D. M. BELL.

SPEEDOMETER.

APPLICATION FILED NOV. 1, 1909.

957,727.

Patented May 10, 1910.

4 SHEETS—SHEET 1.

Fig. 2.

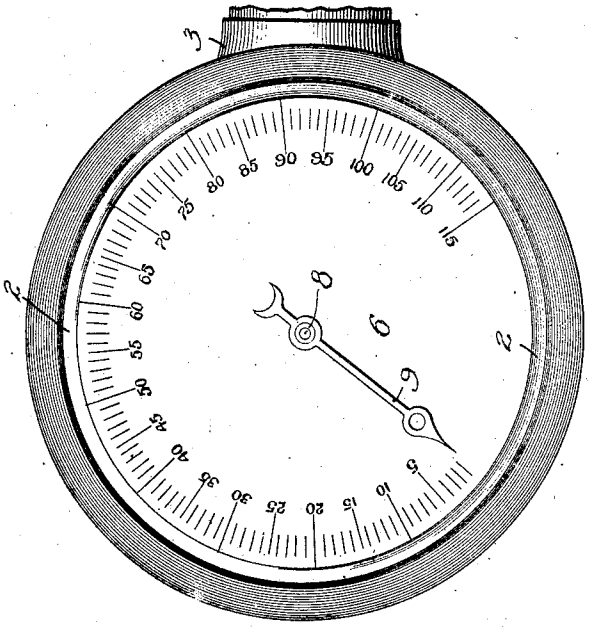
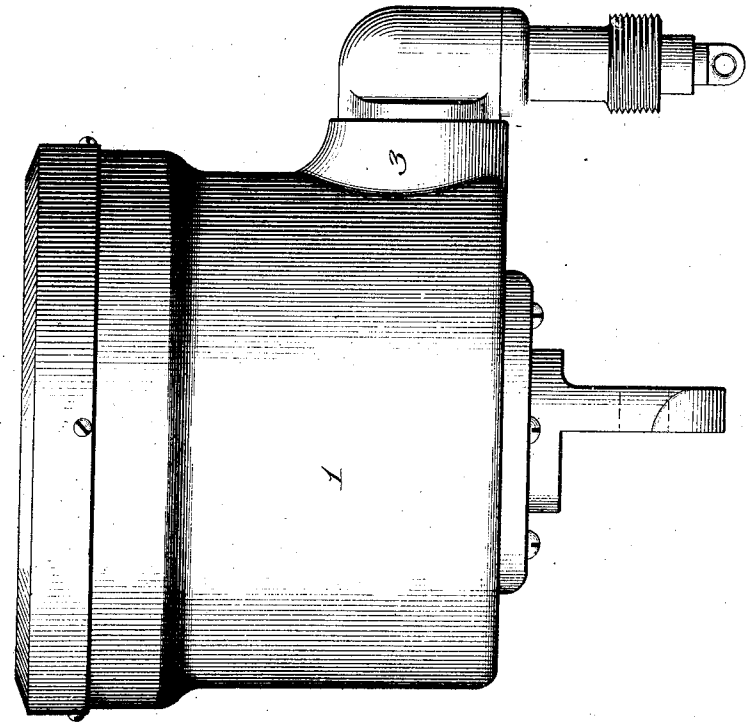


Fig. 1.



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4 SHEETS—SHEET 2.

Fig 3.

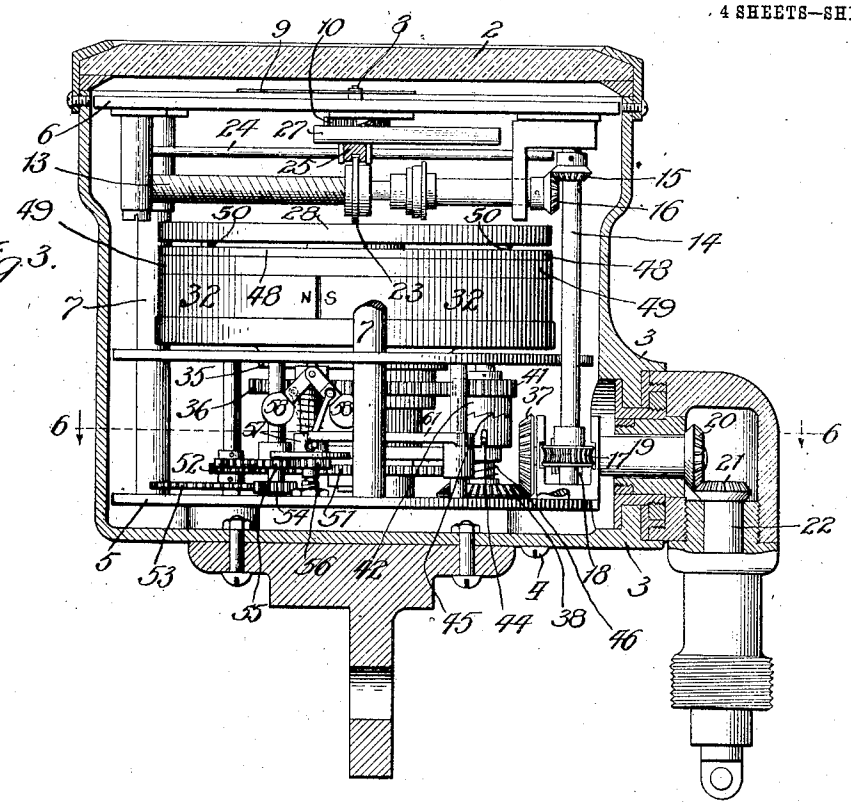
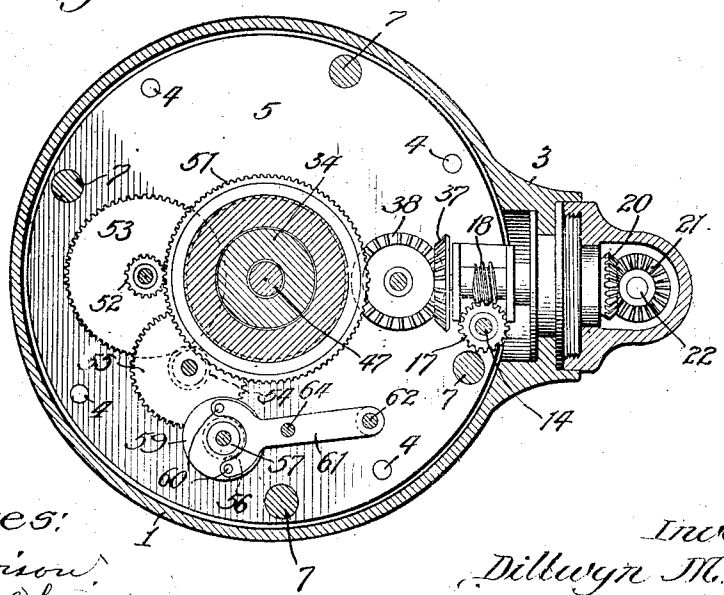


Fig 6



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4 SHEETS—SHEET 3.

Fig. 4.

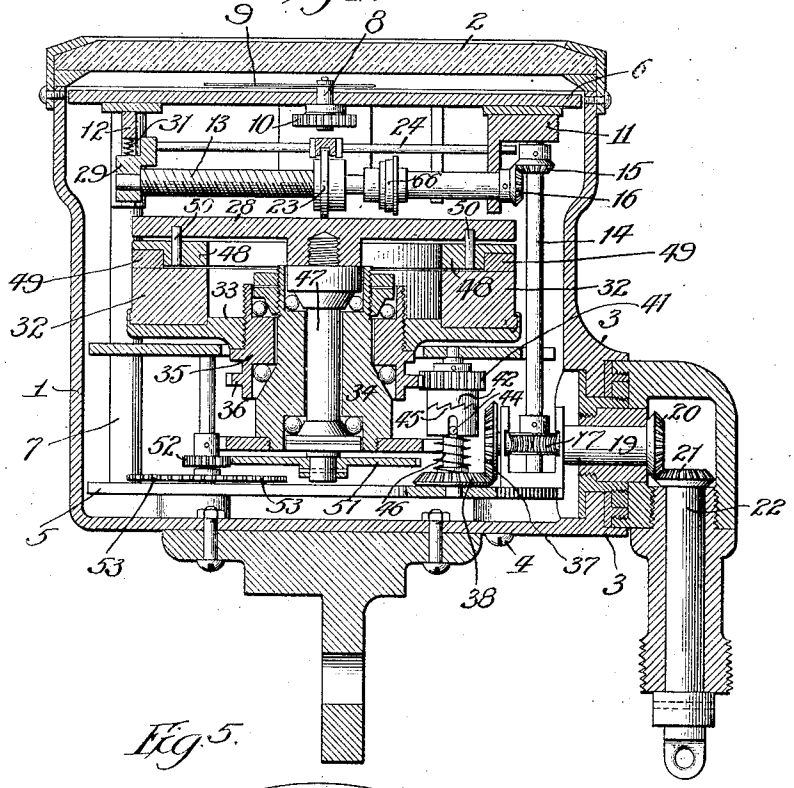
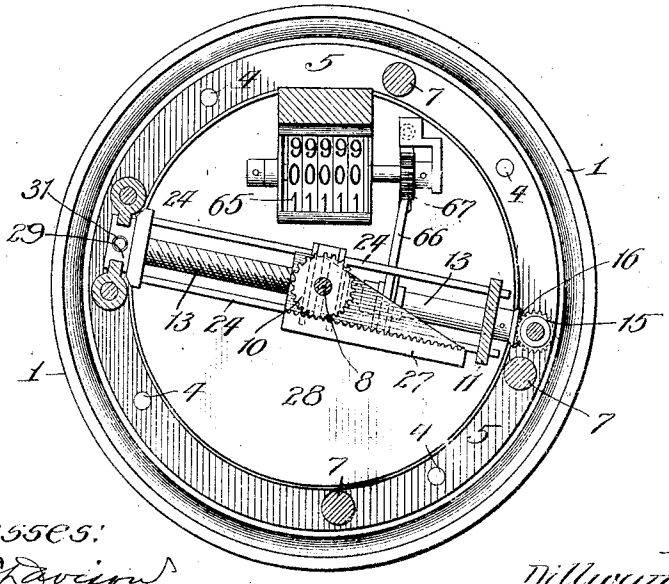


Fig. 5.



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957,727. **Patented May 10, 1910.**

4 SHEETS—SHEET 4.

Fig. 7

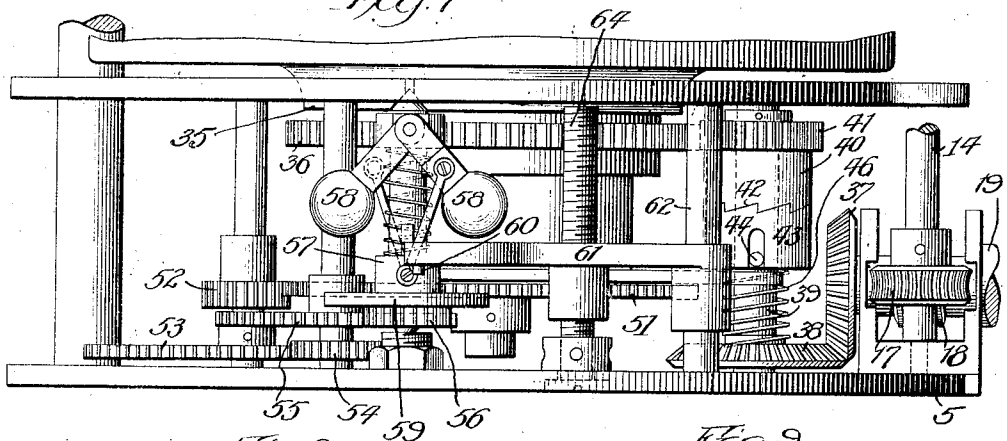


Fig. 8.

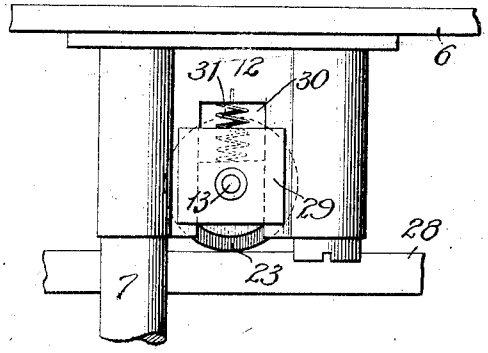


Fig. 9

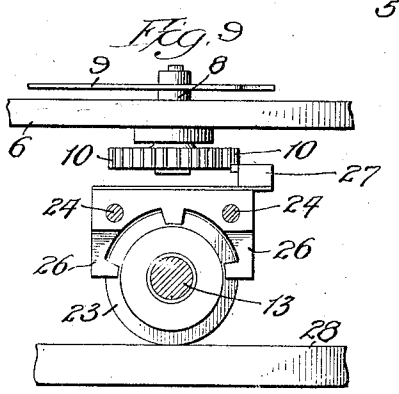


Fig. 10.

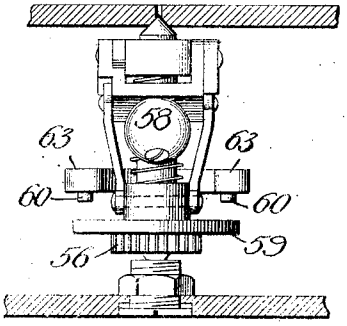
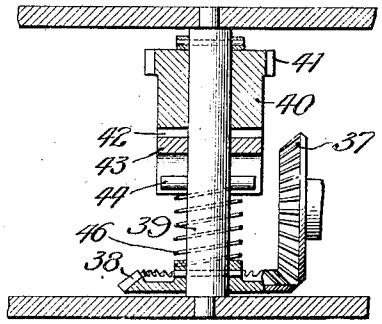


Fig. 11



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UNITED STATES PATENT OFFICE.

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SPEEDOMETER.

957,727. Specification of Letters Patent. **Patented May 10, 1910.**

Application filed November 1, 1909. Serial No. 525,613.

To all whom it may concern:

Be it known that I, DILLWYN M. BELL, citizen of the United States, residing at Oak Park, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Speedometers, of which the following is a full, clear, concise, and exact description.

My invention relates to speedometers, and its object is to provide a speed-indicating device which is accurate in its indications, which retains its accuracy despite the wear due to long continued service, and in which the indicating hand or other equivalent structure does not fluctuate in its readings by reason of the vibrations to which speedometers are frequently subjected in use.

The principle of operation of the type of speedometer on which my invention constitutes an improvement is based upon the actuation of an indicating means by the resultant action of two movements, one a constant and predetermined movement and the other a variable movement proportional to the speed of the motion which is to be indicated by the indicating means.

As the essential foundation of an apparatus embodying my invention, I employ for driving the disk or equivalent device to which a constant and predetermined movement is given, a rotary magnet which drives said disk through the action of the magnetic pull of said magnet upon an armature mounted in proximity to the magnet.

My invention consists, primarily, in a novel combination of elements some of which are old and well-known and some of which constitute novel sub-combinations of the broad combination comprising my invention.

The combination constituting my invention comprises the following elements: the novel subcombination consisting of a rotary magnet driven from any suitable source, preferably from the wheel, shaft, or the like object whose speed of rotation is to be determined, and a magnet armature rotatably mounted in the field of said magnet and rotated by the magnetic pull exercised by said magnet; means, preferably a centrifugal brake actuated by the armature itself, whereby said armature is prevented from exceeding a predetermined speed; indicating means, which may be of a well-known type; and means, actuated by the difference in the relative speeds of said armature and of the object whose speed is being measured, for actuating the indicating means.

My invention further consists in certain other novel features and sub-combinations all of which may be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a side elevation showing the exterior or casing of the speedometer; Fig. 2 is a plan view showing the graduated dial and the index needle; Fig. 3 is a side elevation of the interior mechanism of the speedometer, with the inclosing casing in section; Fig. 4 is a vertical central section; Fig. 5 is a plan view with the face of the casing and the dial plate removed; Fig. 6 is a section approximately on the line 6—6 of Fig. 3; Fig. 7 is an enlarged detail view in side elevation of certain portions likewise shown in side elevation in Fig. 3; Figs. 8, 9 and 10 are enlarged views in side elevation of details of my invention; and Fig. 11 is an enlarged sectional detail view of a portion of the gear which drives the rotary magnet.

Like figures of reference refer to like parts throughout the several views.

In the embodiment of my invention shown in the drawings, the speedometer casing 1 is provided with the usual crystal or protecting glass cover 2 for the top thereof and a bearing 3 in one side of the casing. The speedometer mechanism itself is preferably self-contained and is removable as a unit from said casing, being held therein by screws 4 which extend through the bottom of the casing into the circular plate 5 forming the base of the indicating mechanism. The lower plate 5 and the upper circular plate 6 are connected near their peripheries by a plurality of standards 7, said plates and standards constituting a supporting frame for the mechanism. The circular plate 6 also serves as a dial-plate and is graduated to indicate such speeds as it is desired to measure by means of the instrument. Pivotally mounted in the center of the plate 6 is a rotatable pin or pivot 8, the opposite ends of which respectively carry an index needle or hand 9 and a small pinion 10.

Mounted in suitable bearings provided in brackets 11—12 secured upon diametrically opposite sides of the lower face of the plate 6 is a rotary screw or worm 13. The worm 13 may be driven from the vehicle wheel,

axle or other rotating object the speed of which is to be measured in any desirable manner, preferably, however, by a vertical spindle 14 provided at its upper end with a beveled gear 15 which meshes with a similar gear 16 carried upon the end of the screw 13. The lower end of said spindle is provided with a pinion wheel 17 which is engaged by the worm 18 carried by the short spindle 19. The spindle 19 is suitably mounted in bearing 3 and is provided at its outer end with a beveled gear 20 which meshes with a similar gear 21 carried by the rotary spindle 22. The rotary spindle 22 may in turn be connected in any suitable manner with a wheel or other rotary object whose speed is to be measured. It is evident, therefore, that the screw or worm 13 is rotated at a speed proportionate to the speed of rotation of the rotating mechanism to which the speedometer is connected.

Mounted on the screw 13 is a traveler-wheel 23, which traveler-wheel tends to move in one or the other direction upon the screw 13 dependent upon the direction of rotation of said screw.

Mounted upon opposite upper sides of the screw 13 and in parallel relation thereto are two rods 24—24 constituting tracks for the carriage 25, said carriage being provided with depending arms 26 which straddle the traveler-wheel 23, said carriage being thus adapted to be moved by said traveler-wheel. The carriage 25 carries a rack 27 which meshes with the pinion 10, the motion of the traveler-wheel being thereby communicated through such intermediate gear to the indicating means or index needle 9.

The screw 13 extends diametrically across the disk 28 to which a constant predetermined rotary motion is given in a manner to be presently described. The traveler-wheel may thus have a movement radially of the disk 28, while traveling upon the face of the disk in substantially concentric circles. The periphery of the traveler-wheel 23 is brought into such engagement with the face of the disk that the rotation of the disk tends to move said wheel in a direction opposite to the movement imparted to it by the rotary screw 13, the result of such differential action being that said traveler-wheel will assume a position at which the two opposite driving actions to which it is subjected exactly balance each other. This action of the traveler-wheel is well-known and needs no further description.

It is desirable that the engagement of the traveler-wheel with the face of the disk be such as to insure the proper coöperation of said disk with the traveler-wheel, but it is also desirable that no such unnecessary pressure is exerted as would cause undue wear or other detrimental action. For this reason the disk 28 is preferably made of iron or other magnetic material and is magnetized in the manner hereinafter set forth. One end of the screw 13 is preferably mounted in a yielding bearing 29 supported in a guideway 30, a slight downward pressure being exerted upon the bearing 29 by the spring 31. The pressure of the spring 31 need not be more than is necessary to bring the periphery of the traveler-wheel 23 in contact with the face of the disk 28 since the magnetic attraction of the disk 28 upon the wheel 23 is sufficient to produce a proper coöperation between said wheel and disk. The traveler-wheel is preferably made of hard steel, such material being capable of resisting wear and at the same time possesses such magnetic properties as will cause it to coöperate with the magnetic disk 28. I do not wish to be understood, however, as limiting my invention to a structure in which the disk 28 is of magnetic material since a more or less efficient structure can be employed in which the magnetic attraction between the disk 28 and the traveler-wheel is not taken advantage of.

The disk 28 is given a rotary movement directly or indirectly through the magnetic pull exercised by the magnet 32. The magnet body 32 is preferably of a cylindrical form having a plane end face provided with a suitable number of magnet poles. I preferably employ an annular permanent magnet, the two poles N and S of which are brought into close proximity. This magnet is mounted upon a suitable support such as a brass disk 33 rotatably mounted upon a central hub 34. Said base 33 is preferably provided with a central collar 35 which carries at its lower end a pinion 36 through which said magnet is given a rotary motion. The magnet may be driven from any suitable source of power, but I preferably make use of the driving action of the spindle 19. For this purpose the spindle 19 is provided with a beveled gear 37 which meshes with a similar gear 38 affixed to the lower end of a short spindle 39. Loosely mounted upon the upper end of spindle 39 is a sleeve 40 provided with the pinion gear 41, the lower end of said sleeve 40 being provided with ratchet teeth 42. Slidably mounted upon the spindle 39 is a second sleeve 43 which is rotatably secured to the spindle 39 by pin 44. The upper end of the sleeve 43 is provided with ratchet teeth 45 adapted to engage with the teeth 42 when the spindle 39 is rotated in one direction. The sleeve 43 is thrust into engagement with the sleeve 40 by means of a coil spring 46. It is apparent, therefore, that when the rotary object to which the speedometer is attached is rotated in one direction a rotary motion is imparted to the magnet 32, whereas when the said object is rotated in an opposite direction a corresponding motion is not imparted to

said magnet. I preferably provide such mode of operation since it is not ordinarily desirable to indicate but one direction of rotation. I do not wish to be understood as limiting my invention in this respect.

The rotary magnet 32 is thus preferably provided with suitable gearing, such as hereinbefore described, by means of which it is driven at a speed proportionate to the rotation of the object whose speed is to be measured. This magnet is in turn employed to rotate the disk 28. Any suitable arrangement may be provided by which said magnet drives the disk through the action of the magnetic pull or drag of the magnet. I preferably employ, however, the structure shown in the drawings, in which the disk 28 is carried upon the upper end of a spindle 47 which is journaled in the hub 34. The disk 28 is thus maintained in approximately parallel relation with the plane end face of the annular magnet 32. Lying between the outer edges of the disk 28 and the magnet 32 is an annular armature 48 of iron or other suitable magnetic material. The armature 48 is preferably maintained out of direct contact with the magnet 32, though it is desirable to bring it in as close proximity as possible without direct contact. For this reason a washer 49 is placed between the annular magnet 32 and the annular armature 48, the armature being cut away about its circumference to provide a portion for receiving the washer. The washer 49 is preferably made of fiber or other suitable material which will be both durable and be of such character as will produce practically no friction between the armature and the magnet. The armature is thus supported upon the magnet through the washer 49. The armature is in turn connected with the disk 28 so that said disk and armature will rotate together. It is preferable that the armature be not made integral with the disk, since said armature can thus be supported in more exact relation to the rotary magnet and with greater ease than could otherwise be done. For this reason the disk 28 is provided with a series of pins 50 which loosely project into the armature 48 thus providing a slight relative endwise movement between said disk and armature.

The magnet 32 is made of such strength that the armature 48, and hence the disk 28, would be rotated by magnet 32 at the same rate of rotation as the magnet except for the means independent of the magnet by which the disk is prevented from exceeding a predetermined speed. The lower end of the spindle 47 carries a pinion 51 which drives a train of gears 52, 53, 54, 55, 56 and through said train of gears a centrifugal governor, provided with the usual slidable sleeve 57 and weighted governor arms 58—58. Such centrifugal governor may be and preferably is of the usual construction, and hence further description thereof is unnecessary. Carried by slidable sleeve 57 of the governor is a friction plate or disk 59 which coöperates with the brake-shoes 60 carried upon the adjustable arm 61. One end of the arm 61 is slidably mounted on the post 62 and the other end of said arm is bifurcated presenting the two arms 63—63, which carry the pins 60, which acts as brake-shoes, which coöperate with the disk 59. The arm 61 has threaded therethrough a screw 64, and by rotating said screw the arm 61 is adjusted along the post 62 thus adjusting the position of the brake-shoes 60.

When the speed of rotation of the disk 28 reaches the maximum velocity for which said disk is adjusted, the centrifugal action of the governor draws the disk 59 into frictional engagement with the pins or brake-shoes 60, thereby producing a braking action which prevents the disk from exceeding a predetermined speed. It is obvious, therefore, that the armature and the disk 28 is capable of being driven by the magnet pole of the magnet 32 up to a certain predetermined speed, whereupon any further speed of rotation of the magnet will fail to produce any additional speed of rotation of the disk, owing to the means described, or some other suitable means, whereby said armature is prevented from exceeding a predetermined speed.

In the drawings an odometer 65 is shown, such odometer being actuated from the wheel 13 by a pawl and ratchet mechanism 66—67.

It is obvious that the speedometer of my invention presents only positively actuated parts of inexpensive design. It is further obvious that the accuracy of the instrument depends but little if at all upon the resistance of the parts to wear, and can readily be adjusted merely by adjusting the screw 64 which controls the maximum speed rotation of the disk 28. While a magnet 32 is used to drive the disk 28, the rotation of such disk is not dependent upon eddy currents produced therein, as has heretofore been commonly the case in speedometers provided with rotary magnets, and hence variations in strength of the magnetic field of the magnet are absolutely immaterial, it sufficing if the rotary magnet merely exercises a sufficient pull to carry the disk with it at the same rate of speed until the regulating means are brought into play whereby the disk is prevented from exceeding a predetermined speed. The accuracy of the speedometer of my invention, therefore, is not dependent upon the strength of a permanent magnet, which, as is well known, is susceptible to variations, nor is it dependent upon the delicate operation of a hair spring or the like. The instrument responds to slight and quick variations in speed of the vehicle or

other device to which it is operatively attached and will indicate such variations with a great deal of accuracy and positiveness, the index hand not being susceptible to movement due to vibrations of the vehicle upon which the instrument is mounted.

It is not my intention to limit the invention to the precise details of construction shown in the accompanying drawings, as it is apparent that such details may be varied without departing from the spirit and scope of the invention.

What I claim is:

1. In a device for indicating the speed of rotation of a wheel or other rotating object, the combination with a rotary magnet, of means whereby said magnet is driven from said rotating object, a magnet armature rotatably mounted in the field of said magnet and driven thereby, means whereby said armature is prevented from exceeding a predetermined speed, indicating means, variable speed mechanism driven at a speed proportionate to the speed of said rotating object, and means responsive to the resultant action of said armature and said variable speed mechanism for actuating said indicating means.

2. In a device for indicating the speed of rotation of a wheel or other rotating object, the combination with a rotary magnet, of means whereby said magnet is driven from said rotating object, a magnet armature rotatably mounted in the field of said magnet, means whereby said armature is regulated to rotate at a predetermined speed, variable speed mechanism driven at a speed proportionate to the speed of said rotating object and speed-indicating mechanism differentially actuated by said armature and said variable speed mechanism.

3. In a speedometer, the combination with gear mechanism adapted to be operatively connected to an object the speed of which is to be indicated, of a rotary magnet driven through said gear mechanism, a rotary armature of magnetic material driven by said magnet, means whereby said armature is prevented from exceeding a predetermined speed, indicating mechanism, and means whereby said indicating mechanism is subjected to a tendency of said armature to move it in one direction and to a tendency of said gear mechanism to move it in an opposite direction.

4. In a speedometer, the combination with a rotary magnet, of a rotary disk, means whereby said disk is rotated by the magnetic pull exerted by said magnet, a traveler-wheel having its periphery in engagement with said disk, said traveler-wheel being mounted to rotate upon its own axis and to travel radially of said disk, means cooperating with said magnet to maintain a constant maximum speed of rotation of said disk, means tending to impart to said traveler-wheel a speed of rotation proportional to the speed to be measured, indicating means, and means actuated from said traveler-wheel for actuating said indicating means.

5. In a speedometer, the combination with a rotary magnet, of a rotary disk, means whereby said disk is rotated by the magnetic pull exerted by said magnet, a rotary screw, a traveler-wheel mounted on said screw, said traveler-wheel having its periphery in engagement with the surface of said disk, means for maintaining a constant maximum speed of rotation of said disk, means whereby a speed proportional to the speed to be measured is transmitted to said screw, indicating means, and means actuated from said traveler-wheel for actuating said indicating means.

6. In a speedometer, the combination with a rotary magnet having a plane face and means for driving said magnet, of a disk rotatably mounted concentric with the axis of rotation of said magnet, an annular armature mechanically connected to said disk in proximity to said plane face of the magnet and in parallel relation thereto, said armature and disk being thereby adapted to be rotated by said magnet, means for maintaining a constant maximum speed of rotation of said disk, a traveler-wheel having its periphery in engagement with said disk, said traveler-wheel being mounted to rotate upon its own axis and to travel radially of said disk, means tending to impart to said traveler-wheel a speed of rotation proportional to the speed to be measured, indicating means, and means actuated from said traveler-wheel for actuating said indicating means.

7. In a speedometer, the combination with an annular magnet having a plane face, of a stationary hub upon which said magnet is mounted to rotate, means for rotating said magnet, a rotary disk having a supporting spindle journaled in said hub, an annular armature mechanically connected to said disk in proximity to said plane face of the magnet and in parallel relation thereto, said armature and disk being thereby adapted to be rotated by said magnet, means whereby said disk is prevented from exceeding a predetermined speed, a traveler wheel having its periphery in engagement with said disk, said traveler-wheel being mounted to rotate upon its own axis and to travel radially of said disk, means tending to impart to said traveler-wheel a speed of rotation proportional to the speed to be measured, indicating means, and means actuated from said traveler-wheel for actuating said indicating means.

8. In a speedometer, the combination with a rotary magnet having a plane face, of means for rotating said magnet, a disk rota-

tably mounted concentric with the axis of rotation of said magnet, an annular armature lying between said disk and magnet, means mechanically coupling said armature to said disk, means whereby said disk is prevented from exceeding a predetermined speed, a traveler-wheel having its periphery in engagement with said disk, said traveler-wheel being mounted to rotate upon its own axis and to travel radially of said disk, means tending to impart to said traveler-wheel a speed of rotation proportional to the speed to be measured, indicating means, and means actuated from said traveler-wheel for actuating said indicating means.

9. In a speedometer, the combination with a rotatably mounted cylindrical body having a plane end face and provided with magnet poles, of a rotary disk mounted in parallel relation to said plane face, an armature mechanically connected to said disk and lying in the magnetic field created by said magnet poles, whereby said disk is rotated by the rotation of said cylindrical body, means whereby said disk is prevented from exceeding a predetermined speed, a traveler-wheel having its periphery in engagement with said disk, said traveler-wheel being mounted to rotate upon its own axis and to travel radially of said disk, means tending to impart to said traveler-wheel a speed of rotation proportional to the speed to be measured, indicating means, and means actuated from said traveler-wheel for actuating said indicating means.

10. In a speedometer, the combination with a rotatably mounted cylindrical body having a plane end face and provided with magnet poles, of a rotary disk mounted in parallel relation to said plane face, an annular armature lying between said disk and magnet poles means whereby said armature is supported upon said plane end face of said cylindrical body, pins carried by said disk and extending loosely into said annular armature, whereby said disk is rotated by the rotation of said cylindrical body, means whereby said disk is prevented from exceeding a predetermined speed, a traveler-wheel having its periphery in engagement with said disk, said traveler-wheel being mounted to rotate upon its own axis and to travel radially of said disk, means tending to impart to said traveler-wheel a speed of rotation proportional to the speed to be measured, indicating means, and means actuated from said traveler-wheel for actuating said indicating means.

11. In a speedometer, the combination with a rotatably mounted cylindrical body having a plane end face and provided with magnet poles, of a rotary disk mounted in parallel relation to said plane face, an annular armature lying between said disk and said magnet poles, an annular washer spacing said armature from said cylindric body, said armature being supported by sai cylindrical body through said washer, pin carried by said disk and extending loosely into said annular armature, whereby said disk is rotated by the rotation of said cylindrical body, means whereby said disk is prevented from exceeding a predetermined speed, a traveler-wheel having its periphery in engagement with said disk, said traveler-wheel being mounted to rotate upon its own axis and to travel radially of said disk, means tending to impart to said traveler-wheel a speed of rotation proportional to the speed to be measured, indicating means, and means actuated from said traveler-wheel for actuating said indicating means.

12. In a speedometer, the combination with a rotary magnet, of a rotary disk of magnetic material mounted in the field of said magnet and rotated by the magnetic pull exerted by said magnet and inductively magnetized by said magnet, means for maintaining a constant maximum speed of rotation of said disk, a traveler-wheel of magnetic material, said wheel having its periphery in engagement with said disk, said traveler-wheel being mounted to rotate upon its own axis and to travel radially of said disk, means tending to impart to said traveler-wheel a speed of rotation proportional to the speed to be measured, indicating means, and means actuated from said traveler-wheel for actuating said indicating means.

13. In a device for indicating the speed of rotation of a wheel or other rotating object, the combination with a rotary disk, of means whereby said disk is driven from said rotating object, said means including a magnet and its armature, means whereby said disk is prevented from exceeding a predetermined speed, indicating means, variable speed mechanism driven at a speed proportional to the speed of said rotating object, and means responsive to the resultant action of said disk and said variable speed mechanism for actuating said indicating means.

14. The combination with a rotary magnet and means for driving the same at variable speeds of rotation, of a rotary armature of magnetic material mounted in the field of said magnet and rotated thereby, a centrifugal governor, gears through which said governor is driven from said armature, and a brake for said armature controlled by said governor.

15. The combination with a rotary magnet and means for driving the same at variable speeds of rotation, of a rotary armature of magnetic material mounted in the field of said magnet and rotated thereby, a centrifugal governor, gears through which said governor is driven from said armature, a brake-disk arranged to rotate with said gov-

ernor, and a brake-shoe arranged to coöperate with said brake-disk and thereby to limit the speed of rotation of said armature.

16. The combination with a rotary magnet having a plane face, of means for rotating said magnet, a disk rotatably mounted concentric with the axis of rotation of said magnet, and an annular armature mechanically connected to said disk in proximity to said plane face of the magnet and in parallel relation thereto, said armature and disk being thereby adapted to be rotated by said magnet.

17. The combination with an annular magnet having a plane face, of a stationary hub upon which said magnet is mounted to rotate, means for rotating said magnet, a rotary disk having a supporting spindle journaled in said hub, and an annular armature mechanically connected to said disk in proximity to said plane face of the magnet and in parallel relation thereto, said armature and disk being thereby adapted to be rotated by said magnet.

18. The combination with a rotary magnet having a plane face, of means for rotating said magnet, a disk rotatably mounted concentric with the axis of rotation of said magnet, an annular armature lying between said disk and magnet, means for mechanically coupling said armature to said disk, and means whereby said disk is prevented from exceeding a predetermined speed.

19. The combination with a rotatably mounted cylindrical body having a plane end face and provided with magnet poles, of a rotary disk mounted in parallel relation to said plane face, an armature mechanically connected to said disk and lying in the magnetic field created by said magnet poles, whereby said disk is rotated by the rotation of said cylindrical body, and means whereby said disk is prevented from exceeding a predetermined speed.

20. The combination with a rotatably mounted cylindrical body having a plane end face and provided with magnet poles, of a rotary disk mounted in parallel relation to said plane face, an annular armature lying between said disk and magnet poles means whereby said armature is supported upon said plane end face of said cylindrical body, pins carried by said disk and extending loosely into said annular armature, whereby said disk is rotated by the rotation of said cylindrical body, and means whereby said disk is prevented from exceeding a predetermined speed.

21. The combination with a rotatably mounted cylindrical body having a plane end face and provided with magnet poles, of a rotary disk mounted in parallel relation to said plane face, an annular armature lying between said disk and said magnet poles, an annular washer spacing said armature from said cylindrical body, said armature being supported by said cylindrical body through said washer, pins carried by said disk and extending loosely into said annular armature, whereby said disk is rotated by the rotation of said cylindrical body, and means whereby said disk is prevented from exceeding a predetermined speed.

In witness whereof, I, hereunto subscribe my name this thirtieth day of October, A. D., 1909.

DILLWYN M. BELL.

Witnesses:
GEORGE E. FOLK,
GEO. C. DAVISON.