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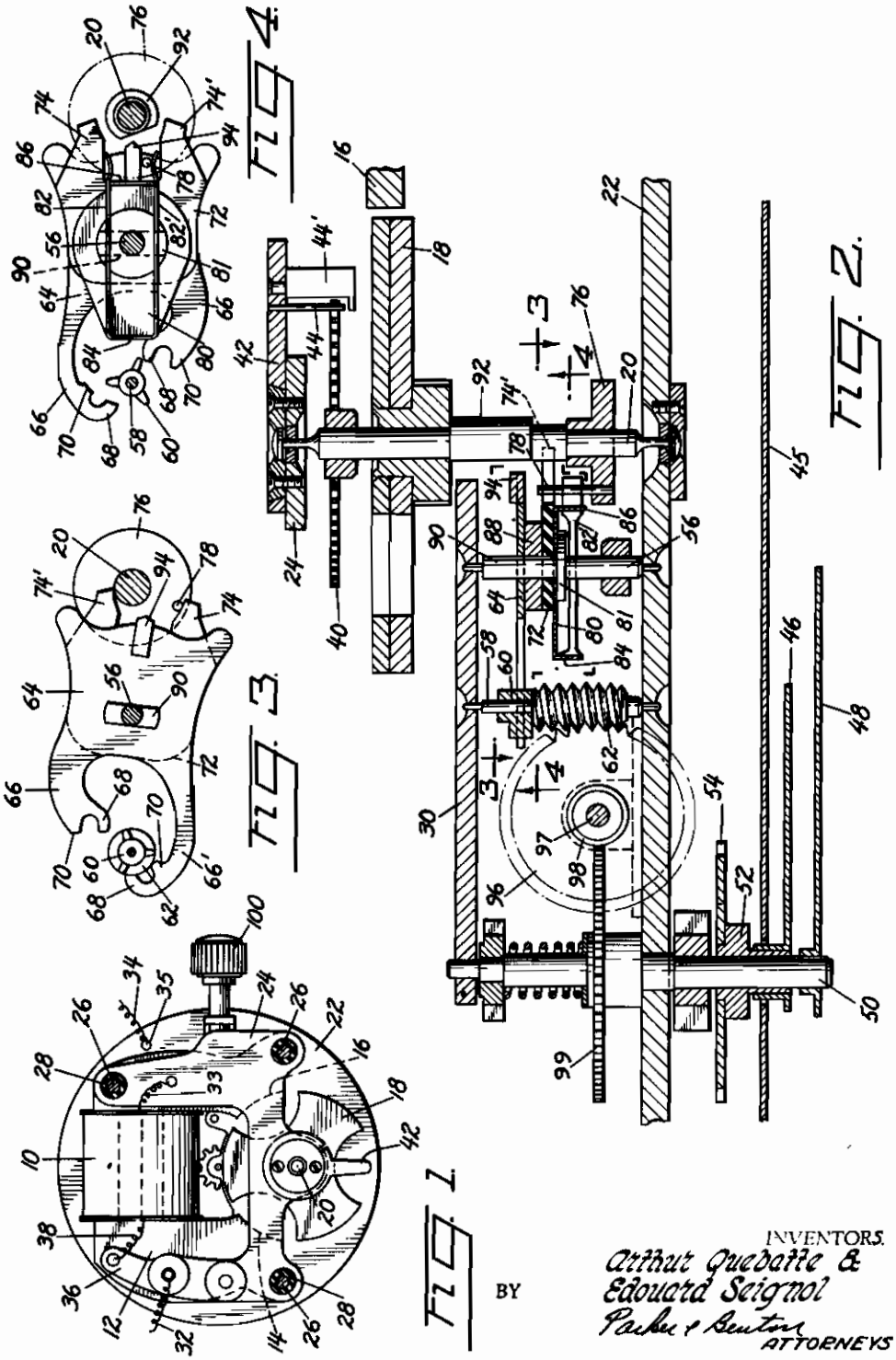

FIG. 4

FIG. 2.

FIG. 3

FIG. 1

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# ALIEN PROPERTY CUSTODIAN

## ELECTRIC CLOCK MECHANISM

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Application filed April 2, 1942

This invention relates to time pieces and particularly to improvements in the electric clock described and claimed in the application of Arthur Quebatte and Edouard Seignol, Serial No. 199,036, filed March 30, 1938.

An important object of this invention is to provide improvements in electrically operated clocks which increase their accuracy of operation, simplify their construction, and reduce the electric current consumption. Another object of this invention is to improve the ruggedness of the clock structure so that it will withstand considerable abuse without impairing its function. All these objects are accomplished by associating certain elements of the clock mechanism together in a distinctly novel manner and by providing novel features on these elements which cooperate with one another to drive the clock mechanism accurately over long periods of time.

The description of the invention which follows and the accompanying drawings show by way of example a structural embodiment of the present invention. It is evident that the details of construction shown in the drawing and described herebelow are able to be combined or employed separately as desired and modified to suit different conditions.

Various other objects, advantages and meritorious features of the invention will become more fully apparent from the following specification, appended claims and accompanying drawings, wherein:

Fig. 1 is a back view of a clock embodying my invention.

Fig. 2 is a sectional view through a portion of the mechanism of the clock showing in enlarged detail the invention and associated operating parts,

Fig. 3 is a back side view of my novel form of double pallet fork and associated parts, and

Fig. 4 is a front side view of my double pallet fork.

Referring in detail to the drawings, the electromagnet coil 10 produces when energized a magnetic field in a stationary armature 12 having opposite pole sections 14 and 16. A balance wheel 18 is fixed on a shaft 20 and is shaped with three arms as shown, two of which are capable at the same time of approaching into close magnetic relationship with the pole sections 14 and 10. The balance wheel 18 is formed of two metal pieces and functions as a movable armature between the poles of the fixed magnet and as will become more apparent hereinafter its oscillations are magnetically influenced thereby.

The operating mechanism is mounted between a front supporting plate 22 of circular dimension and a rear supporting plate 24 of irregular formation. These plates are secured together in spaced parallel relation by pillar posts 26. Three are shown in Fig. 1 and each is insulated from direct contact with the plate 24 as indicated by insulating washers 26. The pole sections of the fixed armature are secured to the pillars in a plane slightly forward of the back supporting plate. In advance of the fixed armature is a third or intermediary supporting plate 30 (Fig. 2) of irregular formation. The majority of the shafts of the clock mechanism have their ends journaled in this third or intermediary supporting plate and the front plate 22. The balance wheel shaft 20, however, is of longer length and is journaled between the front and rear supporting plate 22 and 24 as shown in Fig. 2.

Leads 32 and 34 deliver direct electric current from any suitable source of electricity, such as a wet or dry cell battery of proper voltage. The lead 32 is connected directly to the coil 10 through a conductor 30 insulatively supported on the back plate 24 and through a wire 30 from the conductor to the coil. The opposite end of the coil is electrically connected to the rear plate 24 by wire 33. Lead 34 is connected to the front platee at 35. From there the circuit is completed back to the coil 10 through a novel electric make and break device associated with the balance wheel which is hereinafter described and also described and claimed in the aforesaid application for patent of Arthur Quebatte and Edouard Seignol.

The balance wheel 18 as previously described oscillates back and forth with shaft 20 between the opposite poles of the magnet. As customary, a spirally coiled spring, shown in cross section at 40 in Fig. 2 is provided to yieldingly oppose the oscillations of the balance wheel and to return it after each oscillation. It is fixed at one end to the shaft 20 and at the other end to any immovable part of the clock such as the back plate 24. Journaled to the back plate 24 for rotation about the axis of the balance wheel is a speed regulator 42 having a pair of depending elements 44—44' which extend past the opposite sides of one of the loops of the spiral spring. Adjustment of the regulator to various positions will vary the resistance of the spiral spring to the oscillations of the balance wheel and thereby alter the rate of advance of the clock mechanism.

The clock face or dial is indicated at 48 and extends in spaced parallel relation to the front supporting plate 22. The minute and hour hands

are indicated at 46 and 48 respectively. The minute hand is fixed to shaft 50 projecting through the center of the dial and journaled in the supporting plates 22 and 30. The hour hand is fixed on a sleeve 52 carrying a gear wheel 54.

Disposed in line with shaft 20 but spaced therefrom and from each other are two shafts 56 and 58. Shaft 58 carries an escapement wheel 60 and a worm gear 62. Shaft 56 carries novel means including fork-like instrumentalities which extend on the one hand to the balance wheel shaft to receive driving impulses therefrom and on the other hand to the escapement wheel to drive the same. The novel means is a composite structure formed of elements associated together on shaft 56 and partaking of the same movement. Because of this compact association and joint action, the assembly of these elements is referred to as a body.

The body on shaft 56 comprises a metal sheet or plate 64 shaped with narrow arms 66 and 66' (Fig. 3) which extend to and partially embrace the escapement wheel 60. The extremities of the arms are each correspondingly shaped to provide an operating finger 68 and a retaining finger 70. As will be described more particularly hereinafter, the body on shaft 56 receives driving impulses which cause it to rock back and forth. As a result the arms 66 and 66' alternately swing into and out of engagement with the escapement wheel which is of star shape design. As the body rocks back and forth, the operating finger of each arm is adapted to engage a tooth in the escapement wheel and cause the wheel to rotate a part of its revolution. The retaining finger 70 of the particular arm engaging the escapement wheel then functions to stop the advance of the next succeeding tooth on the escapement wheel. Thus as the arms swing back and forth the escapement wheel is intermittently rotated in one direction around its axis of shaft 58. The escapement wheel is of novel design as shown. The teeth are few in number, three in this particular instance, and are quite widely spaced apart. The arms 66 and 68' are each shaped in a novel manner to provide both an operating finger and a retainer finger on the end thereof. The engaging portions of the escapement wheel and the arms 66 and 66' are formed integrally on their respective members and result in a saving in material and space.

On the same body as plate 64 but spaced therefrom is a second metal plate or sheet 72 shaped with arms 74 and 74' which extend toward and partially straddle the shaft 20. Carried on member 76 fixed to shaft 20 is a pin 78. This pin extends parallel to but spaced from the axis of shaft 20 and as the balance wheel oscillates it traverses an arcuate path back and forth in timed relation thereto. This pin projects between the arms 74 and 74' and in its swinging movement strikes these arms and causes the plate 72 and associated parts to rock back and forth about the axis of shaft 56.

On the side of plate 72, opposite to plate 64, is a thin sheet 80 of flexible metal material. This sheet bears on a circular shoulder 82 formed on shaft 50. This shoulder forms a seat for the whole body holding the same against axial movement toward the front of the clock. Sheet 80 is cut or otherwise shaped to provide a pair of flexible strips or fingers 82 and 82' which extend substantially parallel to one another and perpendicular to one another. To reduce the cost of manufacture and conserve space it is preferred that the strips 82 and 82' be formed integrally out of sheet 80. As shown in Figs. 2 and 4, the sheet is bent at 84 on the side adjacent to the escapement wheel axis. From this bent section the two strips 82 and 82' extend. They are bent with respect to section 84 so as to overlie the sheet 80 and extend parallel to one another past the opposite sides of the shaft 56. The free ends of these strips overlap upon the path of swinging movement of the pin 78. The free ends of these strips lie closer together than the arms 74 and 74' and are so disposed with respect thereto that the pin in its swinging strikes the ends of the flexible strips before striking the arms. A portion of plate 86 near the balance wheel shaft is turned down as shown in Fig. 2 to serve as a stop limiting the distance the two strips may move toward one another.

Insulation material in the form of a sheet or block 88 is interposed between the plates 64 and 72, and functions not only as a spacer but also electrically insulates one sheet from the other. The separate components of the body on shaft 56, elements 64, 72, 80 and 88, are loosely assembled on the shaft but partake of joint rocking movement because of the provision of novel means keying the elements to the shaft. This is accomplished by widening that part of the shaft 56 above the circular shoulder 82 in one dimension like that shown at 90 in Fig. 3. The composite body structure on the shaft is correspondingly apertured so that it will slidingly fit upon the widened section of the shaft. The latter will therefore function as a key holding the parts together for joint rocking movement. It is obvious that the parts of the composite device on shaft 56 are assembled thereon from the end journaled on the intermediary supporting plate 30.

The balance wheel shaft 20 is provided with a widened portion 92 of general circular character. It is, however, flattened on the side adjacent to shaft 56. Carried by plate 64 on the part nearest shaft 20 is a pointer-like element 94 which projects toward the shaft 20 and close enough to be struck by the flattened side of the widened section 92 of the shaft when the latter oscillates about its axis. However, the pin functions in advance of the flattened sides of portion 92.

The worm gear 62 on the escapement wheel shaft drives a large toothed wheel 96 on shaft 97. The latter shaft carries a worm 98 in engagement with a toothed wheel 99 mounted on shaft 50. The last mentioned wheel is frictionally coupled to the shaft 50. This form of mounting and the manner of regulating and starting the clock by the control knob 100 are described in the aforesaid application for patent of Arthur Quebatte and Edouard Seignol.

The operation of the device is generally apparent from the previous description. As previously described, one lead 34 from the source of electricity is connected to the front supporting plate 22. From thence the circuit may be traced through shaft 56 to the plate 80 and flexible strips 82 and 82'. When the pin engages either one of these strips, the circuit is closed through the shaft 20 to the rear supporting plate 24 where lead 33 completes the circuit to the electromagnet. This oscillation of the balance wheel may be started in any suitable way such as that described in the aforesaid application for patent. The pin 78, swinging in timed relation thereto, first strikes one of the flexible strips and then the adjacent arm 74 of the plate 72. The pin will engage the strip for a moment and then ride

off as it continues its swing. During the time it is in engagement with the strip, the circuit is closed to the electric magnet and the latter becoming energized exerts a magnetic force tending to draw the balance wheel even further than normally against the resistance of the spiral spring 40. After the pin swings out of engagement with the strip, the spiral spring takes hold and with added impetus oscillates the balance wheel back in the other direction. The pin returns without striking the strip it has just engaged and continues on until it strikes the other flexible strip. The same performance is then repeated except that both the pin and balance wheel are swinging in the opposite direction.

The alternate engagement of the pin with the flexible strips and arms 72 and 72' causes the plate 70 and the shaft 58 to which it is keyed to rock back and forth. This movement is transmitted to plate 84 which through the arms 86 and 86' causes the escapement wheel to rotate as previously described. Rotation of the escapement wheel is carried through a gear train including worm gear 62, wheel 88, worm gear 98 and wheel 96, to the shaft 58 to which the minute hand is fixed. By suitable reduction, gearing wheel 54 is caused to rotate and revolve the hour hand.

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