# 140,856

# PATENT SPECIFICATION

*Application Date, Dec. 30, 1918. No. 21,813/18.*
*Complete Left, June 13, 1919.*
*Complete Accepted, Mar. 30, 1920.*

## PROVISIONAL SPECIFICATION.

## Improvements in Electric Clocks.

We, THE COVENTRY ELECTRIC CLOCK COMPANY LIMITED, of 43, Gray's Inn Road, London, W.C., and THOMAS RUSHTON, Electrical Engineer, of 58, Birnam Road, Tollington Park, London, N., do hereby declare the nature of this invention to be as follows:—

This invention relates to electrically driven clocks operated wholly or partly by a weight which is lifted at intervals and in its descent drives a clock train. Towards the end of this downward movement the weight causes the closing of an electrical contact completing the circuit of an electro-magnet which by attracting its armature raises the weight.

In one construction according to the invention the driving weight is mounted at the end of a lever pivotted upon the spindle of the pinion which it drives. The lever carries also a pivotted pawl so weighted as normally to be held in engagement with a ratchet wheel on the spindle. The lever carries also for instance at the opposite end from the weight, a carbon contact which may be in the form of a carbon disc or may consist of a short carbon pencil mounted in a metal block. Adjacent to the weight lever is another arm preferably pivotted upon the same spindle and carrying a carbon contact in position to engage the carbon contact just described and carrying also the armature of an electro-magnet. In the path of the pawl on the weighted lever is a stop, which, as the weight approaches the limit of its downward movement engages the pawl, causing it to be released from the ratchet wheel, whereupon the weight drops suddenly and the carbon contact on its lever makes sudden contact with the carbon contact on the armature arm. Flexible leads join the respective carbon contacts to the winding of the electro-magnet of a source of supply so that the circuit of the electro-magnet is completed when the contacts touch. The armature is therefore attracted so turning the arm to which it is attached and thereby through the carbon contacts turning the lever which carries the weight. This movement is rapid and the momentum acquired by the weight while the armature is lifting it carries it beyond the point at which the armature comes to a standstill, with the result that the carbon contacts are sharply separated. The armature returns to its un-attracted position under the action of the spring, while the pawl on the weight lever re-engaging the ratchet wheel causes the weight to resume the driving of the clock. If desired the upward movement of the weight may be limited by a suitable buffer spring; and this spring may serve also to ensure the re-engagement of the pawl with the ratchet wheel.

[*Price* 1/-]

In an alternative construction the lever carrying the weight is also drawn by a spring towards the lowermost position of the weight. This has the advantage of enabling the clock to be driven by a smaller weight and also renders the mechanism less liable to damage during transport because the spring restricts the free movement of the weight. Further such a spring serves also as a buffer spring.

In order that the drive may be continued during the space of time occupied by the lifting of the weight any suitable form of maintaining device may be employed. For example, the ratchet wheel driven by the pawl on the weight lever may be loose upon its spindle and joined through a spiral spring to the spindle or wheel on it. The weight driven wheel should not be completely independent of the spindle or the second wheel but should have only a limited arc of movement in which the spring is tensioned and thereafter should engage the wheel or spindle positively. The positive engagement will be the normal means for driving the clock but while the weight is being lifted the tensioned spring will sufficiently maintain the drive. A back pawl prevents the spring unwinding without driving the clock.

Even without a maintaining device it is desirable to provide means for preventing backward movement of the driven parts during the lifting of the weight. For this purpose a spring pressed lever may bear upon a wheel of the train. The spring is preferably connected to the armature arm, so that it is but little tensioned except when the armature is attracted. It is at this moment that backward motion needs to be prevented, and it will be prevented by the increased pressure of the lever on the wheel. If such a lever is formed with a bevelled tooth it will operate as a maintaining device if the re-lifting of the weight is timed to occur when the bevelled edge of the tooth engages the rear side of a tooth of the wheel. The inward pressure of the lever when the spring joining it to the armature is tensioned then causes its tooth to rotate the wheel.

Clocks according to this invention are suitable for operation on the relatively high voltages of supply mains if suitable windings are provided for the electro-magnets. The nature of the mechanism permits of both rapid and wide separation of the contacts and these being made of carbon do not much deteriorate in use. A preferred form of electro-magnet consists of a substantially square iron magnetic circuit, cut into two three-sided halver, each bearing a winding; one of them being movable and taking the part of the armature refered to above. If desired these two members may be so wound as to produce like poles at the adjacent ends, so that the weight is lifted by magnetic repulsion instead of attraction.

Dated this 30th day of December, 1918.

SEFTON-JONES, O'DELL & STEPHENS,
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## COMPLETE SPECIFICATION.

## Improvements in Electric Clocks.

We, THE COVENTRY ELECTRIC CLOCK COMPANY LIMITED, of 43, Gray's Inn Road, London, W.C., and THOMAS RUSHTON, Electrical Engineer, of 58, Birnam Road, Tollington Park, London, N., 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 relates to weight driven electric clocks in which the weight is lifted at intervals by an electromagnet the circuit of which is completed by the abutment of a contact moving with the weight upon a contact moving with the armature. Clocks of this kind have been unsatisfactory hitherto on account of contact difficulties. To overcome these according to this invention carbon contacts are employed; also the contacts are brought firmly and sharply together; and in order that there may be no abrasion of the carbon contacts they are so arranged as to move along the same path during the time they are touching together. Other improvements forming part of the invention, for instance in regard to the maintenance of the drive during re-winding, are set forth in the following detailed description.

Three constructions of clock are illustrated in the accompanying drawings, in each case a part of the frame being omitted to show the mechanism, and the bulk of the clock train itself omitted for the sake of clearness.

Figures 1, 2 and 4 are all elevations,

Figure 3 is a detail in perspective of Figure 2.

In Figure 1 an electromagnet 1 has an armature 2, which on the excitation of the electromagnet rotates on a central pivot until it lies directly between the poles 3. This armature is fast upon, and turns upon the same spindle as, the arm 4 which carries at its end a carbon contact, which may be in the form of a carbon disc 5 suitably insulated from the arm. This arm and the armature are twisted to the position in which they are shown by a spring 6. A lever 7 also pivoted on the same spindle as the arm 4, bears a driving weight 8, and has pivoted on it a gravity actuated pawl 9, whose tail piece 10 keeps it normally engaged with a ratchet wheel 11. This ratchet wheel may be fast upon the spindle 12 which forms the pivot of the arm 4 and lever 7, and the same spindle will carry and drive the first member 13 of the clock train. The lever 7 also carries at its opposite end, and at the same radius from the spindle 12 as the contact 5, a carbon contact 14, insulated from the arm, and joined by a flexible conductor 15 to one end of the winding of the electromagnet 1. A flexible conductor 16 joined to the contact 5, and a conductor 17 joined to the other end of the magnet winding serve to connect the clock to a battery or to a power supply.

A smooth pivotted bar 18 is pressed by the spring 6 upon the clock train member 13, serves to steady it and particularly to prevent backward movement when the weight is being lifted. A pin 19 placed in the path of the tail piece 10 near the lower limit of its travel serves to disengage the pawl 9 from the ratchet wheel 11. A spring 20 also in the path of the tail piece, near the upper limit of its travel, acts as a buffer and ensures the re-engagement of the pawl with the ratchet wheel.

The clock works in the following way. The weight 8 descending under gravity drives the clock train at a rate determined in any usual manner. The pin 19 disengages the pawl 9 from the ratchet wheel 11 while the contacts 14 and 5 are still a short distance apart. The weight then falls freely, bringing the contacts together quickly and firmly. This completes the circuit of the electromagnet which twists its armature, so pulling down the arm 4. Contact 5 bearing on contact 14 turns the lever 7 lifting the weight 8. The contacts do not move relatively so no abrasion occurs. The momentum acquired by the weight makes it travel upward after the arm 4 ceases to travel downward, and so the contacts 5 and 14 are sharply separated. The upward travel of the weight is stopped by the spring 20 which bearing on the tail piece 10 ensures the pawl 9 re-engaging with the ratchet. The spring 6, being tensioned by the twisting of the armature presses the bar 18 firmly on the wheel 13 during winding, and afterwards returns the armature to its initial position.

In Figure 2, the armature 22 of the electromagnet 21 itself carries one of the exciting coils. It is carried by, and on its attraction rocks, the arm 24 which bears a carbon contact 25. This preferably consists of a small carbon stud in a metal setting, such a form of contact being little liable to fracture. 26 is the spring which returns the armature. The lever 27, again on the same pivot as the arm 24, carries a driving weight 28, and a pawl 29 engaging a finely toothed ratchet wheel or milled edged disc 31, and also a contact 34. The ratchet wheel is steadied and prevented from turning backward by a spring pawl 38.

In this case a spring 41 assists in pulling down the weight and so driving the clock. This enables a smaller weight to be used and also tends to hinder the weight rocking violently about; both of which features are important if the clock has to be carried from place to place. The ratchet wheel 31 is not fast upon the spindle 32, as is the first member 33 of the clock train, but is fastened to the spindle by a spiral spring 42; but it also carries a pin 43 which engages a pin 44 on the spindle.

Normally the clock train is positively driven by the weight 28 and spring 41 through the pins 43 and 44; but during winding the drive is continued by the spring 42. The spring 41 serves as a buffer to the lifting of the weight.

If desired the magnet 21 and armature 22 may be so wound as to produce like poles at their adjacent ends, and the weight may be lifted by magnetic repulsion instead of by attraction.

In the construction of Figure 4 there is an electromagnet 51, armature 52, arm 54, contact 55, weight lever 57 and weight 58, performing functions already described. The first wheel of the clock train 63 is driven by the pawl 59 carried by the lever 57. The same wheel is engaged by a bevelled pawl 71 which has an extension 72 engaging at its end with the arm 54. This pawl prevents backward movement of the wheel 63, and the forward movement of the wheel rocks the pawl and extension 72 as each tooth passes. The engaging part of the pawl 71 is so shaped that when the extension 72 is being lifted it lifts a little more quickly than the end of the lever 57. A spring 73 draws together the arm 54 and the pawl 71, so that the arm under the action of this spring and the extension 72 lifts and falls with the pawl. A spring 61 tends to draw down the lever 57.

This arrangement also provides for a quick and firm making of contact. For owing to the designed rate of movement of the extension 72 contact can only be made as the pawl 71 falls over the edge of a tooth, when the contact 55 will be moving smartly downward. During such movement, also, the pawl 71, under the action of the spring 73, which will be further tensioned by the movement of the armature, exercises a driving pressure on the tooth over the edge of which it is passing and so serves to maintain the drive of the clock during winding.

It will be obvious that a similar use could be made of the bar 18 in Figure 1 if it were formed with a suitably shaped tooth; and generally a feature described in any one of the examples illustrated may be employed, if needed, in any other; the mechanisms are but examples and do not delimit the invention.

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

1. In a weight driven electric clock in which the weight is lifted at intervals by an electromagnet, a carbon contact moving with the weight, and a second carbon contact moving with the electromagnet armature, said contacts being arranged to abut one upon the other as the weight falls and to move in the same path so long as they are in contact.

2. In a weight driven electric clock in which the weight is lifted at intervals

by an electromagnet, the provision of means for releasing the weight from the clock train as it nears its lowest point so that the contact travelling with it abuts suddenly and firmly on the contact moving with the armature.

3. A modification of the arrangement according to Claim 1 or 2 in which a member of the clock train rocks the contact moving with the armature, moving it away from the weight contact at a slightly faster rate than the weight contact moves, so that contact is made when the armature contact is moving towards the weight contact, and is therefore made suddenly and firmly.

4. In a weight driven electric clock according to Claim 1 or 2, the provision of a spring pressed check pawl the spring of which is adapted to be tensioned by the attraction of the armature.

5. A construction according to Claim 4 in which the check pawl is used to maintain the drive during winding.

6. In a weight driven electric clock according to Claim 1 or 2, the interposition of a spring between the first member of the clock train and a member driven immediately by the weight, and the provision of positive means of driving the clock train from the weight driven member, said spring being normally tensioned and the clock positively driven except during re-winding.

7. In a weight driven clock according to Claim 1 or 2, the use of a spring acting as a buffer in the lifting of the weight, and ensuring the re-engagement of the weight with the member it drives.

8. The improved constructions of electric clock substantially as described with reference to Figure 1, 2 and 3, and 4 of the accompanying drawings.

Dated this 12th day of June, 1919.

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140,856. COVENTRY ELECTRIC CLOCK CO. & another's COMPLETE SPECIFICATION.

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

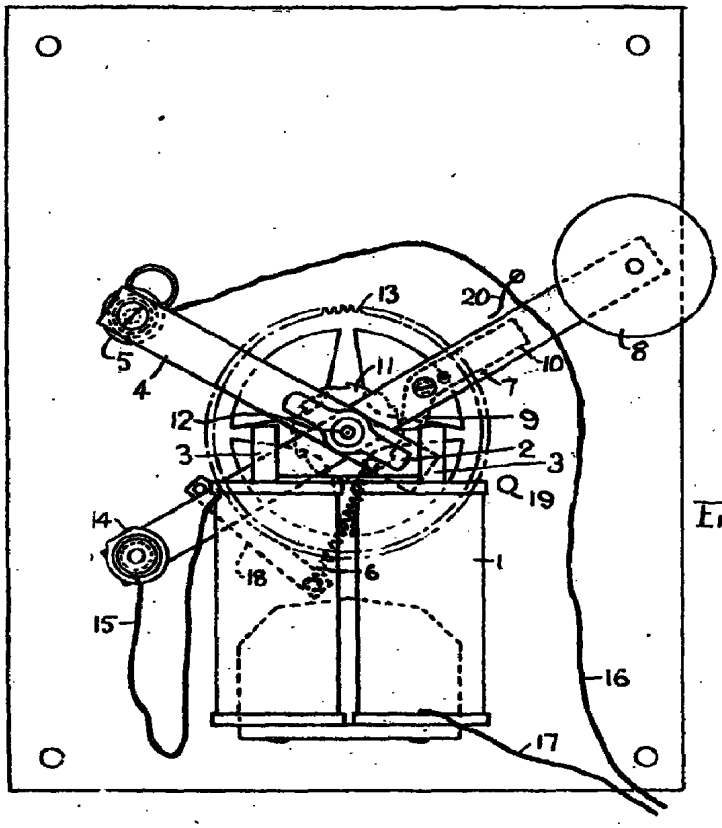


Fig. 1.

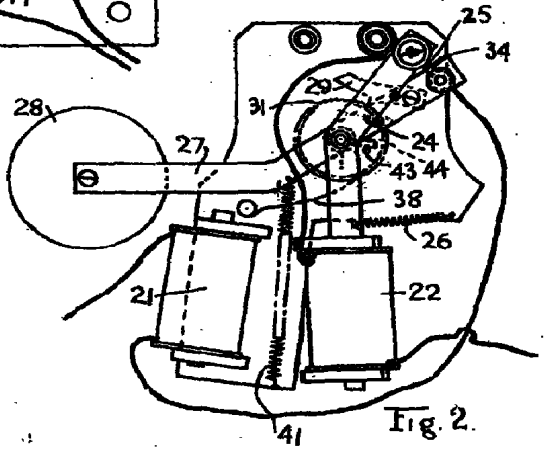


Fig. 2.

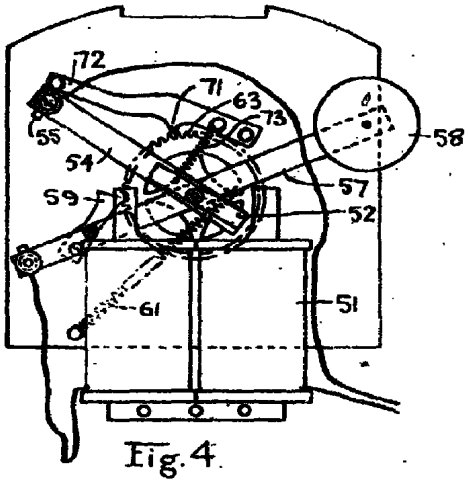


Fig. 4.

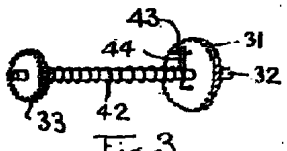


Fig. 3.

Malby & Sons, Photo-Litho.