No. 855,676. PATENTED JUNE 4, 1907.

J. K. STEWART.

SPEEDOMETER.

APPLICATION FILED OCT. 22, 1906.

Fig. 1

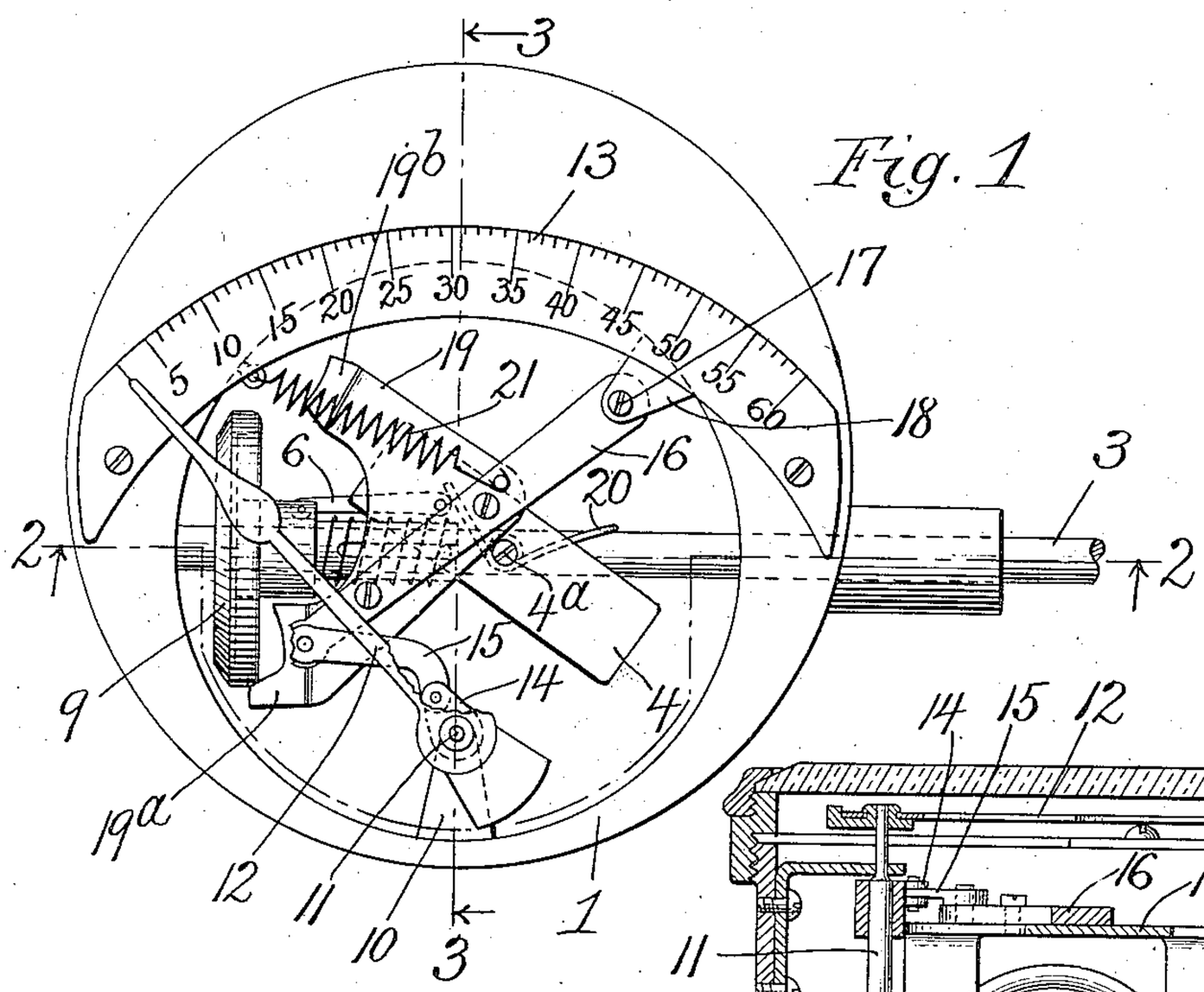


Fig. 3

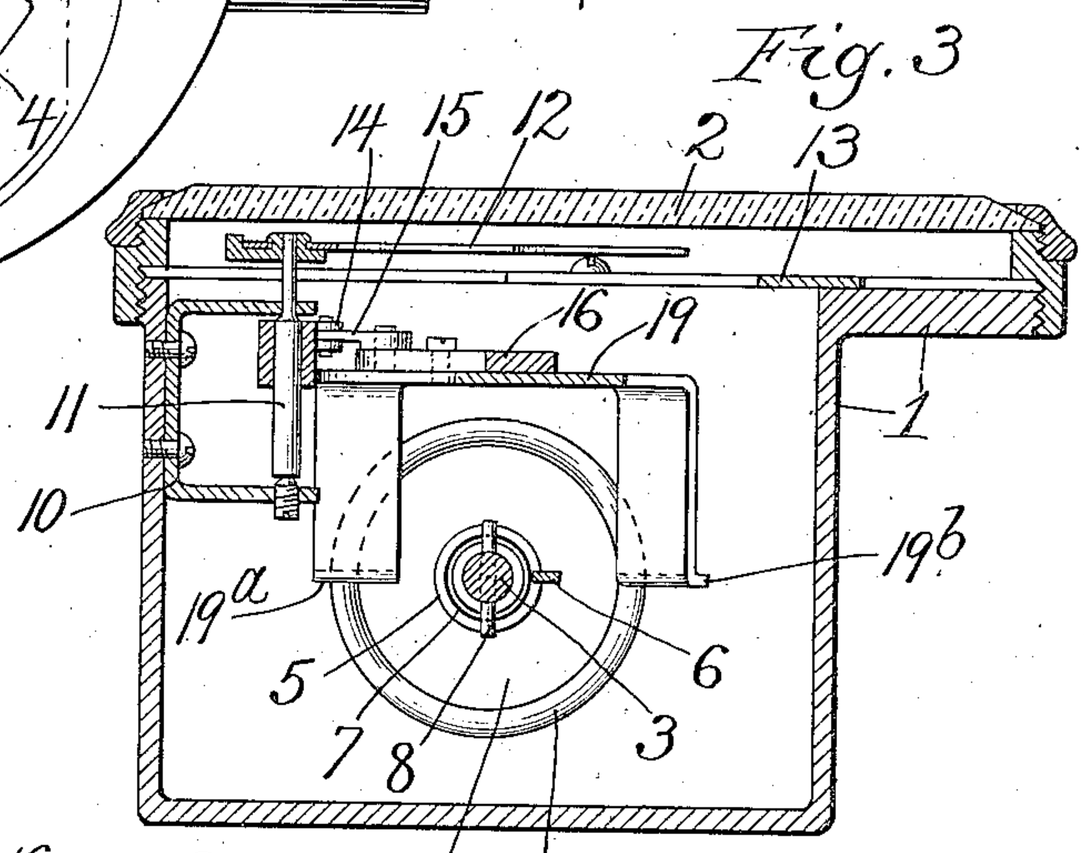


Fig. 2.

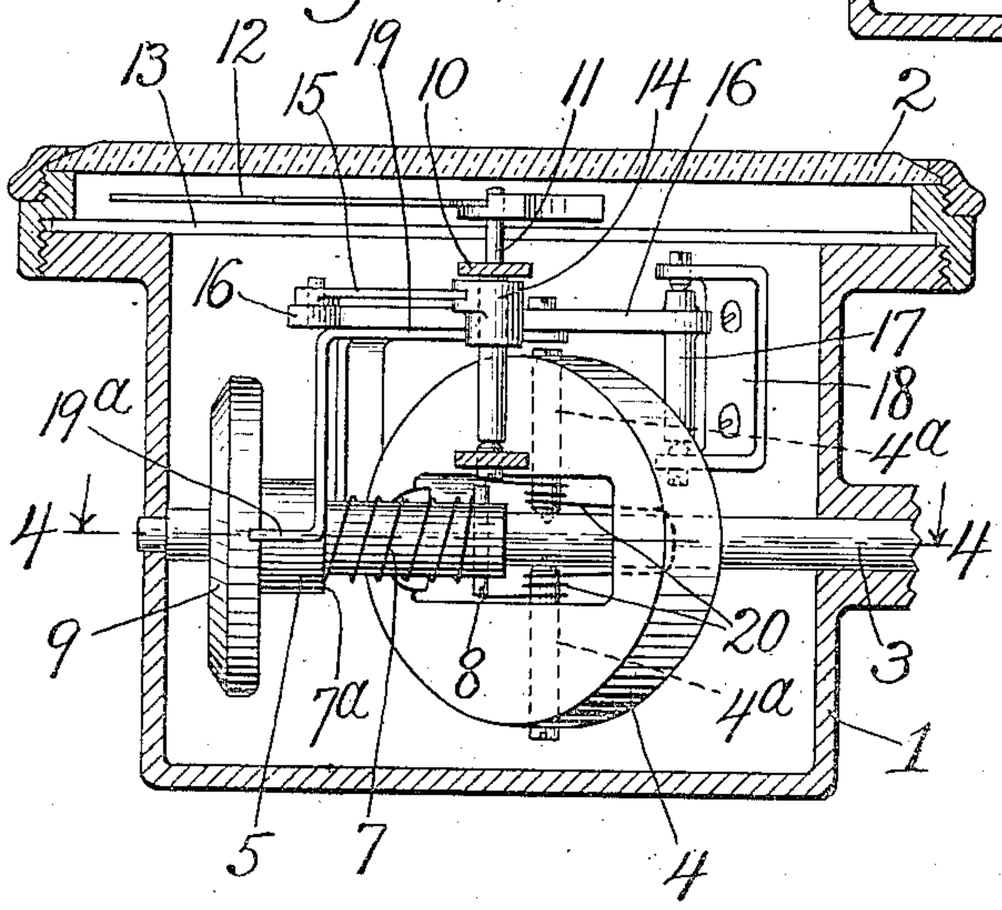
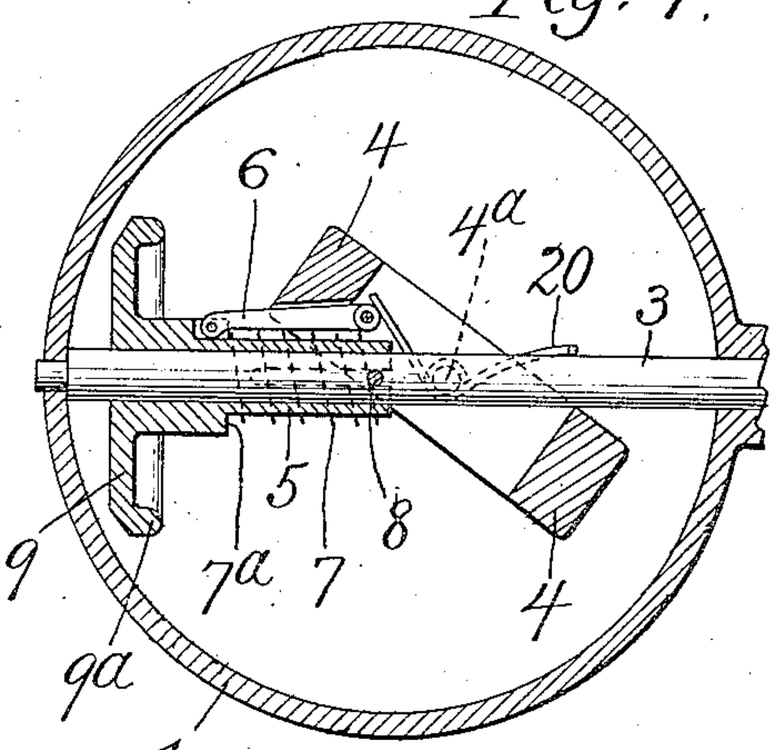


Fig. 4.



Witnesses.
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UNITED STATES PATENT OFFICE.

JOHN K. STEWART, OF CHICAGO, ILLINOIS.

SPEEDOMETER.

No. 855,676. Specification of Letters Patent. Patented June 4, 1907.

Application filed October 22, 1906. Serial No. 339,897.

To all whom it may concern:

Be it known that I, JOHN KERWIN STEWART, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Speedometers, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved device by which at a glance the speed of a traveling vehicle may be ascertained.

It consists in the devices for transmitting the movement of a part which is centrifugally actuated, and modifying that movement for actuating an index finger proportionately to the increase of speed, and which consists also of specific details of construction, as may be understood from the specifications and as set out in the claims.

In the drawings:—Figure 1 is a front elevation of a speed indicator involving this invention, the glazed front cap being removed. Fig. 2 is a section at the line 2—2 on Fig. 1 with the cap in place. Fig. 3 is a section at the line 3—3 on Fig. 1 with the cap in place. Fig. 4 is a section at the line 4—4 on Fig. 2.

The mechanism of this device is mounted in a case, 1, having a front closed by a glazed cap, 2.

3 is a shaft journaled in the case and protruding therefrom for connection by any means (not shown) with the part which rotates in definite time with the wheels of the vehicle whose speed is to be measured or indicated. On this shaft, 3, there is pivotally mounted for rotation with the shaft, but so as to swing about its pivot, a fly-wheel or centrifugally actuated element, 4.

5 is a sleeve mounted for sliding on the shaft, 3, and connected by a link, 6, with the fly-wheel, 4, so that the rocking of the fly-wheel about its pivot to the shaft tends to slide the sleeve; and vice versa, the sliding of the sleeve on the shaft tends to rock the fly-wheel about its pivot. A spring, 7, coiled about the shaft and sleeve reacts against a shoulder, 7^a, on the sleeve and against a pin, 8, set through the shaft to force the sleeve yieldingly away from the pivot of the fly-wheel, and thereby to hold the fly-wheel inclined away from position at right angles to the shaft toward a position parallel to the shaft, its limit being an oblique position at which it is shown in the various figures. The pin, 8, takes through slots in the sleeve to prevent the sleeve from rotating on the shaft and cause it to rotate with the shaft and with the fly-wheel. The sleeve is provided with, or has mounted for movement as rigid with it, a disk, 9, which has a peripheral flange, 9^a, projecting from the side toward the fly-wheel.

10 is a bracket mounted upon the inside of the case, having pivot bearings in a plane at right angles to the axis of the shaft, 3, for a rock-shaft, 11, which carries an index finger, 12, mounted in position to swing over a graduated segment dial, 13. This rock-shaft has a short lever arm, 14, connected by a link, 15, to a lever arm, 16, of a second rock-shaft, 17, mounted in a bracket, 18, which is also secured upon the inner side of the case at a distance of about 120 degrees around from the bracket, 10. To the lever arm, 16, there is rigidly secured a cam-plate, 19, of which the cam portion consists of two flanges, 19^a and 19^b, which project from the cam-plate in a plane diametric with respect to the shaft, 3, and at a position to be encountered by the flange, 9^a, of the disk, 9, which is formed rigidly, as described, with the sleeve, 5. At the most remote position of the disk from the fly-wheel,—the position at which it appears in full line in all the figures of the drawings,—the flange, 9^a, bears upon the edge of the cam flange, 19^a, near the outer limit of said edge, and as the rotation of the shaft causing the fly-wheel, by centrifugal force, to tend to assume a position at right angles to the shaft, operates to draw the sleeve inward toward the pivot of the fly-wheel and to press the flange, 9^a, against the cam, the lever, 16, which carries the cam swinging about its pivot in the bracket, 18, actuates the rock-shaft, 11, by means of the link, 15, swinging the index finger, 12, over the graduated dial. At a certain point in the approach of the disk to the pivot of the fly-wheel the lever, 16, occupies a position such that the flange, 9^a, of the disk is in contact with both the cam flanges, 19^a and 19^b, of the cam plate. From this point the pressure of the disk flange, 9^a, operates against both the cam flanges, 19^a and 19^b, the two cam flanges being shaped in view of their different radii of movement about the rock-shaft, 17, so that they share substantially equally the pressure of the sliding element, 9; and this prevents the tendency

to cramp the sleeve, 5, on the shaft, which would result from having the disk flange, 9^a, encounter all the resistance to its movement at one side of the axis. The pressure of the flange, 9^a, against the two cam flanges continues the swinging movement of the lever, 16, in the same direction about the axis of its rock-shaft and continues the swinging of the index finger over the dial. A spring, 20, is provided coiled about the pivot spindle, 4^a, of the fly-wheel, 4, reacting at one side of the pivot against the shaft, 3, and at the other side against the pivot of the link, 6, to the fly-wheel, tending to hold the fly-wheel yieldingly in the position most nearly parallel to the shaft,—that is, the position from which centrifugal force due to the rotation of the shaft would tend to swing it. Either of the springs, 20 or 7, may be chiefly relied upon for resisting the centrifugal action; but preferably the spring, 20, is the stronger or stiffer of the two, the spring, 7, being merely calculated to restore the sleeve, 5, to the position of rest corresponding to the position of the fly-wheel under the action of the spring, 20; and the employment of the two springs, one acting directly about the pivot of the fly-wheel to swing the latter, and the other acting directly in the line of sliding of the sleeve, renders the two movements—rocking of the fly-wheel about the pivot and the sliding of the sleeve on the shaft—uniformly free from any cramping or creation of resistance due to the changing angle at which the link, 6, which connects the two moving parts extends in different parts of the movement. A spring, 21, connected at one end to the case and at the other end to the lever, 16, resists the movement of the lever about its pivot caused by the presence of the flange, 9^a, of the disk, 9, against the cam flanges, 19^a and 19^b, by the approach of the disk toward a pivot of the fly-wheel which is produced by the centrifugal movement of the fly-wheel toward position at right angles to the shaft upon increase of speed. All the springs, 7, 20 and 21, it will be seen, therefore, operate to the contrary of the centrifugal tendency, and each being adapted to resist the movement of the part with which it is associated, by the most direct possible opposition to such movement there is eliminated from the frictional resistance of the parts all resistance due to cramping from indirect action.

It will be understood that in order to cause the angular movement of the index finger to correspond perfectly to the increase of speed, in view of the following variations,—(*a*) variation of the centrifugal force of the fly-wheel which steadily increases as it approaches position at right angles to the shaft, such increase being not, however, in direct arithmetical ratio to the change of speed; (*b*) variation of tension of the spring, 20, which increases substantially in direct ratio to the angular change of position of the fly-wheel about its pivot; (*c*) variation of tension of the spring, 7, which increases in direct ratio to the sliding movement of the sleeve, 5; (*d*) variation in the tension of the spring, 21, which increases as the lever, 16, swings about its pivot under the pressure of the flange, 9^a, of the disk, 9, but not in direct ratio either to the angular movement of the lever or sliding movement of the sleeve,—a net compensation must be provided to absorb, so to speak, all these variations and establish a uniform direct ratio between the increase of speed of the shaft, and the movement of the index finger over the dial, due to said increase of speed. This net compensation is provided in the contour of the cam flanges, 19^a and 19^b, which together may be considered as a single cam, although they are separated by approximately the amount of the diameter of the disk, 9. The contour of this cam will be necessarily worked out with each individual instrument, absolute uniformity in all the instruments of the same general make being impossible because of the impossibility of making direct springs of absolutely the same stiffness so as to yield exactly the same amount for a given amount of pull exerted by the centrifugal tendency of the fly-wheel. In practice the springs can be sufficiently nearly uniform so that the cam flanges can be originally made to conform to a general contour approximating that which will yield accurately the desired result, and this general contour can be rendered sufficiently exact for each instrument by the adjuster or calibrator in fitting up each instrument upon a final test.

I claim:—

1. In a speedometer, a shaft adapted to be driven by the mechanism whose speed is to be measured; a centrifugally-operated element on the shaft revolving therewith; a sliding element on the shaft connected with said centrifugally-operated element; an index finger and a graduated scale over which it moves; a pivotally mounted cam carrier operatively connected with the index finger, and a cam thereon whose cam edge or surface is acted upon by pressure thereagainst of said sliding element for converting the sliding movement, with modification, into the swinging movement of the index finger.

2. In a speedometer, a shaft adapted to be driven by the mechanism whose speed is to be measured; a centrifugally-operated element carried by the shaft; an element mounted on the shaft for sliding thereon and rotation therewith connected with the centrifugally-operated element; a pivoted indicator and a graduated scale over which it moves; a pivotally mounted cam carrier operatively connected with the indicator, and a cam thereon whose cam edge or surface is acted upon by pressure thereagainst of the

sliding element for converting the sliding movement thereof, with modification, into the swinging movement of the indicator.

3. In a speedometer, a shaft adapted to be driven by the mechanism whose speed is to be measured; a centrifugally-operated element pivoted on the shaft and revolving therewith; an element mounted on the shaft for movement longitudinally thereof; means by which the pivoted element communicates such longitudinal movement; an indicator and a graduated scale over which it moves; a pivoted cam carrier operatively connected with the indicator, and a cam thereon whose cam edge is acted upon by pressure thereagainst of said longitudinally moving element for converting said longitudinal movement, with modification, into the movement of the indicator over the scale.

4. In a speedometer, a shaft adapted to be driven by the mechanism whose speed is to be measured; a centrifugally-operated element carried by the shaft; a spring which resists such centrifugal action; an element mounted for movement longitudinally with respect to the shaft; means by which such movement is derived from the centrifugal movement of said centrifugally-operated element; an indicator and a graduated scale over which it moves; a pivoted cam carrier operatively connected with the indicator, and a cam thereon whose cam edge or surface is acted upon by pressure thereagainst of the longitudinally moving element for deriving the movement of the index finger from said longitudinal movement, with modification due to the form of the cam.

5. In a speedometer, a shaft adapted to be driven by the mechanism whose speed is to be measured; a centrifugally-operated element carried by the shaft; a spring which resists such centrifugal movement; an element mounted for movement longitudinally with the shaft; a spring which resists such longitudinal movement; connections for deriving such longitudinal movement from the centrifugal movement of the centrifugally-operated element; an indicator and a graduated scale over which it moves; a pivoted cam carrier operatively connected with the indicator, and a cam thereon whose cam edge or surface is acted upon by pressure thereagainst of the longitudinally moving element for deriving from such longitudinal movement the movement of the indicator over the scale, with modification due to the shape of the cam.

6. In a speedometer, a shaft adapted to be driven by the mechanism whose speed is to be measured; a centrifugally-operated element pivoted on the shaft and revolving therewith; a sliding element mounted on the shaft for rotation therewith connected with said pivoted element; a pivotally mounted index finger and a graduated scale over which the index finger swings; a pivotally mounted cam carrier operatively connected with the index finger, and a cam thereon whose cam edge or surface is acted upon by pressure thereagainst of the sliding element for converting the sliding movement with modification into the swinging movement of the index finger.

7. In a speedometer, a shaft adapted to be driven by the mechanism whose speed is to be measured; a centrifugally-operated element pivotally mounted on the shaft for rotation therewith and oscillation about its pivot toward and from the axis of the shaft; a circular disk mounted on the shaft for rotation therewith and sliding thereon and connected with the pivoted centrifugal element for such sliding movement; a pivoted cam carrier having its cam edge or face acted upon by the periphery of the disk in the sliding movement of the latter; a spring which resists the centrifugal movement of the pivoted element; an index finger connected with the cam carrier for swinging about its pivot in the swinging movement of the latter, and a graduated dial over which the index finger vibrates.

8. In a speedometer, a shaft adapted to be driven by the mechanism whose speed is to be measured; a centrifugal element pivotally mounted on the shaft for rotation therewith and swinging about its pivot toward and from the axis of the shaft; a disk mounted on the shaft for rotation therewith and sliding thereon and connected for such sliding movement with the pivoted centrifugal element; a cam carrier pivoted for swinging in a plane parallel to the axis of the shaft, the plane of rotation of the pivotal axis of the centrifugal element being intermediate the disk and the pivot of the cam carrier; a cam mounted on such carrier having its cam edge divided and located part at one side and part at the opposite side of the plane containing the axis of the shaft and parallel to the pivot of the cam carrier, the disk having a lateral peripheral flange which at opposite sides encounters successively the two divided portions of the cam edge; an indicator oppositely connected with the cam carrier, and a graduated scale over the indicator which is moved by such connection.

9. In a speedometer, a shaft adapted to be driven by the mechanism whose speed is to be measured; a centrifugally-operated element carried by the shaft; a spring which resists the centrifugal movement; an element mounted for movement longitudinally with respect to the shaft, and a spring which resists such movement; connections from the centrifugally-operated element for communicating said longitudinal movement; an indicator and a graduated scale over which it moves; a pivoted cam carrier operatively connected with the indicator, and a cam thereon whose cam edge or surface is acted

upon by pressure thereagainst of said longitudinally-moving element for converting the latter, with modification, into the movement of the indicator, and a spring which resists the movement of the cam carrier.

In testimony whereof, I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 13th day of October, 1906.

JOHN K. STEWART.

In the presence of—
EDWARD T. WRAY
J. S. ABBOTT.