a packing M, of felt, leather, or other substance, to protect the interior from the intrusion of dust. The core has no support at its posterior end, as illustrated in the drawings, but is held in position against the head C′ by the washer and is held against rotation by upsetting the metal in the head, as at l.

k' in Fig. 4 represents a recess across the end of the core to accommodate a spring k, which is forced into place by screwing a pinion D on the posterior end of the shaft B. In this way the internal supporting-core is maintained in position and the star-wheel A and chambered nut L are held yieldingly against the anterior end of the cyclometer, so that there is sufficient friction in the turning of the star-wheel A′ to prevent accidental displacement.

E is an intermediate gear, preferably loose, which meshes on one side with the teeth of the pinion D. This gear E may be fixed to a plate at the end of the core by a pin; but it is illustrated and it is preferably used loose, as shown.

F is a ring fixed in the case within the head C and provided with teeth (marked f) forming an internal fixed gear. Next this internal fixed gear is an index-ring G, which is loose and has its bearing exteriorly upon the inner circumference of the membrane heretofore described or interiorly upon the circumferential surface of the core, as may be preferred. Other similar index-rings are provided, the number of which depends upon the number of figures necessary to mark the distance desired to be recorded by the cyclometer. In the drawings are shown five of these index-rings. Each index-ring is provided upon the right or posteriorly to the actuating means with an internal gear provided with teeth, (marked g^2.). In the embodiment shown in the drawings each posterior gear has twenty teeth, excepting the first, which, as is hereinafter explained, is provided with one less tooth than the fixed gear F. Upon the left of each index-ring, as shown in Fig. 8, is formed a groove, except where it is broken by the projection of two teeth g^3 and g^4. The last or anterior ring can of course be left entirely plain.

H is a shaft rotating in bearings at its ends formed by the slots in the core at h h'. As represented in the drawings and for the denominations to be used in this cyclometer, this shaft carries four pinions I. (Represented more in detail in Fig. 9.) Each pinion has each alternative tooth i' cut off on the posterior side, as shown in Fig. 9 of the drawings. The shaft carrying the pinions and the pinions rest inside the circumference of the index-rings. Posteriorly the cut-away portion of the pinion I engages or rests upon the internal plane surface g^5 of each index-ring, and therefore the two teeth i each side of the cut-away tooth i' resting against the plane surface of the interior circumference of the ring form a locking arrangement by which the pinion is held from turning as the posterior index-ring is rotated upon the core, the index-ring resting upon the pinion or slipping upon it without turning the pinion upon the shaft H. Anteriorly both the teeth i and i' of the pinion are in mesh with the gear on the posterior side of the index-ring G, so that whenever the pinion is permitted to rotate it

will turn the next anterior index-ring i, and the uncut portion of a leaf i' is not only in mesh with the adjacent gear, but a portion of it rests in the groove g^6. If preferred, the groove g^6 may be formed in the posterior face of the anterior index-ring, in which case the groove will be omitted from the anterior side of the posterior ring, and instead the two teeth g^3 and g^4 may project from the face of the posterior ring into the path of the groove. This is a detail of manufacture depending upon the quality of metal used and the convenience of the maker. The requisite is that the broad leaves shall lock on the internal plane surface of the posterior ring and that the narrow leaves shall have opportunity to ride between the rings until they come in contact with the tooth g^3 or g^4.

The thickness of the intermediate gear E is sufficient, as shown in Fig. 1, to engage at once both the teeth on the fixed gear F and the teeth on the interior gear of the index-ring G next to the fixed gear F. These gears upon F and G are differential—that is, in this illustration the gear on G has one less tooth than the gear on F.

The cyclometer must of course be provided with some means of attachment to the bicycle adjacent to the wheel, and a mode of adjustably attaching it thereto is shown in Fig. 10. r is a trip fixed to a spoke of the bicycle-wheel. P O is a clamping device attached to the axle and fixed there securely by the nut Q'. a is a rib, upon the outside of which are fastened the clamps by means of a screw in such a way that the cyclometer can be affixed at a point nearer to or farther away from the wheel within the limit of the length of the cyclometer.

The operation of the device is as follows: As the bicycle-wheel rotates the trip r will strike the points of the star-wheel A' and move the same by one point at each rotation. Thus the shaft B is caused to rotate, and with it the pinion D. This pinion engaging with the intermediate pinion E causes it to revolve upon the teeth of the fixed gear F. As before remarked, the thickness of the pinion E is sufficient to permit it to engage not only the teeth of the fixed gear F, but also the teeth of the gear formed on the posterior side of the adjacent ring G. The pinion E will therefore revolve upon the gears of both F and G. Upon making one revolution upon the fixed gear F the index-ring G will be caused to move forward in rotation one tooth, because it has one tooth less than the fixed gear F. This rotation will also be continuous, it will be observed, because of the relationship of the teeth of the gear F to the teeth of the gear G. (Illustrated in the posterior upper part of the sectional view shown in Fig. 1.) This rotation, therefore, of the first index-ring G will be very slow and as it rotates the first pinion I upon the shaft H will continue stationary because locked from movement by the contact of the teeth i with the internal plane surface g^5 of the first index-ring. The pinion is constructed so that the sheaves or teeth i extend the full width of the pinion. The sheaves i' are cut off and so arranged in reference to the location of the index-rings that while the teeth i rest upon the interior plane surface of the posterior index-ring posteriorly and engage the teeth of the gear anteriorly the teeth i' travel upon the surface of a groove g^6 between the rings through part of their width posteriorly and also engage the teeth of the gear on the next internal index-ring anteriorly. When a posterior index-ring, however, shall have rotated so that a tooth i' shall come in contact with a tooth g^4 or g^3 in the path of the groove g^6, the pinion will be caused to turn, this being allowed by the tooth i dropping into the depression g^7. Therefore until the index-ring shall have moved around so that a tooth i of the pinion shall have been introduced into the depression g^7 between the teeth g^4 g^3, so as to permit the pinion I to rotate past the depression in the gear g^7 formed by the teeth g^3 and g^4, the pinion is locked against turning, and with it the series of index-rings and pinions anterior thereto. The depression g^7 of course extends entirely across the width of the index-ring. As the pinion is thus permitted and caused to rotate, its teeth being in engagement with the teeth g^2 of the internal gear of the second index-ring, said second index-ring will be caused to rotate through two teeth or, as the teeth are arranged in the cyclometer illustrated in the drawings, through one-tenth of its circumference. When the second index-ring shall have thus been caused to complete one rotation, the next pinion will rotate in the same way as heretofore described of the first pinion and cause the third index-ring to rotate through one-tenth of its circumference, and this will be true of each succeeding index-ring and pinion. Each index-ring is provided upon its circumference at regular intervals with figures representing fractional notation. These figures can be seen through the transparent membrane which forms an interior lining to the cyclometer-case, as heretofore described, through a rectangular aperture in said case. (Indicated in Fig. 3 by the letter g.) As shown in the drawings, the first posterior index-ring will indicate fractions of a mile. The second index-ring will represent units. The third index-ring will represent tens. The fourth index-ring will represent hundreds, and the fifth index-ring will represent thousands. The cyclometer, therefore, will register distances traveled up to 9,999.9 miles. A cyclometer can of course be made upon this principle to record any greater or less number of miles by the addition or exclusion of a corresponding number of index-rings.

The above is a description of the mechanism and construction of a cyclometer which is simple in construction and accurate in operation. On account of the positive character of the actuation through the pinions and

bearings if it is desirable, as it undoubtedly is in operation, to have the parts work smoothly and evenly and if it is desired to have a perfect alinement of the figures shown in the opening g it is found useful to employ devices to secure the smooth working of the parts and an accurate alinement of the figures, which is illustrated in Figs. 15 and 16. The core K is slotted or channeled at $j\,j'\,j^2\,j^3$. A peculiarly-formed spring m is laid in each of these slots, as shown in Fig. 16. The spring m, as herein illustrated, is a piece of spring-wire flattened and bent back upon itself, so that the straight part m' will lie flat upon the base of the channel. The upper part m^2 is curved at the end, so that its end m^3 will butt against the notch o' in the latchet. A latchet O is inserted in each slot and held in position by being threaded onto the shaft B. This latchet is held in place against the pinion across the edges of two of the teeth $i\,i$ on the posterior portions, where the pinion i' has been cut away, by the resiliency of the spring, which forces it into such position by being placed in contact with it against a notch at o'. The spring needs to have sufficient strength to press the latchet against the teeth $i\,i$ and force the pinion, and consequently the index-rings, in engagement with the pinion firmly into a position which will consequently be a constant one. The construction of parts herein described necessarily presupposes a certain slight looseness and play of the parts, which need not, however, be very great. It will be noticed that each spring acts independently, but that all coact to keep the index-rings in a position so that the figures thereon will be in a straight and constant line, resuming their position after the index-rings have been rotated by the pinions. The result of this use of the latchets and springs will be a smooth working of the pinions upon the rotation of the index-rings and a maintenance of the pinions, and consequently the index-rings against which they press and with which they engage, in a constant position, and consequently a perfect alinement of the figures, indicating the distance traveled.

It is manifest that there may be sundry modifications of the construction illustrated in the drawings described above which may be introduced without changing the principle of the mode of construction and operation which may be preferred by different makers or which may be necessary to adapt the instrument for use under different conditions. It will be seen, however, that the cyclometer herein illustrated and described is exceedingly simple in construction, positive in action, and certain in result.

I claim as my invention—

1. A cyclometer comprising in its construction a cylindrical case, said case being provided with a protected slot or opening to permit a view of the interior; an actuating-shaft journaled in the heads or ends of the case provided with a pinion upon the end opposite the application of force; a core supported upon said shaft loosely and prevented from turning by a connection with a head of the case, said core having a recess within its ends on the side adjacent to the opening in the case, said ends being slotted; a series of index-rings supported upon said core between it and the case; a shaft bearing pinions loosely mounted thereupon supported in bearings formed by the aforesaid slots in the ends of the core, said pinions being arranged in combination with said index-rings so as to transmit motion from one index-ring to the next in order; a fixed internal gear adjacent to the first index-ring and an intermediate gear meshing on one side with the pinion of the actuating-shaft and on the other with the internal gear of both the fixed gear and internal gear of the first index-ring differential to that of said fixed gear, and means to actuate said shaft, substantially as described.

2. A cyclometer comprising in its construction a cylindrical case with an opening along its length and provided with a rib by which it may be adjustably attached through a clamp to the axle of the bicycle, a transparent membrane formed into shape and forced into the interior of the cylindrical case so that the ends butt tightly against each other, heads to inclose the end of the cylinder to butt tightly against the edges of said membrane, an actuating, reducing, and transmitting mechanism consisting of a shaft caused to rotate by means of a trip on the wheel of a bicycle coming in contact with the star-wheel fixed to the anterior end of said shaft, a pinion on the posterior end of said shaft, a fixed ring provided with an internal gear, a first index-ring loose in the case adjacent to said fixed ring, provided with an internal gear having a different number of teeth from the fixed gear, an intermediate gear meshing on one side with the pinion and on the other side at once with the gears on the fixed ring and the gear on the loose index-ring, a series of index-rings each provided posteriorly with an internal gear, and anteriorly with a groove in whose path is a spur-gear, a series of pinions upon a shaft supported within the circumference of said index-rings, each alternate tooth being cut away posteriorly, so that posteriorly the pinion is locked against motion by contact with the internal plane of the index-ring and permitted to turn by engagement of a broad tooth with a recess in the index-ring only upon the spur-gear coming in contact with a short tooth, anteriorly the teeth of said pinion being in engagement with the posterior gear of the index-ring next in order, means to provide against accidental movement of the star-wheel, all so arranged and combined that with each revolution of the wheel the shaft may be actuated, a slow continuous movement be given to the first index-ring, and a fixed intermittent motion to each index-ring successively, substantially as described.

3. The combination with a cyclometer-case

consisting of a metal cylinder with an opening along its length, a membrane formed into shape and forced to fit closely the interior of said cylinder with ends butting tightly together, the said membrane having a transparent portion through which the indications can be read, heads inclosing the ends of the cylinder butting closely against the edges of the membrane, of index-rings, an actuating-shaft, and reducing and transmitting mechanism to actuate the index-rings as herein set forth.

4. A cyclometer comprising in its construction a cylindrical case, suitable actuating means, a recessed core provided with a series of channels, a series of index-rings surrounding said core, a series of pinions upon a shaft supported by said core within, and in operative connection with, the series of index-rings, reducing mechanism intermediate of the operating means and said series of index-rings and the pinions, and means for positioning said index-rings consisting of latchets loosely mounted upon the actuating-shaft in the channels of the cores and springs substantially as described within said channels to press the latchets against the pinions, so that they in turning shall maintain the index-rings in a constant position and thus provide for a perfect arrangement of the figures and smooth working of the parts, all substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ELMER E. NEAL.

Witnesses:
ROGER S. NEWELL,
JOHN J. JENNINGS.