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PROVISIONAL SPECIFICATION.

Improvements in Electric Clocks.

We, ISAAC HARDY PARSONS, of the Croft, Kibworth Harcourt, near Leicester, Electrical Engineer, and ALFRED ERNEST JOSEPH BALL, of Kingston House, Evington Road, Leicester, Clockmaker, do hereby declare the nature of this invention to be as follows:—

This invention relates mainly to electric master clocks as used on board ship, or for positions in which similar conditions prevail, and has for object improved means for advancing and retarding the secondary clocks operated thereby.

In carrying this our invention into effect, we provide a device which operates on the principle of a Morse key, the centre member being adapted to make contact with either of two other members on being moved in one direction or the other.

In one form, the device is mounted on a base-plate, and suitably insulated. When working normally, and the whole of the clocks are being driven, the centre member is in contact with one of the members which we will term No. 1, and is held in firm contact by a comparatively strong spring.

We may provide two levers or handles to be operated by hand, and we term one the "advancing lever" and the other the "retarding lever".

When it is desired to retard the clocks, when sailing westwards for instance, the retarding lever is pressed. This lever is arranged to draw the centre member out of contact with No. 1 member, and to put it in forcible contact with the other member which we term No. 2.

The centre member is held in this position by one end of a double-ended spring-impelled catch, which we term the "interval catch", and which may be controlled by a secondary clock mechanism or impulse movement in the following manner:—

The impulse movement (which we will term the correcting movement) is fixed to the same base-plate as the Morse key device, and the spindle of the movement, which is operated by the usual ratchet mechanism, has fixed rigidly thereto a clutch-part consisting of a clutching wheel provided with radial teeth. We mount freely on the same arbor a notched disc, (or cam), which we provide with a handle, a pointer, and a clutch device which is arranged to engage at will the clutching wheel. We attach pivotally to the base a spring-impelled lever which we term the "releasing lever", and which we provide with a stud or equivalent which is adopted to either rest on the periphery of the notched disc, or drop into the notch. We further arrange that on dropping into the notch the releasing lever engages the interval catch, and causes one end of the latter to disengage the centre member of the Morse key, thereby permitting it to take up its normal position under the influence of its spring.

The correcting movement is provided with a graduated dial which is usually marked so that the number indicated by the hereinbefore mentioned pointer

[*Price 6d.*]

represents the number of minutes it is desired to retard, (or advance) the clocks.

The hereinbefore described device for retarding the clocks provides for and permits of robust and reliable contacts with ample pressure between the surfaces, the energy required to operate them being provided by the operator, the function of the clockwork being only to release the centre member after the lapse of the number of minutes for which the pointer is set.

Hitherto it has been usual to advance the clocks when sailing eastwards by pressing a push a number of times by hand, and the success of such operation depends largely on the skill of the individual operator in making clean and decisive contacts by hand.

In accordance with this invention, the operation of advancing the clocks is effected automatically.

The master clock is provided with a spring-impelled driving lever which, by means of a pawl and ratchet wheel, drives a short train of wheels terminating in a balance escapement. We term this train of wheels the "time train".

This driving lever is provided with a contact, which, on the lever descending a pre-determined distance, closes a circuit through an armature and electro-magnet, and the lever is lifted and the driving pawl engages the next tooth of the ratchet wheel in a well-known manner. This contact takes place normally, at each half minute, but when advancing the clocks when sailing eastwards for instance, we provide for the automatic making of the contacts at the rate of approximately 90 per minute, in the following manner:—

We provide a short train of wheels terminating in a comparatively large fly, and dispose the whole preferably below the driving lever.

We provide the driving lever with a second pawl adapted to engage a fine cut ratchet wheel which we fix to the arbor of the first wheel of the train.

We provide a bell crank lever arranged so that on one member being moved the other member draws the driving pawl out of engagement of the ratchet wheel, and simultaneously puts the second pawl into engagement with the fine cut ratchet wheel.

The arrangement is such that so long as the bell crank lever is held in this latter position the driving lever descends, and being now controlled by the comparatively fast moving fly, makes contact at the rate of about 90 per minute, thus rapidly advancing the clocks. In order to effect this advancement automatically we link the bell crank lever to the hereinbefore mentioned advancing lever which we dispose near the interval catch.

We arrange that the advancing lever on being pressed by hand engages the second catch of the interval lever, and is thereby held. The hereinbefore mentioned notched disc and pointer is previously moved to the number of minutes it is desired to advance the clocks.

The impulse movement which is always in circuit and which is operated by the rapidly made contacts, rotates the notched disc until the releasing lever falls into the notch, and thereby releases the interval catch. The driving pawl then engages its ratchet wheel, the time train is again driven, and the driving lever operates the contacts normally at each half minute as before.

While the clocks are being advanced, it is an advantage to stop the balance from vibrating, and we may attach to the bell crank lever a fine leaf spring arranged to engage the balance so long as it is in that position which causes the fly train to be operated.

We may arrange the electrical connections so that the master clock is always in series with the correcting movement, and that while No. 1 contact is closed, the whole of the clocks and all the cells of the battery are connected in series, and these connections obtain when the clocks are working normally, or are being advanced.

When No. 2 contact is closed the connections are such that a pre-determined number of the cells only are connected in circuit with the master clock and correcting movement, the clocks and the remainder of the battery being cut out.

In some instances instead of reducing the number of cells it may be arranged that a resistance be put in to compensate for the clocks being cut out.

Dated this 22nd day of April, 1914.

ISAAC HARDY PARSONS.
ALFRED E. J. BALL.

COMPLETE SPECIFICATION.

Improvements in Electric Clocks.

We, ISAAC HARDY PARSONS, of the Croft, Kibworth Harcourt, near Leicester, Electrical Engineer, and ALFRED ERNEST JOSEPH BALL, formerly of Kingston House, Evington Road, Leicester, and now of 165, Mere Road, Leicester aforesaid, Clockmaker, 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 mainly to electric master clocks as used on board ship, or for positions in which similar conditions prevail, and has for object improved means for advancing and retarding the secondary clocks operated thereby.

In carrying this our invention into effect, we provide a device which operates on the principle of a Morse key, the centre member being adapted to make contact with either of two other members on being moved in one direction or the other.

In previous proposals for the use of a Morse key device for the purpose of automatically retarding a system of electric clocks, it has been suggested that the centre member be held in contact in its retarding position by means of a spring, while, on the other hand, it be held in contact in its normal position by means of another spring which must be of sufficient strength to overcome the first mentioned spring.

It has further been proposed that the amount of retardation be controlled by a greater or less distension of the stronger spring, and that the gradual return of this spring to its normal position be controlled by a step-by-step movement.

A disadvantage of such a method of effecting the automatic retarding of clocks as required on board ship when sailing westwards is that it does not also provide for, or permit of, the automatic advance of the clocks when sailing eastwards.

Our improved device as herein described provides for, and permits of, the automatic advance of the clocks, in addition to providing for the automatic retarding of the clocks.

In one form, the device is mounted on a base-plate, and suitably insulated. When working normally, and the whole of the clocks are being driven, the centre member is in contact with one of the members which we will term No. 1, and is held in firm contact by a comparatively strong spring.

We may provide two levers or handles to be operated by hand, and we term one the "advancing lever" and the other the "retarding lever".

When it is desired to retard the clocks, when sailing westwards for instance, the retarding lever is pressed. This lever is arranged to draw the centre member out of contact with No. 1 member, and to put it in forcible contact with the other member which we term No. 2.

The centre member is held in this position by one end of a double-ended spring-impelled catch, which we term the "interval catch", and which may be controlled by a secondary clock mechanism or impulse movement in the following manner:—

The impulse movement (which we will term the correcting movement) is fixed

to the same base-plate as the Morse key device, and the spindle of the movement, which is operated by the usual ratchet mechanism, has fixed rigidly thereto a clutch-part consisting of a clutching wheel provided with radial teeth. We mount freely on the same arbor a notched disc, (or cam), which we provide with a handle, a pointer, and a clutch device which is arranged to engage at will the clutching wheel. We attach pivotally to the base a spring-impelled lever which we term the "releasing lever", and which we provide with a stud or equivalent which is adapted to either rest on the periphery of the notched disc, or drop into the notch. We further arrange that on dropping into the notch the releasing lever engages the interval catch, and causes one end of the latter to disengage the centre member of the Morse key, thereby permitting it to take up its normal position under the influence of its spring.

The correcting movement is provided with a graduated dial which is marked so that the number indicated by the hereinbefore mentioned pointer represents the (number of) minutes it is desired to retard (or advance) the clocks.

The hereinbefore described device for retarding the clocks provides for and permits of robust and reliable contacts with ample pressure between the surfaces, the energy required to operate them being provided by the operator, the function of the clockwork being only to release the centre member after the lapse of the number of minutes for which the pointer is set.

Hitherto it has been usual to advance the clocks when sailing eastwards by pressing a push a number of times by hand, and the success of such operation depends largely on the skill of the individual operator in making clean and decisive contacts by hand.

In accordance with this invention, the operation of advancing the clocks is effected automatically.

The master clock is provided with a spring-impelled driving lever which, by means of a pawl and ratchet wheel, drives a short train of wheels terminating in a balance escapement. We term this train of wheels the "time train".

The driving lever is provided with a contact, which, on the lever descending a pre-determined distance, closes a circuit through an armature and electro-magnet, and the lever is lifted and the driving pawl engages the next tooth of the ratchet wheel in a well-known manner. This contact takes place normally, at each half minute, but when advancing the clocks when sailing eastwards for instance, we provide for the automatic making of the contacts at the rate of approximately 90 per minute, in the following manner:—

We provide a short train of wheels terminating in a comparatively large fly, and dispose the whole preferably below the driving lever.

We provide the driving lever with a second pawl adapted to engage a fine cut ratchet wheel which we fix to the arbor of the first wheel of the train.

We provide a bell crank lever arranged so that on one member being moved the other member draws the driving pawl out of engagement with the ratchet wheel, and simultaneously puts the second pawl into engagement with the fine cut ratchet wheel.

The arrangement is such that so long as the bell crank lever is held in this latter position the driving lever descends, and being now controlled by the comparatively fast moving fly makes contact at the rate of about 90 per minute, thus rapidly advancing the clocks. In order to effect this advancement automatically we link the bell crank lever to the hereinbefore mentioned advancing lever which we dispose near the interval catch.

We arrange that the advancing lever on being pressed by hand engages the second catch of the interval lever, and is thereby held. The hereinbefore mentioned notched disc and pointer is previously moved to the number of minutes it is desired to advance the clocks.

The impulse movement which is always in circuit and which is operated by the rapidly made contacts, rotates the notched disc until the releasing lever falls into

the notch, and thereby releases the interval catch. The driving pawl then engages its ratchet wheel, the time train is again driven, and the driving lever operates the contacts normally at each half minute as before.

While the clocks are being advanced, it is an advantage to stop the balance from vibrating, and we may attach to the bell crank lever a fine leaf spring arranged to engage the balance so long as it is in that position which causes the fly train to be operated.

We may arrange the electrical connections so that the master clock is always in series with the correcting movement, and that while No. 1 contact is closed, the whole of the clocks and all the cells of the battery are connected in series, and these connections obtain when the clocks are working normally, or are being advanced.

When No. 2 contact is closed the connections are such that a pre-determined number of the cells only are connected in circuit with the master clock and correcting movement, the clocks and the remainder of the battery being cut out.

In some instances instead of reducing the number of cells it may be arranged that a resistance be put in to compensate for the clocks being cut out.

Referring to the annexed drawings in which like letters indicate like or equivalent parts:—

Fig. 1 shows diagrammatically the advancing and retarding mechanism with the parts shown in position for advancing.

Fig. 2 shows (also diagrammatically) the advancing and retarding mechanism with the parts in position for retarding.

Fig. 3 shows a diagram of the connections.

Referring to Fig. 1, A shows the centre member of the Morse key, No. 1 that member with which it contacts (under the influence of the spring A^2) while working normally and while advancing, and No. 2 that member with which it contacts while retarding. A^1 shows the retarding lever or handle, while B^1 shows the advancing lever or handle. B shows that part of the advancing lever which engages the interval catch C at C^1, while the lever A is adapted to engage at C^2. C^3 shows the fulcrum of the interval catch, and C^4 shows a comparatively light returning spring which is attached to that part of the interval catch C^5. D shows the releasing catch which is fulcrumed at D^1, and is energised by a comparatively strong spring D^2. E shows the notched disc or cam, and E^1 the notch. F shows the clutching wheel, and F^1 the clutch which engages the same. F^2 shows a form of pointer, and F^3 the setting dial. G shows the handle, and G^1 and G^2 two lighter handles which are grasped along with the handle G, G^1 being provided to control the clutch F^1, while G^2 is provided to lift the releasing catch D out of the notch E^1 before commencing to turn the disc E. The various parts are shown in the positions occupied while "advancing".

Referring to Fig. 2, H shows the driving lever which is fulcrumed at H^1, and is impelled by the driving spring H^2. J shows the driving pawl which engages the ratchet wheel K, and by means of a short train of wheels such as L and M drives an escapement which is represented in the figure by the balance O only. The ratio of the wheel train to the vibrations of the balance is such that the driving lever H descends a distance which equals one tooth of the wheel K in the space of 30 seconds or other predetermined period. The contacts P and P^1 then close a circuit which includes the electro-magnet R^1, the armature R^2 then becomes attracted, and the lever H is returned to its potential position, and the circuit broken in a well-known manner. The armature then returns to its normal position against the stop R^3 under the influence of the spring R^4.

When advancing the clocks, the lever H instead of descending and making contact every 30 seconds, descends and makes contact in quick succession a pre-determined number of times in the following manner:—

The compound handle, G^1, G^2, and G is grasped by the operator, its members brought together, and the handle moved until the pointer F^2 indicates the number of minutes it is desired to advance the clocks. The advancing lever B^1

is then depressed, and its end B engages the catch part C^1, and is then held as shown in Fig. 1.

The act of depressing the lever B^1 pulls the connecting rod S which in turn moves the crank S^1, the connecting rod S^2, the crank lever S^3, and the lever S^4, the latter being moved by the pin S^5 acting on the fork S^6. The thin leaf spring T engages the balance O, and prevents it from vibrating, and the pin S^7 engages the catch J, and pushes it out of engagement with the wheel K to the position also shown in Fig. 1. The pawl J^1 then engages the ratchet wheel U, and the rate of movement of the lever H is controlled by the air brake or fly V^1 which is rapidly rotated by the wheel U^1, which on the one hand is attached rigidly to the ratchet wheel U, and on the other hand gears with the pinion V of the fly V^1. The lever H descends in approximately half a second when it is thrown up again by the armature R^2 in a manner already described, and this action is automatically repeated, the whole of the clocks in the circuit being advanced each time contact is made. The correcting movement (not shown) which operates the clutch wheel F also advances at each contact, and on the pointer F^2 arriving at zero the releasing lever D falls into the notch E^1 and its member D^3 strikes the member C^5 of the interval catch C, when the catch part C^1 releases the lever B which then returns to its normal position under the influence of the spring B^2.

The rod S, the crank S^1, the rod S^2, the crank lever S^3, and the lever S^4 all then return to their normal positions under the influence of the springs B^2 and S^8. The pawl J then engages the ratchet wheel K, and the train of wheels and escapement are driven as normally. While the master clock is working normally, the mechanism of the impulse movement which drives the clutch wheel F engages a tooth of its ratchet wheel or equivalent, on the next half minute impulse passing through its magnet, but it does not advance the ratchet wheel, being unable—in consequence of its limited power—to drive the clutch wheel F against the clutch F^1, while the disc E is held by the lever D.

Referring to Fig. 3 which shows a diagram of the connections, while working normally and while advancing the path of the current is from the positive end of the battery to terminal X^1, then to terminal X^2, through the winding X^3 of the magnet of the master clock, then through the contacts P^1 and P, from thence through frame to terminal X^4, then through the winding X^5 of the correcting impulse movement, and from thence through the Morse key member A, through spring No. 1, through winding X^6 of the "pilot" dial to terminal X^7, and through the circuit of the clocks shown back to the negative end of the battery.

When retarding, the path of the current is as hereinbefore described up to the point where it reaches the Morse key member A. The path then taken is through the spring No. 2 with which it will then be contacting to terminal X^8 and from thence to the point X^9 of the battery. When retarding, the number of cells in circuit is reduced, because of the clocks being cut out of the circuit.

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 an electric master clock an automatic advancing and retarding mechanism for controlling the secondary clocks connected thereto, comprising a Morse key, the centre member of the key being held in contact with the contact on one side by means of a strong spring while the clocks are being driven normally or advanced, and being adapted for manual movement out of contact with this contact and into forcible contact with the contact on the other side, the centre member being held in forcible contact with this latter contact by means of a catch while the clocks are being retarded, and the catch being released by means of an impulse movement driven by the periodic contacts of the master clock after the lapse of a pre-arranged time or after a pre-arranged number of contacts have been made.

2. An automatic advancing mechanism in an electric master clock comprising a catch device controlled by an impulse movement and released thereby after a pre-arranged number of impulses have been made, a lever engaged and held by the said catch on being manually and forcibly moved, means whereby the driving pawl of the master clock is disconnected from the ratchet wheel which it drives, and means whereby a second driving pawl engages a second ratchet wheel, the rotation of the second ratchet wheel being controlled by a retarding device.

3. An automatic advancing device of an electric clock system, comprising a spring-impelled part which is moved to a potential position by the operator when setting the device to the number of minutes it is desired to advance the secondary clocks, a cam or equivalent which holds the spring impelled part in its potential position and which is rotated by an impulse movement and means whereby the spring impelled part is released by the impulse movement after a pre-determined number of impulses have been made.

4. In an advancing and retarding device of an electric clock system a lever such as D which is lifted to the periphery of a cam or equivalent potential position by a lever such as G^2 by the energy of the operator and the utilisation of the energy for effecting the subsequent release of an advancing lever such as B^1 or a retarding lever such as A^1.

5. Automatic advancing and retarding mechanism in an electric clock system constructed and operating substantially as herein described and illustrated.

Dated this 22nd day of October, 1914.

ISAAC HARDY PARSONS.
ALFRED E. J. BALL.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1915.

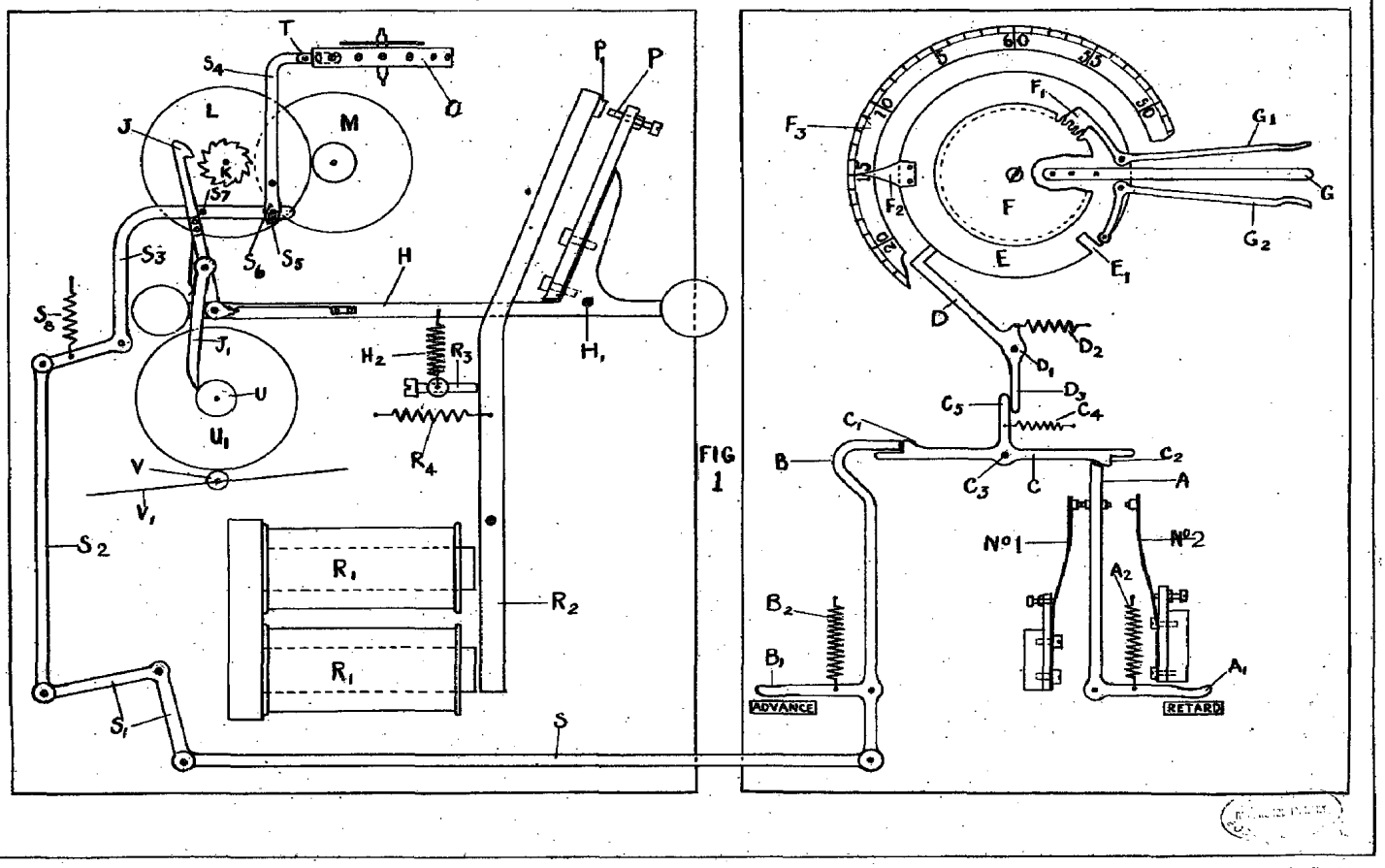

FIG 1

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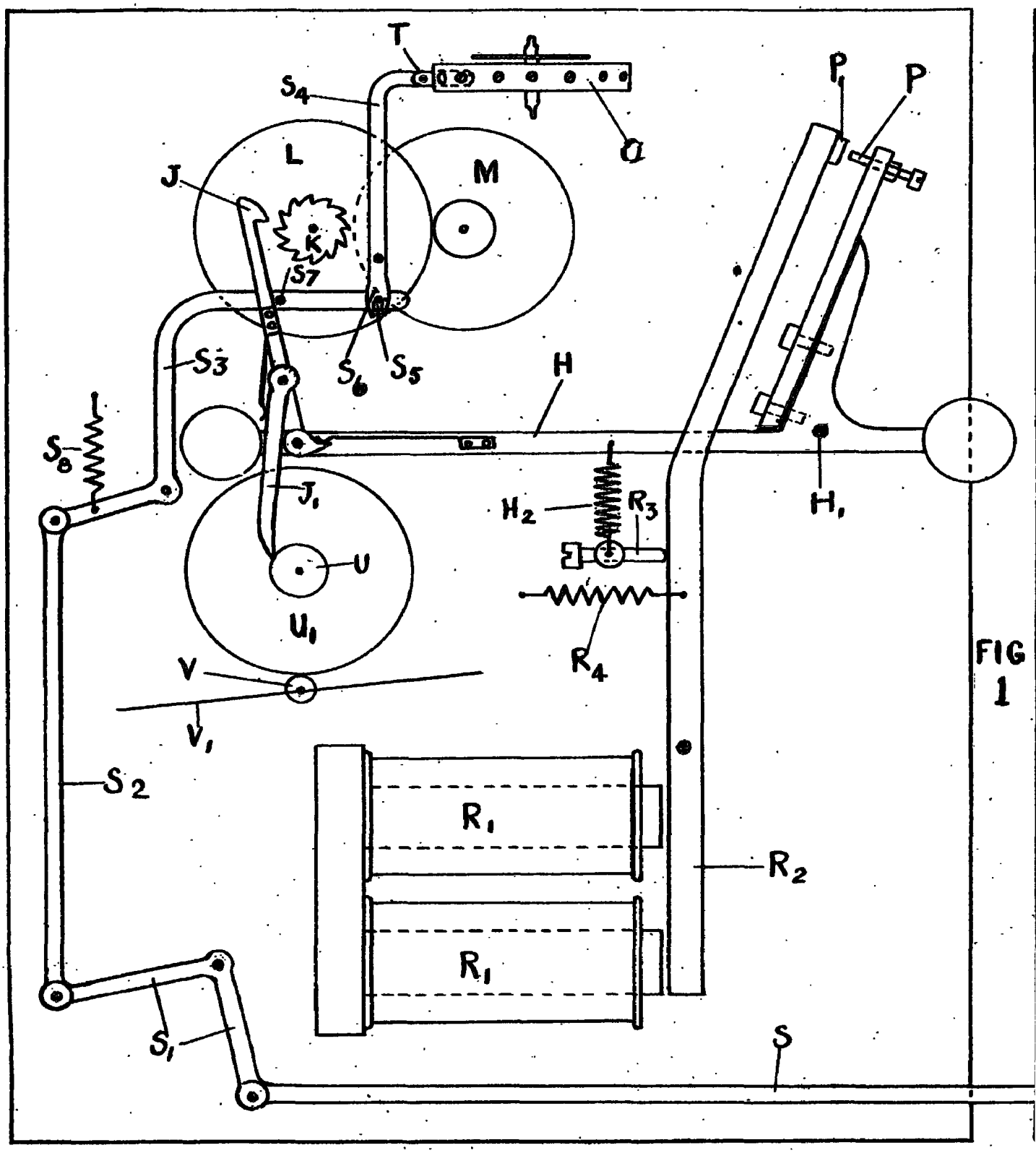
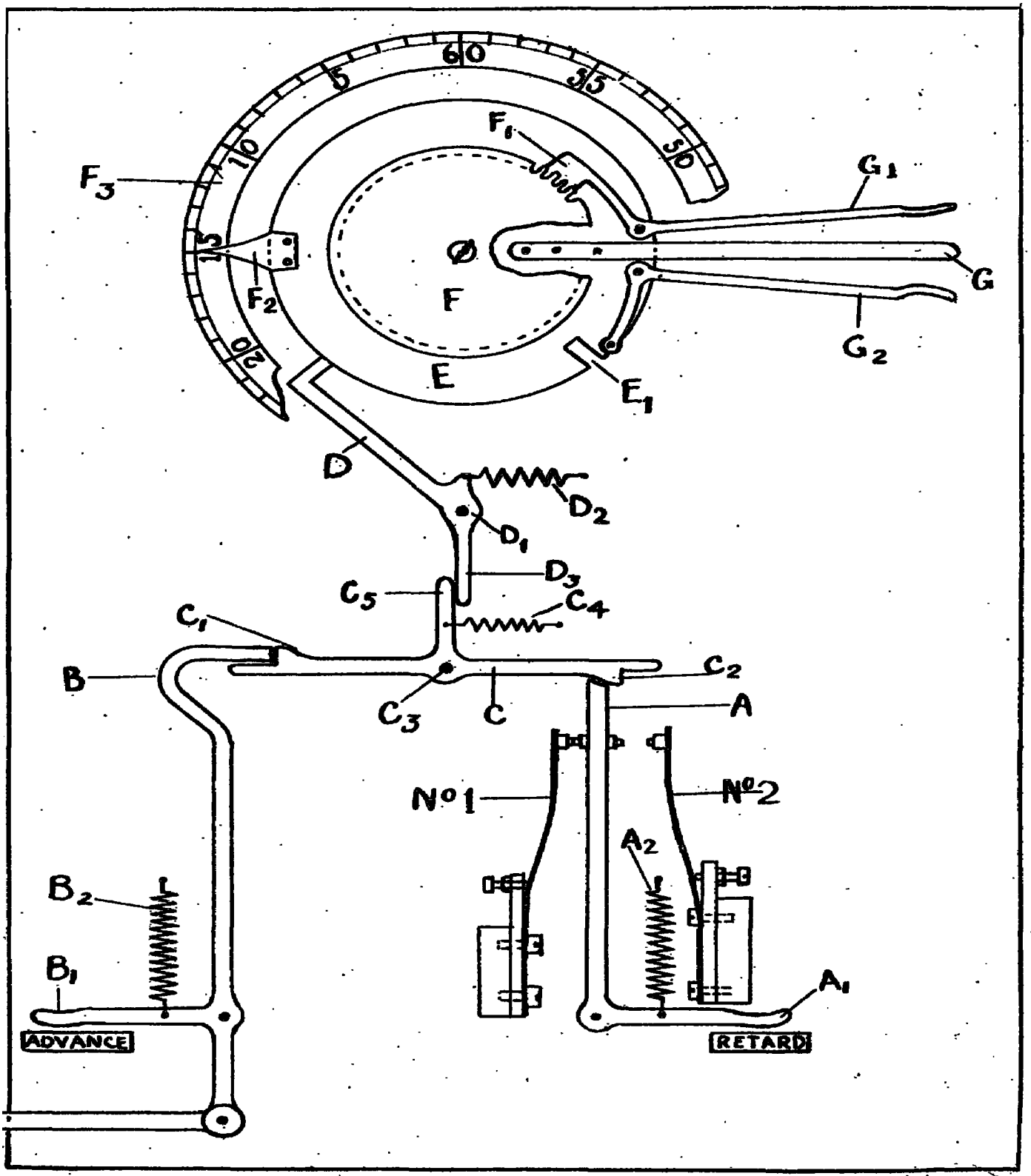


FIG 1

[This Drawing is a full-size reproduction of the Original.]



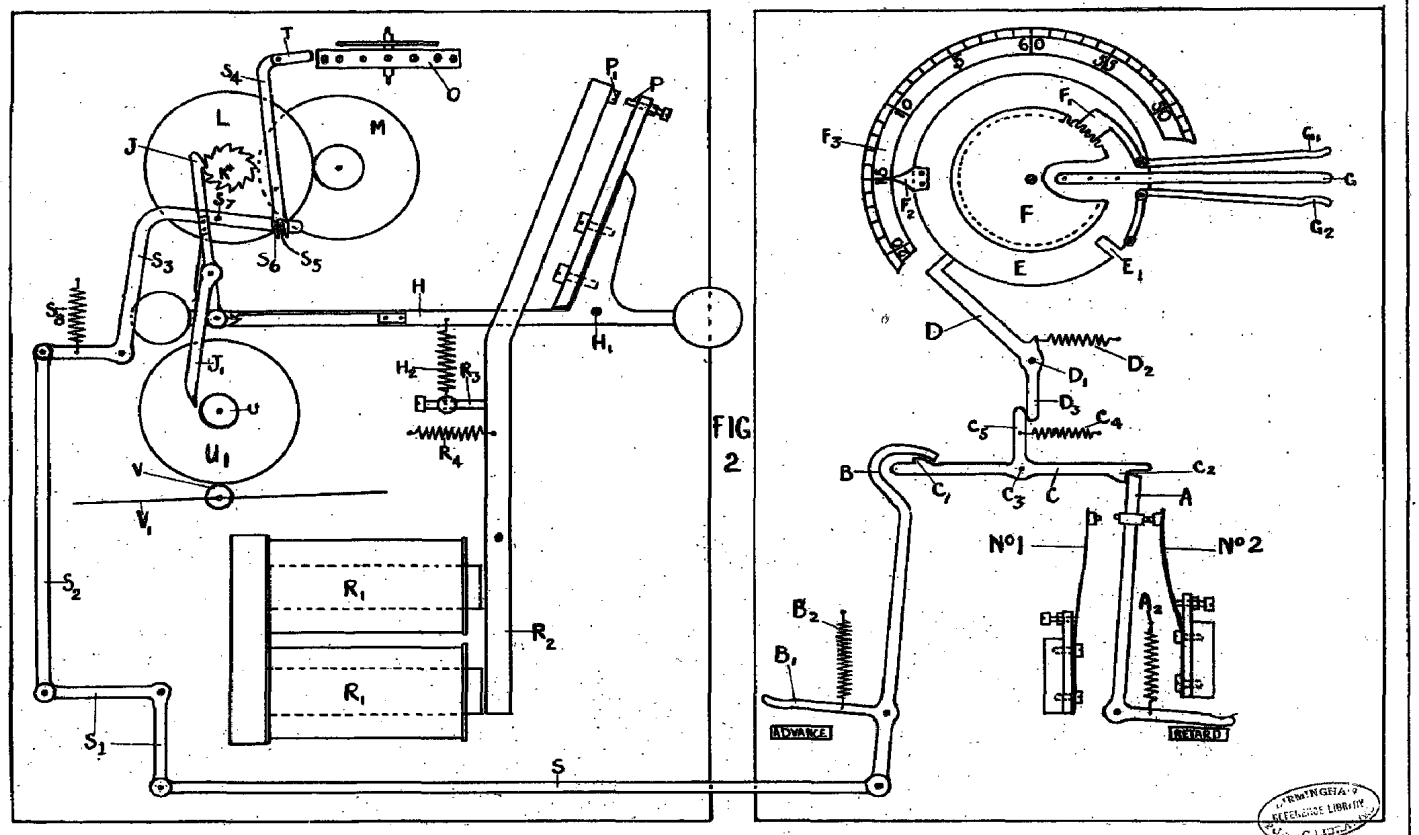


FIG 2

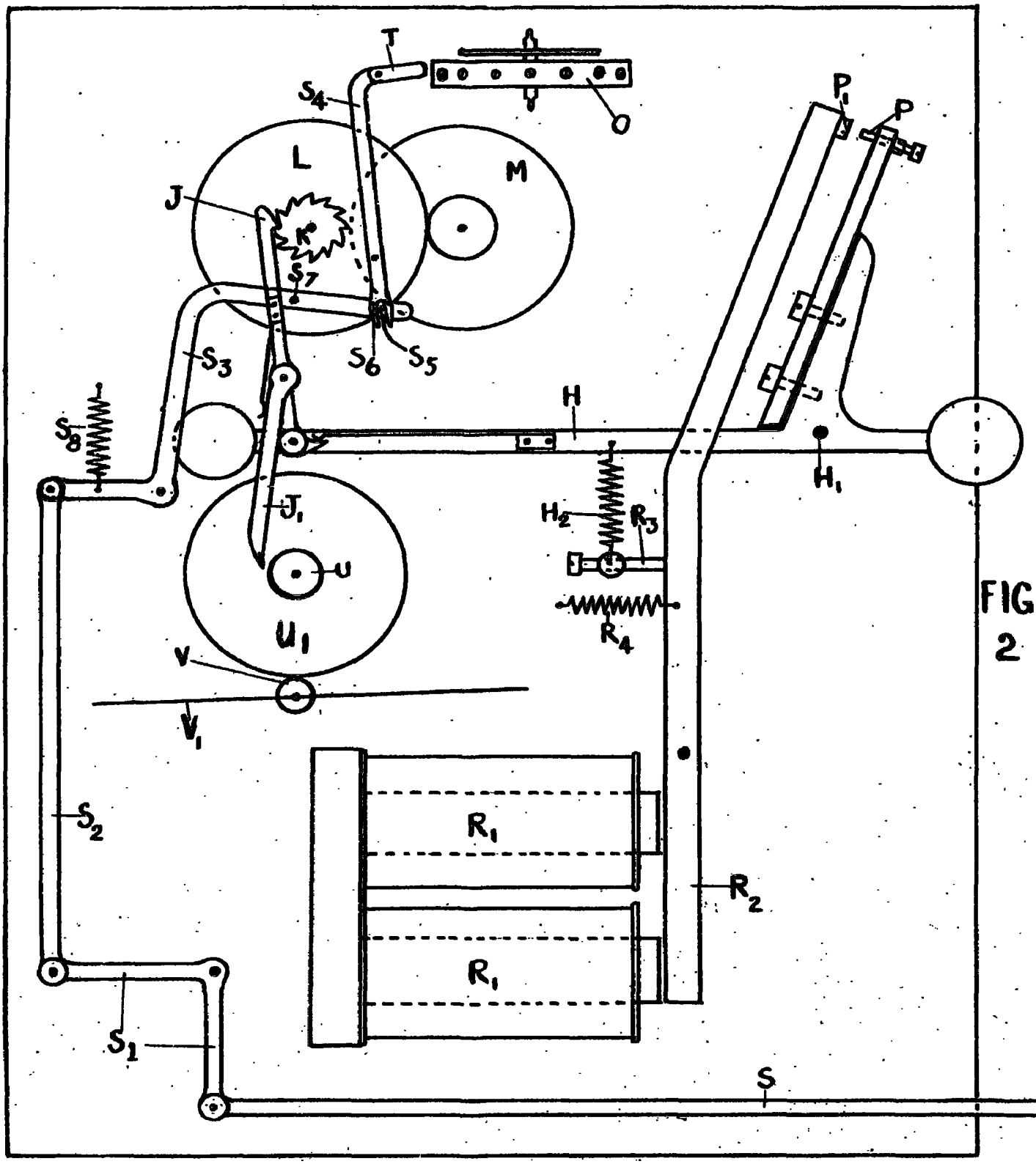
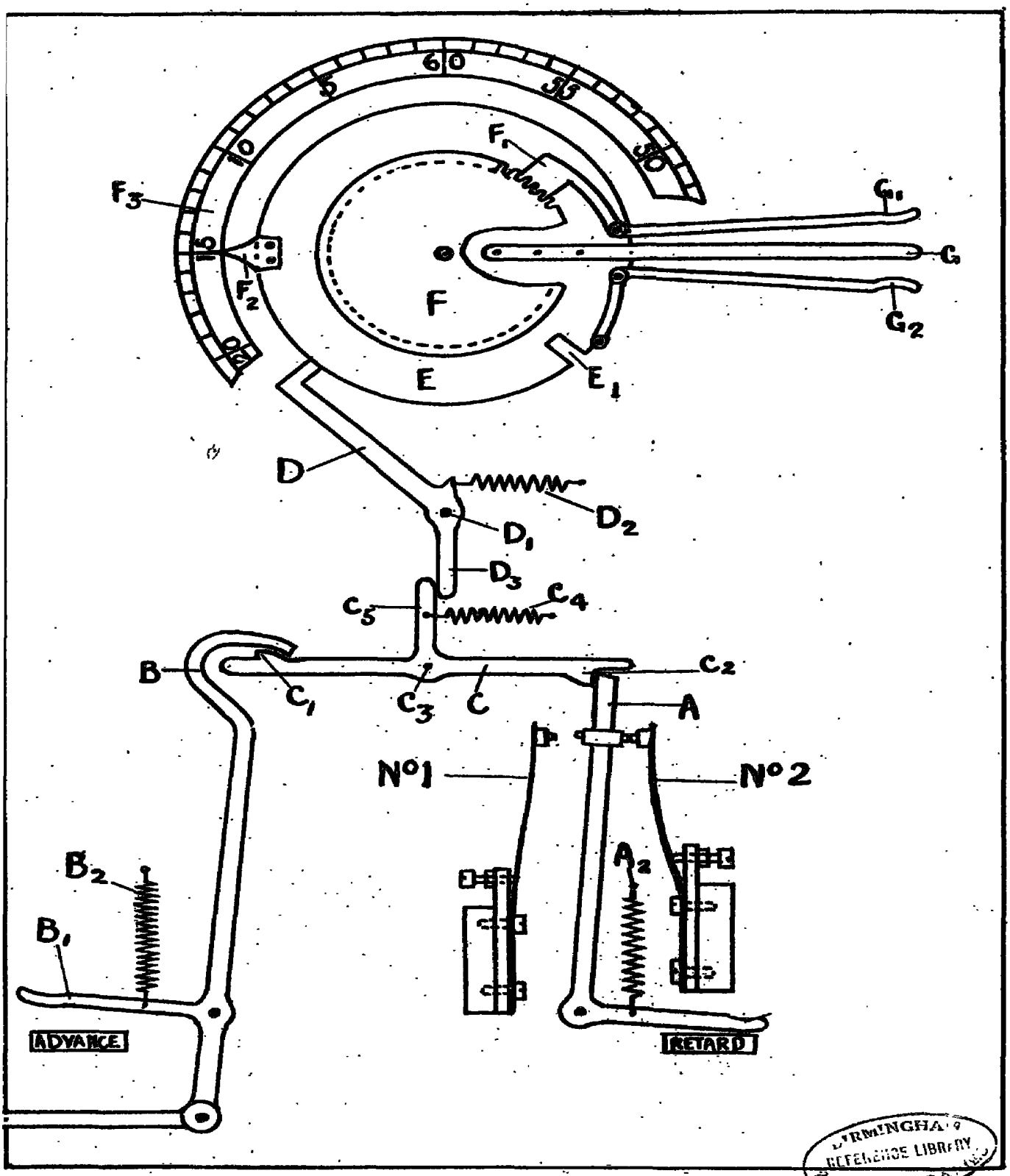


FIG 2

[This Drawing is a full-size reproduction of the Original.]



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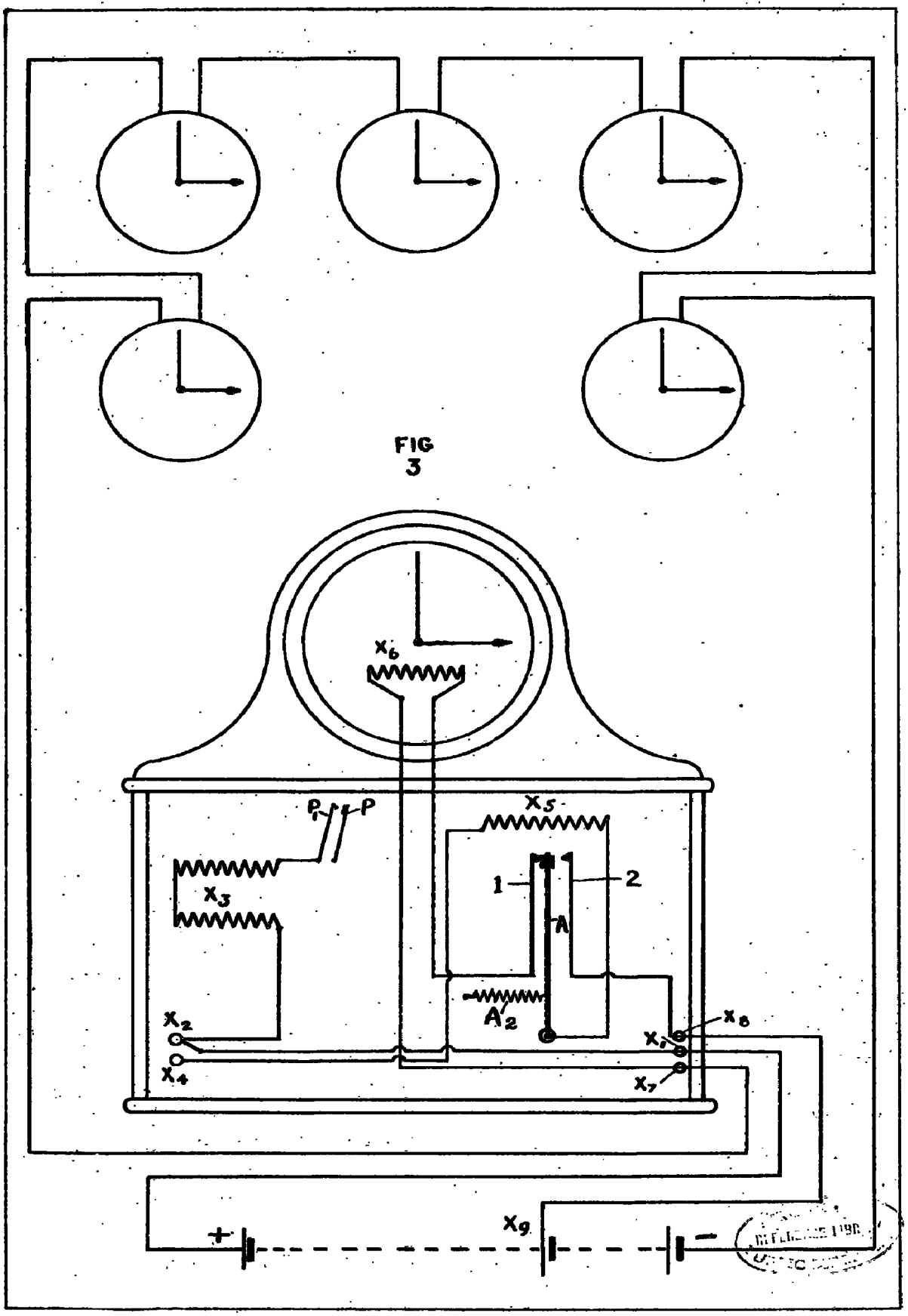
[This Drawing is a reproduction of the Original on a reduced scale.]



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