(No Model.) 2 Sheets—Sheet 1.

G. L. FOOTE & W. C. MOORE.

ELECTRIC SIGNAL RECEIVING INSTRUMENT.

No. 454,643. Patented June 23, 1891.

Fig. 1.

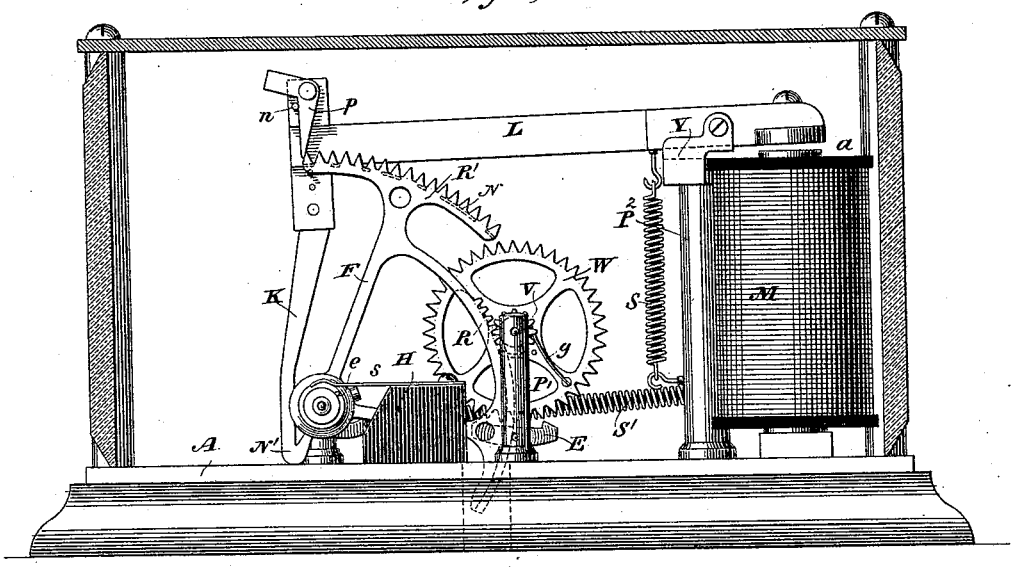
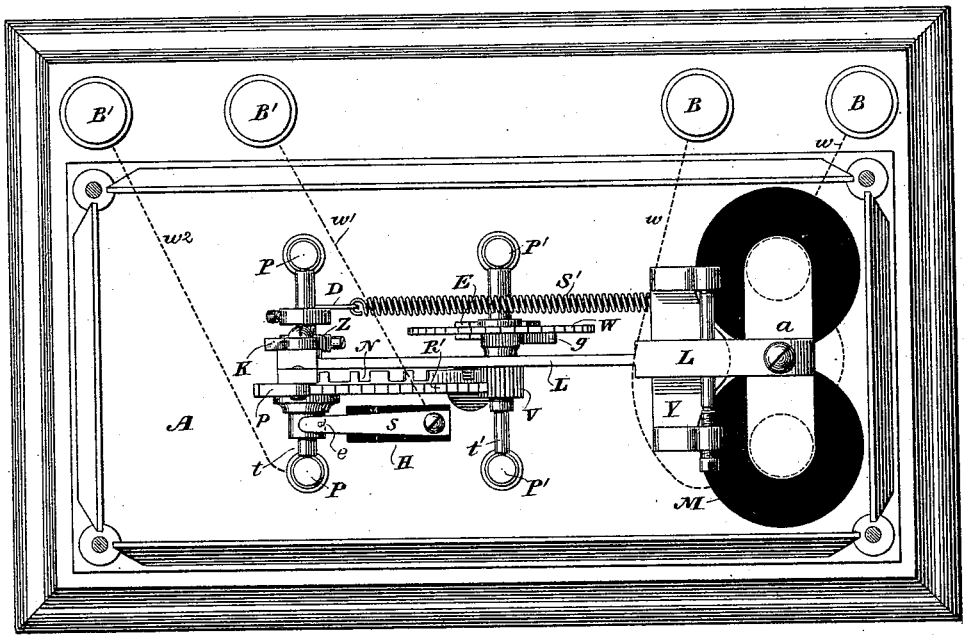


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

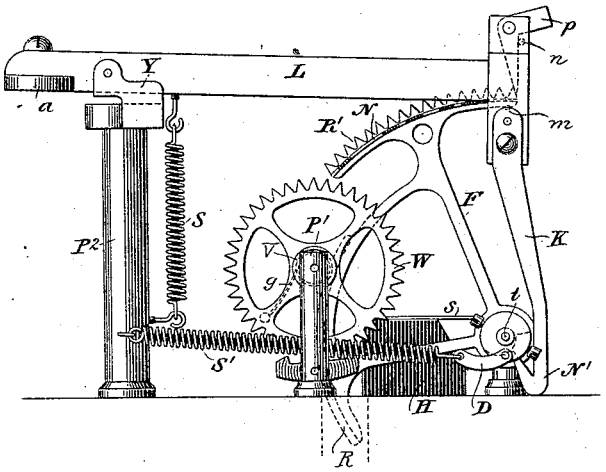


Fig. 4.

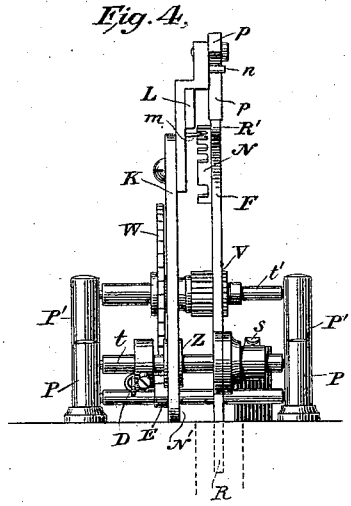


Fig. 8.

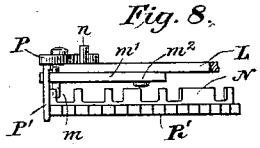


Fig. 5.

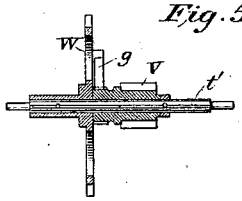


Fig. 7.

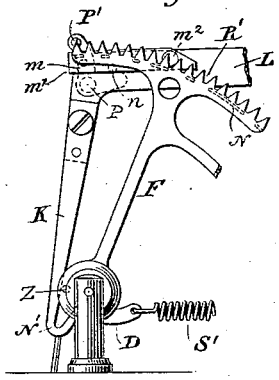


Fig. 6.

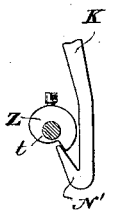
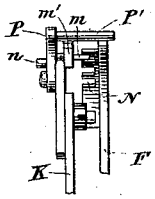


Fig. 9.



Witnesses
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UNITED STATES PATENT OFFICE.

GEORGE L. FOOTE, OF BROOKLYN, NEW YORK, AND WILLIAM C. MOORE, OF KANSAS CITY, MISSOURI, ASSIGNORS TO THE ELECTRIC SECRET SERVICE COMPANY, OF NEW YORK, N. Y.

ELECTRIC SIGNAL-RECEIVING INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 454,643, dated June 23, 1891.

Application filed April 14, 1891. Serial No. 388,942. (No model.)

To all whom it may concern:

Be it known that we, GEORGE L. FOOTE, a citizen of the United States, residing at Brooklyn, county of Kings, and State of New York, and WILLIAM C. MOORE, a citizen of the United States, residing at Kansas City, county of Jackson, and State of Missouri, have made a new and useful Improvement in Electric Signal-Receiving Instruments, of which the following is a specification.

This invention relates particularly to electrical signal-receiving devices of the type known in the art as "individual call apparatus," in which any one of a series of outlying signal-receivers located on a single or common main line may be actuated to the exclusion of all the others; and to this end it is directed particularly to improvements upon an invention patented to Adin A. Hatch on the 2d day of September, 1890, No. 435,894.

The present invention has for its objects, first, the simplification of the apparatus disclosed in the aforesaid patent; second, the cheapening of the construction of such a device; third, the accomplishment of a certainty of operation at all times. These objects are attained by the use of the apparatus hereinafter described, and particularly claimed at the end of the specification which follows.

In the apparatus disclosed in the aforesaid patent to Adin A. Hatch there is arranged a curved sector which is caused to advance step by step through the agency of a gravitating weight, and the forward advance of this sector is regulated by a series of loops or eyes and a hooked stop in conjunction with a pivoted pawl, said pawl and stop being carried by an armature-lever which is vibrated back and forth by makes and breaks of a battery-current transmitted over a main line, and the swinging sector is returned to its original or normal position through the agency of an armature energized by a second electromagnet located in a local circuit and under the control of the first-named armature. This arrangement of parts necessitated the use of two or more local batteries and a dash-pot for the complete control of the apparatus, and it was with a view of reducing the number of elements that the present invention was conceived. Reference is had to the aforesaid Hatch patent, No. 435,894, as to the manner in which the swinging sector is advanced to the completion of its phase, so long as the proper signal is being turned in, and to the fact that the armature-lever which controls the advance of this sector is allowed to complete its stroke and put the apparatus in condition for restoring the sector to normal position in the event of any variation in the transmitted signal from that intended to actuate the particular instrument responding.

With this brief reference to the Hatch patent, reference is now had to the accompanying drawings, which illustrate the present improvement, and to the following description thereof.

Figure 1 is a longitudinal sectional elevation of the entire apparatus. Fig. 2 is a plan view thereof. Fig. 3 is an elevational view of the mechanical portions of the apparatus. Fig. 4 is an end elevational view of the apparatus as seen looking at Fig. 3 from the right to the left. Fig. 5 is a detail view of the escapement-wheel and its attached parts. Fig. 6 is a similar detail view of a portion of the restoring mechanism for restoring the sector to normal position. Figs. 7, 8, and 9 are detail views of a modified form of the pawl mechanism which controls the operation of the apparatus.

A is the base of the apparatus.

M represents a pair of electro-magnets, the coils of which are joined by wires *w w* through the binding-posts B B, either directly to the main line, which includes similar electromagnets of analogous receiving apparatus, or these magnets may be of a local nature and controlled by relays in the same manner as is illustrated in the Hatch patent above referred to.

L is an armature-lever pivoted to a yoke Y, carried by the upright post P^2.

a is an armature attached to the shorter arm of L, a retractile spring S being attached to its longer arm and to the post P^2. At the outer end of the lever L is secured an arm K, having a hook N′ at its lower end and carry-

ing at its upper end a pivoted detaining-pawl *p*, adapted to take in any of the teeth of the rack R′, carried by an arm F and a shaft *t*, as the rack rotates from right to left. (See Fig. 1.) In the rear of rack R′ is a curved sector N, provided with a series of variable notches or stops having a prearranged order and representing the dots and dashes of the character to be transmitted, and in effect substantially the same as the curved sector in the Hatch patent above referred to, in which there are arranged a series of loops of varying length and order.

m is a pin projecting from the side face of the armature-lever L, (see Figs. 1 and 4,) and adapted as the armature is vibrated to either come into mechanical contact with the under side of the projecting teeth of the sector as it rotates, if the proper sequence of characters is transmitted, or to be drawn through the openings of the sector if this sequence is varied.

R is a curved rack, also carried by the arm F and adapted to mesh with the pinion V, carried by a shaft *t′*.

W is an escapement-wheel, located on the same shaft *t′* with the pinion V and carrying a spiral spring *g*, one end of which is fixed to the frame of the machine.

S′ is a spiral spring, one end of which is secured to the post P^2 and the other by a link D to an eccentric Z, carried by the shaft *t*. This spiral spring S′ serves the function of a source of stored-up energy for impelling the curved sector N and rack R′ in a forward direction, and is placed under tension by the action of the electro-magnet M, armature *a*, lever L, and hook K, when said armature is allowed to complete its full stroke, as will be pointed out in connection with the description of the mode of operation which follows.

s is a leaf-spring carried by a block H, of insulating material, secured to the base A of the apparatus, said spring being connected at its fixed end to a binding-post B′ by wire *w′*, its free end lying in the path of a movable contact-point *e*, carried by the same shaft which carries the eccentric Z. This contact-point *e* is in electrical connection through this shaft and the upright post P and wire w^2 with a second binding-post B′, the two binding-posts B′ B′ being connected to a local battery and local alarm apparatus, (not shown,) said contact-point *e*, the shaft which carries it, and the rotating sector constituting a movable or rotary circuit-closing device, as will be fully understood on examination of Fig. 1 of the drawings.

The operation of the apparatus is as follows: Suppose a particular signal is to be transmitted which is to actuate the apparatus illustrated in the drawings. Each closure of the circuit causes the armature-lever L to lift the weighted pivoted pawl *p* from the rack R′, thereby allowing the spring S′ to rotate the sector N to the left, as seen looking at Fig. 1. When the circuit is broken, the lower end of the pivoted pawl *p* having been tilted to the right falls into some one of the rack-teeth in advance, and the spiral spring S′ carries the sector N forward until the pawl *p* strikes the pin *n*. Each succeeding closure of the circuit therefore causes the sector to advance, under the stress of the spring S′, so long as the proper sequence of makes and breaks is transmitted. When the sector reaches the completion of its phase, the pin *e* comes into contact with the free end of the leaf-spring *s* and closes the local circuit of the local battery and the signal or alarm apparatus. (Not shown.) At the same time the sector N, having passed from over the pin *m*, the next closure of the circuit causes said pin to pass above the teeth of the sector, and the power of the electro-magnet, which has been exerted between the pin and the teeth of the sector through the armature, is now brought to bear upon the hook N′, and through it and the eccentric Z caused to rotate the shaft *t*, and hence to carry with it the sector N back to its normal position, at the same time placing the spiral spring S′ under strain and ready for the next advancement of the sector.

It will be noticed that the forward movement of the sector N is governed or regulated in its speed by the escapement-wheel W and escapement E through the agency of pinion V, rack R, and spiral spring *g*. This delicate escapement apparatus permits the sector N to advance at a substantially regular speed through every portion of its forward movement, and when the apparatus is once adjusted its certainty of operation is assured.

We will now describe the modified form of pawl mechanism disclosed in Figs. 7, 8, and 9. The essential features of difference between this mechanism and the pawl *p* and stop *m* (illustrated in Figs. 1, 2, 3, and 4) lie in the fact that we utilize a pair of pivoted pawls, which are much more delicate in their operation than a single weighted pivoted pawl *p* and a fixed stop-pin *m*. The stop-pin *m* in this instance is carried on the free end of a lever *m′*, pivoted to the end of the armature-lever L at m^2, while the weighted pawl P is pivotally secured to the other side of said lever and is provided with a detent-arm P′, which is located over the free end of the lever *m′* and is adapted to take in the teeth of the rack R′ in the same manner as the weighted pawl in Figs. 1. 2, and 3.

n is a stop-pin lying in the path of the weighted end of the pivoted pawl P.

By arranging the stop-pin *m* on the free end of the pivoted lever and giving to its lower front face an incline or bevel we avoid the danger of causing any locking of the sector in its rear position. In other words, with a stationary pin *m*, as shown in Figs. 3 and 4, there is danger of the sector and the armature being locked together when the sector is

drawn forward squarely against the face of the pin. This cannot occur with a beveled pin or stop *m* carried by a pivoted lever, as *m'*.

The present invention is not limited to the specific apparatus herein shown and described for accomplishing the results obtained, as it is believed to be broadly new with the inventors to manipulate a circuit-closing device in in its forward advancement by a single electro-magnet through the completion of its phase, and to restore said circuit-closing device to its normal condition, either during any portion of the forward advancement thereof or at the end thereof, through the agency of the power exerted by the same electro-magnet.

Having thus described this invention, what is claimed and what is desired to secure by Letters Patent of the United States, is—

1. A signal-receiver having a single electro-magnet, a source for storing up energy, a circuit-closing device controlled in its advance movement by the armature of the electro-magnet, in combination with mechanical connections between said armature and the source for storing energy, whereby the circuit-closing device is positively moved in a reverse direction and energy is stored up for impelling it in its advance direction, substantially as described.

2. A signal-receiver consisting of a movable circuit-closing device operatively connected to a source for storing up energy, adapted to move it in one direction, a single electro-magnet having its armature provided with means for regulating the forward movement of the circuit-closing device under stress of the energy when stored, in combination with mechanical connections between the armature-lever, the source for storing energy, and the circuit-closing device, whereby the latter is restored to normal position and the source for storing up energy is brought into action, substantially as described.

3. A signal-receiver having a movable part provided with a prearranged order of stops, a source for storing up energy operatively connected with the movable part, an electro-magnet provided with an armature-lever having means for checking the movable part in its forward movement, and additional mechanical connections between the armature-lever, the movable part, and the source for storing up energy, whereby when the armature is drawn through its full stroke the movable part is restored to normal position and placed under the influence of the source of stored-up energy, substantially as described.

4. A signal-receiver having a circuit-closer carried by a movable part, a source of mechanical power, as a spring, for moving said movable part, a single electro-magnet with an armature having mechanical connections for regulating the advancement of the movable part, and additional mechanical connections for restoring it to normal position and at the same time placing the actuating-spring under stress, substantially as described.

5. A signal-receiver having a movable circuit-closer, a source of mechanical power for advancing it, an electro-magnet with an armature having mechanical connections for regulating the forward advancement of the circuit-closer and additional connections between the armature and the circuit-closer for restoring the latter to normal position and for reviving the mechanical power, and an escapement for regulating the forward rate of motion of the circuit-closer, substantially as described.

6. In a signal-receiver, a rotary circuit-closer, a power-impelled shaft carrying said circuit-closer, a step-by-step device for regulating the forward movement of the circuit-closer, a restoring device for returning the circuit-closer to normal position, and a single electro-magnet having an armature-lever provided with means for controlling the advance movement of the step-by-step device, said armature-lever being also mechanically connected to the restoring device, substantially as described.

7. In a signal-receiver of the type named, a rotary sector carried by a shaft provided with a movable circuit-closer having electrical connections with a local signaling-instrument, and a single electro-magnet with an armature having both means for regulating the advancement of the sector and additional means for restoring the sector to normal position, substantially as described.

8. In a signal-receiver of the type named, a rotary sector having a prearranged order of stops and provided with a movable circuit-closer, a single electro-magnet with an armature provided with means for checking the sector in its forward motion, a source of power tending to advance the sector, and mechanical connections between the armature and the shaft which carries the sector for restoring it to normal position and reviving the applied power, substantially as described.

9. In a signal-receiver, a step-by-step device provided with a series of variable notches or stops, controlled in its forward advance by the armature of an electro-magnet, a source of power tending to continuously advance the step-by-step mechanism, an escapement regulating the application of the power, and mechanical connections between the step-by-step device and the aforesaid armature, whereby the apparatus is restored to normal condition and the power revived, substantially as described.

10. In a signal-receiver, a sector having a prearranged order of notches or stops, a pivoted armature-lever having a pin adapted to strike said stops or pass between them at will, a pivoted weighted pawl carried also by the armature-lever, a rack carried by the sector and in the plane of the pivoted pawl, a restoring-hook carried by the armature-lever, an eccentric carried by the shaft which carries

the sector, a spring-impelled escapement, and a second rack carried by the sector and meshing with a pinion carried by the same shaft which carries the escapement and retractile springs S and S′, substantially as described.

11. In a signal-receiver, an escapement rack or device R′, carrying a sector provided with a series of variable notches or stops, in combination with a pivoted weighted pawl and a pivoted stop or pin, said pawl and pin being carried by an armature-lever, substantially as described.

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