(No Model.)

# C. J. MEANS.

## ELECTRIC SIGNAL FOR RAILWAYS.

No. 257,233. Patented May 2, 1882.

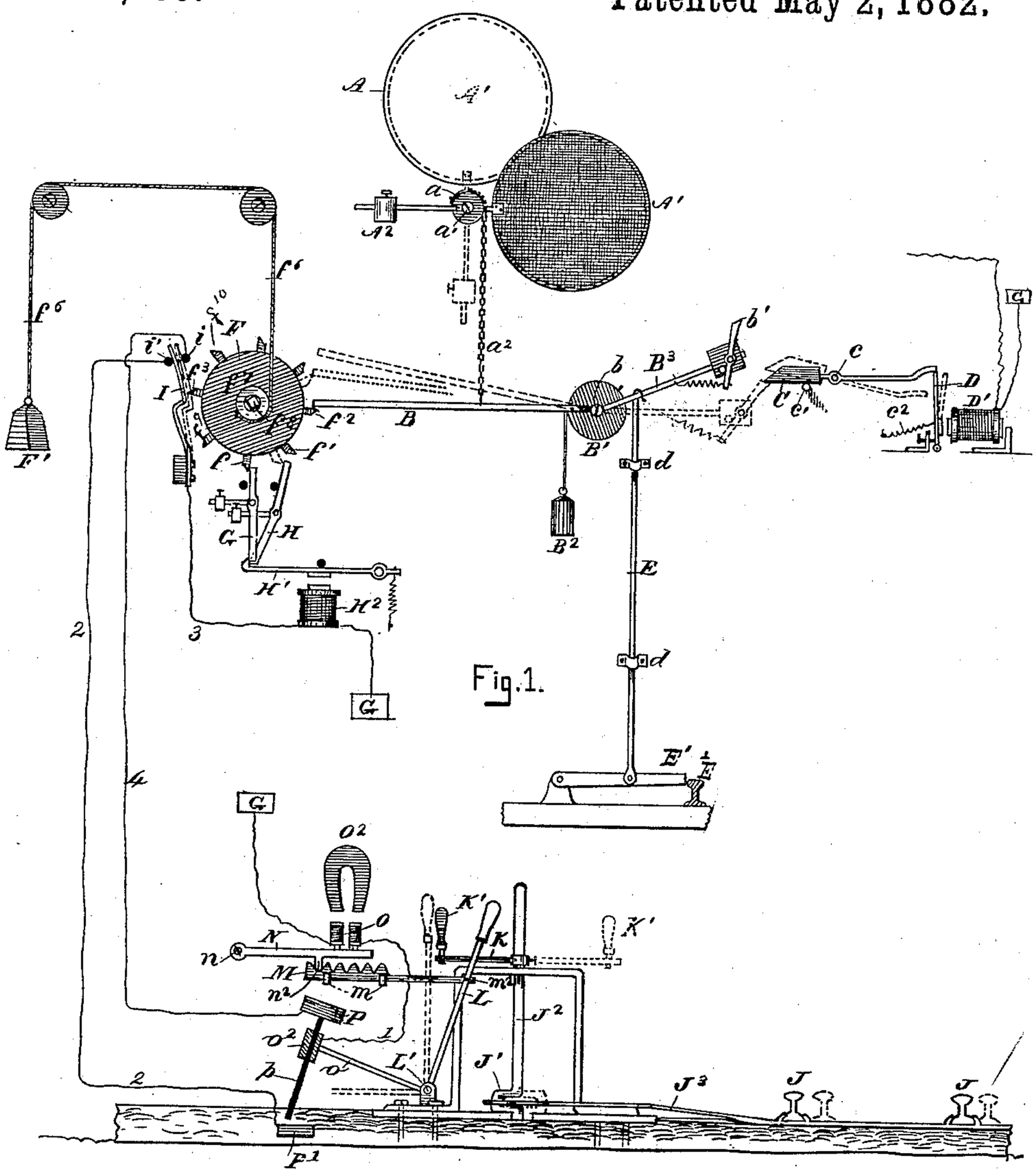

Fig. 1.

Fig. 2.



Fig. 3.

Witnesses:
Wm. H. Means
H. E. Renick.

Inventor.
Charles J. Means.

# UNITED STATES PATENT OFFICE.

CHARLES J. MEANS, OF BOSTON, MASSACHUSETTS.

## ELECTRIC SIGNAL FOR RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 257,233, dated May 2, 1882.

Application filed November 14, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES J. MEANS, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Electric Signals for Railways, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to that class of electric signals which are designed to show a danger-signal to the engineer of a train should there be a train or misplaced switch on the section of the track he is about to enter, and has for its object the avoidance of the use of galvanic batteries in operating signals of this description.

To this end my invention consists, first, in an improved device for setting the signal at "danger" mechanically by a passing train operating a suitable track-lever, the said signal being retained in a position to indicate danger by means of a locking device controlled by an electro-magnet; second, in an improved motor for operating the signal independently of the track-lever, said motor being controlled by an electro-magnet; third, in an improved device connected to a switch, consisting of a magneto-generator, which must be operated to cause the setting of a signal at "danger" before said switch can be moved from its normal position, and which cannot be operated to set a signal at "safety" unless the switch is in its normal position.

In the accompanying drawings, Figure 1 is an elevation of my improved signal-setting mechanism. Fig. 2 is an elevation of my improved combination of a magneto-generator with a switch. Fig. 3 is a top plan of the locking device which prevents the movement of the magneto-generator to set a safety-signal unless the switch is in its normal position.

For convenience I shall describe my signal in two parts—first, showing how it is operated by a train on the section of track guarded by it; and, second, how a misplaced switch causes the signal to indicate "danger." It will be understood that a train entering a certain section of track sets a signal at "danger" located at said entrance, the said signal being locked in that position by a locking device controlled by an electro-magnet. When the train passes out of the section of track, which is commonly one mile in length, said electro-magnet is excited and allows the signal to return to "safety."

Referring to Fig. 1, A is an aperture, preferably covered by a glass pane, in a suitable signal-house.

A′ is a signal-disk, consisting of a wire hoop covered by red bunting. This hoop is attached to a disk, *a*, on a shaft, *a′*.

$A^2$ is a counter-weight, which has a tendency to pull the signal into the position shown in the dotted lines in front of the aperture, thus indicating "danger."

$a^2$ is a chain passing over the disk *a* and connected to a swinging lever, B, on a shaft, *b*, which is normally held by a weight, $B^2$, acting on a disk, B′, on the shaft *b*, in the position shown. The action of the weight $B^2$ overbalances the signal-weight $A^2$, thus normally holding the signal-disk A′ in the position shown, which indicates "safety."

$B^3$ is an arm on the shaft *b*, which carries on its extremity a pivoted pawl, *b′*.

C is a lever, pivoted at *c*, the heavy end of which (represented by the dark lines) normally rests on the stud *c′*.

D is an armature-lever of an electro-magnet, D′, the upper end of which is normally drawn under the end of the lever C by a spiral spring, $c^2$.

E is a rod sliding in guides *d d*, having a hook-shaped end, which engages the arm $B^3$. The sliding rod E is pivoted at its lower end to a lever, E′, which is depressed by the wheels of a train passing over the track $E^2$, thus giving a downward movement to the rod E.

I will now describe the operation of the block-signal just described.

A train passing the signal, as it enters the section of track guarded by it, operates the track-lever E′, connected to rod E, pulling it downward. The hook-shaped end of this rod draws the arm $B^3$ on the shaft *b* into the position shown by the dotted lines. The pawl $b^2$ yields to the lever C on its downward movement; but as the lever $B^3$ is drawn up by the action of weight $B^2$ it catches on the under side of the latch-lever C, and, as the extremity of this lever is held by armature-lever D, the arm $B^3$ is held in the position in which it has been placed

by the sliding rod E. The swinging lever B, which is practically a continuation of arm $B^3$, being raised, the chain $a^2$ becomes slack and allows the signal to gently change to "danger," by the action of its counter-weight $A^2$, where it remains until the electro-magnet D′ is excited, thus liberating the lever C. The latch-lever C is so weighted against the tendency of the arm $B^3$ to ascend that it requires but little power to draw the armature-lever D from under the lever C. This current can be generated by any suitable electric device located at the exit end of the section and operated by the train as it passes out of the section.

I do not confine myself to the exact form of disk shown, as a disk which should be turned edgewise to indicate "safety" might be used.

I will now describe the method by which a misplaced switch turns the signal to "danger." I do this briefly as follows: A motor operated by a weight and controlled by an electro-magnet operates the signal. Two wires run from the signal to the switch, and a circuit-changer, operated by the motor, is so arranged that currents sent to the signal on one wire cause the signal to be placed at "danger," while currents sent on the other wire allow the signal to return to "safety." At the switch I place a magneto-generator, which must be operated by a lever in the path of the handle, which moves the switch-rails before said handle can be moved. A commutator is so arranged that a movement of the lever out of the path of the handle transmits the currents of electricity produced by the magneto-generator attached to said lever to the signal on the wire, which cause the signal to operate and indicate "danger," and when the lever is moved to its normal position the currents pass to the signal over the safety-wire. A locking device prevents this last movement unless the switch-rails are in their normal position.

I will here state that I do not confine myself to the exact mechanical devices shown, as their construction must be varied to meet the different forms of switches used by different railroads.

In Fig. 1, F is a toothed wheel on a shaft, $f^8$. This wheel is rotated by a weight, F′, suspended by a cord, $f^6$, wound around a drum, $f^7$, on the shaft $f^8$.

G and H are two locking-levers controlled by the armature-lever H′ of the electro-magnet $H^2$ and normally held in the position shown. These locking-levers control the rotation of the wheel F in the following manner: Suppose a current of short duration excites the magnet $H^2$, the armature-lever H′ is attracted, but immediately falls back. This movement is sufficient to loose the latch G, and the wheel F rotates until it comes to latch H, which, being locked, stops the wheel F. At the same time the latch G returns to its normal position by its own weight.

I is a flat spring, with a tendency to rest against the stud *i*, but normally pressed against the stud *i′* by one of the teeth $f^3$ of wheel F. The end of swinging lever B is in the path of the teeth of wheel F, so that as the wheel is revolved the lever B is raised.

Referring to Fig. 2, J J are movable switch-rails, connected by a rod, $J^3$, to the crank J′ on the shaft $J^2$.

K is a crank secured to shaft $J^2$, having a handle, K′, by which the switch-rails J J are moved. This is one of the common forms of switch used in railway service, and forms no part of my present invention.

L is a handled lever, pivoted at L′.

M is a toothed rack, sliding in guides *m*, pivoted at $m^2$ to the lever L.

N is a lever, pivoted at *n*, having a projection, $n^2$, which rests on the toothed rack M.

O is an electro-magnet, acting as an armature to a permanent magnet, $O^2$, attached to the lever N. The permanent magnet is rigidly secured to a fixed support.

*o* is an arm attached to the lever L.

$o^2$ is a friction-sleeve on the end of lever *o*.

*p* is a rod fitting snugly in the friction-sleeve $o^2$, but capable of independent movement in it.

P P′ are fixed studs, against which the rod *p* abuts, according as the lever L is moved to the right or left. One end of the coils of electro-magnet O is grounded and the other is connected to the rod *p*.

We will now suppose the switch to be in the position shown, which is its normal position, and that it is desired to move it. To move the switch the crank K is moved in the direction of the arrow *t*, Fig. 3, but before this can be done the lever L, which is in the path of the crank K, must be moved to the left into the position represented by the dotted lines. As the lever L is moved the electro-magnet O on lever N is vibrated in front of the permanent magnet $O^2$ by the action of the toothed rack M, producing currents of magneto-electricity, which travel by wire 1 to the rod *p*. As the arm *o* is moving downward the rod *p* leaves the stud P, upon which it normally rests, and makes contact with the stud P′. This, however, does not stop the movement of arm *o*, as the rod *p* slides in the friction-sleeve $o^2$. The current then flows from rod *p* to stud P′, thence by wire 2 to stud *i′*, flat spring I, wire 3, electro-magnet $H^2$ to ground. The magnet $H^2$ attracts armature-lever H′, and the tooth *f* on wheel F pushes the latch G to one side, and the tooth $f^2$ on wheel F raises the arm B into the position shown by the fine dotted lines, which allows the signal-disk A′ to turn to "danger" by the action of the weight $A^2$. As the wheel F begins to revolve the tooth $f^3$ leaves the flat spring I, which, by its elasticity, then rests on the stud *i*. The current of electricity coming over wire 2 being thus cut off from the electro-magnet $H^2$, the armature-lever H′ flies back in time to hold the latch H, which stops the wheel F, it having rotated the distance between the two teeth. It will be seen by the drawings that but a slight movement of the wheel F is nec-

essary to free the lever B from the tooth *f*, so that the signal will be returned to "safety" by the action of the weight $B^2$, while heretofore in signals operated by a mechanical motor an equal movement of said motor has been required to produce either a danger or safety signal. Although the arm B is raised by the tooth $f^2$ on wheel F to allow the signal to turn to "danger," the pawl *b'* on arm $B^3$ does not fall far enough to catch on the lever C, but should a train enter the section the arm $B^3$ will be pulled farther down, as hereinbefore described, and the signal will remain at "danger" until the train has left the section independently of the movement of the wheel F.

I have thus far described how the movement of the lever L to the left sets a danger-signal by the magneto apparatus producing currents, which travel through the electro-magnet, controlling a motor. To set the signal at "safety" after the switch is restored to its normal position, the lever L is moved to the right, and the currents of magneto-electricity travel from rod *p* to stud P, thence by wire 4 to stud *i*, upon which then rests flat spring I, wire 3, electro-magnet $H^2$ to ground. Armature-lever H' then being attracted, the latch H is pushed to one side, and the wheel F begins to revolve; but immediately the tooth $f^9$ comes in contact with latch G, which has returned by its weight to its normal position, and it is held there by the armature-lever H', as the tooth $f^{10}$, coming in contact with spring I, pushes it away from the stud *i* to the stud *i'*, thus cutting off the currents from the magnet $H^2$ which were coming over wire. It is highly important that this last-described movement of the lever L should not be made to set the signal at "safety," unless the crank K and consequently the rails J J are in their normal position. To prevent this movement I have invented the device shown in Fig. 3.

S is a semicircular frame on the shaft $J^2$. When the handle K' on crank K is moved in the direction of the arrow, even if the movement is not sufficient to throw the switch-rails to their fullest extent, this frame swings in front of the handle of lever L, thus preventing its movement. By this arrangement it is impossible to set the safety-signal unless the switch is in the right position and locked by the lever L being moved to its normal position.

Instead of a toothed wheel, F, a wheel having pins on its face might be used.

I do not confine myself to the method of producing magneto electric currents shown, as a rotating armature might be used without altering the spirit of my invention.

It is obvious that the lever L, operating the magneto-electric device, might lock other of the moving parts of the switch than the crank K without altering the spirit of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In an electric railway-signal, the combination of the following elements, namely: a weighted signal, A', having a tendency to turn to indicate "danger," weight $B^2$, normally holding the said signal at "safety," mechanism operated by a passing train entering the section of railroad-track to raise said weight to allow the signal to gently rotate to "danger," and an electro-magnetic locking device for holding the weight in its raised position until said locking device is operated by the train leaving the said section of track, substantially as and for the purpose set forth.

2. The combination of the weighted signal A', chain $a^2$, arm B, weight $B^2$, acting on said arm and overbalancing the weighted signal A', arm $B^3$, bearing a pawl, *b'*, latch-lever C, and armature-lever D, substantially as and for the purpose set forth.

3. The combination of the toothed wheel F, latches G and H, separated from one another by a distance equal to about three-fourths of the distance between the teeth of the toothed wheel, and an electro-magnet controlling said latches, substantially as and for the purpose set forth.

4. In a magneto-electric switch-signal apparatus, the combination of the following elements, namely: a lever, L, normally in the path of the switch-operating crank K, a magneto-electric generator caused to be operated by the said lever L when it is moved in either direction, a commutator which transmits the magneto-currents over the wire which sets the signal at "danger" when the lever L is moved out of the path of the switch-operating crank K and over the safety-wire when the lever L is moved into the path of the switch-operating crank K, and a frame, S, which prevents the last-mentioned movement except when the switch-rails are in their normal position, substantially as and for the purpose set forth.

In witness whereof I hereunto set my hand in the presence of two subscribing witnesses.

CHARLES J. MEANS.

Witnesses:
WM. H. MILLER,
H. E. REMICK.