N° 22,819 A.D. 1908

Date of Application, 27th Oct., 1908

Complete Specification Left, 27th Apr., 1909—Accepted, 27th Oct., 1909

PROVISIONAL SPECIFICATION.

Improvements in Primary Electric Clocks.

I, THOMAS JOHN MURDAY, of 32, Avonwick Road, Hounslow, Middlesex, Electrical Engineer, do hereby declare the nature of this invention to be as *follows*:—

The mechanism herein described and shown in the accompanying drawings is principally designed to be operated by an electrically driven pendulum of that particular type in which the arc or amplitude of oscillation remains (within narrow limits) practically constant, and can never fall below a predetermined value. The construction of such a pendulum is explained fully in Patent Specification No. 15,664 of 1901.

Referring to the drawings herewith—

Figure 1 shows the method by which the oscillations of the pendulum are made use of to drive wheel work for the purpose of indicating time, and

Figure 2 illustrates a device for transmitting electric impulses to secondary dials at regular intervals of time—for example, say every thirty seconds.

In Figure 1 a may be taken to represent that part of a seconds pendulum rod from six to nine inches below the suspension spring. An arm c projects from a, and carries the bearings for the wire rods or clicks d d^1. The ratchet wheel b, shown on the right, is alternately pulled and pushed through a space equal to half a tooth at a time, by the clicks d d^1, as the pendulum swings. The points of the click wires are bent at right angles so as to engage with the teeth of wheel b. It will be observed that the upper click d pulls the wheel b round in the direction of the arrow when the pendulum swings from right to left; and the under click d^1 pushes the wheel in the same direction on the return swing of the pendulum. Thus equal movements are transmitted to the wheel train at every second. Wheel b is geared to wheel f in such ratio that one revolution of f, with its arbor and disc h, takes place in sixty seconds. This arbor may carry a seconds hand, and may be geared to motion work carrying the usual minute and hour hands. With five teeth in the ratchet wheel b, as shown, one revolution takes place in ten seconds.

This comprises the timekeeping and indicating part; and, when the swing of the pendulum is properly adjusted so as to give clicks d d^1 length of travel sufficient to safely propel the wheel b, a very uniform, steady motion of the seconds hand is obtained—free from irregular jumps and backlash.

The contact mechanism for the transmission of impulses to secondary dials is shown in Figure 2, and consists of a block of ebonite, or other insulating material m, pivotted at n, and carrying two flat springs s s^1, ending at their free extremities in cylindrical pins p^1 p^2, of platinum or silver, projecting sideways, as shown on the left hand side of Figure 2.

An extension on pendulum a carries another, and, preferably, a larger, cylindrical pin p.

The arrangements are such that, normally, when the pendulum is swinging, the pin p passes under and just clear of pin p^2; but when the block m is tilted slightly the pins p^1 p^2 are lowered to a position which allows the pin p to pass between them, thus completing the electric circuit. The motion of the block m is regulated by levers l l^1, fixed to m, and having pins in their upper

[*Price* 8*d*.]

ends bearing against the peripheries of discs *h i*. Disc *h* is slotted at opposite points so that the pin on lever *l* may fall into one of these slots at each half minute. The more quickly moving disc *i* determines the particular moment at which block *m* is allowed to tilt—bringing the pins p^1 p^2 into line with pin *p*. The drop is adjusted to occur just at the completion of the swing of the pendulum to one side, and an adjusting screw *t* limits the extent of this drop.

The pins p^1 p^2 are in a position for contact with pin *p* when the pendulum is at the middle point of its swing, and they are raised again to the normal position by the inclined edge of the slot in disc *i* forcing lever *l* outwards when the pendulum is approaching the other extremity of its swing.

This method of making electrical contact by means of cylindrical pins, as herein described and shown, is also applicable to weight driven regulators for astronomical or other purposes, where a current is to be transmitted to secondary mechanisms, chronographs, *etc.*, at every second. In such cases block *m* would be fixed—the levers *l* l^1 and discs *h i* being unnecessary—and pin *p* would pass between pins p^1 p^2 at every swing of the pendulum.

The duration of contact will be shorter the lower the pins are situated, so that to obtain contacts of a duration of, say $^1/_{50}$ sec. the pins might have to be placed some considerable distance below the position shown in Figure 2.

Dated this 27th day of October, 1908.

T. J. MURDAY.

COMPLETE SPECIFICATION.

Improvements in Primary Electric Clocks.

I, THOMAS JOHN MURDAY, of 32, Avonwick Road, Hounslow, Middlesex, Electrical Engineer, 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:—

The mechanism herein described is principally designed to be operated by an electrically driven pendulum of that particular type in which the arc or amplitude of oscillation remains (within narrow limits) practically constant, and can never fall below a predetermined value. The construction of such a pendulum is explained fully in Patent Specification No. 15,664/01.

Referring to the drawing accompanying the Provisional Specification,

Figure 1 shows the method by which the oscillations of the pendulum are made use of to drive wheel work for the purpose of indicating time, and

Figure 2 illustrates a device for transmitting electric impulses to secondary dials at regular intervals of time—for example, say every thirty seconds.

In Figure 1 *a* may be taken to represent that part of a seconds pendulum rod from six to nine inches below the suspension spring. An arm *c* projects from *a* and carries the bearings for the wire rods or clicks *d* d^1. The ratchet wheel *b*, shown on the right, is alternately pulled and pushed through a space equal to half a tooth at a time by the clicks *d* d^1, as the pendulum swings. *e* e^1 are counterpoises. The points of the click wires are bent at right angles so as to engage with the teeth of wheel *b*. It will be observed that the upper click *d* pulls the wheel *b* round in the direction of the arrow when the pendulum swings from right to left and the under click d^1 pushes the wheel in the same direction on the return swing of the pendulum. Thus equal movements are transmitted to the wheel train at every second. Wheel *b* is geared to wheel *f* in such ratio that one revolution of *f*, with its arbor and disc *h*, takes place in sixty seconds. This

arbor may carry a seconds hand, and may be geared to motion work carrying the usual minute and hour hands. With five teeth in the ratchet wheel *b*, as shown, one revolution takes place in ten seconds.

In order to more clearly show the particular action of the before mentioned mechanism, Figures 1 and 2, of the drawing accompanying the Complete Specification, have been prepared.

Figure 1 represents the relative positions of the clicks *d* d^1 and the teeth of the click wheel *b* at the moment when the pendulum *a* has reached the limit of its swing to the right. Click d^1 has just completed its work of pushing round the wheel *b*, and its point is shown engaging with the click wheel tooth numbered 3. The point of click *d*, shortly before the pendulum reached this limit, dropped over the tooth numbered 1, and is now shown ready to engage with 1 directly the pendulum begins its movement towards the left. As the pendulum moves through the vertical (indicated by a dotted line), wheel *b* is drawn round by click *d* until the position shown in Figure 2 is arrived at.

On the return swing of the pendulum towards the right the point of click d^1 will engage with the tooth numbered 4—thus pushing wheel *b* round in the same direction as that in which it was pulled by *d*; while the point of *d* will slide on the edge of *b* until it meets tooth numbered 2 with which it drops into engagement, and is ready to pull the click wheel *b* round as before, on the next swing of the pendulum to the left.

This comprises the timekeeping and indicating part, and, when the swing of the pendulum is properly adjusted so as to give clicks *d* d^1 length of travel sufficient to safely propel the wheel *b*, a very uniform, steady motion of the seconds hand is obtained—free from irregular jumps and backlash.

I am aware that an earlier specification refers to the use of a pushing and a pulling click acting on a ratchet wheel of many teeth, in conjunction with a backstop click; but my arrangement of parts, as herein set forth, is distinctly different in construction and mode of action from the invention referred to.

The contact mechanism for the transmission of impulses to secondary dials is shown in Figure 2 of the Provisional drawings, and consists of a block of ebonite, or other insulating material, *m* pivoted at *n*, partially counterbalanced by weight *r* and carrying two flat springs *s* s^1 ending at their free extremities in cylindrical pins p^1 and p^2 of platinum or silver, projecting sideways as shown on the left hand side of Figure 2.

An extension on pendulum *a* carries another, and, preferably, a larger, cylindrical pin *p*.

The arrangements are such that, normally, when the pendulum is swinging, the pin *p* passes under and just clear of pin p^2 but when the block *m* is tilted slightly the pins p^1 and p^2 are lowered to a position which allows the pin *p* to pass between them, thus completing the electric circuit. The motion of the block *m* is regulated by levers *l* l^1, fixed to *m*, and having pins in their upper ends bearing against the peripheries of discs *h* and *i*.

Disc *h* is slotted at opposite points so that the pin on lever *l* may fall into one of these slots at each half minute. The more quickly moving disc *i* determines the particular moment at which the block *m* is allowed to tilt, bringing pins p^1 and p^2 into line with pin *p*. The drop is adjusted to occur just at the completion of the swing of the pendulum to one side, and an adjusting screw *t* limits the extent of this drop. The pins p^1 and p^2 are in a position for contact with pin *p* when the pendulum is at the middle point of its swing, and they are raised again to the normal position by the inclined edge of the slot in disc *i* forcing lever l^1 outwards when the pendulum is approaching the other extremity of its swing.

This method of making electrical contact by means of cylindrical pins, as herein described and shown, is also applicable to weight driven regulators for astronomical or other purposes, where a current is to be transmitted to secondary mechanisms, chronographs, *etc.*, at every second. In such cases block *m* would

be fixed; the levers l l^1 and discs h i being unnecessary, and pin p would pass between p^1 and p^2 at every swing of the pendulum.

Although a seconds pendulum is referred to in the foregoing description it will be obvious that a longer or shorter pendulum may be used, provided the distance between the suspension and clicks d d^1 and the ratio of gearing between wheels b and f, are varied in proportion.

The duration of contact will be shorter the lower the pins are situated, so that to obtain contacts of say the duration of $^1/_{50}$ second the pins might have to be placed some considerable distance below the position shown in Figure 2.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. In an electric clock, the use of a specially shaped ratchet wheel having few teeth and operated by two clicks of the form, and in the manner, specifically described and shown, so that a large peripheral movement of a cam disc, mounted on the arbor of the said ratchet wheel, takes place at each push or pull of the clicks; and, by this means, the secondary contact mechanism (referred to in the following claim) is dropped at the completion of one swing of the pendulum, remains down while the pendulum is returning through the vertical, and is restored to its normal position when the pendulum has reached the other extremity of its swing—substantially as herein described and shown in the drawing accompanying the Provisional Specification.

2. In an electric or mechanical clock, the contact mechanism for operating a secondary dial circuit, consisting of a pivotted block carrying two springs terminating in cylindrical pins, two levers being attached rigidly to the block, which levers carry pins at their extremities, said pins bearing upon two cams or discs rotating in such a manner that notches on their peripheries cause the levers to lower the block, and with it the cylindrical pins on the ends of the springs attached thereto, so that a corresponding pin attached to the pendulum can pass between them and complete contact, after which the aforesaid pins are quickly raised again to their normal position; substantially as herein described and shown in Figure 2, of the drawing accompanying the Provisional Specification.

Dated this 26th day of April, 1909.

T. J. MURDAY.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1909.

A.D. 1908. Oct. 27. N° 22,819.
MURDAY'S PROVISIONAL SPECIFICATION.

(1 SHEET)

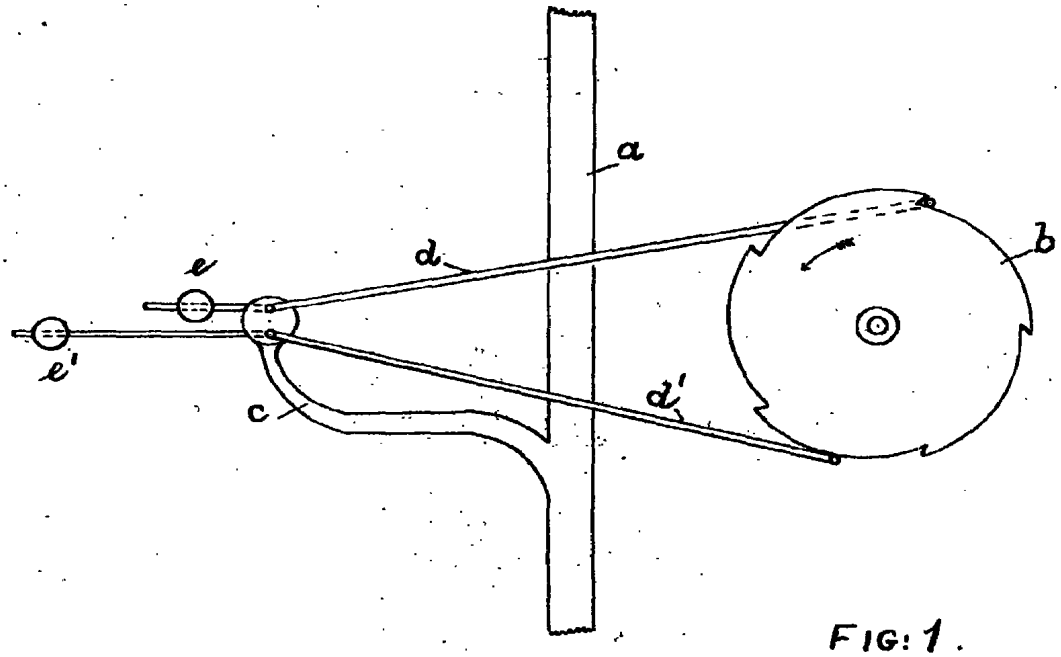

FIG: 1.

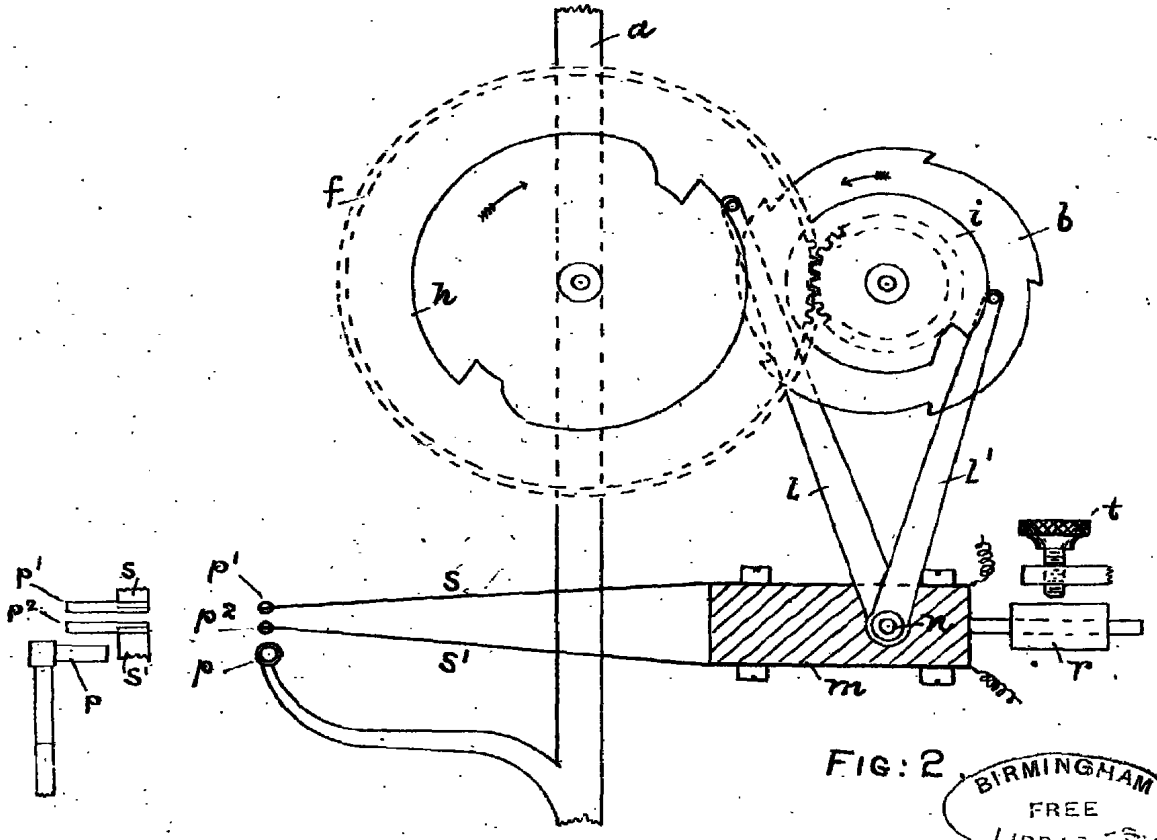

FIG: 2.

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MURDAY'S Complete Specification.

[1 SHEET.]

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

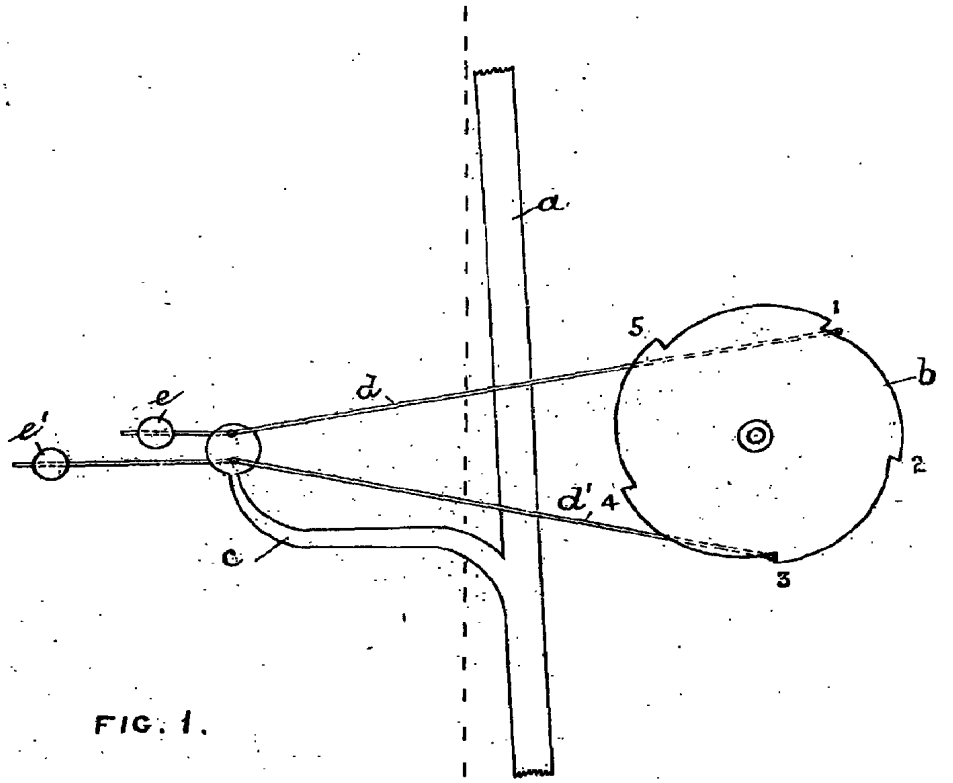

FIG. 1.

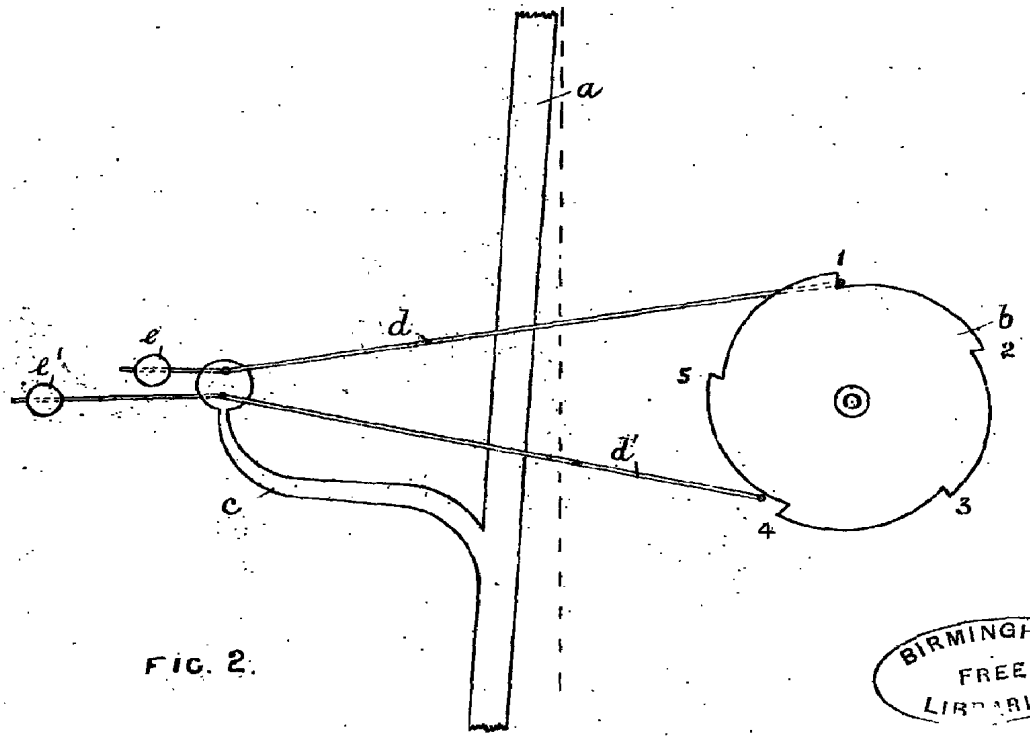

FIG. 2.

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