N° 8464 A.D. 1913

Date of Application, 10th Apr., 1913

Complete Specification Left, 17th Sept., 1913—Accepted, 29th Jan., 1914

PROVISIONAL SPECIFICATION.

Improvements in or relating to Electrically Driven Clocks.

I, PERCIVAL ARTHUR BENTLEY, Clock and Watch Maker, of Forest Gate, Clarendon Park Road, Leicester, do hereby declare the nature of this invention to be as follows:—

This invention relates to electrically driven clocks wherein a circuit containing a coil and some source of current is controlled by a contact operated by the pendulum so that a current is sent through the coil periodically to give an impulse to the pendulum.

In the Specification of my prior British Letters Patent No. 19,044 of 1910 an electrically driven clock is described having an arrangement of contacts whereby the amplitude of the swing of the pendulum is maintained constant by reversing the direction of the current in the coil so that a retarding force is exerted on the pendulum.

The present invention also relates to a clock in which this retarding effect is produced, its primary object being to simplify the construction of the contacts.

According to this invention it is preferred to give an impulse to the pendulum once in each complete swing and not at every half swing. This in itself is well known but in the improved construction the arrangement is such that the current which is to give the accelerating impulse to the pendulum on its next half swing is caused to circulate in the coil before the completion of the preceding half swing thus exercising a retarding influence on the pendulum and serving to maintain the amplitude of its swing constant.

Thus, according to this invention retardation is effected without any reversal of the current one contact only being necessary.

In one construction according to this invention the contact comprises an arm or frame pivoted either in front of or behind the plane in which the pendulum rod swings. This arm is pendent from its pivot and terminates in a cam surface adapted to engage with a small roller mounted upon a spring or spring-controlled arm. The undersurface of this arm carries a contact and beneath this contact and normally separated from it by a slight gap is another contact carried by a second spring or spring-controlled arm. When the cam surface at the end of the pivoted arm is brought into engagement with the roller by moving the arm from one side into a position vertically over the roller, the upper spring is depressed so that the contact which it bears makes connection with the contact on the other spring below it.

Adjusting screws are preferably provided so that the break between the contacts may be made of a definite length and stops may also be arranged so that the springs cannot make connection merely by vibration.

The swinging movement of the arm is brought about by the motion of the pendulum which is provided with two tappers preferably in the form of adjustable screws carried on a frame on the pendulum rod and set out some short distance from its centre.

[*Price* 8*d*.]

The adjustment of the various parts is preferably such that as the pendulum swings the pivoted arm is not carried right over the roller in each direction, but is carried from one side where it is free of the roller, on to the roller to depress it and make contact and then remains in that position until the proper point in the return swing of the pendulum when it is moved off again in the same direction from which it started.

The cycle of operations is preferably as follows:—

The pivoted arm being, say to the left of the roller which is consequently not depressed the pendulum starts swinging from the same side, that is the left hand side, with no current flowing through its coil. Consequently it is acted upon by gravity alone. At the proper point in its swing from left to right one of the tappers carried by the pendulum moves the pivoted arm so that its cam surface engages with the roller and depresses it, making a contact. The circuit thus being closed, current will flow through the coil of the pendulum in such a direction that the swing of the pendulum, still from left to right, will be retarded. The pendulum continues to swing from left to right but the parts are so adjusted that the arm is not moved sufficiently to release the roller so that the retarding force continues to be exerted. Presently the pendulum reverses its motion and starts swinging from right to left. The current still continues to flow and consequently an accelerating force is now exerted on the pendulum until the other tapper comes into action and swings the pivoted arm to the left clear of the roller. The circuit is then broken and the pendulum finishes its swing from right to left by its inertia and then reverses its motion so that the cycle of operations is repeated.

In order to avoid a kick or jerk of the pivoted arm by the rising of the roller a small notch or recess may be made at each extremity of the rounded or cam surface in which the roller may rest.

Although it is preferred to construct the mechanism so that an impulse is given to the pendulum once for every whole swing, yet if desired arrangements may be made so that an impulse is given every half swing without employing additional reversing contacts. All that is necessary in such a case is to arrange the contact mechanism so that the circuit is completed just before the end of each swing the contact remaining closed during the reversal of the movement of the pendulum for the requisite portion of the return stroke. If this construction is adopted the current will always circulate in the one direction through a coil carried by the pendulum but two magnets must be provided co-operating with the coil one at each side of the pendulum.

Dated this 10th day of April, 1913.

KILBURN & STRODE,
Agents for the Applicant.

COMPLETE SPECIFICATION.

Improvements in or relating to Electrically Driven Clocks.

I, PERCIVAL ARTHUR BENTLEY, Clock and Watch Maker, of Forest Gate, Clarendon Park Road, Leicester, 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 electrically driven clocks wherein a circuit containing a coil and some source of current is controlled by a contact operated by the pendulum so that a current is sent through the coil periodically to give an impulse to the pendulum.

Bentley's Improvements in or relating to Electrically Driven Clocks.

In the Specification of my prior British Letters Patent No. 19,044 of 1910 an electrically driven clock is described having an arrangement of contacts whereby the amplitude of the swing of the pendulum is maintained constant by reversing the direction of the current in the coil so that a retarding force is exerted on the pendulum.

The present invention also relates to a clock in which this retarding effect is produced, its primary object being to simplify the construction of the contacts.

In a clock according to this invention, which is preferably of the type in which an impulse is given to the pendulum once in each complete swing and not at every half swing, the pendulum operates a pivoted arm carrying a cam surface at its lower end, this cam surface being caused to depress a contact spring to complete an electric circuit and cause a current to circulate through a coil carried by the pendulum such current exercising a retarding force upon the pendulum during the latter part of one half swing.

In the accompanying drawings,

Figure 1 is an elevation showing the pendulum and contact apparatus of one construction of electrically driven clock according to this invention,

Figure 2 is a similar view of a modified construction also according to this invention, and

Figure 3 is a plan of a portion of the apparatus shown in Figure 2.

With reference first to Figure 1 an arm A pivoted to some stationary member at A^1 carries at its lower extremity a cam surface A^2. This cam surface is adapted to engage with a small roller B mounted on a contact spring C carried by a cock or bracket D. Beneath the contact at the free end of the spring C and separated from it by a small gap is another contact at the end of another spring E and the springs C and E may each be adjusted by means of a screw F. The springs C and E are in electrical connection with a battery or some source of current G and with a coil H carried by a pendulum J, so that when the gap between the contacts is closed, a current will circulate through the coil. Working in conjunction with the coil is a permanent magnet K.

It is to be understood that the coil and connections are represented diagrammatically only and obviously in practice, the leads to the coil might be brought down in or attached to the pendulum rod.

The pendulum rod is pivoted as at J^1 and in the example illustrated swings in a plane in front of the plane of oscillation of the arm A. It is provided with a cross-arm bearing two tappers J^2 which in the drawing are illustrated merely as pins, but it is to be understood that they may be made adjustable in any convenient way. These pins or tappers J^2 project on each side of the contact-making arm A so that at each half swing of the pendulum the contact arm is moved although, owing to the distance between the tappers J^2, the arm A has a period of rest in each half swing whilst the pendulum continues to move.

The adjustment of the various parts is such that as the pendulum swings the cam surface is not carried right over the roller in each direction but is moved from one side on to the roller to depress it and make contact between the springs C and E and then remains in that position until the proper point in the return swing of the pendulum when it is moved off again in the same direction from which it started.

The cycle of operations is as follows, supposing the pivoted arm to be to the left hand of the roller B as indicated in full lines in Figure 1 where the roller is not depressed and consequently no current is flowing through the coil H. The pendulum starts swinging from the left hand side and is acted upon by gravity alone. At the proper point in its swing from left to right the left hand tapper J^2 moves the pivoted arm so that the projection on the cam surface A^2 engages with the roller B and depresses it, thus completing the circuit. Current will now flow through the coil H in such a direction that the swing

of the pendulum, still from left to right, will be retarded by the re-action between the current in the coil H and the magnetic field of the magnet K. The pendulum continues to swing from left to right and the adjustment of the parts is such that the arm A is not moved sufficiently to cause the cam surface to release the roller so that the retarding force continues to be exerted. Presently the pendulum reverses its motion and starts swinging from right to left. The current still continues to flow in the coil H and consequently an accelerating force is now exerted on the pendulum until the other tapper comes into action and swings the pivoted arm sufficiently to the left to allow the roller B to rise. The circuit is then broken and the pendulum finishes its swing from right to left by its inertia and then reverses its motion so that the cycle of operations is repeated.

It will be seen that the cam surface A^2 is provided with a small notch or recess A^3. This does not normally come into operation but if the swing of the pendulum from left to right should be abnormally long the notch A^3 allows the roller B to rise and then on the return swing from right to left the pendulum during the first part of its motion is acted upon by gravity alone the current only being switched on when the right hand tapper J^2 swings into contact with the arm A and moves the cam surface slightly towards the left. It will be noticed that the side of the cam surface opposite to the notch or recess A^3 is gently curved. The object of this is that there shall be no tendency for the arm to kick or spring off the roller when moved to its extreme left hand position.

It will be seen from the above description that the mechanism works without reversal of the current and that the current which is to accelerate the pendulum during one half swing is switched on during the latter part of the preceding half swing in order to retard the motion of the pendulum.

In the construction illustrated by way of example in Figure 1, during one half swing the pendulum is not acted upon by a current having an accelerating effect for in the half swing from left to right the first part of the motion of the pendulum is due to gravity alone, then when the current is switched on it acts to retard the second portion of the swing from left to right and finally when the pendulum turns and commences to move from right to left the current remaining on acts to accelerate the pendulum during the next half swing.

In the construction illustrated in Figures 2 and 3, the pendulum is acted upon by a current having an accelerating effect during a portion of each half swing but still the current which is to accelerate the pendulum during one half swing is switched on during the latter part of the preceding half swing to produce the retarding effect. In this construction the pendulum J operates the swinging arm A by tappers J^2 just as in the form illustrated in Figure 1, but the arm A bears at its lower extremity two cam surfaces A^4 and A^5 one behind the other. The cam surface A^4 co-operates with a roller B^1 and contact springs C^1 and E^1 whilst the cam surface A^5 works in conjunction with a second roller B^2 and contact springs C^2 and E^2. The electrical circuit containing the coil H and the battery G is completed when either of the rollers B^1 or B^2 is depressed and two magnets K and K^1 are provided co-operating with the coil.

This arrangement may be regarded as similar in all respects to that described with reference to Figure 1, except that the motion of the pendulum is retarded during the latter portion of each half swing. The action is as follows:— Supposing the pendulum to be swinging from left to right the contact springs C^2 and E^2 have been closed together during the latter part of the preceding half swing and the reaction between the magnet K^1 and the current in the coil H has retarded the swing of the pendulum. The current remains on and now, during the first part of the swing from left to right acts to accelerate the pendulum until the cam surface A^5 releases the roller B^2 when the circuit is broken. The pendulum continues its swing and at the appropriate moment the

roller B^1 is depressed by the cam surface A^4, the gap between the contact springs C^1 and E^1 is closed and the motion of the pendulum is retarded by the reaction between the magnet K and the current in the coil. When at the end of its stroke the motion of the pendulum is reversed the current remains on and now accelerates the motion of the pendulum from right to left until the roller B^1 is released by the cam surface A^4 and the circuit broken. After a short interval the cam surface A^5 depresses the roller B^2 and retardation of the motion of the pendulum again commences until the limit of the swing from right to left is reached.

In both constructions the actual contacts carried by the springs are preferably in the form of short platinum wires arranged so that those forming each pair are at right angles to each other. Thus a good rubbing contact is made when the springs are pressed one upon the other.

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 electrically driven clock the combination with the pendulum, of a pivoted arm carrying a cam surface at its lower end and a contact-carrying spring adapted to be depressed by the cam surface the arrangement being such that the pendulum moves the pivoted arm and causes the cam surface to depress the contact spring to complete an electric circuit and cause a current to circulate through a coil carried by the pendulum such current exercising a retarding force upon the pendulum during the latter part of one half swing.

2. The contact-making mechanism for an electrically driven clock as described and illustrated in Figure 1, or in Figures 2 and 3 of the accompanying drawings.

Dated this 17th day of September, 1913.

KILBURN & STRODE,
Agents for the Applicant.

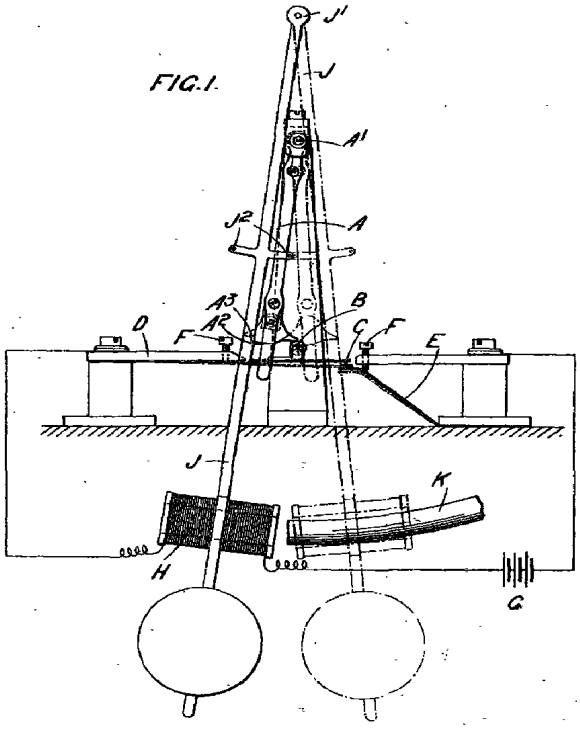
Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1914.

A.D. 1913. April 10. N° 8464.
BENTLEY'S Complete Specification.

(2 SHEETS)

SHEET 1

FIG. 1.



SHEET 2

FIG. 2.

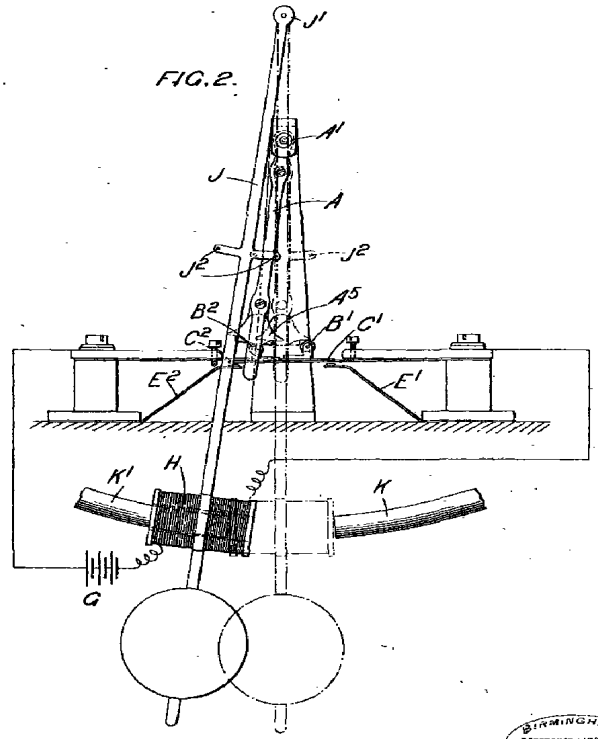


FIG. 3.

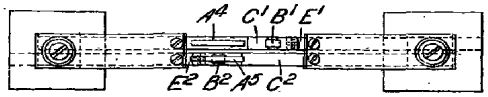


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FIG. 1.

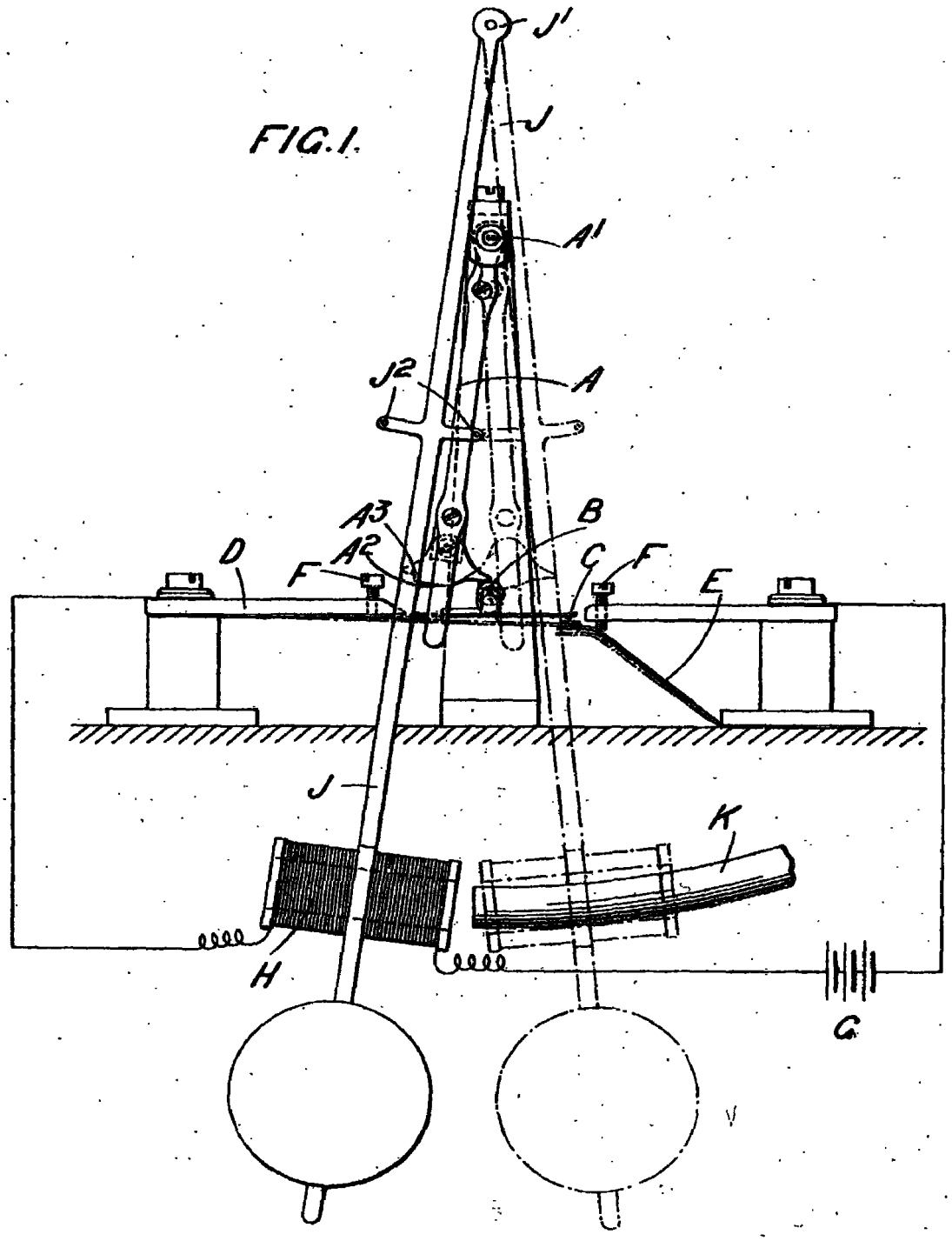


FIG. 2.

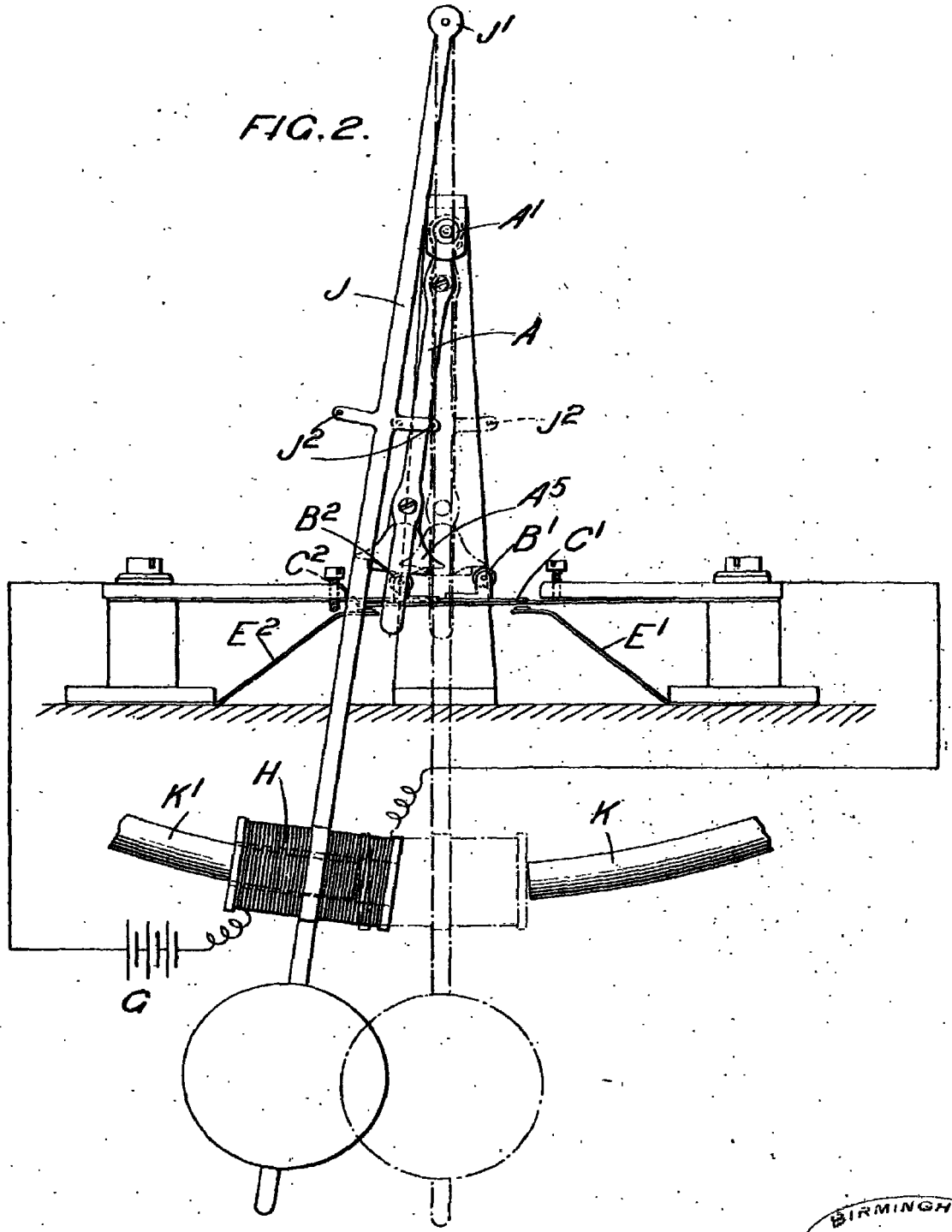
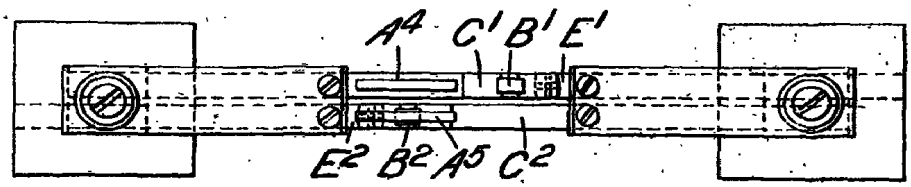


FIG. 3.



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