S. C. WINGER AND A. RICKENBACHER.

ELECTRIC SPEEDOMETER.

APPLICATION FILED AUG. 26, 1919.

1,341,958. **Patented June 1, 1920.**

2 SHEETS—SHEET 1.

Fig. 1

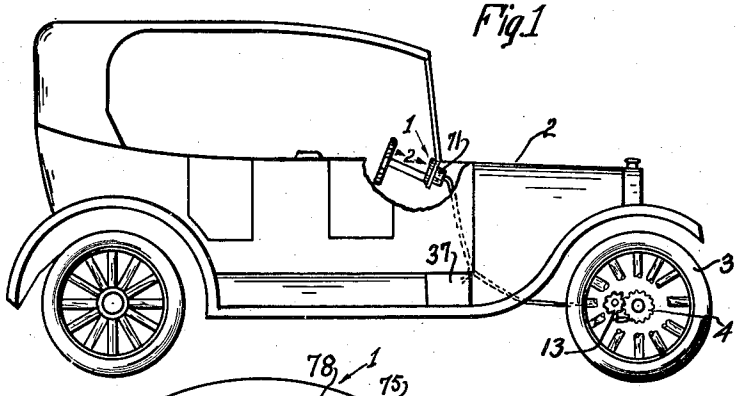


Fig. 2

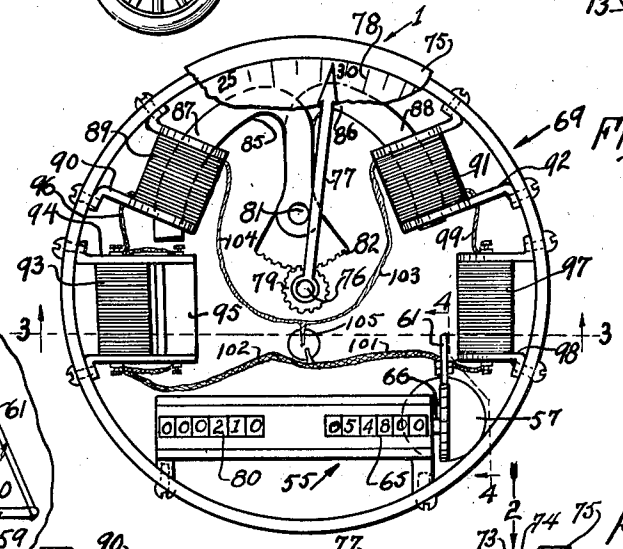


Fig. 3

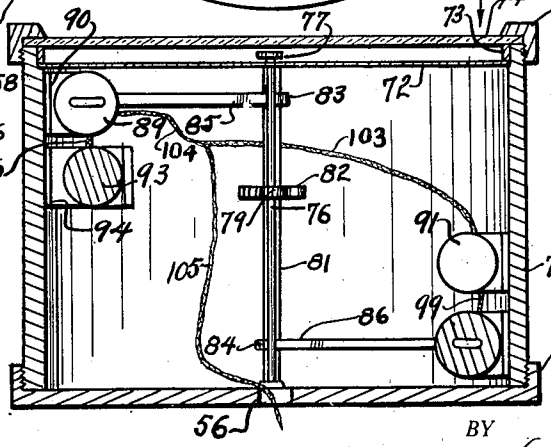
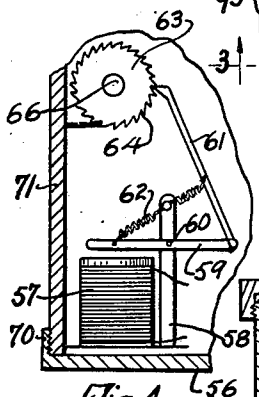


Fig. 4



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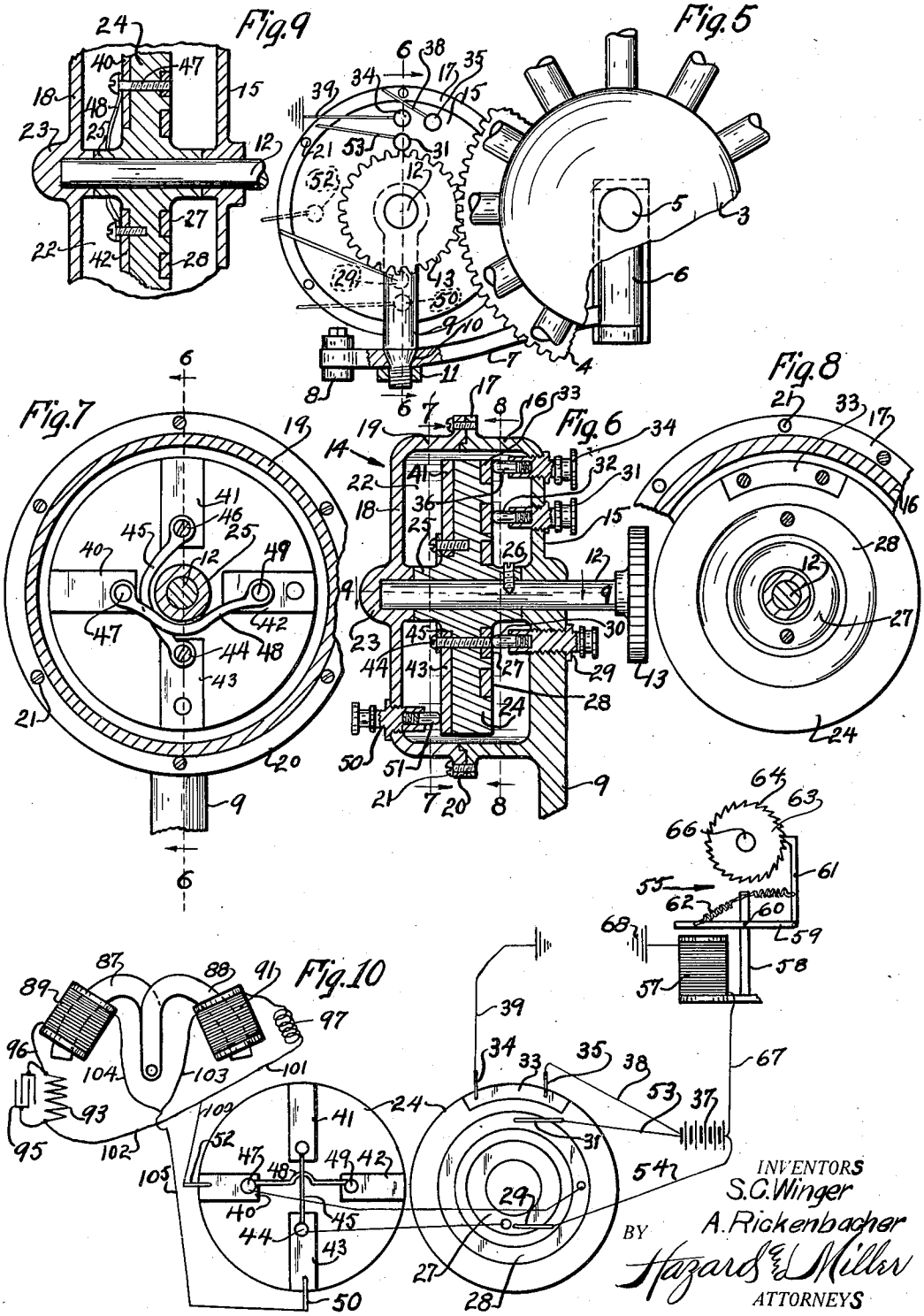
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

STOVER CARL WINGER AND ADOLPH RICKENBACHER, OF LOS ANGELES, CALIFORNIA.

ELECTRIC SPEEDOMETER.

1,341,958. Specification of Letters Patent. Patented June 1, 1920.

Application filed August 26, 1919. Serial No. 319,998.

To all whom it may concern:

Be it known that we, STOVER CARL WINGER and ADOLPH RICKENBACHER, citizens of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Electric Speedometers, of which the following is a specification.

Our invention relates to speedometers and consists of the novel features herein shown, described and claimed.

Our object is to make an electric speedometer for indicating the speed and mileage.

Our electric speedometer consists of two voltmeters so connected as to oppose each other. In series with one of the coils is connected an impedance coil, while in series with the other coil is connected a non-inductive resistance equal to the resistance of the impedance coil. The two series are then connected in shunt across the line. A condenser is shunted across the non-inductive resistance.

The principle upon which this speedometer operates is that a high frequency alternating current will pass through an impedance coil with difficulty, the degree of impedance depending upon the frequency. Since the two coils are connected in shunt and both have the same resistance, the pull of both coils will be the same when direct current is sent through them, since the direct current can flow through the impedance coil as readily as through the non-inductive resistance. But when the current is changed to alternating by being sent through the commutator which is connected to the wheel or drive-shaft of the automobile, the current will be prevented from flowing through that half of the circuit in which the impedance coil is connected, but will still flow readily through the half in which the non-inductive resistance is connected, thereby drawing the armature over that way; the amount of pull depending upon the impedance, which in turn depends upon the frequency, and the frequency depending upon the speed of the commutator which is proportional to the speed of the machine.

The reading of the speedometer will not be affected by any ordinary variation in voltage as the two coils are at all times balanced against each other, the difference in pull depending not upon the line voltage but upon the impedance.

The commutator consists of four or six segments and two collector rings mounted on a shaft which is to be driven either from the drive-shaft or from the wheel. Every other segment on the commutator is connected together making two sets of segments connected together, each set being connected to a collector ring. The battery is connected across the collector rings, the current being taken off the commutator by two brushes so placed as to bear on adjacent segments.

For the mileage meter a ratchet will be placed on the shaft which rotates the numbers, the number of teeth being equal to the number of revolutions the commutator shaft will make in traveling one-tenth of a mile. A pawl which is operated by an electro-magnet will engage the ratchet, the movement being limited so that the ratchet is only advanced one tooth for each impulse.

Figure 1 is a side elevation of an automobile provided with an electric speedometer embodying the principles of our invention, parts being broken away to show the speedometer.

Fig. 2 is a fragmentary front elevation of the speedometer as seen looking in the direction indicated by the arrows 2 in Figs. 1 and 3, parts being broken away to show the details of construction.

Fig. 3 is a horizontal sectional detail on the line 3—3 of Fig. 2 and looking upwardly as indicated by the arrows.

Fig. 4 is a fragmentary sectional detail on the line 4—4 of Fig. 2 and looking in the direction indicated by the arrows.

Fig. 5 is an enlarged fragmentary elevation upon the same plane as Fig. 1 and showing the operating mechanism connected to the wheel.

Fig. 6 is a sectional detail on the line 6—6 of Figs. 5 and 7 and looking in the direction indicated by the arrows.

Fig. 7 is a sectional detail on the line 7—7 of Fig. 6 and looking in the direction indicated by the arrows.

Fig. 8 is a fragmentary sectional detail on the line 8—8 of Fig. 6 and looking in the direction indicated by the arrows.

Fig. 9 is a fragmentary sectional detail upon the line 9—9 of Fig. 6.

Fig. 10 is an electrical diagram of the speedometer system.

Referring to Fig. 1, the speedometer 1 is mounted upon the cowl or instrument board of the automobile 2 and is connected to the hub 3 of the front wheel.

Referring to Fig. 5, the spur gear 4 is fixed to the hub 3. The hub 3 is mounted upon the axle 5, and the axle 5 is rigid with the steering knuckle 6. The steering knuckle arm 7 extends from the steering knuckle 6 and is connected to the tie rod 8. The post 9 is inserted downwardly through the steering knuckle arm 7, said post having a tapered pintle 10 fitting in a tapered hole in the arm 7, and a nut 11 upon the lower end to draw the post tight and make it rigid with the arm 7 of the post.

Referring to Fig. 6, the shaft 12 is mounted through the upper end of the post 9, and a spur pinion 13 is fixed upon one end of the shaft and meshes with the spur gear 4.

The upper end of the post 9 is formed integral with the commutator housing 14. The details of the commutator are as follows:

The flat housing plate 15 is formed integral with the upper end of the post 9 and the annular rim 16 is formed integral with the plate 15. An annular flange 17 extends outwardly from the inner edge of the rim 16. The flat plate 18 has an annular rim 19 meeting the annular rim 16, and an annular flange 20 fitting the flange 17, and the flanges 17 and 20 are connected together by screws 21 so as to make a commutator chamber 22.

The shaft 12 extends through the center of the plate 15 concentric to the rims 16 and 19 and into a hub 23 at the center of the plate 18. The body 24 and the hub 25 of the commutator wheel are formed of insulation. The hub 25 fits upon the shaft 12 between the plate 15 and the plate 18 and is held in place by a set screw 26.

The collector rings 27 and 28 are embedded into one side face of the body 24 concentric to each other and concentric to the shaft 12. The binding post 29 is mounted through the plate 15 in the concentric plane of the collector ring 27, and a spring pressed carbon brush 30 is mounted in the inner end of the binding post 29 in position to bear upon the collector ring 27.

In a like manner the binding post 31 is fixed through the plate 15 in the concentric plane of the collector ring 28 and has a spring pressed carbon brush 32 in its inner end bearing upon the collector ring 28.

Referring to Figs. 6 and 8 a connecting plate 33 is embedded into the face of the body 24 outside of the collector ring 28. Binding posts 34 and 35 are mounted through the plate 15 in the concentric plane of the connecting plate 33 and have spring pressed carbon brushes 36 in position to bear upon the plate 33. The plate 33 is more than long enough to make an electrical connection between the brushes of the binding posts 34 and 35 when the plate is in proper position, as in Fig. 8.

Referring to Fig. 10, the battery 37 is connected through the line 38 to the binding post 35 and the binding post 34 is grounded through the line 39.

Referring to Figs. 6 and 7, the commutator segments 40, 41, 42 and 43 are embedded into the opposite side of the body 24 from the collector rings 27 and 28. The segment 43 is electrically connected through the body 24 to the collector ring 27 by a screw 44, and the segment 41 is electrically connected to the segment 43 by a conductor wire 45 leading half way around the hub 25, one end of the conductor 45 being connected to the screw 44 and the other end being connected to a screw 46 in the segment 41.

In a like manner the segment 42 is electrically connected to the collector ring 28 by a screw 47 inserted through the segment 40, through the body 24 and tapped into the collector ring 28. The conductor 48 is connected to the screw 47 and passes half way around the hub 25 and is connected to the segment 42 by a screw 49.

A binding post 50 is mounted through the plate 18 and has a spring pressed carbon brush 51 in position to bear upon the segments 40, 41, 42 and 43 as the wheel rotates. In a like manner the binding post 52 is mounted through the plate 18 and has a spring pressed carbon brush in position to bear upon the segments 40, 41, 42 and 43. The binding posts 50 and 52 are spaced apart so as to bear simultaneously upon two adjacent segments, as shown in Fig. 10.

The line 53 leads from the battery 37 to the binding post 31 and the line 54 leads from the opposite end of the battery from the line 53 to the binding post 29. The commutator segments 40 and 42 are in the line 53 and the commutator segments 41 and 43 are in the line 54, that is the circuit passing over the line 53 passes through the collector ring 28, through the screw 47 and conductor 48 to the segments 42 and 40, and the current passing over the line 54 passes through the collector ring 27, through the screw 44 to the segment 43 and over the conductor 45 to the segment 41, and when the brushes 51 are electrically connected through the speedometer construction and the brushes are bearing upon two adjacent segments as 40 and 41 the circuit is complete.

The rotation of the wheel driving the commutator will change the direct current of the battery 37 into a high frequency alternating current passing from the commutator through the segments 40, 41, 42 and 43 and binding posts 50 and 52 carrying the carbon brushes 51.

Referring to Figs. 2, 4 and 10, the mileage meter 55 is a part of the speedometer 1, and the details of the mileage meter 55 are as follows:

The back plate 56 of the speedometer casing is flat and circular. An electro-magnet 57 is fixed against the inner face of the plate 56, a post 58 is made rigid with the plate 56 beside the magnet 57, an armature lever 59 is pivotally mounted upon a pin 60 carried by the post 58, so that one end of the lever 59 is attracted by the magnet when the magnet is energized.

A pawl 61 is connected to the opposite end of the lever 59 from the magnet. A spring 62 connects the armature end of the lever 59 to the pawl 61, the tension of the spring being exerted to pull the armature from the magnet. A pawl wheel 63 is mounted in position to be engaged by the pawl 61. The teeth 64 upon the pawl wheel are in the direction to be engaged by the pawl 61 when the armature is pulled down by the magnet so as to drive the wheel 63 one tooth, and the mileage indicating mechanism 65 is operated by the pawl wheel 63. The pawl wheel 63 is mounted upon a shaft 66.

The line 67 connects the opposite end of the battery 37 from the line 38 to the magnet 57, and the magnet is connected to the ground 68, so that at each revolution of the commutator the connecting plate 33 passes the brushes 34 and 35 and completes the circuit and sends an impulse through the magnet 57 to rotate the pawl wheel 63 to the extent of one tooth.

The number of teeth 64 upon the pawl wheel 63 will be equal to the number of revolutions the commutator shaft 12 will make while the vehicle is traveling one-tenth of a mile, so that the shaft 66 will make one revolution while the vehicle is going a tenth of a mile and ten revolutions to the mile and the indicating mechanism 65 will be made upon this basis.

The mileage indicating mechanism 65 may be any of the ordinary constructions, and it is not necessary to show or describe the details herein, my invention in the mileage meter being limited to the means for operating the mechanism.

Referring to Figs. 2, 3 and 10, the details of the speed indicating mechanism 69 of the speedometer 1 are as follows:

The back plate 56 has an internally screw-threaded flange 70 screwed upon the cylindrical casing 71. The front plate 72 is recessed into the front end of the casing 71, a spacing ring 73 is placed in front of the plate 72, a glass 74 is placed against the front edge of the casing 71, and a cap ring 75 is screwed upon the casing 71 and holds the glass 74 in place.

A shaft 76 is mounted in bearings at the centers of the back plate 56 and front plate 72. An indicator hand 77 is fixed upon the front end of the shaft 76 in front of the plate 72, and the plate 72 has graduations 78 upon its front face to which the hand 77 points to indicate the speed per hour. A pinion 79 is fixed upon the shaft 76 near its longitudinal center. The mileage meter 55 is mounted in the lower part of the casing 71 and the reading 80 upon the mileage meter appears through openings in the plate 72.

A shaft 81 is mounted in bearings in the back plate 56 and front plate 72 parallel with the shaft 76. A segmental gear 82 is fixed upon the shaft 81 and meshes with the pinion 79. A hub 83 is fixed upon the shaft 81 near its forward end, and a similar hub 84 is fixed upon the shaft 81 near its rear end. An arm 85 extends from the hub 83, and a similar arm 86 extends from the hub 84. A solenoid core 87 extends from the outer end of the arm 85 in a plane substantially concentric to the shaft 81, and a similar solenoid core 88 extends from the outer end of the arm 86 in a plane substantially concentric to the shaft 81, said cores 87 and 88 extending in opposite directions, and the arms 85 and 86 being in parallel planes radial to the shaft 81.

A solenoid magnet 89 is mounted upon brackets 90 secured against the inner face of the casing 71, and the core 87 operates through the magnet 89. A similar solenoid magnet 91 is mounted upon brackets 92 secured against the inner face of the casing 71, and the core 88 operates through the magnet 91. The magnet 89 and the core 87 form a voltmeter and the magnet 91 and core 88 form another voltmeter and the voltmeters are opposed to each other.

The non-inductive resistance coil 93 is mounted upon brackets 94 below the magnet 89. A condenser 95 is mounted parallel with the non-inductive coil 93 and shunted across the non-inductive coil and the non-inductive coil 93 is connected to the magnet 89 by a line 96.

The inductive resistance coil 97 is mounted upon brackets 98 secured to the casing 71 and connected to the magnet coil 91 by a line 99.

The line 100 leads from the brush 52, and a branch 101 leads from the line 100 to the inductive resistance 97, and a branch 102 leads from the line 100 to the opposite ends of the non-inductive coil 93 and condenser 95 from the line 96. The line 103 leads from the opposite end of the magnet 91 from the line 99, and the line 104 leads from the opposite end of the magnet 89 from the line 96. The lines 103 and 104 are brought together and the line 105 connects the lines 103 and 104 to the brush 50.

In arranging the parts the arms 85 and 86 normally stand straight up and down,

and the cores 87 and 88 stand in their normal positions relative to the solenoid magnets 89 and 91, and the hand 77 is arranged upon the shaft 76 to point to zero upon the dial 78.

The high frequency alternating current produced by the commutator would normally operate the same upon the solenoid magnets 89 and 91 and the forces of the magnets would be neutralized or balanced. But the high frequency alternating current will pass through the inductive resistance 97 with difficulty and the degree of resistance will increase with the increase of frequency while the current will pass more freely through the non-inductive resistance 93, and the non-inductive resistance will not be increased by the increase of the frequency, so that when the vehicle is standing still the solenoids or voltmeters will balance, and as the vehicle starts and gains speed the solenoid magnet 89 will overbalance the magnet 91 and the faster the vehicle goes the greater the overbalance thereby moving the hand 77 to indicate the speed per hour.

Thus we have produced an electric speedometer which effectually eliminates the mechanical transmission from the wheel to the indicating mechanism.

Various changes may be made without departing from the spirit of our invention as claimed.

We claim:

1. An electric speedometer comprising a commutator adapted to be connected to be driven from a wheel, a mileage indicator adapted to be mounted upon the dash board or the like, an electrical step by step mechanism for operating the mileage indicator, and a storage battery connected through the electrical step by step mechanism and through a circuit breaker upon the commutator.

2. An electric speedometer comprising two voltmeters mounted to oppose each other, an indicator hand mounted to be operated by the voltmeters, an inductive resistance connected to one voltmeter, a non-inductive resistance connected to the other voltmeter, a commutator adapted to be operated from a wheel, a battery connected to one side of the commutator, a connection between the other side of the commutator and the inductive and non-inductive resistances, and a connection between the commutator and the opposite ends of the voltmeters from the inductive and non-inductive resistances.

3. An electric speedometer comprising two voltmeters mounted to oppose each other, an indicator hand mounted to be operated by the voltmeters, an inductive resistance connected to one voltmeter, a non-inductive resistance connected to the other voltmeter, a condenser connected around the non-inductive resistance, a commutator adapted to be operated from a wheel, a battery connected to one side of the commutator, a connection between the other side of the commutator and the inductive and non-inductive resistances, and a connection between the commutator and the opposite ends of the voltmeters from the inductive and non-inductive resistances.

4. An electric speedometer comprising two voltmeters of equal power mounted in opposition, an indicating hand mounted to be operated by the voltmeters, a non-inductive resistance coil connected in front of one voltmeter, a condenser connected to the ends of the non-inductive resistance, an inductive resistance connected in front of the other voltmeter, a commutator adapted to be operated from a wheel, a storage battery connected to the commutator, a connection between the commutator and the near ends of the non-inductive and inductive resistances, and a connection between the further ends of the voltmeters and the commutator; the commutator having an independent brush for each connection and the brushes being set to simultaneously contact with two adjacent segments of the commutator.

In testimony whereof we have signed our names to this specification.

STOVER CARL WINGER,
ADOLPH RICKENBACHER.