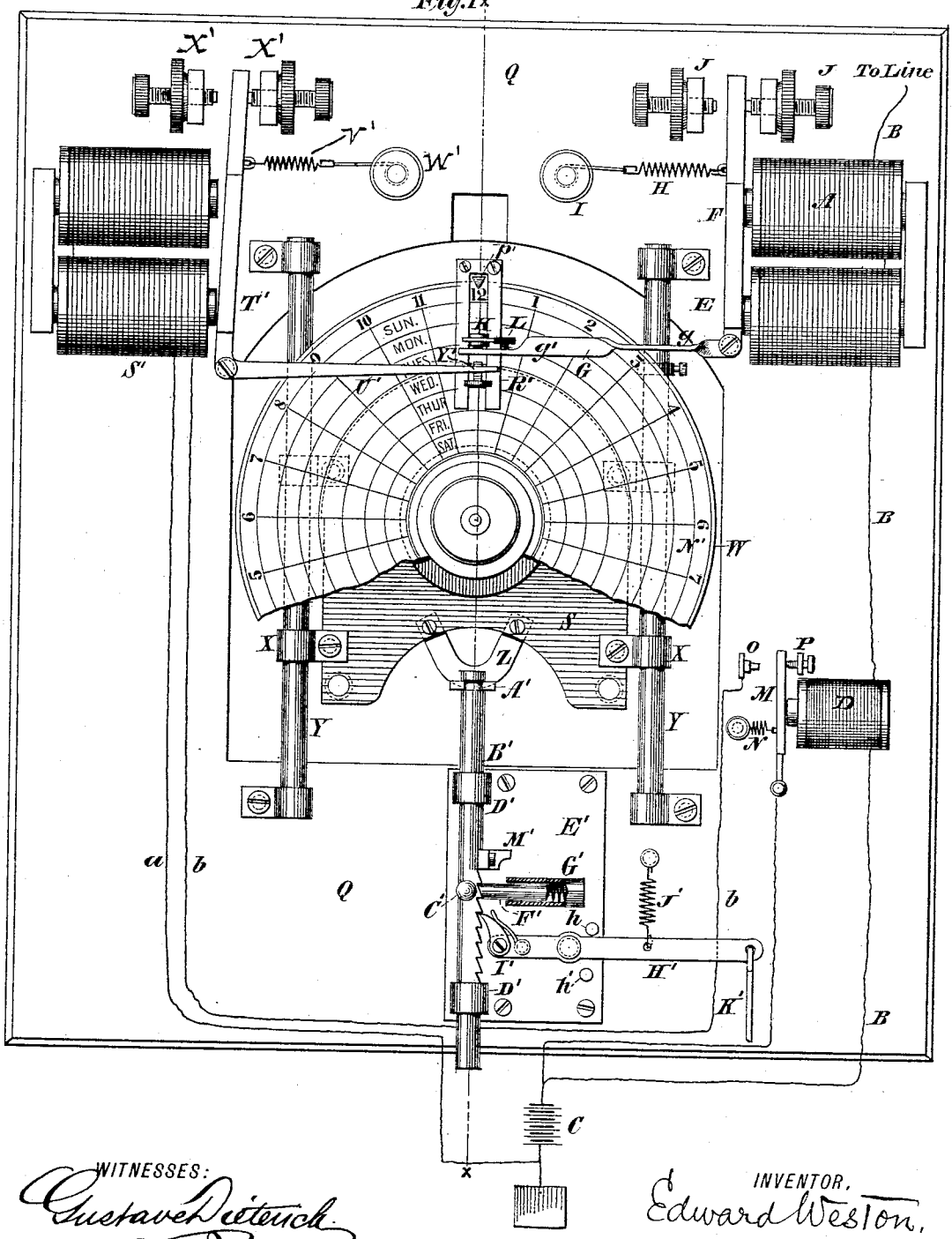
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E. WESTON.

ELECTRICAL RECORDING MECHANISM.

No. 389,273. Patented Sept. 11, 1888.

Fig. 1.



WITNESSES:

Gustave Dieterich.

Edgar Goodwin

INVENTOR,

Edward Weston,

BY Clark Benjamin,

His ATTORNEY.

N. PETERS, Photo-Lithographer, Washington, D. C.

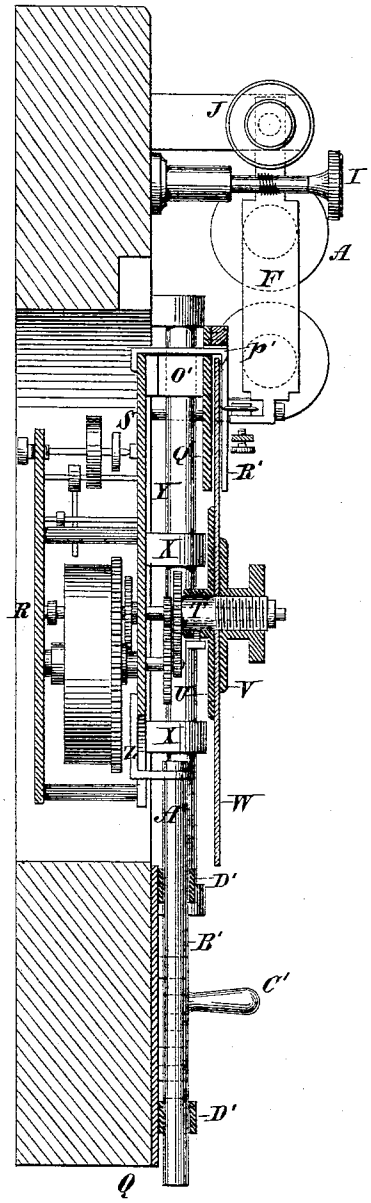
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E. WESTON.

ELECTRICAL RECORDING MECHANISM.

No. 389,273. Patented Sept. 11, 1888.

Fig. 2.



WITNESSES:

Gustave Peterich.

Edgar Goodwin.

INVENTOR,

Edward Weston.

BY Paul Benjamin,

his ATTORNEY.

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.)

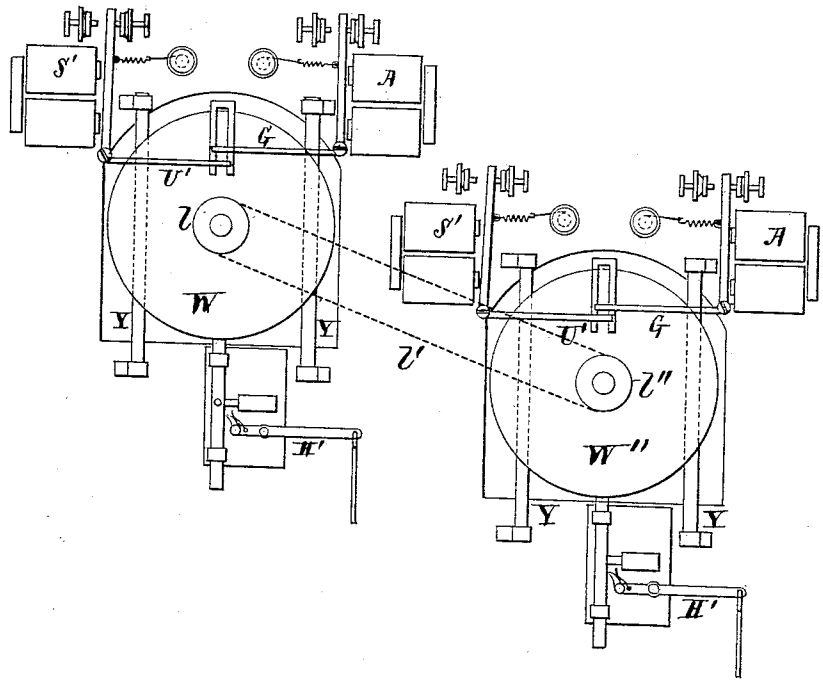
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E. WESTON.

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Fig. 3.



WITNESSES:

Gustave Dieterich.

Edgar Goodwin.

INVENTOR.

Edward Weston.

BY Park Benjamin.

his ATTORNEY.

N. PETERS. Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

EDWARD WESTON, OF NEWARK, NEW JERSEY.

ELECTRICAL RECORDING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 389,273, dated September 11, 1888.

Application filed March 10, 1888. Serial No. 266,849. (No model.)

To all whom it may concern:

Be it known that I, EDWARD WESTON, of Newark, Essex county, New Jersey, have invented a new and useful Improvement in Electrical Recording Mechanisms, of which the following is a specification.

My invention relates to apparatus for producing a visible and continuous record of the variations concerning which knowledge is desired, which record shall exhibit the time of occurrence and duration of such variations.

My invention consists in the apparatus and combinations thereof, substantially as herein described and shown.

I here exhibit my said invention in connection with electrical apparatus and as constructed to record decrease in current strength or interruption of current in a circuit; but it is to be understood that my said invention is not necessarily limited to use in connection or combination with electrical attachments.

In the accompanying drawings, Figure 1 is a front or face view of my recording mechanism, a portion of the rotary disk being broken away to exhibit parts otherwise concealed. Fig. 2 is a sectional view on the line *x x* of Fig. 1. Fig. 3 is a diagram showing two record-disks driven by the motor mechanism.

Similar letters of reference indicate like parts.

A is an electro-magnet the coils of which are in circuit with the line-conductor B and with the battery C, one pole of said battery being grounded. Interposed in the line-conductor between battery and magnet A is an electro-magnet, D. The magnet A has a pivoted armature, E, in bell-crank form, F and G being the arms of said bell-crank. The arm G is a spring-arm and yields in two directions relatively at right angles. To this end the arm is twisted or turned, as shown, one part, *g*, of said arm being horizontal and the other, *g'*, vertical. At H is a retracting-spring for said armature, which may be adjusted by the screw I. Stops J are placed in proximity to said armature to limit its range of movement. The lower horizontal arm, G, of the bell-crank carries a pivoted horizontal roller or disk, K, the beveled edge of which meets a pivoted disk, L, of felt or other absorbent material, also secured to said armature-arm. This felt disk is kept moistened with any marking-ink and serves as an inking device for the beveled edge of disk K. The magnet D is also provided with a pivoted armature, M, having an adjustable retracting-spring, N, and limiting-stops O P.

The magnets A and D are supported upon the base or back board, Q, in which is made an opening which receives an ordinary spring clock-train, R, which is secured upon a metal plate, S. The gearing of this clock-train is arranged so that the hour-hand arbor T makes a revolution once in twenty-four hours, instead of once in twelve hours, as is usual. In other respects the common clock mechanism is unchanged. Upon said arbor T are rigidly secured a disk, W', a flanged collar, U, and nut V by screwing down the latter. Consequently said disk rotates once in twenty-four hours.

The plate S, which supports the clock mechanism R and disk W, is provided with four eyes or loops, X, which slide freely upon the vertical guide-bars Y, which are fastened to the back board, Q. On the lower part of plate S is affixed a yoke-piece, Z, which is provided with a forwardly-extending forked arm, A'. B' is a rod having near its upper end an annular channel, into which the parts of the forked arm A' may be conveniently slid, as shown in Fig. 1. By raising or lowering the rod B' the plate S, and hence the clock-train R and disk W, may be moved upward or downward upon the guide-bars Y. This may be done by hand by means of the handle C' on the rod B'. The rod B' passes through and is guided by eyes D' upon a metal plate, E', attached to the back board, Q. Upon said rod between said guide-eyes are formed ratchet-teeth, with which engages a pin, F', which enters a metal cylinder, G', secured upon plate E', and bears against a spiral spring in said cylinder. The plate S and mechanism thereto attached are normally supported in the position in which they may be adjusted upon the guide-bars Y by means of this pin F'. The rod B' is free to turn in its guide-eyes D' and in the yoke-piece Z, so that by rotating it in proper direction by means of the handle C' the ratchet-teeth may be withdrawn from engagement with the pawl and the pin F', when the rod and parts supported by it may readily be lowered.

Pivoted upon the plate E′ is a lever, H′, having at one end a pivoted spring-pawl, I′, which also engages with the ratchet-teeth upon the rod B′. Near the other extremity of lever H′ is a spiral spring, J′, and, finally, to said extremity of the lever may be attached a cord or wire, K′. On each side of the lever H′ are stops *h h′*, which limit its range of movement. By pulling down the cord K′ the pawl I′ lifts the rod B′. When the cord is released, the lever H′ is retracted by the spring J′ and the pawl I′ slips over the next following tooth of the ratchet, the rod B′ meanwhile being supported in the position to which it was lifted by the pin F′. This pin F′, it will be noted, has a beveled end, so that when the rod B′ is raised, as described, the inclined sides of the ratchet-teeth slide readily beneath the pin. Upon the rod B′ is secured a stop, M′, which, as the rod is moved, meets either the upper guide-eye, D′, or the pin F′, and so limits the extent of travel of said rod.

Upon the outer face of the disk W is secured in any suitable manner (as by clamping between the face of the disk and the nut V) a record-sheet, N′. Upon this sheet is marked a series of concentric circles dividing it into seven annular spaces, each corresponding to a day of the week, as shown in Fig. 1. Said sheet is also divided by radial lines into twenty-four equal segments, each corresponding to an hour of the day, and numbered in regular succession in two series of from one to twelve. Secured to the fixed plate S is a bar, O′, which extends over the top of disk W and is provided with an indicator-tip, P′, which is located in a line just above the center of the disk. The bar O′ passes through an opening in and so supports a small vertical plate, Q′, which extends downward in rear of disk W. To said plate Q′ is attached a plate, R′, which extends down in front of the record-sheet on disk W, and which is slotted or recessed. The rim of the marking wheel or roller K passes through the slot in plate R′, and so meets the record-sheet, as shown in Fig. 2.

S′ is an electro magnet, also supported upon the base-board Q. The pivoted armature T′ of said magnet is in bell-crank form, having a horizontal arm, U′, a retracting-spring, V′, adjustable by screw W′, and limiting-stops X′. At the extremity of arm U′, which comes just beneath the end of arm G, is an adjustable contact-screw, Y′. The coils of magnet S′ are connected in local circuit by wires *a b* with battery C, armature M of magnet D, and the contact-stop O, limiting the movement of said armature.

The operation of my above-described apparatus is as follows: The disk W is continuously rotated by means of the clock mechanism, so that the record-sheet N′ thereon is carried beneath the marking-point K, which produces a trace or line thereupon. This line will obviously be a true circle as long as the position of the marking-point over the disk is not changed. The current from battery C energizes both magnets D and A so long as the line-circuit is unbroken, or so long as said current is strong enough to cause the magnet D to keep its armature M up to its pole. The magnet A, therefore, normally attracts its armature and the marking-point K remains at rest. If, however, circuit on the line is interrupted, the magnet A releases its armature, which is attracted by the spring H, and the end of arm G falls upon the tip of the screw Y′. Simultaneously the magnet D releases its armature M, which, being retracted by spring N, makes contact with the stop O, and so completes local circuit through said armature, battery C, wires *a b*, and magnet S′. In descending the marking-roller K makes a vertical or radial trace upon the sheet, and the precise hour and minute when this is done is shown by the time-divisions on the sheet. When magnet S′ is energized, it attracts its armature T′, raises the arm U′, and in this way the armature E, and hence the marking-roller K is lifted to a position slightly above that which the marking-roller had before the interruption of circuit occurred. The roller then begins a new circular trace immediately following the radial line, which circular line, being different in location from that previously made by the marking-roller, indicates by its continuance for how long a time the interruption of circuit has lasted.

It will be apparent that by suitably adjusting the retracting-springs H and N of the armatures E and M the magnet A may be caused to continue to retain its armature under the influence of a current too weak sufficiently to cause the magnet D to hold its armature against the pull of spring N. In such case the magnet D would, as before, release its armature and local circuit would, as before, be established through the magnet S′, the current dividing through the line and magnet S′ in proportion to their respective resistances. In such event the magnet A, under the influence of the still more weakened current, might release its armature, while, the armature of magnet S′ being attracted, the marking-point would produce on the scale the same indication as if an actual rupture of circuit had occurred. If, however, the magnet A did nevertheless retain its armature, then the arm U would still act to lift the marking-point above its original position, only no long vertical trace would first be produced by the dropping of the arm G.

Any one skilled in the art will easily perceive various relative adjustments of the armature-springs of the three magnets, so as to vary the ability of said magnets to hold their armatures under currents of different strengths. Thus, for example, the spring H might be arranged to draw away the armature E under a less weakening of the current than would suffice to effect the release of armature M of magnet D. In such case the arm G would

drop and the marking-roller begin a new trace nearer the center of the record-sheet, local circuit not being closed at all through magnet S', and hence no movement of the arm U' taking place.

It has already been stated that the plate S, which supports the disk W and motor mechanism, is carried by the rod B', the ratchet-teeth of which engage with the spring-pin E'. The object of the lever H, which is provided with the spring-pawl I', is to enable the rod B' and mechanism supported thereon to be raised at will, this movement being guided in a vertical plane by the eyes X, which slide upon the fixed bars Y. It will be noticed that the annular spaces into which the record-sheet is divided by the concentric circles correspond to and are marked for the days of the week in regular order radially inward. Consequently, in order to set the record-sheet so that the marking-roller having completed the record for one day shall make it for the following day, it is necessary simply to raise the disk to a new position, so that the roller will bear upon the next adjacent annular space. This is effected by pulling down on the cord K', attached to lever H', until said lever meets the lower stop, *h'*. This stop is so placed that when the lever H' meets it the pawl I' will have lifted the rod B' a distance slightly more than the length of one ratchet-tooth, so that the spring pin G' easily slips under the shoulder of the tooth which has been moved above it. The distance which the record-sheet has thus been moved is that required to bring the next annular space thereon under the marking-roller. As there are seven ratchet-teeth, it follows that a single pull of the cord K' daily, as described, is all that is necessary instantaneously to set the apparatus to make its daily record on the proper space corresponding to the day.

Of course the record-sheet may be differently divided from that here shown, and may be laid off for any number of days or part of a day, the number of ratchet teeth being correspondingly modified. So, also, the segmental divisions indicating hours or minutes may be varied, as described.

In Figs. 1 and 2 I show the clock-work mechanism rotating a single disk, W, on the arbor T. I may cause, however, a single clock-work or other mechanism to actuate one or more additional disks with which may be associated similar magnets, &c. This is illustrated in Fig. 3, in which a pulley, *l*, on the arbor T transmits motion by a small chain belt, *l'*, to a pulley, *l''*, on a rotary shaft which supports another disk, W.'' The disk W and the associated apparatus may thus serve for the record of one circuit and the disk W'' for another circuit.

In another application for Letters Patent, filed January 27, 1888, Serial No. 262,177, I have fully described and shown the same electrical recording mechanism here shown in connection with an electrical protective system for safes, rooms, &c. The subject-matter of the claims of my said application are herein disclaimed.

I do not limit my present device in any sense to use with a protective system—such as a burglar-alarm—inasmuch as it may be combined with any electrical mechanism which produces an interruption or decrease of current strength, the existence, period, and duration of which it may be desirable to record.

My invention also includes the polarization of the armature and of magnet D whenever it may be considered desirable to indicate change of direction of current—such as might occur, for instance, should a new current of greater strength, but opposite in direction to the normal battery-current, be thrown upon the line. In such event the magnet-pole and armature might be of unlike names when the normal current passes, but of like names when the current through the magnet-coils was reversed. The armature M in the latter case being repelled would establish contact with stop O, as before, and then the new reverse current would flow by wire B to wire *b*, and so join with and move in the same direction on the local circuit as the current from battery C.

My invention is not limited to the precise arrangements of circuits here shown. I may provide an independent battery in the local circuit, for example, or I may otherwise change the various connections in any way within the knowledge of a person skilled in the art so as to produce substantially the same results as hereinbefore set forth.

By the term "record-surface" as herein used I mean any substance or material adapted to receive on its face a trace or line from a marking-point. By "moving record-surface" I mean such a substance or material caused to travel beneath such marking-point or above which said marking-point is moved in order that a trace or line may be produced on such surface. By the term "marking-point" I mean any body or thing competent to produce when moved over and in contact with a record-surface, or when a record-surface is moved under and in contact with it, a visible mark upon said surface.

I claim—

1. A record-surface, a marking-point movably supported in front of and bearing upon said surface, and a movable arm or lever extending in front of said surface and having its extremity in contact proximity to said marking-point, the aforesaid elements being disposed so that the extremity of said arm may be moved into contact with said marking-point, and so carry said marking-point to a new position over the record-surface, substantially as described.

2. A record-surface, a spring-arm extending over said surface, a marking-point carried by said spring-arm and bearing upon said surface, and a movable arm or lever extending in

front of said surface and having its end in contact proximity to the extremity of said spring-arm, the aforesaid elements being disposed so that the end of said movable arm may be moved into contact with said spring-arm, and the said marking-point so carried to a new position over the record-surface, substantially as described.

3. A rotary record-disk, a marking-point bearing upon said disk, a spring-arm supporting said marking-point, an electro-magnet, and an armature for said magnet extending over said disk and into proximity to said spring-arm, the said armature when attracted by said magnet operating to move the extremity of said spring-arm, the spring yielding, and hence said marking-point in a direction radial to the center of rotation of said disk, substantially as described.

4. The combination, with the rotary disk W, electro-magnet A, bell-crank armature E, having arm G, and marking-point K, carried by said arm and bearing upon said disk, of the electro-magnet S′ and bell crank armature T′, having arm U′, substantially as described.

5. In combination with a moving record-surface and electro-magnet in main circuit with a battery, a marking-point bearing upon said surface and controlled by the armature of said magnet, a relay in the circuit of said magnet, a local circuit closed by the armature of said relay, an electro-magnet in local circuit, and an armature for said magnet extending over said record-surface in contact proximity to said marking-point, the said elements being relatively disposed so that when main circuit is closed through said magnet and relay the said marking-point shall be held at rest above said record-surface and when said circuit is broken or strength of the current therein decreased the said local circuit shall be closed by the relay and the armature of said second magnet shall move said marking-point to a new position over the record-surface.

6. A vertical rotating record-disk, a marking-point supported in front of and bearing upon said disk, a support for said disk, a rod secured to said support at one end and free to rotate on its axis thereon, a guide collar or sleeve for said rod, a fixed catch or stop, and ratchet-teeth on one side of said rod, the aforesaid elements being disposed so that normally the said catch or stop will engage with said ratchet-teeth, and so sustain said disk-support, and when the rod is rotated on its axis the said teeth will be withdrawn from said catch and the said disk-support be no longer sustained, substantially as described.

7. In combination with a moving record-surface, two electro-magnets in main circuit with a battery, a movable marking-point controlled by the armature of one of said magnets and bearing upon said record-surface and in local circuit, the armature of said second electro-magnet, a contact-stop in proximity thereto, a battery, and a third electro-magnet, the armature of said third electro-magnet extending over said record-surface and in contact proximity to said marking-point, the said elements being disposed so that when main circuit is closed through said first and second magnets the said marking-point shall be held at rest above said record-surface, and when said circuit is broken or the strength of current therein decreased the said local circuit shall be closed by the armature of said second magnet and the armature of said second magnet and the armature of said third magnet shall move said marking-point to a new position over the record-surface, substantially as described.

8. The combination of the rotary disk W, electro-magnets A and D in main circuit with battery C, armature E of magnet A, having arm G and marking-point K, and in local circuit, the armature M of magnet D, stop O, battery C, and magnet S′, the said magnet S′ having armature T′, provided with arm U′, substantially as described.

EDWARD WESTON.

Witnesses:
PARK BENJAMIN,
EDGAR GOODWIN.