PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Electric Watch.

I, MAURICE PHILIPPE FAVRE-BULLE, of 59, Boulevard Beausejour, Paris, in the Department of the Seine, and Republic of France, a citizen of the French Republic, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention has for its object to provide an improved electric watch whose working shall be reliable, notwithstanding the vibrations to which it may be subjected. For this reason it is more especially adapted to be used on motor vehicles without however being limited to that particular use. The oscillating device consists of a coil or bobbin adapted to move along an arc-shaped magnet, this coil being located in a circuit which is periodically closed. The oscillations of this coil are transmitted by means of suitable multiplying gearing to a balance wheel somewhat similar to that of a large watch, that is to say having the same regulating power as regards weight, mass and moment of inertia.

The driving of the transmitting devices by means of the oscillating device is effected in the following manner:

A plate fixed to the oscillating device comprises, at right angles to its own plane, one or two small cylinders which are capable of turning freely on their axes and are held between the two prongs of an oscillating fork carrying a pawl which, at each complete oscillation of the fork, moves forward the wheel, the axis of which coincides with the axis of oscillation of the fork. A counter-pawl prevents any backward movement of this wheel, and each time it rocks it can make a contact which closes the circuit in which the coil is included.

The axle of the wheel, above referred to, carries at its end an eccentric on which is fixed a spring pawl which receives by this means a to-and-fro motion which causes a second wheel to move forward one tooth each time the first wheel has made a complete revolution. Finally, a suitable gearing of any known type transmits the motion of this wheel to the hour hand arbor.

A constructional form of this invention is illustrated by way of example in the accompanying drawings in which:—

Figure 1 is a cross-section, on a larger scale, of the entire apparatus.

Figures 2, 3 and 4 are plans of the three superposed plates carrying the devices that constitute the apparatus.

Figures 5, 5[a] and 6 are detail views drawn to a larger scale.

The whole of the devices constituting the watch, forming the subject matter of the present invention, is carried by three parallel plates, 1, 2 and 3.

On the plate 1 (Figures 1 and 2) there is fixed by means of two clips 4 and 5, a magnet 6 of annular, gapped circular form, or having the shape of an arc of a circle. On this magnet is wound a coil 7 connected to the electric circuit 8 of a current generator 9.

The coil 7 is fixed to a toothed wheel 10 fixed to an axle 11 pivoted at 12 on the plate 1 and extending through the plate 2. A counter-weight 13 likewise fixed to the wheel 10 serves to balance the coil 7. A spiral spring 14 of steel or nickel located near the wheel 10 is fixed at one end on a ferrule attached to the axle 11 and at its other end to the plate at 15.

The toothed wheel 10 meshes with a pinion 16 constituting the axle of a balance wheel 17 arranged in such a manner as to have a great stability of oscillation.

The axle 11 of the wheel 10, which as above stated extends through the plate 2,

[Price 1/-]

carries upon the said plate a plate 18 (Figures 1 and 3) upon which are located two axles 19, 20 at right angles to the plane of the plate 18 around each of which a small cylindrical roller 21, 22 is able to turn freely (Figure 5). On the other end, of the plate 2 there is pivoted an axle 23 which extends through the plate 3 and is fixed to a toothed wheel 24 which has for instance sixty teeth if a simple oscillation of the oscillatory system corresponds to a half-second. Around the axle 23 there can oscillate a fork 25 the two prongs of which embrace the two cylindrical rollers 21, 22. The length of these prongs is such as to prevent any possibility of these two rollers escaping from the said prongs. This construction has the great advantage of allowing, at the end of the stroke of each of the rollers 21 and 22, the fork to turn through a gradually smaller distance in such a manner that the angle of total rotation of the fork shall be only slightly influenced by the variations in the amplitude of the oscillating device.

The two rollers above mentioned may be replaced by a single roller 46 (Figure 5a) having a diameter that is slightly smaller than the distance between the two prongs of the fork 25, and pivotally mounted on an axle 47 carried by a plate 18. A counter-weight 26 carried by the end of the arm of the fork, serves to balance the latter.

On the arm of the fork 25 there is articulated at 27 a pawl 28 engaging with the teeth of the wheel 24. A counter pawl 29 is pivoted on an axle 30 and is subjected to the action of a returning spring 31 located obliquely in relation to this counter pawl. The latter carries an elastic conducting strip 32 on which is located a contact piece 33 capable of making contact with a second adjustable contact piece 34 that is carried directly by the plate 2. The contact piece 34 is connected to one of the poles of the battery 9, the second pole of which is connected to the spring 31.

The axle 23 of the wheel 24 which extends through the plate 3, terminates above the latter in the form of an eccentric 35 (Figures 1, 4 and 6) on which is mounted a pawl 36 subjected to the action of a returning spring 37 constituted for instance by an elastic strip forming one piece with the pawl. This pawl comes into engagement with the teeth of the toothed wheel 38 fixed to an axle 39 adapted to pivot on the plate 3. A counter pawl 40, which is similar to the pawl 36, is capable of pivoting on an axle 41 and is subjected to the action of a returning spring 42. The axle 39 of the wheel 38 has fixed on it the minutes hand 43 of the watch (Figure 1). Any suitable gearing serves to transmit the motion of the minutes hand axle to the axle 44 of the hour hand. On the end of the axle 23, there may be mounted if desired, a seconds hand 45.

The operation of this apparatus is as follows:—

When the coil 7 moves along the magnet 6 whilst making oscillations of very small amplitude, it carries with it the wheel 10. This oscillatory motion is transmitted by the pinion 16 to the balance wheel 17 which has a large amplitude of oscillation. Further, this balance wheel must have suitable dimensions so that there shall exist between the two oscillating devices an equilibrium such that vibrations will have no effect or only a very slight effect upon the duration of their oscillations.

The oscillations of the wheel are transmitted by the axle 11 which is fixed to it, to the plate 18, the cylindrical rollers 21 and 22 of which compel the fork 25 to rock around the axle 23. At each oscillation of this fork towards the left hand of the figure the pawl 28 moves the wheel 24 forwards one tooth, but owing to the construction hereinbefore described, it is sufficient that the distance between the two prongs of the fork 25 shall be suitably calculated to cause the drive to be done tooth by tooth. Consequently the wheel will be advanced one tooth per second. The counter pawl 29 prevents the wheel 24 from moving back, and, at each passage of a tooth, this counter pawl, pivoting on the axle 30, will cause contact between the contact pieces 32 and 33 and consequently will close the circuit 8. It will be perceived that in this manner the current is sent into the coil 7 at the desired instant for maintaining the oscillation. The returning spring 31 is arranged obliquely so as to allow of an automatic taking up of "play."

The rotation of the wheel 24 is transmitted through the medium of the axle 23 fixed thereto, to the eccentric or fork 25. Consequently, the pawl 36 receives a longitudinal to-and-fro motion and causes the wheel 38 to move forward one tooth at each complete revolution of the wheel 24. The counter pawl 40 prevents the wheel 38 from going backwards. The hand 43 which is fixed on the axle 39 of the wheel 38 will thus show the minutes. As already stated, suitable gearings serve to transmit the motion to the hour hand 44.

Having now particularly described and ascertained the nature of my said inven-

tion and in what manner the same is to be performed, I declare that what I claim is:—

1. An electric watch particularly applicable for use on motor vehicles, wherein the oscillating device consists of a coil movable along a magnet having the shape of an arc of a circle, said coil receiving current at the proper moment for maintaining the oscillations of said device, these oscillations being transmitted by a suitable multiplying gearing to a balance wheel which is so arranged as to have a great stability of oscillation.

2. An electric watch particularly for use on motor vehicles according to Claim 1, wherein the transmission of the oscillations of the coil to the seconds wheel is effected by means of an oscillating plate fixed to the axle of this wheel, upon which plate there are located one or two cylindrical rollers capable of revolving freely each around an axis at right angles to the plane of the plate, these rollers being inserted between the two prongs of a fork oscillating around the axis of the seconds wheel and carrying a pawl which engages with the teeth of the said wheel.

3. An electric watch particularly for use on motor vehicles according to Claim 2, wherein the transmission of the motion of the seconds wheel to the minutes wheel is effected by means of an eccentric fixed on the end of the rotating axle of the seconds wheel upon which there is mounted a pawl engaging with the minutes wheel which causes the latter to advance one tooth at each complete revolution of the seconds wheel.

4. An electric watch particularly for use on motor vehicles according to Claim 2, wherein the teeth of the seconds wheel come into engagement with a counter pawl which is subjected to the action of a returning spring, and closes at each of its oscillations a contact that sends current into the oscillating coil.

5. The improved electric watch substantially as described and as illustrated by the accompanying drawings.

Dated this 2nd day of August, 1923.

MARKS & CLERK.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1924.

[This Drawing is a reproduction of the Original on a reduced scale]

Fig. 1

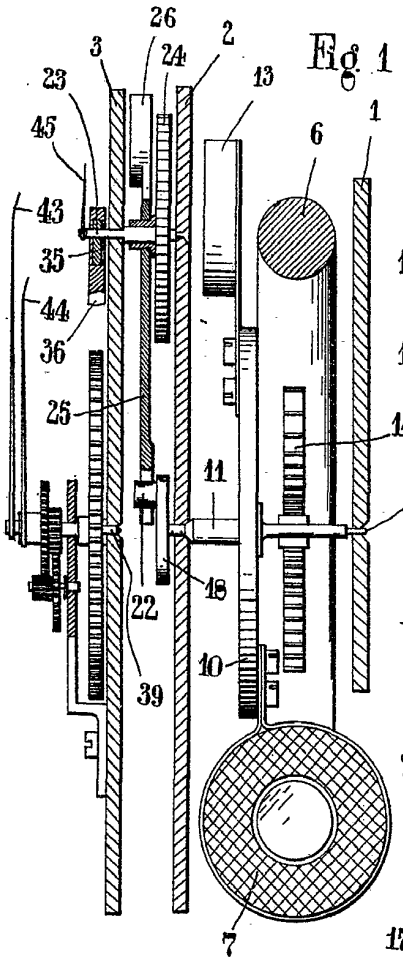


Fig. 2

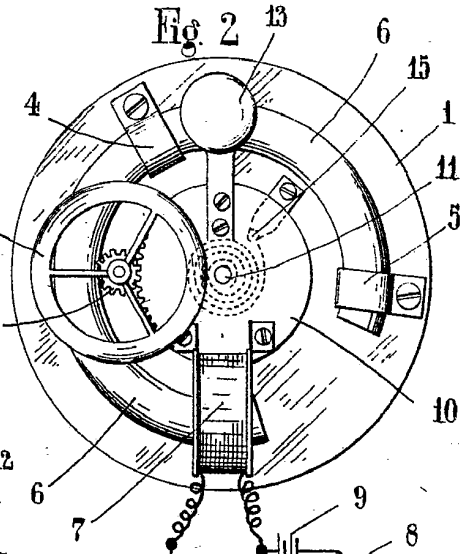


Fig. 3

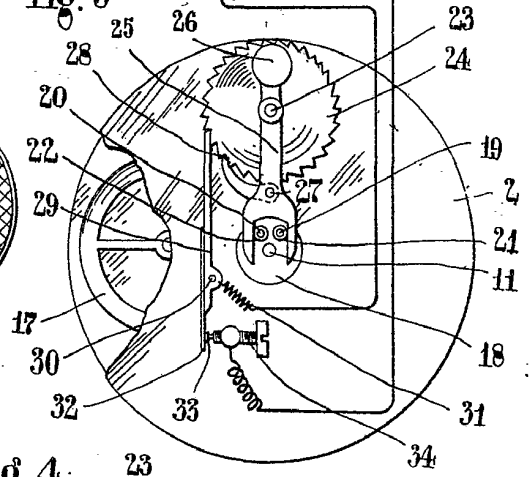


Fig. 5

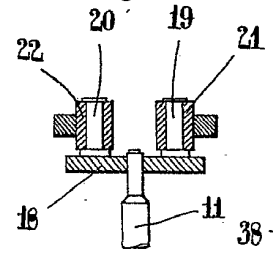


Fig. 5a

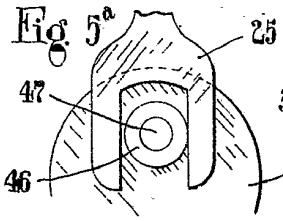


Fig. 4

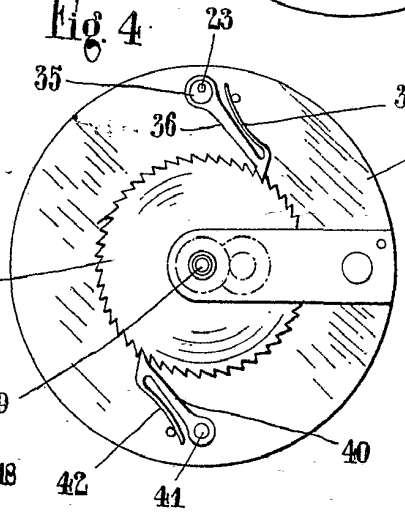
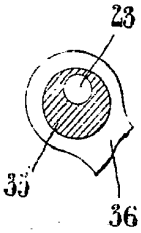


Fig. 6



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