G. H. HILL.

COASTING REGISTERING MECHANISM FOR ELECTRIC CARS.

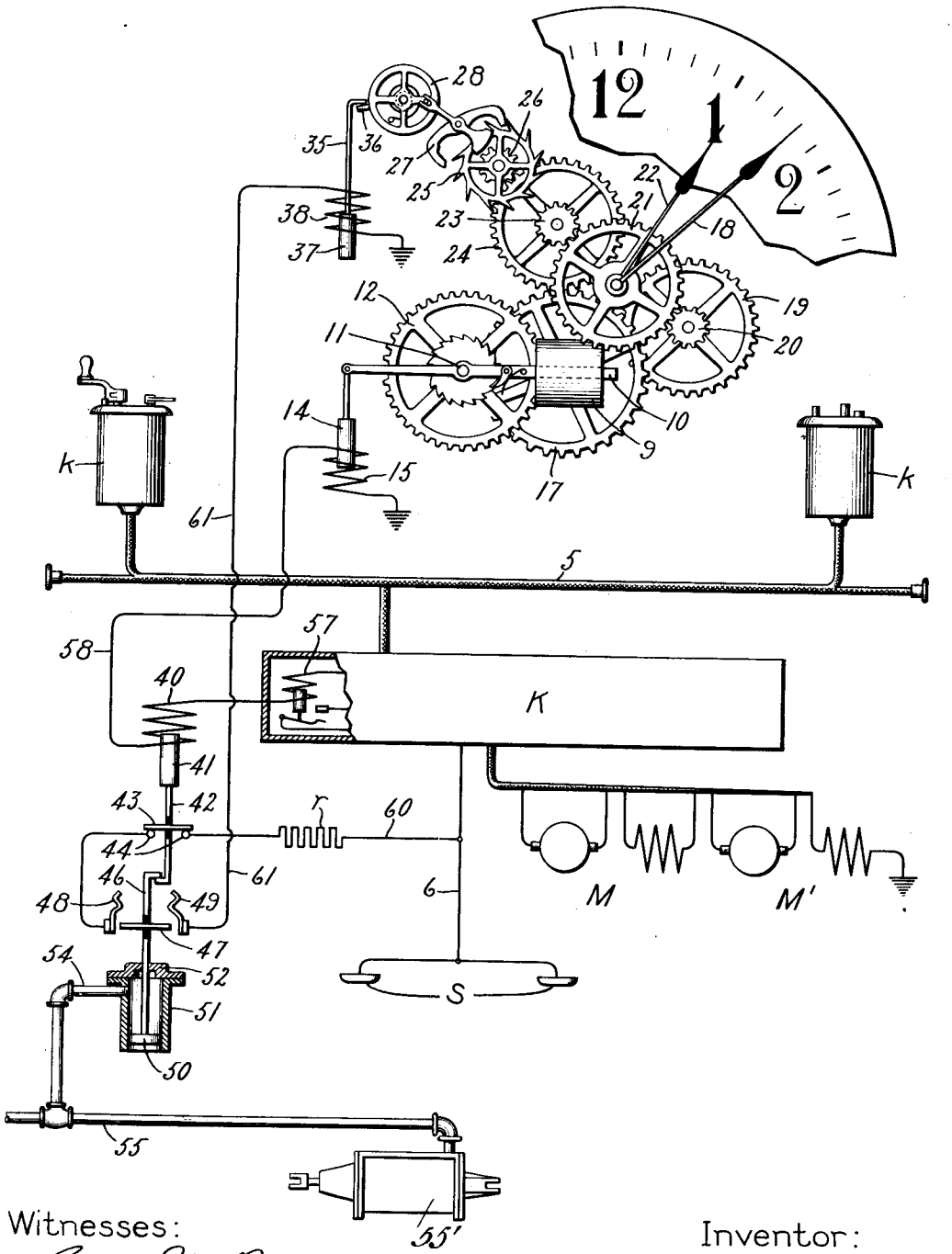
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**1,133,028.**

Patented Mar. 23, 1915.

2 SHEETS—SHEET 1.

Fig. 1.




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Inventor:

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His Attorney

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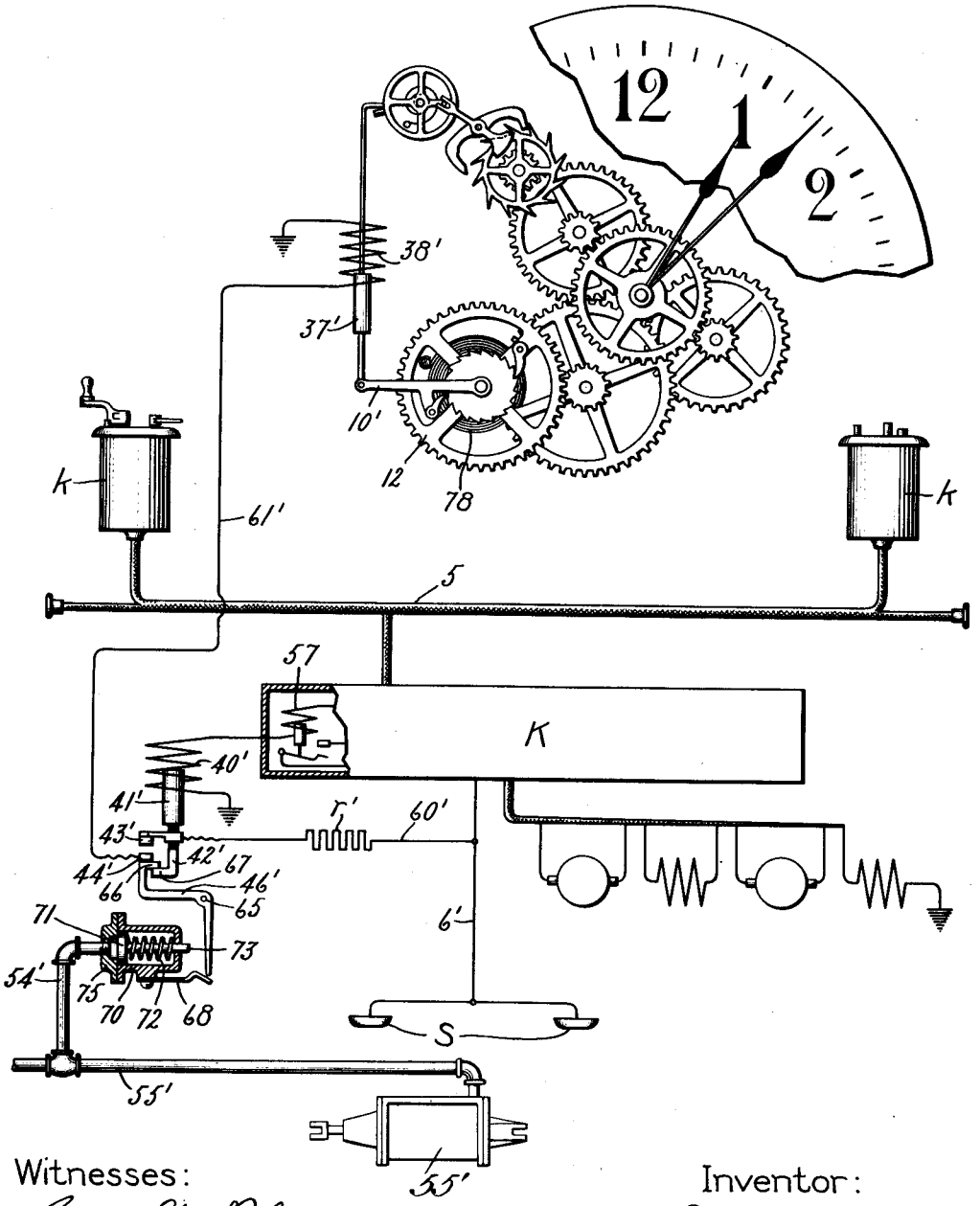
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2 SHEETS—SHEET 2.

Fig. 2.




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# UNITED STATES PATENT OFFICE.

GEORGE H. HILL, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## COASTING-REGISTERING MECHANISM FOR ELECTRIC CARS.

1,133,028. Specification of Letters Patent. Patented Mar. 23, 1915.

Application filed August 1, 1910. Serial No. 574,996.

*To all whom it may concern:*

Be it known that I, GEORGE H. HILL, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Coasting-Registering Mechanism for Electric Cars, of which the following is a specification.

My invention relates to coasting registering mechanisms and is particularly intended for use on electrically driven cars.

The object of my invention is to provide a simple and efficient arrangement which will register the time a car is allowed to coast during its regular operation.

To the above end, my invention comprises certain arrangements, hereinafter described, whereby throwing off of the controller of the car will result in starting a registering mechanism which is stopped when the brakes are applied or when the controller is thrown on again.

My invention will be understood from the following description taken in connection with the accompanying drawing, in which—

Figure 1 shows, more or less diagrammatically, my invention applied to an electrically driven car; and Fig. 2 shows another arrangement in which my invention may be embodied.

Referring to Fig. 1, the motors which drive the cars are indicated at M and $M^1$. These motors are controlled by any desired style of controller, for instance by a plurality of electromagnetically operated switches or contactors arranged in a contactor box K, these contactors being controlled by master controllers *k* at each end of the car. The control wires between the master-controllers *k* and the contactors in the box K are located in a cable 5; and the current for the motor and control circuits of the car is supposed to be derived from the third rail shoes S through the wire 6.

In the arrangement shown, the time registering part of my arrangement consists of a clock which is automatically started and stopped by a certain switch mechanism hereinafter described. The clock mechanism is shown in fragmentary form, but it will be easily understood. Of course any particular style of clock mechanism which is preferred may be used, that shown being merely illustrative of one simple kind; and the record may be kept either upon a clock dial as shown or in any other well-known way as, for instance, upon a sheet of paper continuously moved by the clock and engaged by a pen moved by the same means as that hereinafter described for starting and stopping the clock. The driving power for the clock mechanism shown, is furnished by a weight 9 supported on a lever 10 pivoted on a shaft 11, said lever having a driving connection with a gear 12 mounted upon the shaft 11 through a pawl and ratchet connection, as clearly shown. The lever 10 is rocked by an electromagnet, the core 14 of which is secured to the end of said lever, the coöperating magnet coil 15 being energized from the control circuits of the car in the manner hereinafter described. It will be clear that energization of the coil 15 will attract the core 14 and rock the lever 10 in a counter-clockwise direction, thereby lifting the weight 9 which in its falling movement after the magnet is deënergized will drive the clock mechanism. The gear 12 engages with a pinion secured to a gear 17 and the gear 17 drives a pinion secured to the shaft upon which the minute hand 18 is mounted. This pinion on the shaft to which the minute hand 18 is secured also engages with a gear 19 having secured to it the pinion 20 which engages with a gear 21 arranged for rotation about the shaft to which the minute hand is secured. The hour hand 22 is secured to and rotates with the gear 21. Meshing with the gear 21 is a pinion 23 to which is secured a gear 24 which is limited in its movement by an escapement having a wheel 25 driven from the gear 24 through a pinion 26, said wheel 25 being engaged by an escapement lever 27 having a balance wheel 28 coöperating with it in the usual manner.

The starting and stopping of the clock may be controlled in many ways and in the particular arrangement shown the arrangement comprises a rod 35 having a hooked end which engages with a lug 36 extending from the periphery of the balance wheel 28. The lug 36 is normally held in position shown by the weight of the attached magnet core 37, which coöperates with the magnet coil 38. When the magnet coil 38 is energized, the core 37 and the rod 35 are lifted and the balance wheel 28 is released, thereby allowing the clock mechanism to operate. The energization of this magnet coil 38 is controlled by an electromagnetically and

pneumatically controlled switch mechanism responsive to the operation of the controller and the brake mechanism of the car. This switch mechanism comprises an electromagnet having an actuating coil 40, a coöperating core 41 which is carried on a rod 42 extending from the core, and a contact disk 43 which coöperates with fixed contact members 44. The lower end of the rod 42 coöperates with a rod 46 carrying a contact disk or member 47 adapted to snap into and make an electrical connection between contact clips 48 and 49. The connection between the rods 42 and 46 is such that upward movement of the rod 42 will lift the rod 46 while permitting free downward movement of the rod 42 without influencing the rod 46; in the drawing this connection is indicated by the hooked ends of the rods 42 and 46. The lower end of the rod 46 is provided with a piston 50 which moves in a cylinder 51 closed at its upper end by the piston head 52 and provided at some point above the uppermost limit of movement of the piston 50 with a pipe 54 which leads to one of the pipes 55 of the air brake system, this pipe being normally at substantially atmospheric pressure and being charged when the air brakes are applied. The magnet coil 40 of the switch mechanism is arranged in any suitable way so as to be energized at all times when the controller is in an "on" position or, if desired, in any "on" position after the first. In the system shown, the coil 40 is connected in series with one of the coils 57 of one of the main line contactors and the same circuit also passes through the wire 58 and through the magnet coil 15 which operates the winding mechanism of the clock, as hereinbefore explained. The circuit controlled by the switch mechanism extends from the lead wire 6, through wire 60, resistance $r$, contacts 44, 43 and 44, contacts 48, 47 and 49, wire 61, and through the magnet coil 38 of the clock mechanism to ground.

The mode of operation of the system of Fig. 1 is as follows: As shown, the clock mechanism is stopped and the switch mechanism which controls the circuit through the magnet 38 is in the position which it assumes when the controller is in an "off" position and the brakes have been applied. If now the brakes are released and the controller is moved to an "on" position, the magnet 40 is energized and the core 41 is moved to its upper position, thereby lifting the disk 43 from the contacts 44 and lifting the disk 47 into engagement with the contact clips 48 and 49. In this position of the switch mechanism, the circuit through the wire 61 and the magnet 38 is not completed and the clock mechanism, therefore, remains stationary. If, however, the controller is thrown to its "off" position, the circuit through the actuating coil 57 of the line contactor and the magnet coil 40 of the switch mechanism is deënergized and the core 41 therefore drops, resulting in the bridging of the contacts 44 by the disk 43. Falling of the core 41 will not affect the contact disk 47 which remains in engagement with the contact clips 48 and 49, and the circuit through the magnet coil 38 of the clock controlling device will be energized, thereby raising the core 37, and releasing the balance wheel 22 and allowing the clock to run. As long as the controller is in its "off" position and the brakes are not applied the car will be coasting and the clock will keep a record on its dial of the time of the coasting movement. As soon, however, as the brakes are applied, the pipes 55 and 54 leading to the brake cylinder 55′ are charged and the piston 50 in the cylinder 51 is forced to its lower position, thereby moving the contact disk 47 out of engagement with the contact clips 48 and 49 and interrupting the circuit through the wire 61 and the magnet coil 38 of the clock controlling device. The clock is, therefore, stopped when the brakes are applied and of course, is also stopped if the controller is moved back to an "on" position before the brakes are applied. In the arrangement shown, after the circuit through the magnet coil 38 has been interrupted at the lower contacts of the switch mechanism owing to application of the brakes, relieving of the brakes will not reëstablish the circuit through this magnet coil, since the disk 47 can only again be brought into engagement with the contact clips 48 and 49 by the energization of the magnet coil 40. The clock mechanism, therefore, makes no record of coasting which takes place directly after application of the brakes. This mode of operation of the recording mechanism is desirable in order that an operator may get no credit for coasting if his handling of the brakes is inefficient due to throwing of the brakes on and off rapidly. The registering mechanism will, therefore, furnish an accurate measure of the time which the operator allows his car to coast usefully during operation on a certain section of line. Of course when the magnet 40 is energized the magnet 15 which furnishes the winding energy for the clock mechanism is also energized and the weight 9 is lifted a notch or two on the ratchet mechanism.

The system of Fig. 2 is similar to that of Fig. 1, the principal difference being in the switch mechanism which controls the energization of the magnet 38′ which controls the starting and stopping of the clock. This switch mechanism comprises an actuating magnet 40′ with which coöperates an armature 41′ carrying a rod 42′, to which is attached through an insulating connection a

contact member 43′ which coöperates with the contact member 44′. The contact member 44′ is insulated from but mechanically connected to a lever 46′, of the form shown, pivoted at 65. This lever is provided with a hooked end 66 which engages with a hooked end 67 on the rod 42′, the parts being so arranged that when the core 41′ is raised by the energization of the coil 40′ the lever 46′ is rocked and the contact member 44′ is raised. The contact members 43′ and 44′ are, therefore, in substantially the same position with reference to one another after the core 41′ is raised, as before. When the lever 46′ is rocked, as just described, its lower end is so moved as to be engaged and held by a spring clip 68 supported in any suitable way, as by being secured to the side of a cylinder 70 within which a piston 71 is arranged for movement. The piston 71 is biased to the position shown in the drawing by a spring 72 and a rod 73 extended upon the piston and through the end of the cylinder 70 coöperates with the lever 46′ in a manner clear from the drawing. The cap plate 75 of the cylinder 70 is provided with a pipe 54′ which connects with a pipe 55′ of the air brake system which is normally at substantially atmospheric pressure and is charged when the brakes are applied. Movement of the piston 71 and the rod 73 to the right results in rocking the lever 46′ in a counter-clockwise direction, the end of said lever being forced out of engagement with the clip 68, and the contact member 44′ being moved out of engagement with the contact member 43′ with which it engages after deënergization of the coil 40′ and consequent dropping of the core 41′ and the contact 43′ secured thereto. The contact member 43′ is connected to the wire 6′ by a wire 60′ through a resistance $r'$, and the contact member 44′ is connected through a wire 61′ to the magnet coil 38′. The magnet coil 40′ is energized in any suitable manner by being connected in series with the actuating coil 57 of one of the line contactors, as in the case of the system of Fig. 1. In the system of Fig. 2 the driving energy for the clock mechanism is furnished by a spring 78 which coöperates with the gear 12, said spring being wound through a lever 10′ and the pawl and ratchet mechanism actuated by the reciprocation of the core 37′ which coöperates with the magnet coil 38′.

The mode of operation of the system of Fig. 2 is as follows: When the controller is thrown to an "on" position the magnet 40′ is energized, the core 41′ is moved to its upper position, thereby lifting the contacts 43′ and 44′ and moving the lever 46′ to the position in which its lower end is engaged by the clip 68. When the controller is thrown to its "off" position, the coil 40′ is deënergized and the core 41′ drops and the contacts 43′ and 44′ are brought into engagement, thereby completing the circuit through the magnet coil 38′ and starting the clock mechanism. The clock will continue to run until the brakes are applied and the piston 71 is moved to trip the lever 46′, thereby dropping the contact member 44′ out of engagement with the contact member 43′. Of course if the operator throws on the controller again before operating the brakes, the circuit through the magnet coil 38′ will be interrupted by the lifting of the contact member 43′ out of engagement with the contact member 44′. It is obvious that with the arrangement of Fig. 2, as with the system of Fig. 1, the clock will not record coasting which takes place directly after the release of the brakes.

While I have shown certain forms in which my invention may be embodied, it is of course to be understood that many changes may be made without departing from the spirit of my invention, and I aim to cover all such modifications in the following claims.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In a mechanism for timing the coasting of electric cars, a time registering mechanism, a circuit through which said mechanism is started and stopped electrically, a switch mechanism for controlling said circuit, latching means for holding said switch mechanism in registering position, electromagnetically operated means actuated from the car controller when the same is thrown on for moving said switch mechanism to the registering position and latching it there, and means actuated from the brake mechanism of the car for moving said switch mechanism to the non-registering position when the brakes are applied.

2. In a mechanism for timing the coasting of electric cars, a time registering mechanism, a circuit through which said mechanism is started and stopped electrically, a normally open switch mechanism for controlling said circuit, latching means for holding said switch mechanism in closed position, electromagnetically operated means actuated from the car controller when the same is thrown on for moving said switch mechanism to closed position and latching it there, and means actuated from the brake mechanism of the car for moving said switch mechanism to its open position when the brakes are applied.

3. In a mechanism for timing the coasting of electric cars, a time registering mechanism, a circuit through which said mechanism is started and stopped electrically, a normally open switch mechanism controlling said circuit, latching means for holding said switch mechanism in closed position, a magnet energized from the car con-

troller when the same is thrown on for moving said switch mechanism to the closed position and latching it there, and a pneumatically operated piston actuated from the brake mechanism of the car for moving said switch mechanism to its off position when the brakes are applied.

4. In a mechanism for timing the coasting of electric cars, a time registering mechanism, a circuit through which said mechanism is started and stopped electrically, a normally open switch mechanism for controlling said circuit comprising two movable elements, a magnet energized from the car controller when the same is thrown on arranged to move both elements of said switch mechanism, latch mechanism for holding one element in the position to which it is moved by said magnet, a connection between the elements of the switch mechanism such that independent movement of one with reference to the other is permitted in one direction to effect closing of the switch when said magnet is deenergized, and a piston actuated from the brake mechanism of the car for moving said latched element to its original position and thereby opening said switch.

5. In a mechanism for timing the coasting of electric cars, a time registering mechanism, a circuit through which said mechanism is started and stopped electrically, a normally closed switch in said circuit, a magnet energized from the car controller for opening said switch when the controller is in an on position, another switch in said circuit closed by said first mentioned switch in opening, latching means for holding said second mentioned switch closed after said first mentioned switch has closed, and a pneumatically operated piston actuated from the brake mechanism of the car for opening the second mentioned switch when the brakes are applied.

6. In an electrically driven car provided with brakes, a time registering mechanism, electromagnetic switch mechanism for controlling the operation of said registering mechanism comprising two switches in series, one of which is mechanically held in closed position, an electromagnet for closing said latter switch and simultaneously opening the other switch, and means whereby the mechanically held switch is opened when the brake is applied.

7. In a mechanism for timing the coasting of electric cars, a time registering mechanism, a circuit through which said mechanism is started and stopped electrically, a normally closed switch in said circuit, electromagnetically operated means actuated from the car controller for opening said switch when the controller is in an "on" position, another switch in said circuit controlled by said first mentioned switch in opening but not opened by said first mentioned switch in closing, and means actuated from the brake mechanism of the car for opening said last mentioned switch when the brakes are applied.

8. In an electrically driven car provided with brakes, a time registering mechanism, electromagnetic switch mechanism for controlling the operation of said registering mechanism comprising two switches in series, the electromagnetic means controlling the operation of said switches in one direction, one of said switches being mechanically held in closed position, and means whereby said latter switch is opened when the brake is applied.

9. In an electrically driven car provided with brakes, a time registering mechanism, an electric circuit through which said mechanism is started and stopped, electromagnetic switch mechanism for controlling said circuit, connections whereby said switch mechanism is operated to start said registering mechanism when the controller is moved to the off position, and means whereby the switch mechanism is mechanically opened to stop the registering mechanism when the brakes are applied.

10. In an electrically driven car provided with brakes, time registering mechanism, an electric circuit through which said mechanism is started and stopped, electromagnetic switch mechanism having contacts in the said circuit, connections whereby certain of said contacts are opened and the other of which contacts are closed by the operation of said switch when the controller is moved away from the off position, and means whereby the switch mechanism is mechanically operated to stop the registering mechanism when the brakes are applied.

In witness whereof, I have hereunto set my hand this 30th day of July, 1910.

GEORGE H. HILL.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.