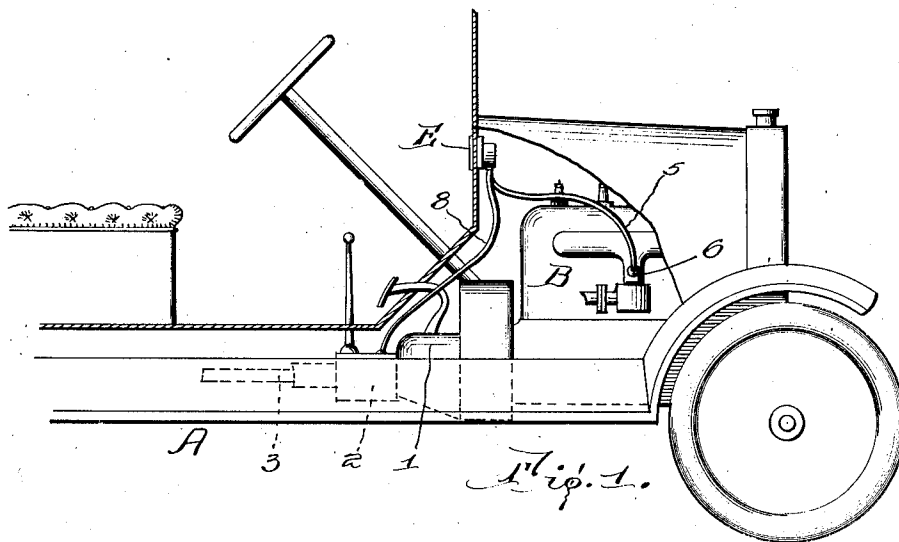
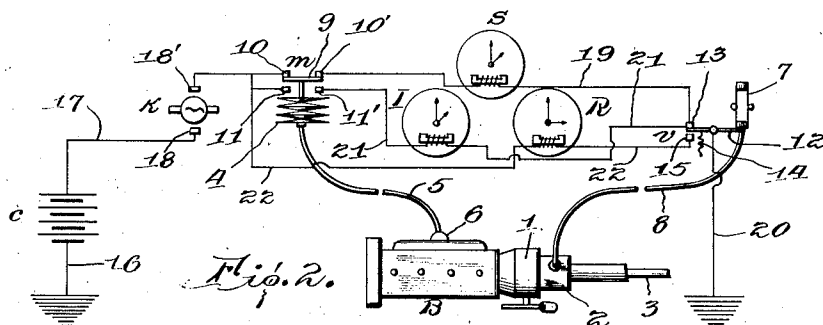
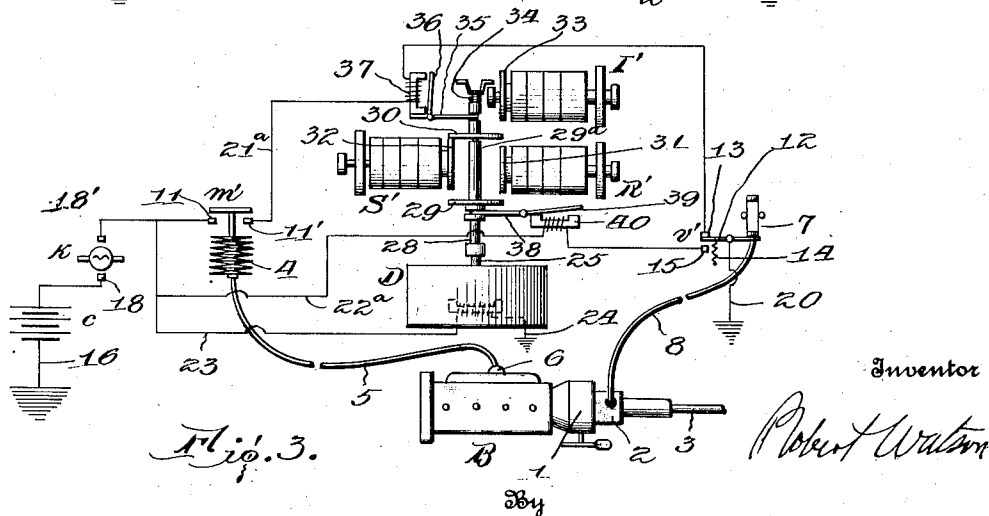


R. WATSON.
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 APPLICATION FILED DEC. 20, 1921.

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2 SHEETS—SHEET 1.



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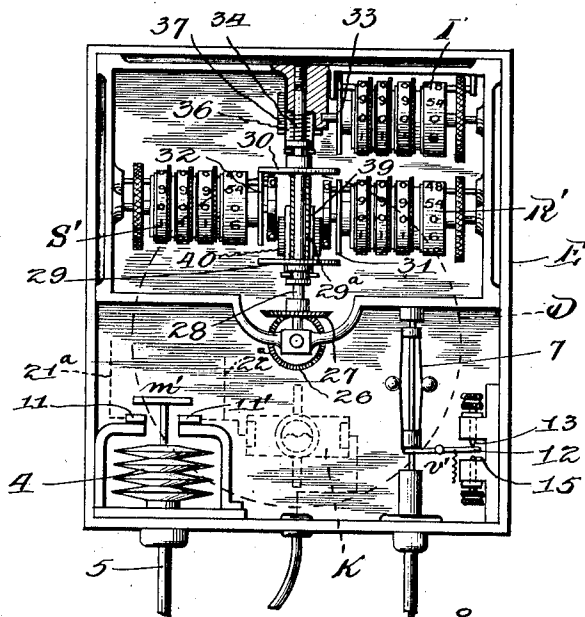


Fig. 4.

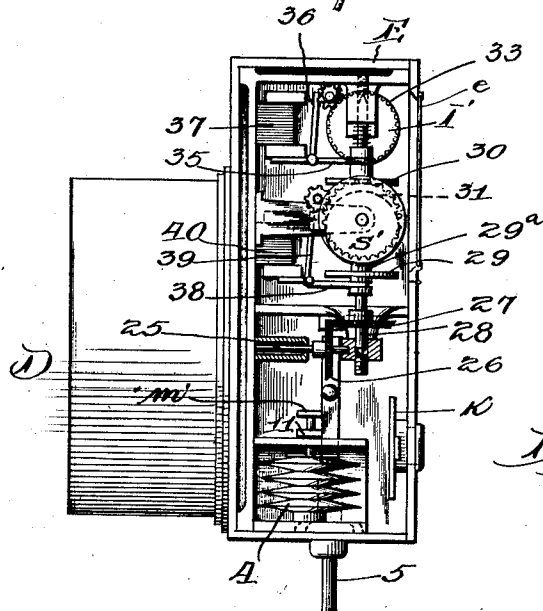


Fig. 5.

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MEANS FOR INDICATING STOPPING, IDLING, AND WORKING TIMES OF AUTOMOBILE ENGINES.

1,414,910.

Specification of Letters Patent.

Patented May 2, 1922.

Application filed December 20, 1921. Serial No. 523,727.

To all whom it may concern:

Be it known that I, ROBERT WATSON, a citizen of the United States, residing at Silver Spring, in the county of Montgomery and State of Maryland, have invented certain new and useful Improvements in Means for Indicating Stopping, Idling, and Working Times of Automobile Engines, of which the following is a specification.

10 This invention relates to improvements in devices for indicating the performance of automobiles operated by internal combustion motors, with respect to the running and stopping time of the vehicle and the idling time of the motor during a trip, or any given period of time such as the working hours of a day, week or month. In my allowed application, Serial No. 476,607, I have shown means for indicating the running time of automobiles and the time during which the motor is allowed to idle while the vehicle is stopped. The apparatus of the present invention includes means for indicating the stopping time of the motor vehicle as well as the means for indicating the running time of the vehicle and the idling time of the motor, so that a complete time record of the performance of the motor and vehicle may be registered during a trip or a given period of time. Thus, for instance, the owner of a fleet of commercial vehicles may at the end of each working day, or of a week, month or year, determine how much of the time a vehicle has been standing idle, what part of the time it has been in use, and what part of the time while the vehicle is stopped, the motor has been allowed to idle, and so determine whether the vehicle and the operator's time are being used to the best advantage, or wastefully.

In the accompanying drawing,

Fig. 1 is a side elevation of the forward part of a motor vehicle, partly broken away, showing my improvements thereon;

Fig. 2 is a diagrammatic view illustrating the invention in connection with a plurality of electro-magnetically operated clocks of the type which stop when the current is cut off;

Fig. 3 is a similar view illustrating the invention as applied to a series of counters;

Fig. 4 is a front elevation of an instrument embodying the features diagrammati-

cally illustrated in Fig. 3, the door or cover of the instrument being removed; and,

Fig. 5 is a side view seen from the left of Fig. 4, certain parts being in section.

Referring to the drawing, A indicates a vehicle having an internal combustion driving motor B and the usual power transmitting mechanism for connecting the engine to the driving wheels, including the clutch contained in the casing 1, change speed gearing in the casing 2, and a propeller shaft 3, which is geared to the traction wheels through the differential mechanism, not shown. The propeller shaft, it will be understood, rotates when the vehicle is in motion, whether coasting or being driven by the motor, and stops when the vehicle stops, while the motor will run free or idle when disconnected from the propeller shaft.

In Fig. 2 of the drawing, I have shown means for indicating the running and stopping time of a motor vehicle, as well as the idling time, during a given period, comprising three, electro-magnetically operated clocks R, S, and I, respectively, these clocks being of a well known type adapted to run while the current is turned on and to stop when the current is turned off, like a stop watch. In this figure of the drawing, 4 indicates a normally expanded bellows, which is connected by a tube 5 to the intake manifold 6 of the motor B, so that when the motor is started the bellows will collapse by the suction of the motor and remain closed until the motor stops, when it will expand. A centrifugal governor is shown at 7, and this governor, which may be the governor of a speedometer, is operable by a flexible shaft 8, which is suitably geared to the propeller shaft 3 so that the flexible shaft and governor will be driven when the vehicle is in motion.

The bellows carries a contact piece 9, adapted to engage stationary contacts 10, 10' on a switch *m*, when the bellows is expanded, and to leave these contacts and engage other stationary contacts 11, 11' when the bellows collapses. The governor 7 controls a switch *v*. As shown, the governor normally bears against one arm of a centrifugally pivoted lever 12 and holds the other arm of said lever against the contact 13. When the vehicle starts, the governor re-

leases the switch lever and the latter is drawn by a spring 14 against a contact 15. When the vehicle stops, the governor returns the switch lever to the contact 13.

5 A battery, which furnishes current for operating the time indicators, is shown at *c*. One pole of the battery is grounded by the connection 16, and the other pole of the battery is connected by conductor 17 to the contact 18 of a manually controlled switch *k*, which may be opened and closed by a key. This switch when closed connects the battery to a switch contact 18', to which the circuits of the several clocks are connected. Thus, a normally closed circuit 19 for the clock *S* extends from the switch *k*, through the normally connected contacts 10, 10' of the switch *m* to the contact 13 of the switch *v*, thence through the arm 12 of said switch and a ground connection 20 to the battery through ground connection 16. A normally open circuit 21 for the clock *I* extends from the switch *k* to the contacts 11, 11' of the switch *m*, thence to the contact 13 of the switch *v*, and thence to the battery through the ground connections; and a normally open circuit 22 for the clock *R* extends from the switch *k* to the contact 15 of the switch *v*, where the circuit is open except when the vehicle is running. If the owner or person in charge of the vehicle desires to register the performance of the motor and vehicle for a trip, or during the working hours of the day, the hands of the several clocks are set to the hour of 12 on the dials and at the commencement of the trip, or the commencement of the working day, he closes the key controlled switch and leaves it closed until the end of the trip or of the day. Upon the closure of this switch, the circuit 19 is completed and the clock *S* commences to operate and register the stopping time. If, now, the operator of the vehicle starts the motor, the suction of the motor will cause the bellows switch to open the circuit of the clock *S* at the switch *m* and close the circuit 21 of the clock *I*. The clock *S* will then stop and the clock *I*, which registers the idling time, will commence to operate and will continue as long as the motor operates idly. If the operator now starts the vehicle, the circuit 21 will be opened at the switch *v*, causing the clock *I* to stop, and the circuit 22 will be closed at said switch, causing the clock *R*, which registers the running time of the vehicle, to start. As long as the vehicle is running, the clock *R* alone will operate. If the vehicle is brought to a stop, the switch *v* opens the circuit of the clock *R*, causing it to stop, and closes the circuit of the clock *I*, causing it to start and register idling time, and if the motor is then stopped, the circuit of the clock *I* will be broken at the switch *m*, causing the latter clock to stop, and the circuit of the clock *S* will be closed, causing

the last mentioned clock to operate and register the stopping time. At the end of the trip, or of the working day, as the case may be, the operator turns off the current at the switch *k*, to stop the operation of the clock *S*, and the indicators will show the time during which the vehicle was running and the time during which it was stopped, and the time that the motor was left idling during the stopping periods of the vehicle.

In Fig. 3 is shown diagrammatically an arrangement for indicating the idling, running and stopping times by means of revolution counters operated from the hour hand arbor of a constantly operating clock, which latter is preferably of the electro-magnetic self-winding type, capable of being started and stopped by turning a manually operated switch. This apparatus is suitable for registering the performance of the motor and vehicle for long periods of time, such as the working hours of a week, month or year. In Figs. 4 and 5, the apparatus of Fig. 3 is shown more in detail arranged within a casing.

Referring to Fig. 3, wherein the parts corresponding to those in Fig. 2 are indicated by the same reference letters, *D* indicates a self winding clock, the circuit 23 of which extends from the battery through the key switch *k* to the magnet of the clock, and thence through ground connections 24 and 16 to the other side of the battery. As long as the switch is closed, the clock runs and when the switch is opened, the clock stops. To the hour hand arbor 25 is connected directly, as shown in Fig. 3, or by gears 26 and 27, as shown in Figs. 4 and 5, a shaft 28 which turns at the same rate of speed as the hour hand arbor, that is, once in an hour. Slidably mounted on the shaft, but turning therewith, are two gears 29 and 30, the former adapted to engage a gear 31 in a revolution counter *R'*, and the latter normally engaging a gear 32 on a revolution counter *S'* and movable into engagement with a gear 33, immediately above it, on a revolution counter *I'*. The gears 29 to 33, inclusive, are of the same diameter so that one revolution of the time shaft will cause one revolution of the right hand ring on any of the counters which may be geared to the time shaft. The engaging surfaces of the gears are preferably merely finely milled surfaces. The gear 30 is normally held in engagement with the gear 32 by a light spring 34, coiled about the time shaft, and it is movable into engagement with the gear 33 by a lever 35 connected to the armature 36 of a magnet 37. The gear 29 has attached to it a long sleeve 29^a which extends upwardly close to the gear 30, the arrangement being such that when the gear 29 is moved upward to engage the gear 31, the sleeve will lift the gear 30 out of engagement

with the gear 32 before the gear 29 engages the gear 31, but the gear 30 will not be lifted high enough to engage the gear 33. A lever 38 is provided for lifting the gear 29, and this lever is connected to an armature 39 controlled by a magnet 40.

The coil of the magnet 37 is in a circuit 21^a, corresponding to the circuit 21 of Fig. 2, that is, it is normally open at the switch *m'*, controlled by the motor, and closed at the switch *v'*, controlled by the vehicle. The coil of the magnet 40 is in circuit 22^a, corresponding to the circuit 22 in Fig. 2, which does not include the switch *m'* and is normally open at the switch *v'*.

In operation, assuming that it is desired to indicate the performance of the motor and vehicle for the working hours of a day, week or month, the switch *k* will be closed at the commencement of each working day and opened at the end of the day. When the switch *k* is closed, the clock D operates the time shaft 28. As the counter S' is normally geared to this shaft, the latter will register as long as the clock runs and the motor and vehicle are stopped. If the motor is started, the switch *m'* will close the circuit through the magnet 37 and the latter will operate the lever 35 to disengage the gear 30 from the gear on the counter S' and move it into engagement with the gear 33 on the counter I', and the latter will register the idling time of the motor. If the vehicle is now started, the governor 7 will cause the switch *v'* to open the circuit of the magnet 37 and close the circuit of the magnet 40, and the latter will rock the lever 38 and move the gear 29 into engagement with the gear 31 on the counter R', so that the latter counter will operate and register the running time of the vehicle. When the circuit of the magnet 37 is broken, the gear 30 drops out of engagement with the gear on the counter I' and rests on the sleeve 29^a which holds it out of engagement with the gear on the counter S' as long as the vehicle is running and the register R' is in operation. If the vehicle is now brought to a stop, the switch *v'* interrupts the circuit of the magnet 40, allowing the gear 29 to drop out of engagement with the gear on the counter R', and immediately closes the circuit of the magnet 37, which latter moves the gear 30 into engagement with the gear on the idling time indicator R'. If the motor is now stopped, the switch *m'* will open the circuit of the magnet 37 and the gear 30 will be disengaged from the counter I' and engage the gear on the counter S' which will register the stopping time. At the end of the working day, the party in charge of the vehicle opens the key switch *k*, and this interrupts the circuit through the clock D, which stops, causing the indicator S' to stop. Thus, the several indicators

will show the working, idling and stopping times for the working hours of the day, week, or longer period of time.

In Figs. 4 and 5, the parts illustrated diagrammatically in Fig. 3, are shown assembled in a casing E, to the back of which the clock D is attached. The casing is provided with a door *e*, which may be unlocked to re-set the counters, and switches are arranged in the lower part of the casing, the switch *k* being shown upon the front of the casing in full lines in Fig. 5, and represented in dotted lines in Fig. 4, wherein the front of the casing is removed.

What I claim is:

1. The combination with a motor vehicle having an internal combustion motor, of three time indicators, means for operating one of said indicators while the motor and vehicle are stopped, means for automatically stopping the latter indicator and starting a second one of said indicators when the motor starts, and means for automatically stopping said second indicator and starting the third of said indicators when the vehicle starts.

2. The combination with a motor vehicle having an internal combustion motor, of three time indicators, means for operating one of said indicators while the motor and vehicle are stopped, means controlled by the motor for automatically stopping the latter indicator and starting a second one of said indicators when the motor starts, and means controlled by a driven part on the vehicle for automatically stopping said second indicator and starting the third of said indicators when the vehicle starts.

3. The combination with a motor vehicle having an internal combustion motor, of an electromagnetically operated clock, a circuit for the clock, a switch for closing and opening said circuit to start and stop the clock, three time indicators, one of which is normally geared to the clock mechanism, means controlled by the motor for disengaging said latter indicator from the clock mechanism and for gearing a second one of said indicators to said mechanism, and means controlled by a part on the vehicle for disconnecting said second indicator from said mechanism and for connecting the third of said indicators to said mechanism.

4. The combination with a motor vehicle having an internal combustion motor, of a constantly operating time mechanism, a shaft driven by said mechanism, three revolution counters, one normally operatively connected to said shaft, means controlled by the motor for disconnecting the latter counter from the shaft and for connecting a second one of said counters to the shaft when the motor starts, and means controlled by a part on the vehicle for disconnecting said second counter from the shaft and con-

necting the third counter thereto when the vehicle starts.

5 5. The combination with a motor vehicle having an internal combustion motor, of two time indicators, magnets for causing the operation of said indicators, normally open circuits for said magnets, means operated by the motor for closing one of said cir-

uits when the motor starts, a governor operated by a driven part on the vehicle, and a switch controlled by said governor adapted to open the latter circuit and close the other one of said circuits when the vehicle starts. 10

In testimony whereof I affix my signature. 15
ROBERT WATSON.