N° 17,826 A.D. 1905

Date of Application, 4th Sept., 1905
Complete Specification Left, 3rd Mar., 1906—Accepted, 23rd Aug., 1906

PROVISIONAL SPECIFICATION.

Improvements in Electric Clock Systems and the like.

We, ISAAC HARDY PARSONS of Faraday Works, Leicester, Electrical Engineer, and ALFRED ERNEST JOSEPH BALL of 40, St. Saviour's Rd. East, Leicester aforesaid, Electrician do hereby declare the nature of this invention to be as follows:—

This invention relates to improvements in electric clock systems and the like in which an electric impulse is sent periodically around a circuit, and chiefly of the class in which the master or transmitting clock after making contact and establishing a circuit or circuits, either partly or entirely depends on the electric current to enable it to break the said circuit or circuits, the object of this our invention being to cause an audible or other signal or warning as well as other useful effects to be automatically produced when the said electric current is getting weak and so thereby prevent the unexpected stoppage of the system by giving timely warning or notice of the said weakening of the electric current.

In carrying this our invention into effect, we construct a device which operates in conjunction with the master or transmitting clock and the battery, so that when placed in circuit it will either strike a gong, expose an indicator flag or give other suitable signal or produce other effects each time contact is made by the master clock, (at each half minute or other regular intervals) on such contact being lengthened beyond its normal duration by reason of the weaker current operating the winding or equivalent magnet slower or by reason of special methods of prolonging the contact as will hereinafter be described, whereas so long as the battery is in good condition and sending its normal current through the circuit, the device does not produce any signal, or other effects.

A convenient form of the device in accordance with this our invention is constructed as follows:—

On to a base or frame, by preference of metal, we pivot a lever which may conveniently be perpendicular.—We dispose its pivot at or near its uppermost end and we attach as close to the pivot as practicable an armature. We fix an electro-magnet to the base with its poles facing, and in close proximity to the armature. Parallel to the armature lever and conveniently near, we pivot also to the base and about its centre, a comparatively long lever, weighted at its lower end, and provided with an adjustable counterpoising weight at its upper end. We connect these two levers pivotally by means of a connecting link which we pivot to the counterpoised lever close to its own suspending pivot and to the armature lever at a distance from its pivot, and arrange the two levers in suitable positions to permit the link to be disposed at right angles to them.

From this construction and disposition of the levers and fulcra, it will be seen that the counterpoised lever being long and having weights at its extremities may be made to possess considerable inertia, and, therefore, as the force tending to move it, is, in this device, applied close to its pivot and by the long end of the armature lever, a short momentary current sent through the magnet is unable during its short "dwell" to overcome the inertia of the counterpoised

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lever, and, therefore, fails to impart to it an appreciable movement; whereas, a current of longer duration is able to overcome its inertia, and by reason of the disposition of the fulcra to cause a considerable movement enabling it to reach and so strike a gong, operate electric contacts and cause other effects which could not take place in this device when operated by a short contact.

By attaching thin vanes to the counterpoised lever, or linking thereto a train of wheels terminating in a fly or other escapement, its mechanical movement can be still further retarded when desired.

In practice it is found that the difference between the length of the contact when the battery is at its full strength and when getting weak, although distinct and definite, is rather small for the operation of the hereinbefore described warning device; the said device requiring rather delicate adjustment to ensure its operation. This our present invention includes methods of prolonging the contact when the current falls below a certain value such as at which it cannot wind the master clock or replace or reset its equivalent armature and means whereby the armature then receives either electrical or mechanical assistance enabling the system to continue in operation, and at the same time the warning device is kept in action.

One method we sometimes adopt to produce a more decided lengthening of the contact, in order to effect a definite ring of the warning bell, is to allow the driving weight or equivalent, or an attachment in connection therewith, to descend further than normally, on the magnet failing to wind or replace it promptly, and in so descending to temporally cut out a resistance which is normally always in circuit, thus momentarily increasing the current strength and, either mechanically or electrically, putting the resistance in circuit again, on the clock again winding or replacing its driving weight.

In another method, we sometimes use some of the mechanical energy stored in the pendulum to assist the magnet in its work of winding or resetting the driving weight; this method being particularly effective when the contact is always made when the pendulum is in the same position, for then the contact remains closed until its next vibration, when by means of a pawl or projection it assists the magnet in lifting the driving weight, and breaking the contact, thus producing the necessary prolongation of the contact to operate the warning device.

This our improved warning device is also particularly applicable to clock systems in which the pendulum of the master clock receives an impulse direct from a weight or spring, and after imparting the impulse is replaced electromagnetically. With this system of driving, if, after the impulse has been given, the electro-magnet is unable to lift or replace the weight or spring, the pendulum on its next or return swing comes in contact with it, and assists the electro magnet to lift it to its potential position; and as the contact remains closed until the weight is assisted by the pendulum the necessary prolongation is obtained which gives the warning device sufficient time to reach and strike the gong or otherwise operate.

In other methods which we adopt to produce the desired periodical prolongation of the said contact as well as to produce other useful effects, we dispose and suitably arrange within the path of the counterpoised lever so as to be operated thereby, two insulated contact springs or equivalent which we employ to make contact for any purpose for which it is desired to produce effects, on the contact of the master clock being prolonged beyond its normal time. In one method of using these contact springs or equivalents we arrange that the warning device shall cut out or short circuit a resistance always normally in circuit, on it being operated each half minute or minute, thus sending more current through the system and winding or resetting the driving weight, as well as operating the warning device. An advantage of this method is that no sparking takes place at the contact springs as contact is broken on open circuit. Instead of cutting out a resistance as in the proceeding method, an equivalent

result may be obtained by disposing the contacts so that extra cells are introduced in the circuit each time the magnet fails to replace the weight unaided.

Instead of or in addition to striking a gong, the device may, by means of the said contact springs, make contact with a spare battery consisting of an equal number of cells, which then would by means of its own current operate a magnetic two-way switch and switch itself in, and at the same time, switch the worn battery out. By this method of automatic switching, the second battery is not brought into use unless in an efficient condition and the gong continues to sound at each half minute until the battery receives attention.

Dated this 2nd. day of September 1905.

ISAAC HARDY PARSONS.
ALFRED E. J. BALL.

COMPLETE SPECIFICATION.

Improvements in Electric Clock Systems and the like.

We, ISAAC HARDY PARSONS of Faraday Works Leicester, Electrical Engineer, and ALFRED ERNEST JOSEPH BALL of 40 St. Saviours Rd East Leicester aforesaid, Electrician, 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 improvements in electric clock systems and the like in which an electric impulse is sent periodically around a circuit, and chiefly of the class in which the master or transmitting clock or its equivalent, after making contact and establishing a circuit or circuits, either partly or entirely depends on the electric current to enable it to break the said circuit or circuits; the object of this our invention being to cause an audible or other signal or warning as well as the making and breaking of contacts to be automatically effected when the said electric current is getting weak and so thereby prevent the unexpected stoppage of the system, by giving timely warning or notice of the said weakening of the electric current.

Examples of the like (clockwork) apparatus to which this our improved warning device is applicable are, recording, signalling and synchronising apparatus in which an electrical contact is made at one point of the circuit, and broken at the same or at a distant point by an electro magnet, after the apparatus has been operated by the current.

In carrying this our invention into effect, we construct a device which operates in conjunction with the master or transmitting clock or the like and the battery, so that when placed in circuit it will either strike a gong, expose an indicator flag, or give other suitable signal, or make and break electric contacts each time contact is made by the master clock, (at each half minute or other regular intervals) on such contact being lengthened beyond its normal duration by reason of the weaker current operating the winding or equivalent magnet slower or by reason of special methods of prolonging the contact as will be hereinafter described, whereas so long as the battery is in good condition and sending its normal current through the circuit, the device does not produce any signal, or operate in any other manner.

A convenient form of the device in accordance with this our invention is constructed as follows:—

On to a base or frame, by preference of metal, we pivot a lever which may conveniently be perpendicular. We dispose its pivot at or near its uppermost end, and we attach as close to the pivot as practicable, an armature. We fix

an electro-magnet to the base with its poles facing, and in close proximity to the armature. Parallel to the armature lever and conveniently near, we pivot also to the base, and at about its centre, a comparatively long lever, weighted at its lower end, and provided with an adjustable counterpoising weight at its upper end. We connect these two levers pivotally by means of a connecting link, which we pivot to the counterpoised lever close to its own suspending pivot, and to the armature lever at a distance from its pivot and arrange the two levers in suitable positions to permit the link to be disposed at right-angles to them.

From this construction and disposition of the levers and fulcra, it will be seen that the counterpoised lever being long and having weights at its extremities may be made to possess considerable inertia, and, therefore, as the force tending to move it is in this device applied close to its pivot by the long end of the armature lever, a short momentary current sent through the magnet is unable during its short "dwell" to overcome the inertia of the counterpoised lever, and, therefore, fails to impart to it an appreciable movement, whereas, a current of long duration is able to overcome its inertia, and by reason of the disposition of the fulcra, to cause a considerable movement enabling it to reach and so strike a gong, operate electric contacts or expose an indicator flag or give other suitable signal, which could not take place when operated by a short contact.

By attaching thin vanes to the counterpoised lever, or linking thereto a train of wheels terminating in a fly or other escapement, its mechanical movement can be still further retarded when desired.

In practice it is found that the difference between the length of the contact, when the battery is at its full strength and when getting weak, although distinct and definite, is rather small for the operation of the herein-before described warning device; the said device requiring rather delicate adjustment to insure its operation. This our present invention includes methods of prolonging the contact when the current falls below a certain value, such as at which it cannot wind the master clock or replace or reset its equivalent armature unaided, and means whereby the armature then receives either electrical or mechanical assistance enabling the system to continue in operation and at the same time keeping the warning device in action.

One method we sometimes adopt to produce a more decided lengthening of the contact, in order to effect a definite ring of the warning bell, is to allow the driving weight or equivalent, or an attachment in connection therewith, to descend further than normally on the magnet failing to wind or replace it promptly, and in so descending to temporarily cut out a resistance which is normally always in circuit, thus momentarily increasing the current strength, and, either mechanically or electrically putting the resistance in circuit again, on the clock again winding or replacing its driving weight.

In another method, we sometimes use some of the mechanical energy stored in the pendulum, to assist the magnet in its work of winding or resetting the driving weight, this method being particularly effective when the contact is always made when the pendulum is in the same position, for then the contact remains closed until its next vibration, when by means of a pawl or projection it assists the magnet in lifting the driving weight, and breaking the contact, thus producing the necessary prolongation of the contact to operate the warning device.

This our improved warning device is also particularly applicable to clock systems, in which the pendulum of the master clock receives an impulse direct from a weight or spring, which after imparting the impulse is replaced electro-magnetically. With this system of driving, if, after the impulse has been given, the electro-magnet is unable owing to a weaker current to lift or replace the weight or spring, the pendulum on its next or return swing comes in contact with it, and assists the electro-magnet to lift it to its potential position,

and as the contact remains closed until the weight is assisted by the pendulum, the necessary prolongation is obtained which gives the warning device sufficient time to reach and strike the gong, or otherwise operate. An example of such a master clock is described and illustrated in our previous Patent No. 24620 of 1904.

In other methods which we adopt to produce the desired periodical prolongation of the said contact as well as to produce other useful effects, we dispose and suitably arrange within the path of the counterpoised lever so as to be operated thereby, two insulated contact springs or equivalent which we employ to make contact for any purpose for which it is desired to produce effects, on the contact of the master clock being prolonged beyond its normal time. In one method of using these contact springs or equivalents we arrange that the warning device shall cut out or short circuit a resistance always normally in circuit, on it being operated each half minute or minute, thus sending more current through the system and winding or resetting the driving weight of the master clock as well as operating the warning device. An advantage of this method is that no sparking takes place at the contact springs as contact is broken on open circuit. Instead of cutting out a resistance, an equivalent result may be obtained by employing the contacts to introduce extra cells into the circuit each time the magnet fails to replace the weight unaided.

In another method we operate the counter-poised lever of our warning device direct from the driving lever of the master clock, by virtue of the slower motion given to it by the magnet in consequence of the weakening of the electric current. In this instance, the motion is conveniently transmitted to the counter-poised lever through the medium of a spring instead of by means of a link.

The contacts may be employed for many other useful purposes, such as for instance, the device may in addition to striking a gong, make contact (by means of its contact springs) with a spare battery, which then would, by means of its own current, operate a magnetic two-way switch, and switch itself in, and at the same time switch out the worn battery. An advantage accruing from this arrangement is that the second battery is not brought into use unless in an efficient condition and the gong continues to sound at each half minute, until the first battery receives attention.

Referring to the annexed drawings in which like letters indicate like parts, Fig. 1 shows the construction of the warning device, when operated by a master clock or equivalent apparatus of the class in which the pendulum or other device assists the winding or equivalent magnet to lift the driving lever on the current strength being insufficient alone, and so produce the interval for the required long contact.

In this figure, A represents the armature lever, and A.[1]. its weighted extension (which has the advantage of balancing the device when set out of perpendicular by reason of the weights A[1] & F.[1]. balancing the weight F,) B its pivot, and C the electro-magnet which operates the armature D., E represents the counter-poised lever, F and F[1] being the weight and counter-poise respectively, while G shows the position of the pivot on which it swings. H represents the connecting link which transmits the motion of the armature to the counter-poised lever at a point which insures the desired motion of the latter. I represents the bell or gong which is struck by the weight F on the contact being sufficiently prolonged. J and J[1] is the metallic base on which the whole is mounted.

Having reference to other methods which we adopt to produce the desired prolongation of the contact, Fig. 2 shows the construction of the warning device required when operated by a master clock or equivalent apparatus of the class which does not receive mechanical assistance when the current fails to perform its winding function and consequently would therefore stop on closed circuit.

Such a master clock is described and illustrated in our previous Patent No. 24620, A.D. 1904. In this figure A represents the armature lever and A^1 its weighted extension, B its pivot and C the electro-magnet which operates the armature D, E represents the counter-poised lever, F and F^1 being the weight and counter-poise respectively, while G shows the position of the pivot on which it swings. H. represents the connecting link which transmits the motion of the armature to the counter-poised lever at a point which insures the desired motion of the latter. I. represents the bell or gong which is struck by the weight F. when the device operates. J and $J.^1$ is the metallic base on which the whole is mounted. On the contact being prolonged by reason of the current being insufficient to raise the driving weight or equivalent of the clock mechanism, the armature lever A, on making a complete movement to the left, closes the contacts K, $K.^1$, cutting out the resistance M. thus sending more current through the clock circuit and so enabling the magnet of the master clock or equivalent mechanism to complete its work and break the circuit. The warning device then returns to its normal position.

Fig. 3, shews a master clock in which is incorporated a cut-out as herein described. In this form the driving lever is in duplicate, one lever being free to fall further than the other, the additional movement being limited by a fork. The action of this device is as follows:—On the lever P. carrying the weight Q. falling to its lowest position and making its half minute contact, the current then flowing if sufficient, lifts the lever R. by means of the fork S. thus replacing the levers to their potential position, but in course of time when the current becomes too weak to reset the levers, the lever R. falls further than normally and in depressing the spring contacts K, $K.^1$, cuts out or short circuits the resistance M. and thereby causing more current to flow through the circuit effecting the resetting of the driving weight Q. as well as ringing a warning bell of the type shown in Fig. 1. The "shake" within the fork S. permits the weight Q. to be lifted within easy range of the magnet before the contact K, $K.^1$, is broken. In some instances we employ a detent (not shewn) to hold down the spring K. until tripped by the lever P. on being raised to its potential position.

Fig. 4 shews our warning device operated direct by the driving lever or its equivalent on the weaker current failing to replace it to its potential position. This pattern is chiefly applicable to clock mechanisms in which the driving lever or equivalent moves with a fairly rapid motion and it operates as follows:—

On the driving lever P. (or equivalent part moving in connection therewith) falling at each half minute, it causes the spring U. to apply pressure to the short member V. of the counter-poised lever E. If the current flowing however is at its normal strength, the driving lever or its equivalent is replaced before the inertia of the counter-poised lever is overcome, but on the weaker current failing to replace it the warning device operates and by means of the contacts K, K^1, either cuts out a resistance as shewn in Fig. 2 or brings into operation another battery W. as illustrated herewith. We sometimes introduce into the device another contact to cut out the first battery.

It is obvious that we may vary the form of this our warning device and the manner of operating same in its various applications to clock-work, without departing from the nature of this our 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 weak current warning device applicable to electric clock systems, the employment of an armature lever operated by an electro-magnet, the said lever in turn operating a counter-poised or inertia lever by applying its power near to its fulcrum, the counter-poised lever in turn striking a gong or pro-

ducing equivalent effects substantially as described and for the purposes specified.

2. In an electric clock system, the employment of a slow moving inertia bell such as that claimed in Claim 1., in combination with a master clock or equivalent device, which produces a contact of longer duration when the electric current weakens, thereby causing the slow moving bell to give warning substantially as described.

3. In a weak current warning device such as that claimed in Claim 1, the combination of a weighted attachment to the armature lever, with a counterpoised lever, the said attachment being approximately of such a weight that the total effective weight of the lighter end of the counterpoised lever and the said attachment may be approximately that of the heavy end substantially as described and for the purpose specified.

4. In a weak current warning device of the class claimed in the preceding claims, the employment of a contact or contacts in such a manner that on the duration of the flow of current operating the said device, being prolonged beyond a predetermined time, the contact or contacts are automatically closed and produce secondary effects substantially as described.

5. In a weak current warning device of the class claimed in the preceding claims, the employment of a contact or contacts in such a manner that on the flow of current operating the said device being prolonged beyond its normal time, the contact or contacts of the device on being automatically closed, are arranged to cut out or short-circuit a resistance and so send more current through the circuit and therefore enable the magnet of the master clock or equivalent mechanism to complete its work and break the circuit, substantially as described.

(6) In a weak current warning device applicable to electric clock systems, the employment of a contact or contacts in such a manner that on the duration of the flow of the current operating the said device being prolonged beyond its normal time, the contact or contacts of the device on being automatically closed are arranged to introduce extra cells into the circuit instead of cutting out a resistance as shown in Fig. 2, and so enable the magnet of the master clock to complete its work and break the circuit substantially as described.

(7) In an electric clock or equivalent system, the operation of the weak current warning device direct from the magnet and armature of the master clock or equivalent, instead of by a separate magnet, the required motion being transmitted by a lever such as P and a spring or equivalent such as U, substantially as herein described and illustrated with reference to Fig. 4 of the accompanying drawings.

Dated this Second day of March, 1906.

J. HARDY PARSONS,
ALF. E. J. BALL.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1906.

A.D. 1905. SEP. 4. N.° 17,826.
PARSONS & *another's* COMPLETE SPECIFICATION

(4 SHEETS)
SHEET 1.

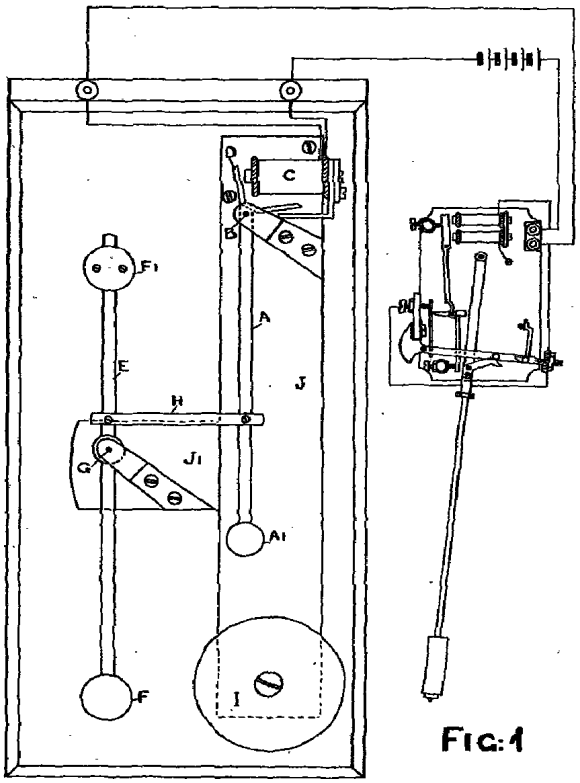

FIG: 1

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SHEET 2.

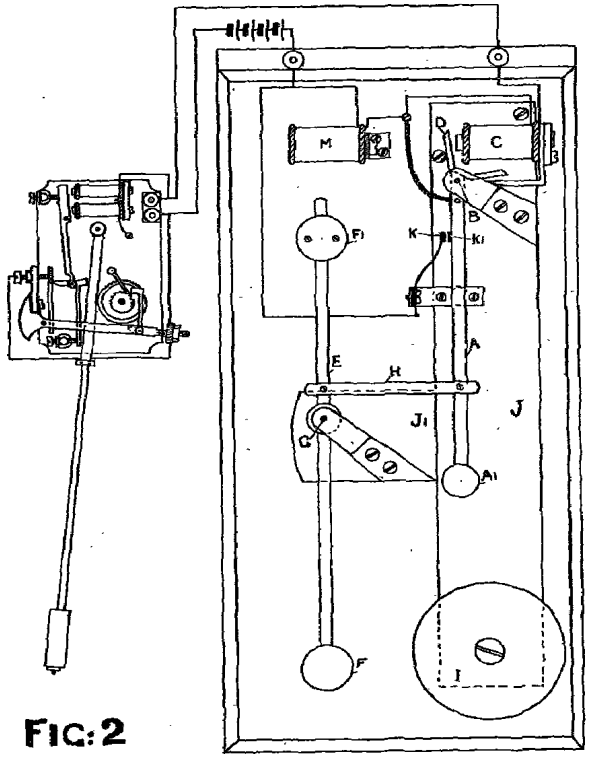

FIG: 2

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

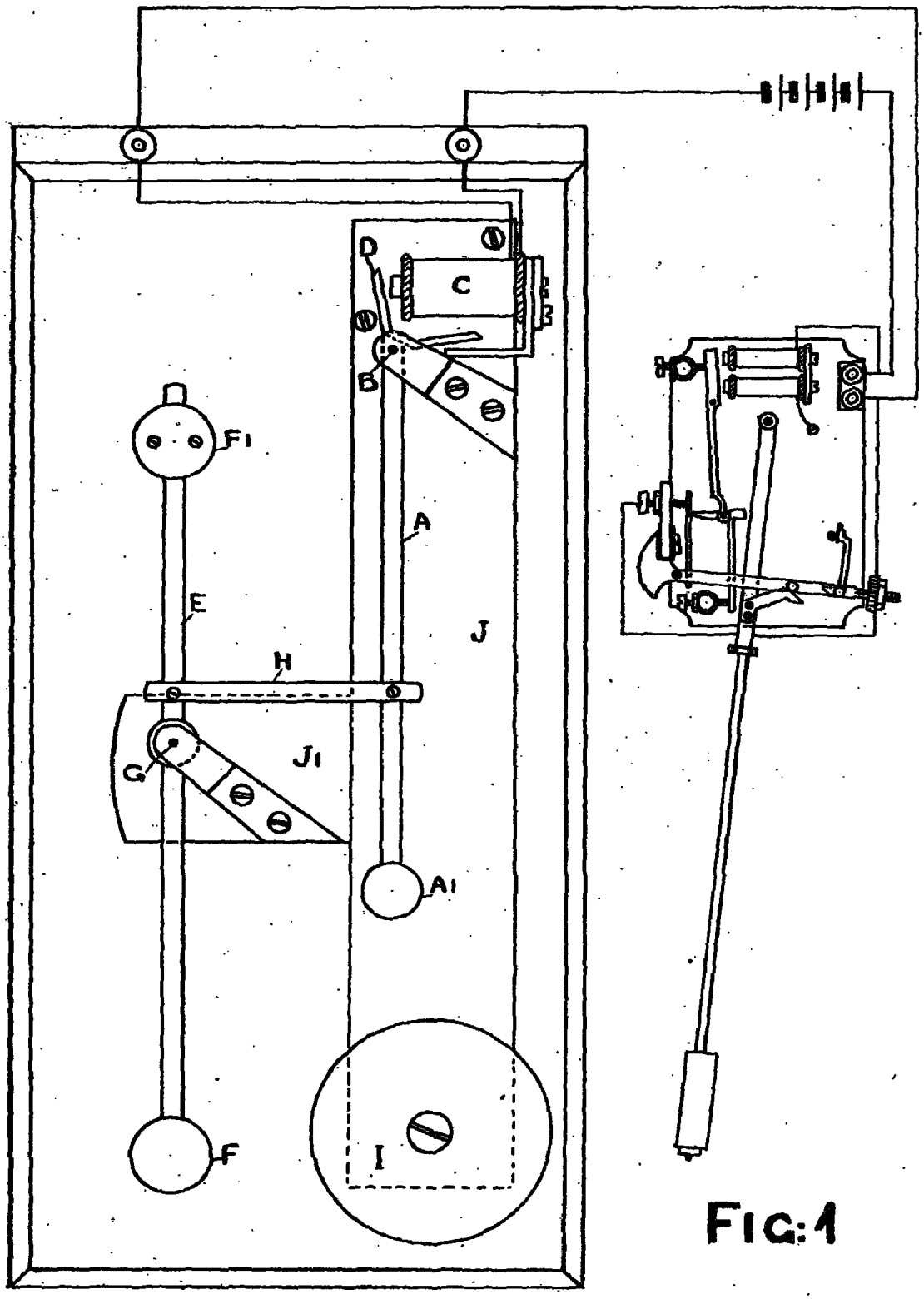

FIG: 1

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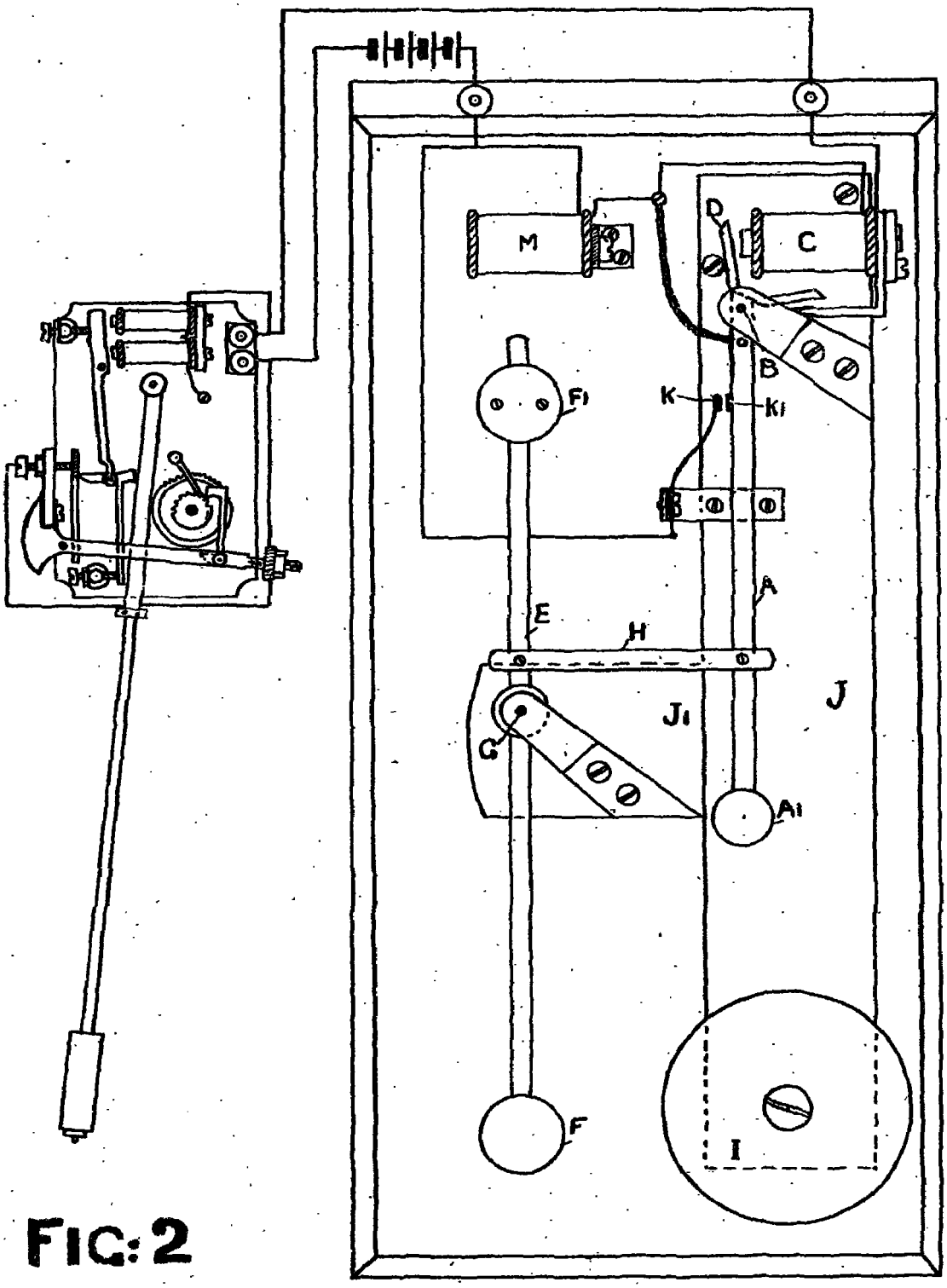

FIG: 2

A.D. 1905. Sep. 4. N.° 17,826.

PARSONS & *another's* Complete Specification.

SHEET 3

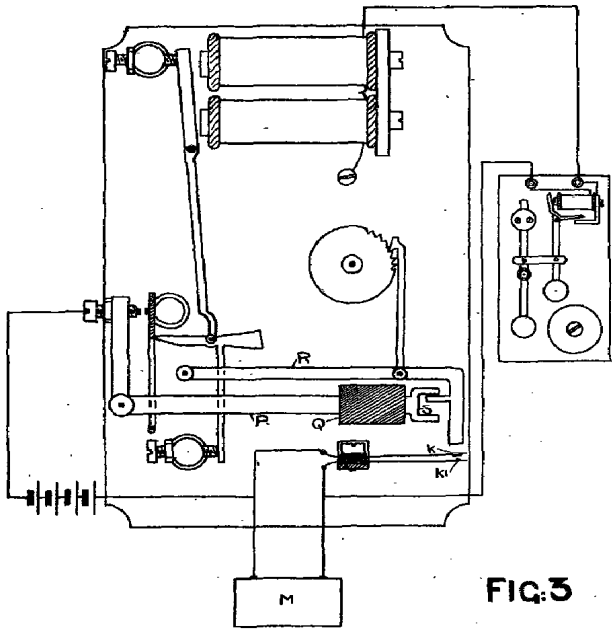

FIG.3

(4 SHEETS)

SHEET 4

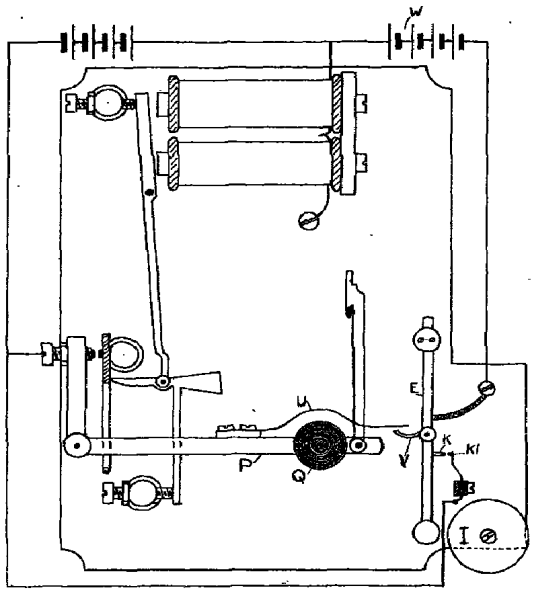

FIG.4

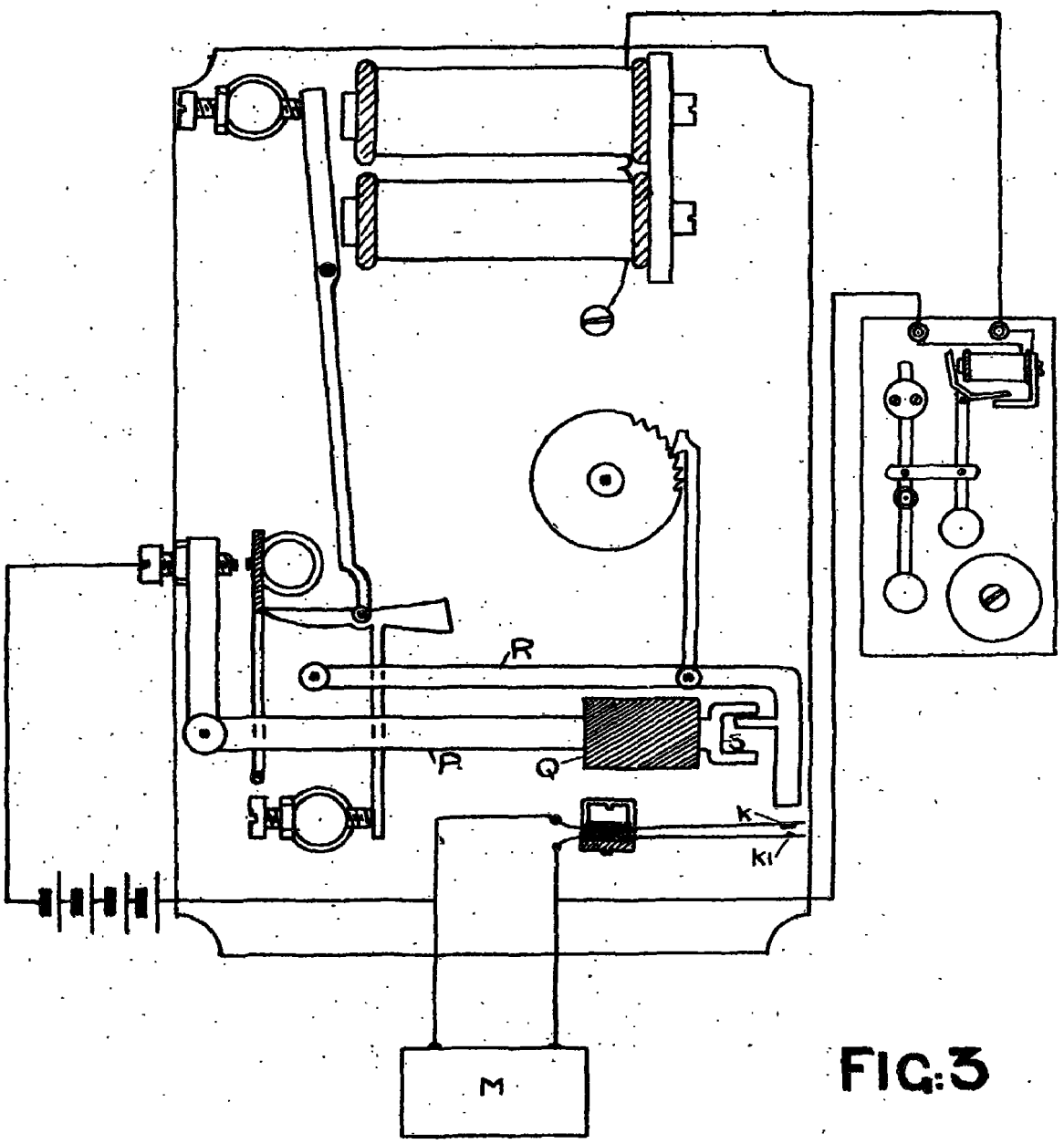

FIG:3

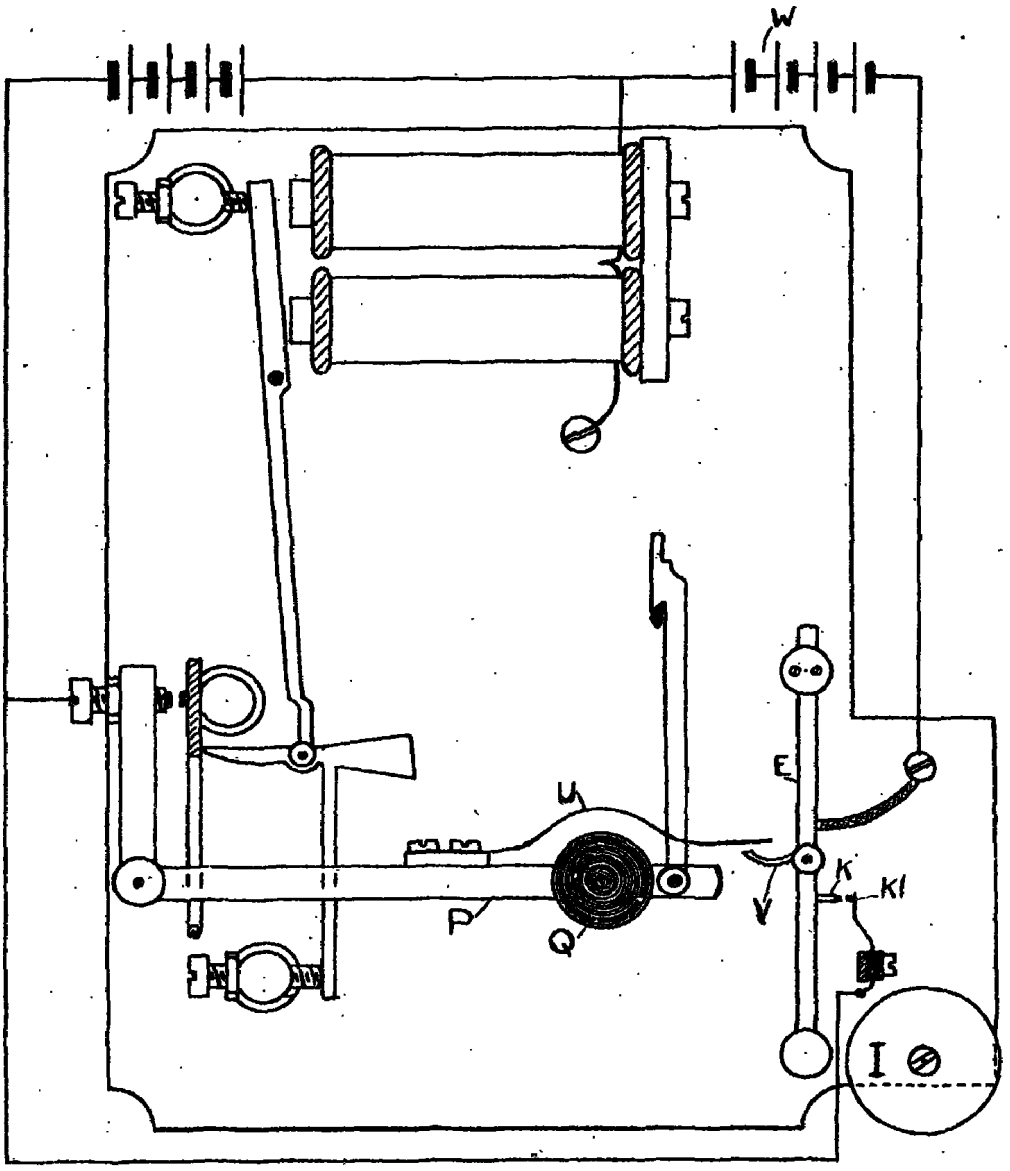

FIG. 4

Malby&Sons, Photo-Litho.