(No Model.)

W. W. ALEXANDER.

AUTOMATIC ELECTRIC RAILWAY SIGNAL.

No. 557,749. Patented Apr. 7, 1896.

Fig. 1.

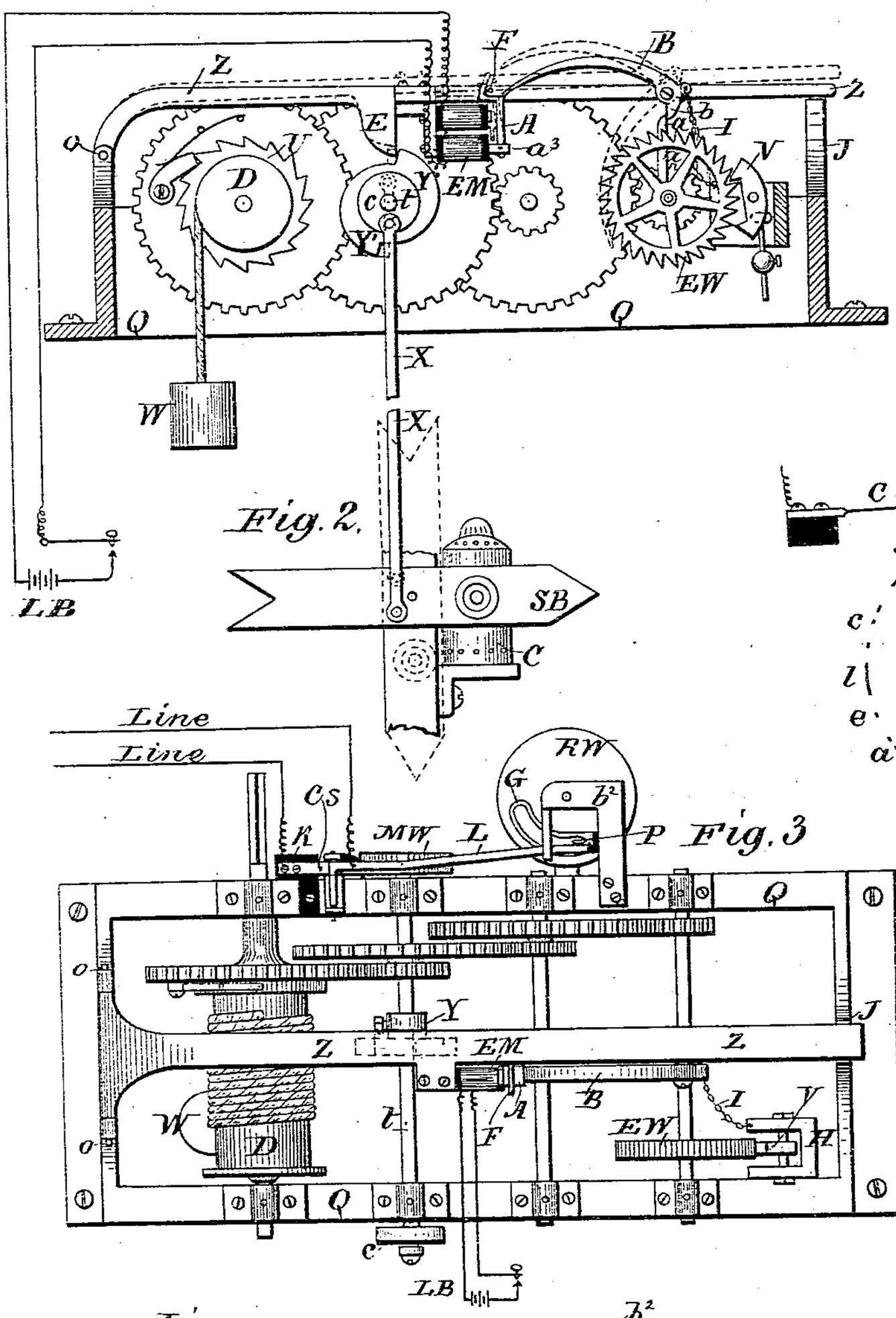

Fig. 2.

Fig. 5.

Fig. 3

Fig. 4.

WITNESSES:

Harry L. Amer.

Edwin R. Gill

INVENTOR

William W. Alexander,

BY

E. E. Masson

ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIAM W. ALEXANDER, OF KANSAS CITY, MISSOURI, ASSIGNOR TO THE GILL-ALEXANDER ELECTRIC MANUFACTURING COMPANY, OF SAME PLACE.

AUTOMATIC ELECTRIC RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 557,749, dated April 7, 1896.

Application filed December 10, 1889. Renewed August 29, 1895. Serial No. 560,938. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. ALEXANDER, a citizen of the United States, residing at Kansas City, in the county of Jackson, State of Missouri, have invented certain new and useful Improvements in Automatic Electric Railway-Signals, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to devices for electro-mechanically operating semaphores or visual signals in connection with a verifying message-transmitter.

The objects of my improvement are, first, to provide a power-train of wheels with a self-setting system of trigger-levers controlled by an electromagnet to operate a visual signal, as hereinafter described; second, to provide simple and reliable means for said power-train to automatically transmit to a distant point a verifying message of the position taken by the signal; third, to provide the message-transmitting portion of the apparatus with a safety device for closing the line-circuit independently of the mechanism used normally in case any stoppage or accident happens to said mechanism and causes it to stop with the circuit open; fourth, to provide a simple and effective means of retardation not materially affected by the thermal or the damp and dry conditions of the atmosphere; fifth, to provide means for releasing or starting the power-train by the action of electricity upon closing the circuit, and thereby releasing the trigger-levers, which normally prevent the mechanism from acting, and after they have been tripped and the mechanism allowed to act, to automatically set themselves by the motion of said mechanism and be ready to catch or stop it immediately after the message has been transmitted and the signal operated. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side view of the device constructed in accordance with my invention with one side removed to show the arrangement of the parts. Fig. 2 is a side view of a visual signal shown connected with the device to illustrate how the mechanism thereof can operate the said signal. Fig. 3 is a top view of the device, showing also the retardation-wheel and the message-transmitting apparatus. Fig. 4 is a side view of the message-transmitting and safety device in detail, showing in dotted lines the position assumed by the lever L and contact-spring C S when the line-circuit is inadvertently left open by the mechanism if the latter stops at the wrong place. Fig. 5 is a diagram showing, on a larger scale, the divisions on the message-wheel.

In the drawings, Q represents the frame, preferably of cast-iron, of the machine, and upon said frame the shafts of the train of gears are pivoted in suitable bearings.

The train of wheels is propelled by a weight W (or any well-known equivalent is used) and is suspended from a chain or cord which is wound upon a drum D, provided with an ordinary pawl-and-ratchet mechanism and its shaft adapted to receive a crank-handle for winding it when run down. The train of wheels are retarded in their motion by an ordinary escapement-wheel E W and a verge V, which I prefer to use, as it is not affected by the thermal or the damp and dry conditions of the atmosphere. The object of retarding the motion of the said mechanism is to cause a message-wheel M W (which is secured adjustably to a shaft *t*) to rotate slow enough to transmit an ordinary telegraph-message of dots and dashes over an electric circuit to a distance (as over an ordinary telegraph-line) by allowing a contact spring or pawl C S to fall or drop between the teeth or elevations upon said wheel M W and break the line-circuit which is made at *u* between the pawl C S (which is mounted upon but insulated from the frame Q) and a lever L, which is also insulated and mounted upon said frame, and said wheel in revolving causes the pawl C S to be elevated against the lever L and complete the line-circuit, and, as will be seen by the drawings in Fig. 4, when the wheel M W is rotated the main-line circuit will be closed and broken in accordance with the amount of peripheral surface of the elevations and the space occupied by each depression upon the said wheel.

The message-wheel M W, as shown in Fig. 4, is at normal position with the spring or pawl C S resting upon one of the wide elevated portions of the surface, (two of which are wider than the rest and opposite each other,) and as the said wheel makes only one-half revolution for each action of the signal the spring C S will rest upon the other wide elevation when the message is completed and the signal is operated.

Mounted also upon the shaft *t* is a crank-wheel *c*, connected by a rod X with a signal-board S B, which can be made to occupy the position known as "safety" or that known as "danger." Mounted also upon the shaft *t* is a cam Y, provided with two eccentric portions Y′, diametrically opposite each other, which are adapted to engage alternately with a downward projection E of a lever Z, said lever extending the length of the device and has one end pivoted at *o* upon an arm or upward extension of one end of the frame Q.

Attached to the lever Z is an electromagnet E M, which has an armature A, pivoted at a^3 upon an extension of one of its poles and which normally serves as a stop to a trigger-lever B, which is pivotally mounted upon the said lever Z, and is provided with a slight downward extension adjacent to its pivot which when in normal position serves as a stop for a rotating trigger-lever *a*, which is attached to the shaft of the escapement-wheel, and said lever *a* will stop the motion of the mechanism when it comes into contact or strikes upon the said downward extension. The free end of the lever Z normally rests upon a post or upward extension J of the frame Q.

The operation of the machine is as follows: Starting from the position shown in the figures, the machine is in one sense locked, but upon closing the electric circuit in which is contained the electromagnet E M the parts will be free to act by virtue of the weight or power W. The first action that will take place is that the said electromagnet will attract or pull its armature against its pole and out of the path of the free end of the trigger-lever B, thereby allowing it to fall into the downward position shown in dotted lines in Fig. 1, carrying its extension *b* out of the path of the trigger-lever *a*, allowing the free movement thereof, and consequently allowing the mechanism to freely act, and, as before stated, the escapement device will prevent the said mechanism from moving too rapidly, because if it did the dots and dashes or pulsations would be transmitted too rapidly to be received by the ordinary means.

Immediately upon the starting of the mechanism the crank-wheel *c* upon one end of the shaft *t* commences to move the semaphore toward the position shown in dotted lines in Fig. 2, and at the same time the message-wheel N W commences to transmit a message over the line-circuit marked "line" "line," and the message that will be transmitted by the arrangement shown in Fig. 4 is illustrated in Fig. 5, and which interpreted means "5," (the number of the semaphore,) "clear," and immediately upon the completion of the said message the semaphore will be in the position to represent "clear," in which position the mechanism will be brought to a stop, as will now be described.

Immediately from the start the cam has begun its rotation, and as its eccentric portion Y′ travels under the downward extension E of the lever Z it gradually raises said lever up into the position shown in dotted lines in Fig. 1, and as the trigger-lever B is provided with an extension *b*, to which is attached one end of a chain I, and as said chain has its other end attached to the bracket H, which is adjustably secured to one side of the frame Q and forms the bearing for the pivots of the verge V, the said chain, as will be seen, normally hangs loosely when the lever Z is resting upon the support J and the trigger-lever B is in its normal position, as shown by full lines in Fig. 1; but as soon as the lever B is released or allowed to fall the slack in the said chain is taken up, and as one of the eccentric portions of the cam Y raises the lever Z into the position shown in dotted lines in Fig. 1, the pivot or fulcrum of the trigger-lever B is carried upward. Consequently, as the said chain will not allow the extension *b* of lever B to move upward with the lever Z, the long portion or trigger-lever end is forced upward to the uppermost position. (Shown in dotted lines in Fig. 1.) In moving to the said position the free end of the trigger-lever B has sprung the armature A of the electromagnet back toward said magnet and passed on upwardly until it has reached a position above the said armature, and then the armature being returned to its normal position against the stop-pin F (by a small spring shown between the head of one of the spools of E M and its armature) into the path of the said free end of lever B, so that when the eccentric part Y′ of the cam has been revolved far enough to allow the lever Z to fall to its normal position and thereby allow the chain to become slack, the trigger-lever B can fall only a short distance, because its free end is caught upon the armature A, and consequently the trigger-lever *a* will be arrested by the downward entension *b* of the lever B and stop the mechanism until the circuit is again closed, when the machine will act again as described, throwing the semaphore alternately to "danger" and to "clear."

The periphery of the eccentric cam is divided into two portions, and each one is adapted to raise the lever Z and thereby automatically set the trigger-lever B and allow the lever Z and its parts to fall when each offset upon the said cam is reached, and stop the mechanism after each half-rotation of the said cam. The semaphore will show after each action "danger" or "clear," as the case may be. The message-wheel M W is also divided into two parts or portions, one for transmitting the number or name of the semaphore

with the position "danger," which it has taken, and the other part also the name or number with the position of "clear."

As shown in the drawings, the semaphore now stands at "danger," and if the circuit be closed through E M and the mechanism operated, the shaft *t* will make a half-turn to throw the semaphore to "clear," and, as will be seen by the drawings in Fig. 4, the wheel M W will be revolved in the direction of the arrow, transmitting thereby over the line three dashes, which in Morse characters is the number "5;" and then two dots, space, dot, which is "C;" and then a long dash, which is "l;" and one dot, which is "e;" one dot and a dash, which is "a;" and one dot, space, two dots, which is "r," and stopping upon an elevated part of the wheel opposite the one from which the previous message began; and when the machine is again operated the signal will turn to "danger" and the number "5" and the word "danger" will be transmitted, as will be seen upon the opposite side of the edge of the wheel M W in Fig. 4 and the diagram in Fig. 5. If the lever L was not pivotally mounted, but was rigidly retained, the wheel M W would, however, in turning allow the spring or pawl C S to drop or spring down into the spaces or notches in the edge of said wheel and ordinarily transmit a message as well as if it was pivotally mounted; but I prefer to have the machine so constructed as to guard against any failure of action which may cause the mechanism to stop with the spring C S down in one of the spaces or notches of the wheel M W by having the lever L pivoted so that the main line circuit will not remain broken for any objectionable length of time, because the lever L will descend and close the circuit by touching the spring or pawl C S, as shown in dotted lines in Fig. 4.

To guard against keeping the line open, from failure of action, I provide the lever L with a pawl P, pivoted to the free end thereof. Said pawl is adapted to strike obliquely upon the surface of a retardation-wheel or body of matter R W, the inertia of which will immediately prevent the lever L from beginning to descend and follow the spring C S, when it is allowed to move downward, and in case the spring C S is not elevated into its normal position after a period of time equal to or exceeding the longest space used in an ordinary telegraph code, the retardation-wheel R W during this time will have its inertia partially overcome by the weight or force of the lever L and commence to rotate and allow the lever L to move downward, thereby closing the circuit, as described; and as soon as the mechanism is set in motion the teeth or projections upon the wheel M W will raise the pawl C S upward and with it the lever L will also be elevated, and the free end of the pawl P being acted upon by gravity (as it is loosely pivoted upon the free end of lever L) will drop or fall back against a rigid guide G, which is attached to an arm b'' of the frame Q. Said arm also serves as a bearing for the upper end of the vertical shaft of the retarding-wheel R W. The lower end of said shaft is supported by a similar arm from said frame. The arm or extension b^2 is also provided with an arm b^3, which serves as a stop against the upward movement of the lever L, thereby causing the contact between the spring or pawl C S and the lever L to be made under pressure and insuring thereby the closing of the main-line circuit.

To prevent the retardation-wheel from acquiring a momentum or motion under the impulses received from the lever L and its pawl P, a brake may be used, as shown in Fig. 4. Said brake consists of an arm *f* pendent from the lever L, and is provided at its lower end with a spring, which, when the lever L is raised up against the arm b^3, will have engaged with the under side or edge of the wheel R W and by friction arrested its motion, and as the lever L can drop down a short distance only before the end of the pawl P strikes upon the surface of the wheel R W, it will cause the spring end of the arm *f* to move down, away from the wheel, and allow said wheel to freely act under the weight of the lever L.

Having thus fully described my invention, I claim—

1. The combination of a power-train of wheels, operating simultaneously a semaphore, and a message-transmitting device, a set of trigger-levers, an electromagnet controlling said levers, and an escapement device for retarding the power-train, substantially as described.

2. The combination of a semaphore, a power-train of wheels retarded in their motion by an escapement device and operating the semaphore, a message device operated by said power-train, for sending a verifying message to a distance, and an electromagnet and trigger-levers for stopping and starting the mechanism, substantially as described.

3. The combination of a semaphore and its operating mechanism, with a message-transmitting device consisting of a wheel having projections of different sizes and indentations between them, with a spring retained at one end and having its opposite end adapted to enter said indentations, and a pivoted lever adapted to close an electric circuit with said spring, substantially as described.

4. The combination of a semaphore and its operating mechanism, with a message-wheel having projections of different sizes upon its periphery, a pawl retained at one end and having its opposite end adapted to rest upon or between said projections, a pivoted lever adapted to press upon said pawl and having a pendent pawl P and an inertia-wheel for engagement with the end of said pawl P, substantially as described.

5. The combination of a semaphore and its operating mechanism, with a message-wheel having projections of different sizes upon its

periphery, a spring retained at one end and having its opposite end adapted to rest upon or between said projections, a pivoted lever adapted to press upon said spring and having a pendent pawl, an inertia-wheel for engagement with the end of said pawl and a brake to operate upon said inertia-wheel substantially as described.

6. The combination of a message-wheel, a contact-spring for said wheel, a pivoted lever adapted to make contact with said spring, and a movable body to retard said lever from making contact with said spring, substantially as described.

7. A signal-operating mechanism provided with a message-transmitting device consisting of a message-wheel, a circuit-operating pawl and a circuit-closing lever, with a movable body the inertia of which prevents the lever from normally closing said circuit, substantially as described.

8. A signal-operating mechanism consisting of a message-transmitting device having a circuit-closing pivoted lever, and a pawl pivotally suspended from one end thereof, with a movable body, the inertia of which prevents the lever from always closing said circuit substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM W. ALEXANDER.

Witnesses:
D. ELLISON,
GARRETT ELLISON.