(No Model.)

# F. LANE.

## RAILWAY SIGNAL APPARATUS.

No. 288,348. Patented Nov. 13. 1883.

Fig. 1.

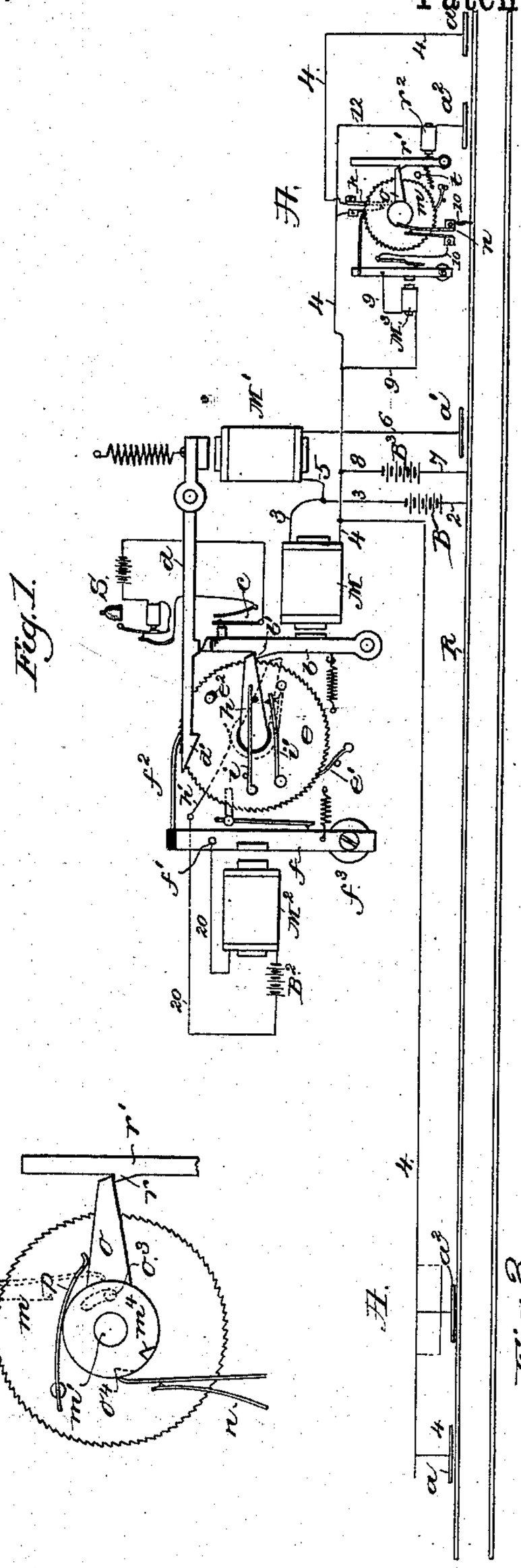
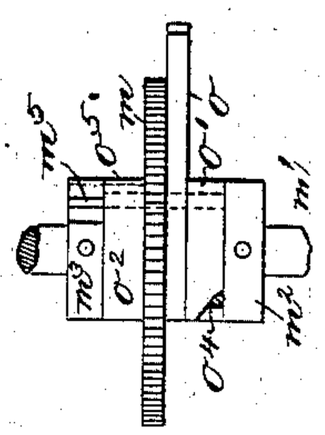


Fig. 2.



Fig. 3.



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# UNITED STATES PATENT OFFICE.

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## RAILWAY SIGNAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 288,348, dated November 13, 1883.

Application filed September 8, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, FRED LANE, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Railway Signal Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention is embodied in a signal or alarm such as employed at the points where a highway crosses a railway-track at grade, the said signal normally being automatically set in operation by an approaching train while at a considerable distance therefrom, and stopped when the train arrives at and passes the signal. In the use of such signal apparatus it sometimes happens that a train passes the point for starting the signal, but fails to pass the crossing or point for stopping the signal, it turning aside upon a branch track, or stopping and backing off, instead of passing on by the crossing and stopping the signal, so that the latter might continue in operation indefinitely. This has been obviated by the employment of a mechanical motor or time movement which is released whenever the signal is set in operation, and itself operates, after a definite period of time, to stop the signal independently of the action of the train, if the latter has not already stopped the signal. Such a motor requires to be wound up from time to time; and the present invention consists, partly, in the combination, with a device controlled by an approaching train for setting a signal in operation, of an electromotor the circuit of which is also controlled by the said train, the said motor being adapted to stop the signal after a definite period of operation. The said electromotor is itself subsequently stopped and its own circuit opened.

The invention is shown as applied to a single-track road over which trains pass in both directions, and it is necessary for the proper operation that the train moving away from the crossing should not operate the signal. The mechanism of the signal is such that it is set in operation by a momentary change in an electric circuit, (shown in this instance as the closing of a normally-open circuit,) and in order to prevent the signal from being operated when the train is receding from the crossing an intermediate instrument is employed for keeping the circuit open until after the train has passed beyond the circuit-closing instrument. Prior to this my invention such a device for keeping the circuit open has been employed, consisting of a mechanical motor or clock-work released by the train passing by it, and adapted to keep the circuit open for a definite interval of time after the train has thus started the motor. In the present invention an electromotor is employed to retain the circuit thus open, the said motor being kept in operation as long as any portion of the train is passing over, and retaining the circuit open for a definite period after the last wheels of a train have passed.

Figure 1 represents, mainly in diagram, the circuits and mechanism constituting a railway signal apparatus embodying this invention, the frame-work of the mechanical parts being omitted for greater clearness; Fig. 2, a detail of a portion of the device for keeping the main circuit broken, to prevent a receding train from operating the signal; and Fig. 3, a plan view of parts of the portion shown in Fig. 2.

The signal proper at the crossing or other point is set in operation by the starting-magnet M, the normally-open circuit of which is as follows: One pole of the battery B is connected by wire 2 with one of the rails R of the track, which is made electrically continuous for a sufficient distance at either side of the crossing. The other pole of the said battery is connected by wire 3 with one electrode of the magnet M, the other electrode of which is connected by wire 4, having suitable branches, with bars *a* at the side of the rail, and normally insulated therefrom, but adapted to be electrically connected therewith by the wheels of passing trains, the said bars constituting track-instruments, for which any other form of track-instrument may be substituted without departing from this invention.

The armature-lever *b* of the magnet M, when attracted by the momentary impulse or current of the battery B, applied by closing its circuit at *a*, operates a circuit-closer, *c*, in the local circuit of the signal S, which may be of any suitable or usual construction, it being shown as a vibrating bell, although any signal oper-

ated or controlled by the movement of the armature *b* would come within the scope of the present invention. The armature-lever *b*, when thus attracted, is engaged and retained by the armature-lever *d* of the releasing or signal-stopping magnet M′, which is also included in the circuit of the battery B by the wires 3, 5, 6, and 2, the said wire 6 being connected with a track-instrument, *a′*, similar to the one *a*, and the armature of the magnet M′ being normally retracted until the wheels arrive at the said instrument *a′*, closing the circuit of the said magnet and causing its armature to be attracted, and thus release the armature-lever *b* of the magnet M, which is then retracted, causing the signal S to cease operating. It will be seen that the signal will remain in operation until the armature-lever *b* is released by the armature *d*, and in case the attraction of the magnet M′ were alone depended on the signal would remain in operation until the train arrived at *a′*, so that in case the train passed either of the instruments *a*, and then stopped and backed off or turned aside before arriving at *a′*, the signal would continue in operation indefinitely, giving a false alarm. This result is obviated by means of an electromotor, consisting in this instance, essentially, of a ratchet-disk, *e*, and an actuating electro-magnet, $M^2$, and its armature-lever *f*, pivoted at *f′*, and provided with a spring-pawl, $f^2$, to engage the said ratchet *e* and rotate the same as the said armature-lever vibrates to and from the poles of the magnet, it being arranged to automatically break and close its own local circuit, 20, including the battery $B^2$, in the usual manner, and being provided with a weight, $f^3$, to give it a slow pendulous movement, so that the disk *e* may be rotated slowly and powerfully, it being provided with a retaining-pawl, *e′*, to prevent its backward rotation during the back-stroke of the actuating-pawl $f^2$. The disk *e* is provided with a laterally-projecting pin, $e^2$, which, in the rotation of the said wheel, engages the inclined end *d′* of the armature-lever *d*, thus mechanically raising it and disengaging it from the lever *b*, if the latter is then held by the one *d*, and thus stopping the signal independently of the action of the magnet M′.

The armature-lever *b* is provided with a projection or shoulder, *b′*, which, when the said lever is retracted, lies in the path of a stop-arm, *h*, having a yielding connection with the disk *e*, and being electrically insulated therefrom, the said arm forming one terminal of the local circuit 20 of the magnet $M^2$, it being shown as connected with a hub on the farther side of the disk, and the said hub touched by the contact-spring *h′*.

The disk *e* is provided with a spring, *i*, tending to give the arm *h* a forward rotary movement relative to the disk *e*, so that the moment the said arm is released by the forward movement of the lever *b*, which sets the signal in operation, the said arm springs forward to the position shown in dotted lines, coming in contact with a spring, *i′*, electrically connected with the disk *e*, and forming the other terminal of the local circuit 20 of the magnet $M^2$, which is thus closed by the same movement of the armature-lever *b* that sets the signal S in operation. The disk *e* will then be rotated by the armature-lever *f*, carrying the arm *h* around with it, until the pin $e^2$ operates the lever *d*, if the latter has not been previously moved by the magnet M′, as will usually be the case, and will move on until the arm *h* is arrested by the shoulder *b′*, after which the wheel *e* will still be turned for a space of one or two teeth, moving it forward relative to the said arm *h* until the local circuit 20 is broken at *i′*, thus effectually stopping the motor.

In order to prevent a train, after passing the crossing or instrument *a′*, from again setting the signal in operation when it arrives at and passes the instrument *a* beyond the crossing in the direction in which it is moving, intermediate instruments, A, are employed, one only of which is shown in Fig. 1, to prevent the train connecting the circuit at *a* R of the magnet M from effectually closing the said circuit. The instrument A consists, essentially, of a circuit-breaker, *k*, in the circuit-wire 4 of the starting-magnet M, the said circuit-breaker being operated by an electromotor consisting of a ratchet-disk, *m*, operated by an electro-magnet, $M^3$, and its vibrating armature-lever and pawl, operating similarly to the one before described, the said magnet $M^3$ being included in the circuit of the battery $B^3$, one pole of which is connected by wire 7 with the rail R or ground, and the other pole by wires 8, 4, and 9 with the electro-magnet $M^3$ and its armature-lever, the back stop of which is connected by wire 10, including a circuit-closer, *n*, with the rail R, thus completing the circuit of the said magnet $M^3$ when the circuit-closer *n* is closed. The said disk *m*, as shown in Figs. 2 and 3, is fixed upon a shaft or arbor, *m′*, which has loose upon it an arm, *o*, connected with hubs *o′* $o^2$, of insulating material, also loose on the said shaft at either side of the disk *m*, the said arm and hubs *o′* $o^2$ being connected by a pin, $o^3$, passing through a curved slot in the disk *m*, as shown in dotted lines, Fig. 2, so that the said arm has a limited movement on the shaft *m′* relative to the disk *m*, the said relative movement being limited by the engagement of the pin $o^3$ with the ends of the slot in the disk *m*. A spring, *p*, tends to turn the arm *o* in the direction of rotation of the disk *m*. The shaft *m′* has fixed upon it, and turning with it and the disk *m*, hubs $m^2$ $m^3$, of insulating material, at either side of the hubs *o′* $o^2$, connected with the arm *o*. The said hubs $m^2$ *o′* are provided with notches $m^4$ $o^4$, which coincide when the arm *o* is moved backward with relation to the disk *m* as far as permitted by the pin $o^3$, the spring *p* then being strained. The hubs $m^3$ $o^2$ are also provided with notches $m^5$ $o^5$, which

also coincide at the same time that the notches $n^4$ $o^4$ do. The arm $o$ is adapted to be engaged and held by a shoulder, $r$, on an armature-lever, $r'$, of an electro-magnet, $r^2$, the circuit of which is controlled by a track-instrument, $a^2$, at an intermediate point between the instruments $a$ $a'$. When the arm $o$ is in this position, held by the armature-lever $r'$, the notches $o^4$ $o^5$ are in position to receive the end of one of the springs of the circuit-closer $n$ and circuit-breaker $k$, respectively, and if, when in this position the disk $m$ is so rotated forward as far as permitted by the pin $o^3$, the notches $m^4$ and $m^5$ are also brought into position to receive the ends of the springs of the said circuit-breaker, which springs bear on the periphery of both hubs $m^2$ $o'$ and $m^3$ $o^2$. When the springs are thus permitted to drop into the notches, the circuit-breaker $k$ is closed, while the circuit-closer $n$ is open, this being the normal condition. When, however, a train passing away from the crossing closes at $a^2$ the circuit of the magnet $r^2$, the arm $o$ is released and immediately thrown forward by the spring $p$, raising the springs of the instruments $k$ and $n$, opening the former and closing the latter, which thus sets the armature of the magnet $M^3$ into operation, causing the disk to rotate, carrying the arm $o$ with it, and the latter remaining in its forward position under the action of the spring $p$. When in the rotation of the said disk and arm the latter arrives at and is arrested by the armature-lever $r'$, the instruments $k$ and $n$ are not affected, and the disk $m$ will consequently continue to rotate. If the train has not passed off from the instrument $a^2$ when the arm $o$ arrives opposite the shoulder $r$, the said arm will not be arrested, or will be immediately released, and the disk $m$ will continue to move for another rotation without permitting the circuit-breaker $k$ to close or the circuit-closer $n$ to open. If, however, the last wheels of the train have passed from the instrument $a^2$ just before the arm $o$ arrives at the shoulder $r$, the said arm will be arrested, but the disk $m$ will have to continue to rotate the distance permitted by the pin $o^3$ and curved slot before bringing the notches $m^2$ $n^5$ into position to receive the springs of the instruments $k$ and $n$, and the time occupied by such further rotation of the disk $m$ will be greater than that occupied by the last wheels of the slowest train passing from the instrument $a^2$ to and beyond the instrument $a$.

It will be seen that the breaking of the circuit at $k$ follows practically instantaneously upon the charging of the magnet $r^2$, so that the instruments $a$ $a^2$ may be placed very close together, a distance of a few feet being sufficient. The magnet $r^2$ is in a branch, 12, of the wire 4, and when its circuit is closed at $a^2$ the magnet M is also included in the said circuit; but the resistance of the said magnets $r^2$ and M is so proportioned that when both are included in the circuit the armature of the magnet $r^2$ alone will be affected. The armature-lever $r'$, after it has been attracted to release the arm $o$, will, on the next breaking of the circuit at $a^2$, fall back until arrested by a stop-pin, $t$, at a sufficient distance from the poles of the magnet $r^2$ to prevent it from being moved by the subsequent attraction of the said magnet, so that it will not vibrate as the circuit is closed and broken at $a^2$ by the passage of the successive wheels of the train. The arm $o$, in its rotation, will engage the armature-lever $r'$ above its shoulder and restore the said armature to the range of attractive influence of the magnet $r^2$.

I do not herein claim the instrument A as an independent apparatus, as it will form the subject of another application for Letters Patent.

I claim—

1. The combination of the starting and stopping electro-magnets and their armature-levers, co-operating together as described, with an electromotor adapted to be set in operation simultaneously with the operation of the starting-magnet, and co-operating with the armature-lever of the releasing-magnet, whereby the latter is caused to disengage the armature-lever of the starting-magnet at the end of a definite interval of time, substantially as and for the purpose set forth.

2. The co-operating starting and stopping electro-magnets and their armatures, combined with the electromotor, comprising a rotating disk and a stop-arm loosely connected therewith, controlled by the armature-lever of the starting-magnet, and a circuit-closer for the actuating-battery of the said motor, operated by the movement of the said arm relative to the said disk, substantially as described.

3. The starting electro-magnet and armature and the stopping electro-magnet and its armature, controlling the armature of the starting-magnet, combined with the electromotor, the circuit of which is controlled by the armature-lever of the starting-magnet, substantially as described.

4. The signal-starting electro-magnet and circuit therefor, containing a circuit-controlling track-instrument, and an intermediate circuit-controlling instrument between the said track-instrument and magnet, combined with an electromotor and track-instrument therefor, the said motor reversing the normal condition of the intermediate instrument while in operation, and being adapted to remain in operation for a period of time after the entire train has passed its track-instrument, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRED LANE.

Witnesses:

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W. H. SIGSTON.