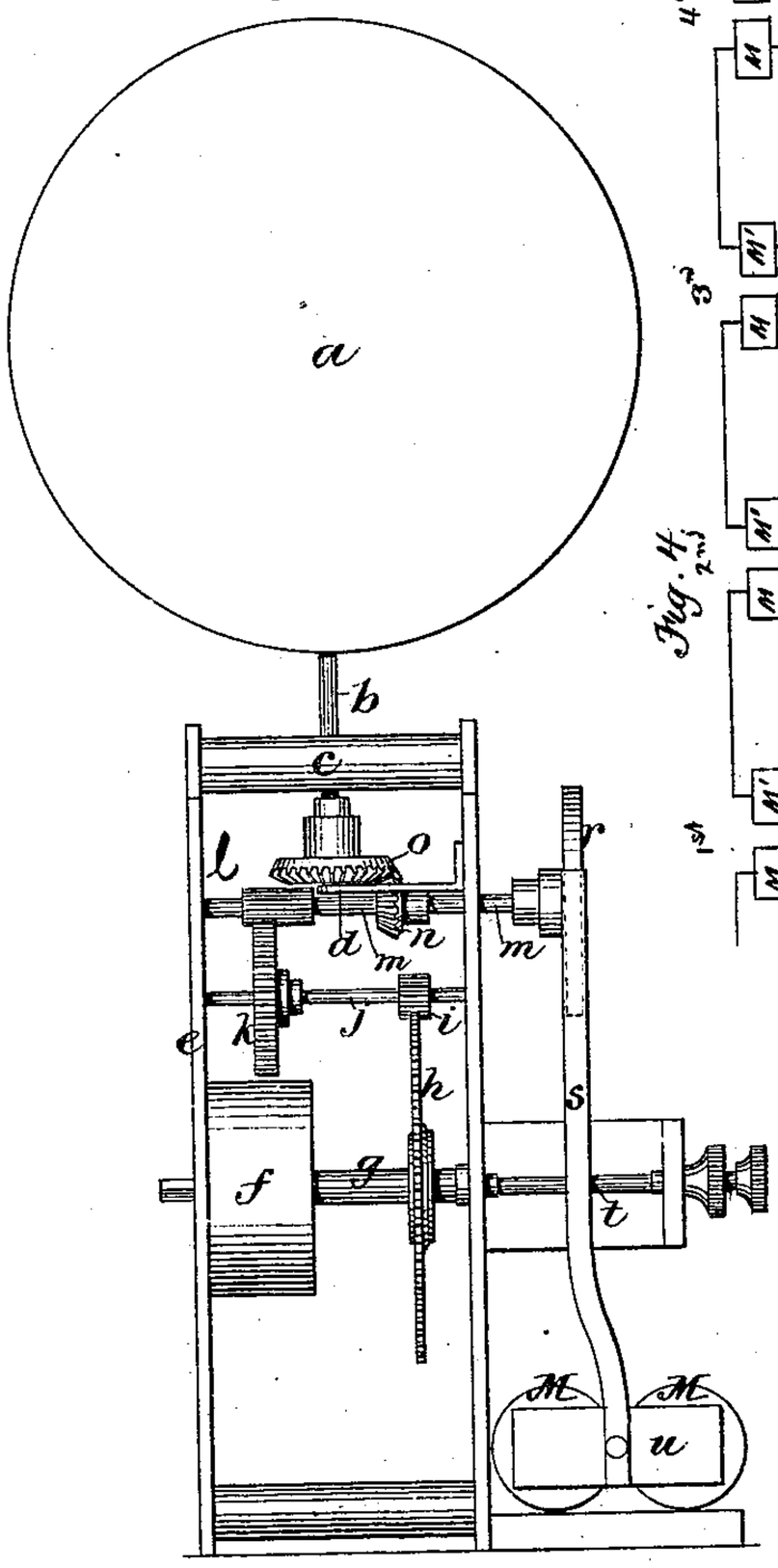
(No Model.)

A. L. RUSSELL.

Electric Railway Signal.

No. 235,025. Patented Nov. 30, 1880.

Fig. 1.



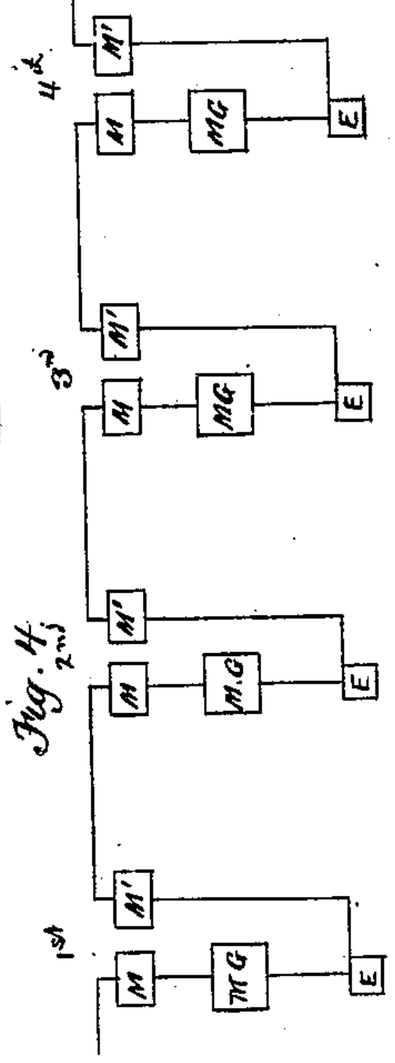


Fig. 4.

Fig. 2.

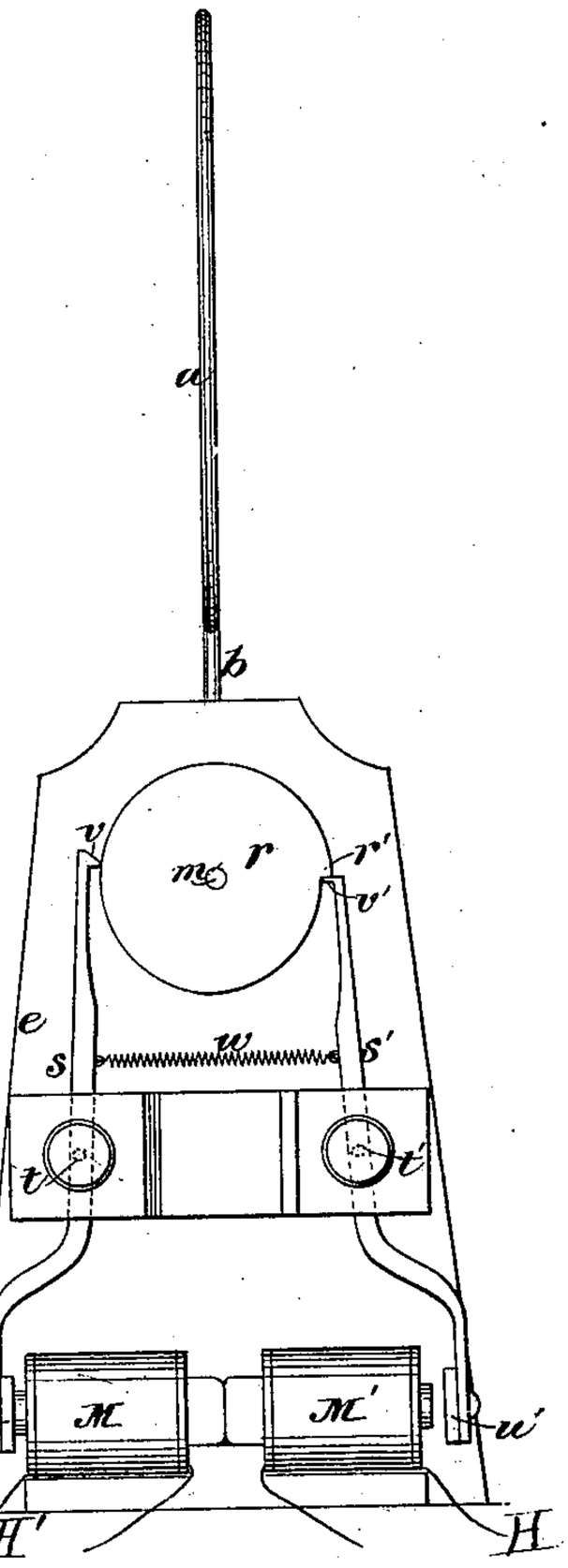
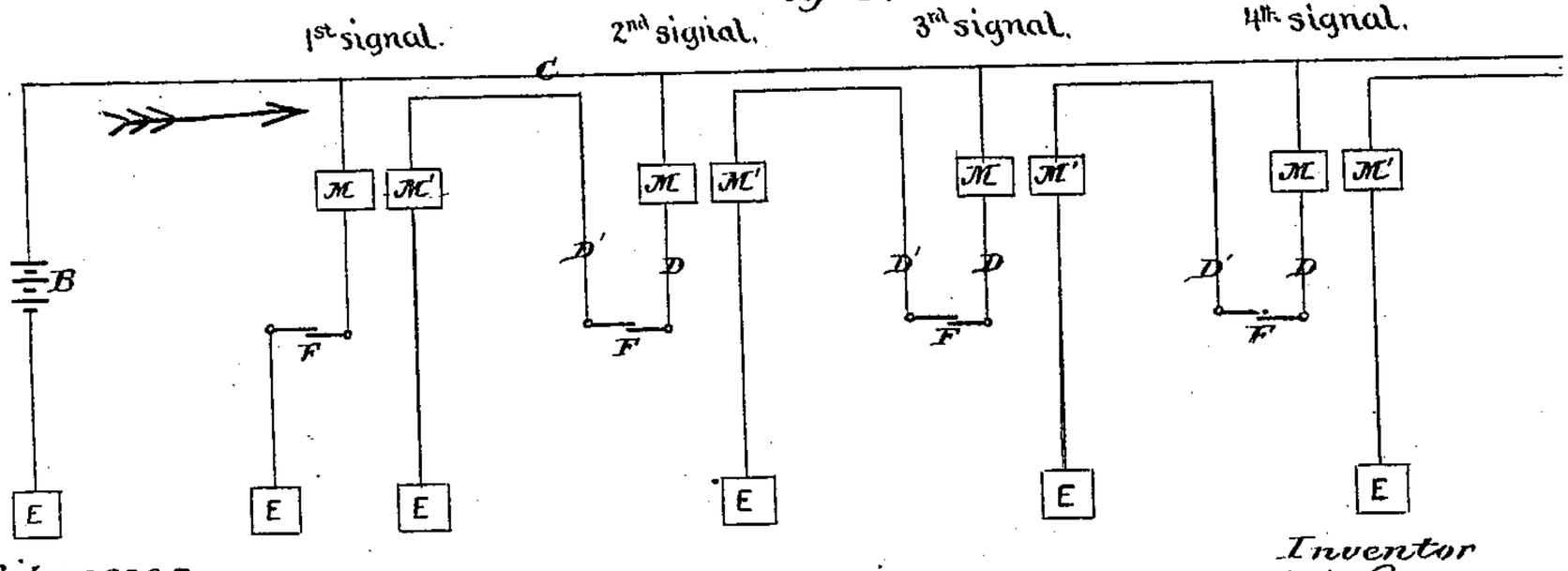


Fig. 3.



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UNITED STATES PATENT OFFICE.

ALBERT L. RUSSELL, OF SOMERVILLE, ASSIGNOR TO HIMSELF AND E. B. WELCH, OF CAMBRIDGE, MASSACHUSETTS.

ELECTRIC RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 235,025, dated November 30, 1880.

Application filed August 13, 1880. (No model.)

To all whom it may concern:

Be it known that I, ALBERT L. RUSSELL, of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Railway-Signals, of which the following is a specification.

This invention relates either to open or closed circuit electric railway-signals, in which a series of targets or signals are employed located at different points along the track, each rotated by a suitable mechanical motor, and released, step by step, by an escapement operated by the successive closings of an electric circuit by a moving train in an open-circuit system, and by operations of a magneto-generator in a closed-circuit system, the target being moved at each release sufficiently to set it to "danger" when it was previously set to "safety," and vice versa. In this class of signals the circuit-closers or the magneto-generators operated by the moving train are so arranged that the train in passing the point where the signal is located sets the signal to "danger," and when the same train passes a point at a suitable distance away it sets the signal to "safety."

My invention has for its object to provide an improved escapement for releasing, step by step, a target or signal of the class above named, and for simultaneously setting one target to "safety" and the next in the series to "danger," whereby, when the target is set to "danger" position by the passage of a car-wheel or train of cars at one point the movement of the target by the passage of another car-wheel or train of cars at the same point is prevented until the signal has been set to "safety" by the passage of car-wheels over the distant point, thus preventing the setting of the target to "safety" while a train is on the section of track intervening between the signal last set to "danger" and the succeeding signal.

My invention consists in the improved escapement and system of connections, which I will now proceed to describe and claim.

Of the accompanying drawings forming a part of this specification, Figures 1 and 2 represent side and front elevations of a target and its escapement embodying my invention. Fig. 3 represents a diagram of the electrical connections in an open-circuit system, and Fig. 4 represents a diagram of the connections in a closed-circuit system in which magneto-generators are employed.

In the drawings, *a* represents a rotary target or signal, of the usual or any suitable construction, located by the side of a railway-track. The target shown is located on a vertical rotary shaft, *b*, and is adapted to be set with its face at right angles to the track to indicate "danger" and parallel with the track to indicate "safety"; but the target may be otherwise adapted to indicate the conditions named. For example, two targets of different colors may be employed located on arms projecting in opposite directions from a rotating horizontal or vertical shaft and adapted to be deployed alternately by the rotation of the shaft, one indicating "safety" and the other "danger." The shaft *b* is journaled in suitable bearings *c d*, in a supporting frame, *e*, and is provided with a motor which is preferably composed of a coiled spring, *f*, arranged to rotate a shaft, *g*, a cog-wheel, *h*, on the shaft *g* meshing with a pinion, *i*, on a shaft, *j*, a cog-wheel, *k*, on the shaft *j* meshing with a pinion, *l*, on a shaft, *m*, and a bevel-pinion, *n*, on the shaft *m* meshing with a bevel-pinion, *o*, on the shaft *b*. This motor, or any suitable motor which may be substituted for it, is adapted to continuously rotate the target *a*. The escapement to limit the rotation of the target is composed of a cam, *r*, rigidly attached to the end of the shaft *m* of the motor, two toothed levers, *s s'*, pivoted, respectively, at *t t'* to the frame *e*, and two electro-magnets, M M', the armatures *u u'* of which are attached, respectively, to the levers *s s'*.

The cam *r* is provided with a single tooth, *r'*, and the levers are provided with teeth *v v'*, each of which is adapted to engage with the tooth *r'*, the levers being held with a yielding pressure against the periphery of the cam by a spring, *w*. The form of the cam *r* and the arrangement of the levers *s s'* and magnets M M' are such that when the tooth of one of the levers is engaged with the tooth *r'* of the cam the armature attached to said lever will be separated from the poles of its magnet and free to be vibrated, while the armature of the other lever will be held by the periphery of the cam in contact with the poles of the magnet, as shown in Fig. 2, so that it is immovable. The entire periphery of the cam is equi-

distant from the center thereof, excepting a short section, which is reduced to form the tooth r', and when this reduced section reaches the tooth of either lever the spring w draws such tooth into the reduced portion, thereby engaging the tooth of the lever with the tooth of the cam and separating the armature of the lever from the poles of the magnet.

The operation of the described mechanism is as follows: The magnets M M′, which I call, respectively, the "danger" and the "safety" magnets, are connected with a battery in an open-circuit system, and with magneto-generators in a closed-circuit system, as hereinafter described, the connections being such that a train passing the point where the signal is located will cause the danger-magnet M to attract its armature, but not the safety-magnet M′. As the target is always set to "safety" before a train passes the point where it is located, the tooth v of the lever s, previous to the passage of the train, is engaged with the tooth r', so that the armature u is separated from the poles of the magnet M. The magnet M being now caused to attract its armature by the passage of the train past the signal, the tooth v is withdrawn from the tooth r', releasing the cam r, which rotates until its tooth meets and is stopped by the tooth v' of the lever s', as shown in Fig. 2, the target being now set to "danger," and the lever s, being now held by the periphery, the cam with its armature u pressed against the poles of the magnet M, so that there can be no movement of the lever s by a second or a continued excitement of the magnet M as by the passage of a second train or the wheels of the same train succeding the first wheel. The departing train next operates a circuit-closer or magneto-generator at a distant point and excites the magnet M′ but not the magnet M. The armature u' is now attracted, causing the lever s' to release the cam, so that the target is again allowed to rotate until it is set to safety by the engagement of the tooth of the lever s with the tooth of the cam, the lever s' being now held with the poles of its armature against the poles of the magnet M′, and the lever s being ready to be moved by the next excitement of the magnet M.

The arrangement of connections in an open circuit, whereby the circuit is closed through the magnets M M′ at different times, is shown in Fig. 3, which represents four signals placed along the track—say a mile apart. The electro-magnets M at all the signals are connected to each other and to the battery B by wire c, and the magnet M′ of each signal is connected to earth. The magnet M of each signal after the first is connected with the magnet M′ of the preceding signal by wires D D′, which wires are normally disconnected from each other, and are connected through circuit-closers F of any suitable construction to be operated by a moving train.

The magnet M at the first signal is connected to earth by wires H H′, normally disconnected from each other, and provided with a circuit-closer adapted to be operated like the other circuit-closers.

When a train moving in the direction of the arrow, Fig. 3, reaches the circuit-closer F, at the first signal it closes the circuit only through the magnet M of that signal, and sets the signal to "danger," and when the train reaches the second signal it closes the circuit simultaneously through the magnet of that signal, and the magnet M′ of the first signal, thereby setting the first signal to "safety" and the second to "danger," and so on throughout the entire series, the train as it passes each signal setting it to "danger" and the preceding signal to "safety" by the same circuit-closer.

An arrangement of circuits in a closed-circuit system employing magneto-generators is shown in Fig. 4, in which the danger-magnets M of each signal are connected to a magneto-generator, M G, adapted to be operated by a passing train. Each magneto-generator is connected to earth, and each safety-magnet M′ in the series is connected to earth and to the danger-magnet M of the succeeding signal, as shown. In this arrangement the safety-magnet of each signal and the danger-magnet of the succeeding signal are in independent circuit, in which is included the magneto-generator, which operates both magnets simultaneously when acted on by a moving train, the operation of the signals being the same as already described.

It will be seen that by the employment of the improved escapement mechanism and arrangement of connections the levers s s' and magnets M M′ are obliged to operate alternately, and there is no possibility of the two levers and magnets of any signal operating at the same time, hence after the target has been set to "danger" by means of the magnet M and lever s there can be no further operation of said magnet until after the target has been set to "safety" by the magnet M′ and lever s, and the passage of the wheels of the train over the circuit-closer after the first wheel has passed and closed the circuit will have no effect.

I do not claim, broadly, a railway-signal operated by two electro-magnets, one of which is excited by the passage of a train over a point near the signal and the other by the passage of the train over a distant point, as I am aware that this is not new.

I claim—

As a means for effecting the step-by-step rotation or escape of a mechanically-impelled target or signal, first, two electro-magnets, M M′, excited, respectively, by the passage of a train over a point near the signal and over a distant point; second, a cam having a single tooth, and located on a rotary shaft forming a part of the target-impelling mechanism; and, third, two toothed armature-levers at opposite sides of the cam, both held in yielding contact with the periphery of the cam and adapted to engage alternately with the tooth thereof

and withdrawn alternately by the action of the electro-magnets, the form of the cam and the arrangement of levers and magnets being such that each lever is held from moving until the tooth of the cam reaches it, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 5th day of August, A. A. 1880.

ALBERT L. RUSSELL.

Witnesses:
C. F. BROWN,
W. CLIMO.