

(No Model.)

5 Sheets—Sheet 1.

I. L. GREEN.  
RAILWAY SIGNAL.

No. 490,626.

Patented Jan. 24, 1893.

Fig-1-

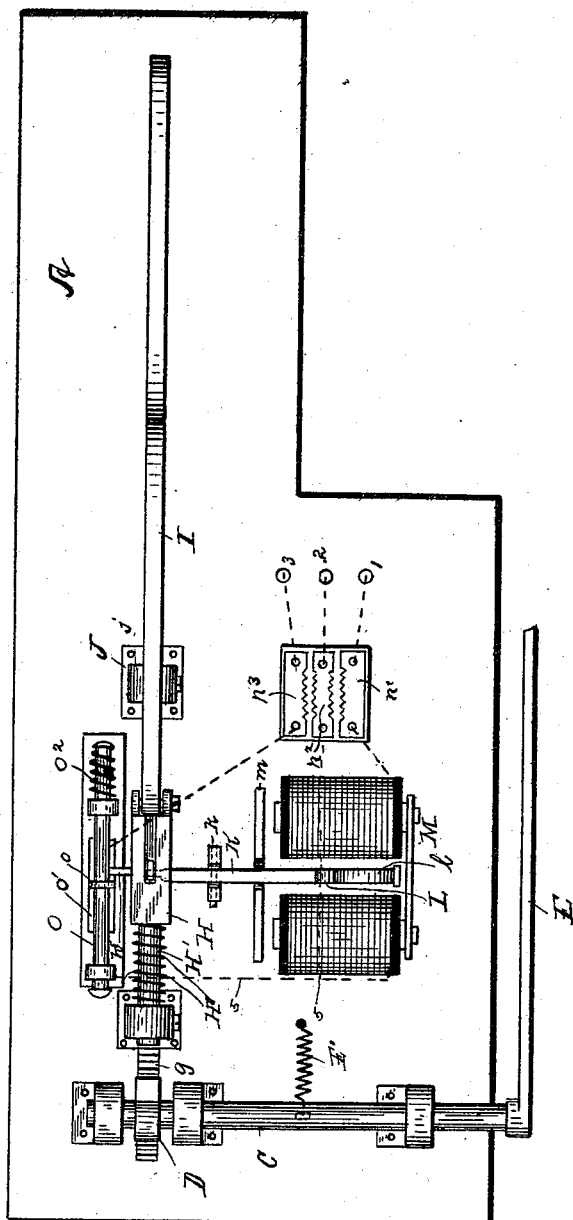
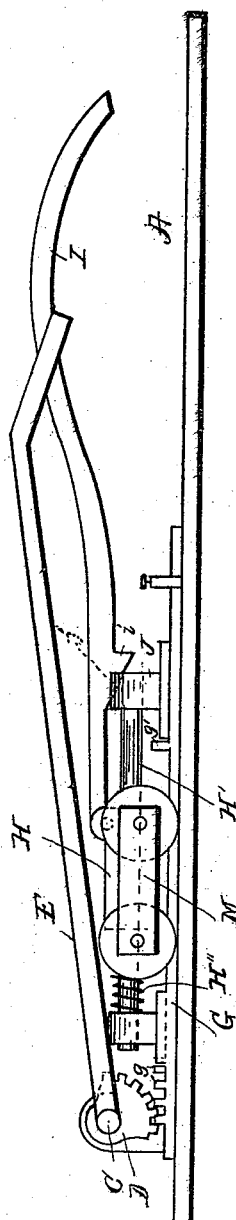


Fig-2-



WITNESSES:

Louis S. Thompson.  
James M. Patterson

INVENTOR

Ira L. Green

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Fig-3 -

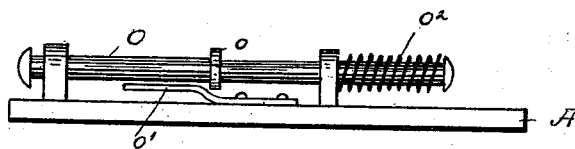


Fig-4.

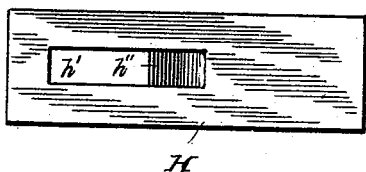


Fig-5-

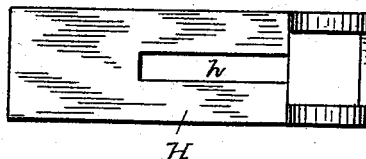


Fig 6

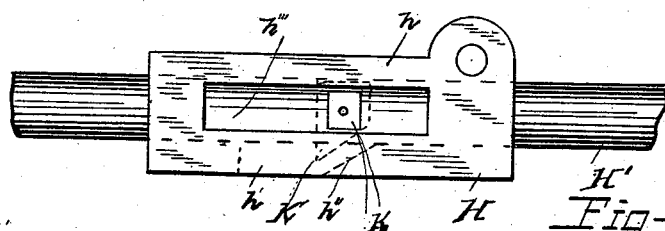


Fig-8-

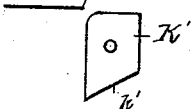
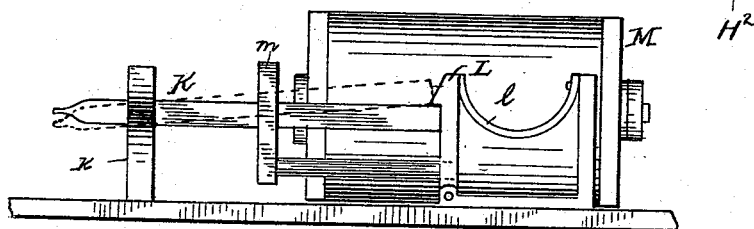


Fig-6A



Fig-7-



**WITNESSES:**

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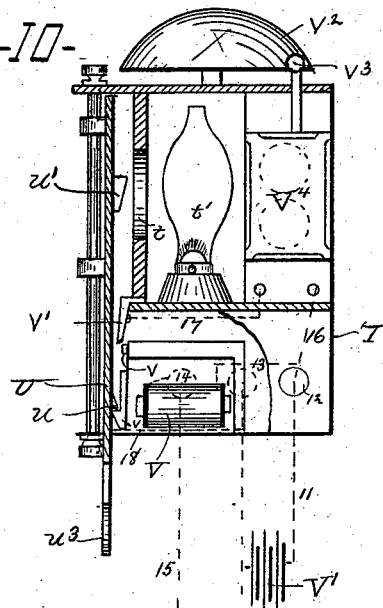
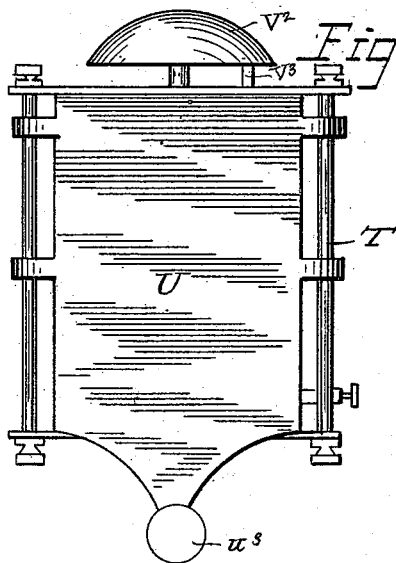
INVENTOR

Ira L. Green

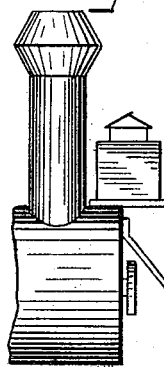
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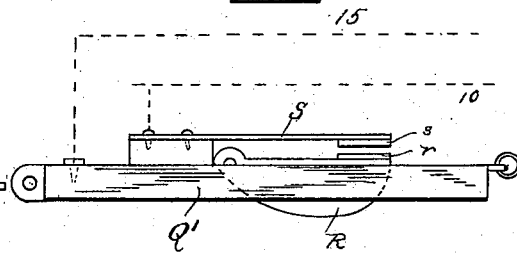
Patented Jan. 24, 1893.



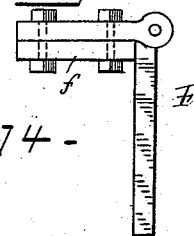
*Fig-11-*



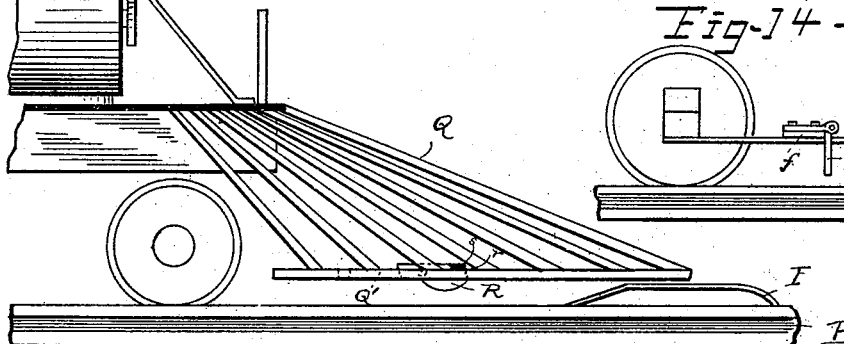
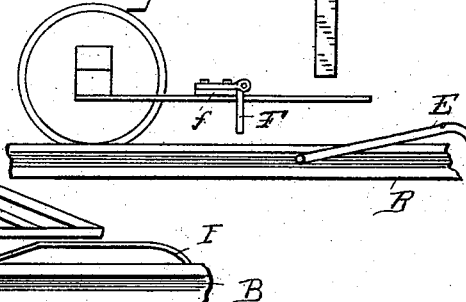
*Fig-12-*



*Fig-13-*

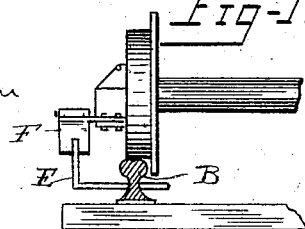


*Fig-14-*



WITNESSES:

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Fig-16-

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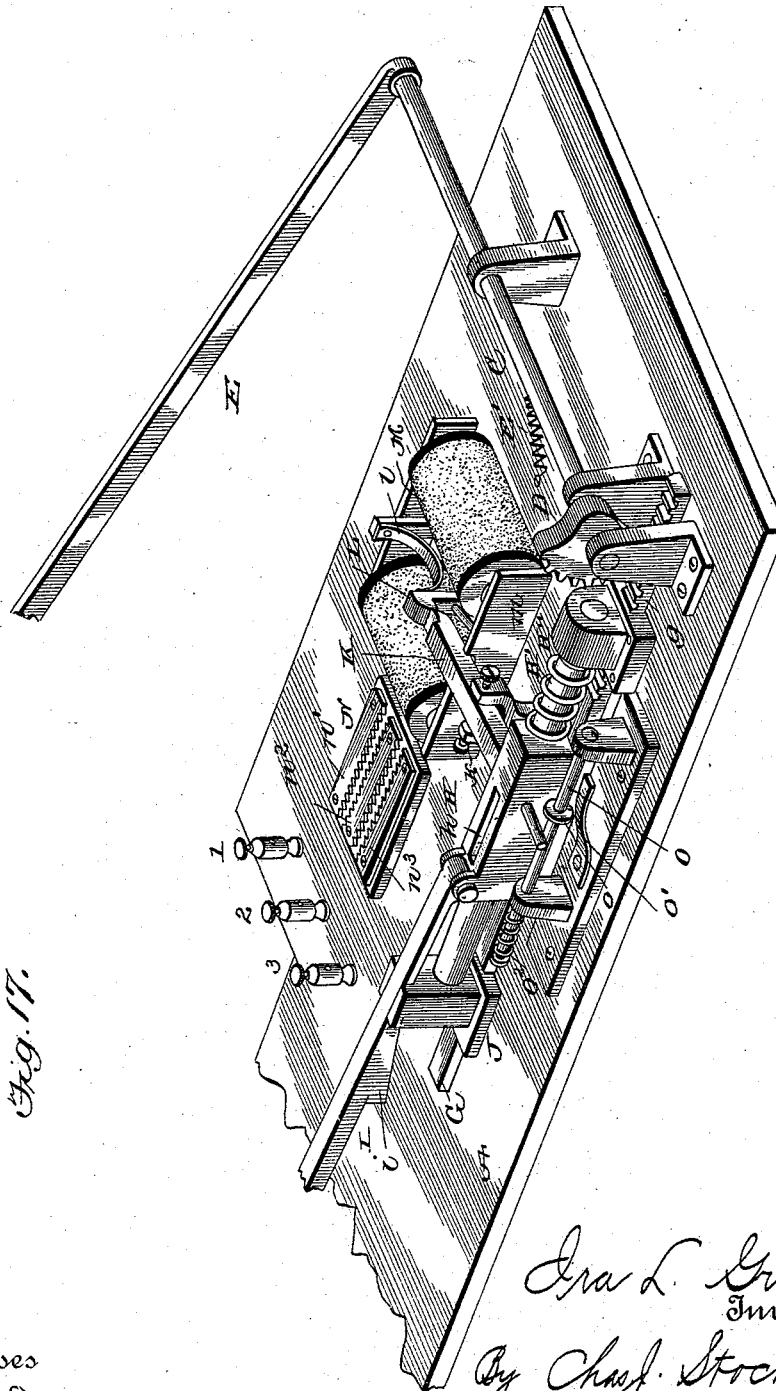


Fig. 17.

Witnesses

John Irvine

Louis S. Thompson

Ira L. Green  
Inventor

By Chas. Stockman

Associate Attorney

# UNITED STATES PATENT OFFICE.

IRA L. GREEN, OF KITTANNING, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF FIVE-SIXTHS TO JAMES M. PATTERSON, OF SHARPSBURG, GEORGE M. FOX, WYTHINGTON REYNOLDS, AND CHRISTOPHER C. SHADLE, OF KITTANNING, AND MARCUS D. WAYMAN, OF FORD CITY, PENNSYLVANIA.

## RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 490,626, dated January 24, 1893.

Application filed January 9, 1892. Serial No. 417,468. (No model.)

*To all whom it may concern:*

Be it known that I, IRA L. GREEN, a citizen of the United States, residing at Kittanning, in the county of Armstrong and State of Pennsylvania, have invented certain new and useful Improvements in Electrical Railway-Signals; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention has relation to electrical railway signals, and its object is to provide a simple and practical means whereby a train entering a block will, if there is another train in the same block, cause the sounding of a continuous alarm and the display of a visual signal in the engineer's cab until the circuit is broken by the engineer thus positively notifying the engineer that there is a train in the same block, and which will also when it leaves said block so operate the parts of the apparatus of the preceding block that they will not operate to sound an alarm or display a visual signal, so that when no alarm is sounded or signal displayed, the engineer will know that the block he is entering is clear of trains. This object is accomplished by the construction illustrated in the accompanying drawings, in which

Figure 1 is a plan view of that part of my improved apparatus which is located beside the track. Fig. 2 is a side elevation of the same. Fig. 3 is a detail representation of the means for closing the circuit through the apparatus of the preceding block. Figs. 4 and 5 are respectively a view of the underside and a plan view of the movable sleeve. Fig. 6 is a side view of said sleeve and a part of the rod upon which it slides. Fig. 6<sup>a</sup> is a detail of a rod upon which the sleeve slides. Fig. 7 is a detail representation of a part of the magnet with its armature, the main bar of the locking mechanism and the hook for engaging said locking bar. Fig. 8 is a detail view of the trigger which is operated upon by

the sleeve to raise and lower the main bar of the locking mechanism. Fig. 9 is a face view of the signaling mechanism in the engineer's cab, with the door of the case closed. Fig. 10 is a longitudinal section through the same. Fig. 11 is a side view of the forward part of a locomotive and the lever I. Fig. 12 is a detail view of the contact plates carried by the pilot of the locomotive. Fig. 13 is a detail view of the trip lever for depressing lever E. Fig. 14 is a side view of a portion of a car, the lever E, and the trip lever for depressing said lever E. Fig. 15 is an end view of the same. Fig. 16, is a diagrammatic view, showing three blocks and the wires extending from one to the other, and Fig. 17 is a perspective view of one of the track instruments, with the ends of the levers and bed plate broken off.

The same letters and numerals of reference are used to designate the same parts in the several figures.

A designates the bed plate of my improved apparatus, which is situated in juxtaposition to the rail B of the track. Supported in suitable bearings mounted upon this bed plate is a transverse shaft C the end of which extends under or through the rail of the track. This shaft carries a segment D and a lever E, said lever being located in position to be engaged by a trip lever F, carried by the rear car of the train.

G designates a longitudinally movable bar which has at one end a series of teeth, *g*, intermeshing with those of the segment D, and near its opposite end a lug, *g'*, adapted to engage an end of the sleeve H and move the same rearward. This sleeve H is formed on its top near one end with an opening, *h*, on its bottom near its opposite end with an opening *h'*, (said opening *h'* having an inclined inner wall *h''*) and on one side with an opening *h'''*. It is loosely mounted on a rod H' which is encircled by a coiled spring H'' that presses against the rear end of said sleeve and tends to keep the latter in its foremost position, and at a suitable point is formed with an opening H<sup>2</sup>. To the forward end of this sleeve H is pivoted the rear end of the

lever I, which has an inclined lug *i* projecting from its underside. A stand J projects from the bed plate and has an inclined upper surface *j* engaged by said lug *i*, as indicated by dotted lines in Fig. 2.

K designates a transverse bar, which is fulcrumed near its inner end within a frame *k*. The inner extremity of this bar passes into the sleeve H through the opening *h'''* and also into the rod H' through an opening in the side thereof, and is provided with a trigger K' having an inclined surface *k'*. This trigger K' extends at right angles with the bar K and its upper end is adapted to be projected through the opening H<sup>2</sup> in the rod H' into the opening *h'* of the sleeve H. This bar K is normally inclined as shown by dotted lines in Fig. 7 and in this position of the bar the trigger will be in the position shown in dotted lines in Fig. 6, but when a train enters the block the trip lever F carried thereby engages the lever E, depressing the forward end of the same and causing the shaft C and segment D to rotate a part of a circle, thus moving the bar K rearward a sufficient distance to bring its lug *g'* into engagement with an end of sleeve H and to move the latter through such engagement into position where its inclined wall *h''* will engage the inclined surface of the trigger K' and elevate said trigger, thus causing said bar K to assume the horizontal position shown in full lines in Fig. 7. In this position of the bar K the upper end of the trigger will project through the opening H<sup>2</sup> in the rod H' into the opening *h* in the sleeve H, and the outer end of the lever will be engaged by a hook L which is flexibly held in proper position by a spring *l*, the sleeve being thus locked in its rearmost position. The lever I being secured to the sleeve moves with the same, and the rearward motion of the sleeve causes the inclined lug *i* to ride upon the inclined surface *j* of the stand J, thus elevating the forward end of said lever, in which position it is held while the train is in the block. Immediately upon the disengagement of the lever E and trip lever F said lever E is returned to its original position by means of a spring E' and it is therefore necessary that said lever E be engaged only by the trip lever of the last car of the train. I therefore hinge the trip levers to blocks *f* suitably supported at the rear ends of the cars, whereby they may be raised to position out of the way of lever E, in which position the trip levers on all of the cars of the train, except the one on the end car, are located. The upper end of the vertical portion of the trip lever abuts against the edge of a block F so that it will be rigid against rearward movement when it strikes lever E.

M designates an electro-magnet between the helices of which the outer end of the main locking bar K extends.

N designates a lightning arrester; 1, 2 and 3 designate binding posts near said lightning

arrester and O designates a longitudinally movable rod carrying a contact point *o* located adjacent to the sleeve H and to a contact plate *o'*, said rod being encircled by a coiled spring *o<sup>2</sup>* which tends to keep it in its normal position with its contact point *o* away from contact plate *o'*. This contact point *o* projects laterally into the path of a lug *h<sup>3</sup>* extending from the sleeve, and is moved into contact with said plate by the rearward movement of said sleeve. When the contact point *o* and plate *o'* are in engagement with each other the circuit will be completed through the magnet of the preceding instrument, causing said magnet to draw upon its armature *m* which pushes the hook L out of engagement with the end of the bar K and allows the spring H'' to force the sleeve H and lever I forward. As this sleeve H is moved forward it engages the trigger K' and forces the same downward and the outer end of the bar K upward. The forward movement of the sleeve also causes the lug *h<sup>3</sup>* to be disengaged from the contact point *o* and allows the spring *o<sup>2</sup>* to draw said rod to its normal position. Thus it will be seen that a train as it enters a block raises the lever I at the entrance thereto and also lowers the lever E at the entrance to the preceding block. It will of course be understood that one of the above instruments is located at the entrance to each block, and in Fig. 16 I have for convenience sake designated the instruments as *x*, *y* and *z*.

The circuit is as follows; starting from ground the current goes to binding post 2 of instrument *x*, by wire 4, thence to strap *n<sup>2</sup>* of the lightning arrester; to back part of rod O, by wire 5; from contact plate *o'* to strap *n<sup>3</sup>*, from strap *n<sup>3</sup>*, to binding post 3, from binding post 3 to one pole of battery of instrument *y*, by wire 6; thence from other pole of battery to binding post 1 of instrument Y; to strap *n* of lightning arrester of said instrument; to magnet; from magnet to strap *n<sup>2</sup>* of lightning arrester; to binding post 2; and thence to the ground.

Q designates the pilot of a locomotive. This pilot carries a plate Q' to which is pivoted a plate R, formed with a curved under surface and provided on its upper side with a contact plate *r* adapted to contact with a contact point *s*, projecting from a plate S said plate S being suitably supported on the plate Q' and insulated therefrom. T designates a case located within the engineer's cab and provided with a door U. The forward end of this case has an opening within which is inserted a glass *t*, preferably red in color, and behind which is a lamp *t'*. The door U has projections *u* and *u'* on its inner side and a knob *w<sup>3</sup>* on its outer side. V designates an electro magnet, V' a battery, V<sup>2</sup> a bell, V<sup>3</sup> a clapper and V<sup>4</sup> a casing within which is a suitable electric bell-operating mechanism. The armature *v* of the electro-magnet is pivoted at its upper end and its lower end is

provided with a hook and adapted to hold the door U in its uppermost normal position so as to cover the light.

From the contact plate S a wire 10 extends to one pole of the battery V', the other pole of which battery is connected by wire 11 to binding post 12, which in turn is connected with the magnet V by wire 13, said wire extending from said magnet to binding post 14, thence by wire 15 to plate Q'. By this means if the lever arm I is in its elevated position, the plate R coming into contact therewith will be pushed upward and its contact point r engaged with contact points, thus completing the circuit through the magnet V and causing the same to attract its armature, whereby the door U will be released and allowed to drop thereby disclosing the visual signal. When the door drops its projection u engages a contact plate v', thus completing the circuit through the bell, and causing an audible alarm to be sounded. This latter circuit commences at one pole of the battery, goes to binding post 12 thence, by wire 16, travels to binding post of the bell operating mechanism; thence through the bell circuit to the other binding post of bell-operating mechanism; thence by wire 17 to contact plate v', thence through the door and bell wire 18 to binding post 13 thence to the other pole of battery.

From the above the full operation of my invention will be readily seen. As a train enters a block its trip lever F engages the lever E thus depressing the same and elevating the outer end of lever I which latter is locked in such position and held until the train enters the next succeeding block. If a train enters a block during the period of another train's occupancy thereof the plate R will engage the elevated end of lever I and the circuit be closed as above described, the door U released and allowed to drop and display the visual danger signal. When the door has dropped its projection u' will be in contact with the contact plate v', thus completing the circuit through the bell and causing an audible alarm to be sounded. The light will be displayed and the alarm will be sounded until the circuit is broken by the engineer raising the door to its normal position by its handle u<sup>3</sup>. This sounding of an audible alarm and displaying of a visual signal within the engineer's cab will be found to be an extremely effective means for attracting the engineer's attention to the fact that he is within a block already occupied by another train. It will of course be understood that if the block is clear of trains the lever I will be in its depressed position and therefore will not be engaged by the plate R so that no alarm will be sounded or signal displayed.

Having thus described my invention what I claim is

1. In a railway signal, the combination with the shaft, a segment mounted on said shaft, and a lever also mounted on said shaft, and

located in the path of a trip lever carried by a train, of a longitudinally movable bar having teeth intermeshing with the teeth of said segment, a sleeve adapted to be moved rearward with said movable bar, a lever pivoted to said sleeve, and adapted to move with the same, a means for elevating the forward end of said lever as it is moved rearward, a means for locking said sleeve in its rearward position, and a means at the entrance of the succeeding block for releasing said sleeve.

2. In a railway signal the combination with a movable sleeve, a lever pivoted to said sleeve, and movable therewith, a transverse locking bar, having a trigger mounted on one of its ends, said trigger being operated by said sleeve, and a hook adapted to engage the opposite end of said locking bar when the same is in its abnormal position, of means for moving said sleeve rearward when a train enters the block, means for elevating the forward end of said lever when it is moved rearward; means for disengaging said hook from the locking bar when the train has left the block, and means for forcing said sleeve to its normal position when said locking bar has been released.

3. In a railway signal, the combination with a movable sleeve, having openings in its top, bottom and side, the opening in the bottom of said sleeve having an inclined wall, a rod upon which said sleeve is mounted loosely, said rod having a vertical opening adapted to register with the openings in the top and bottom of said sleeve, a locking bar having its inner end extending through the opening in the side of said sleeve into said rod, and a trigger mounted upon the inner extremity of said locking bar and located within the vertical opening in said rod, said trigger having a beveled edge adapted to be engaged by the inclined wall of the opening in the bottom of said sleeve, of a lever, pivoted to said sleeve and movable therewith, means for elevating said lever as it is moved rearward, a means engaging the locking bar, whereby the sleeve will be locked in its rearmost position, a means at the entrance of the succeeding block for releasing said locking bar, and a means for forcing the sleeve to its foremost position when said locking bar has been released.

4. In a railway signal, the combination with a movable sleeve, a longitudinal lever pivoted to said sleeve and movable therewith, a transverse locking bar fulcrumed near its inner end and adapted to have its outer portion depressed by the rearward movement of said sleeve, and a hook for engaging the outer end of said locking bar, of an electro-magnet in the circuit with the next succeeding apparatus, the armature of said electro-magnet being connected with said hook, means for forcing said sleeve to its forward position when the hook is disengaged from the locking bar, and means for elevating the forward end of the longitudinal lever when the same is in its rearward position.



5. In a railway signal the combination with a longitudinally movable lever adapted to be moved rearward when a train enters the block, means for elevating the forward end of said lever as it is moved rearward, a transverse bar for locking said longitudinal lever, of a hook for engaging the rear end of said locking bar when the longitudinal lever is in its rearmost position, an electro-magnet in the circuit with the apparatus at the entrance to the next succeeding block, the armature of said electro-magnet being connected with said hook, whereby the hook will be disengaged from the locking bar when the train has passed out of said block, and means for forcing said longitudinal lever to its foremost position when said hook is disengaged from said locking bar.

6. In a railway signal, the combination with the shaft, a segment mounted on said shaft, a lever, also mounted on said shaft and located in the path of a trip lever carried by said train, whereby it will be depressed when the train enters the block, a longitudinally movable bar having teeth intermeshing with the teeth of said segment, a lever, I, connected with said bar and moved rearward by the same, and means for elevating the forward end of said lever when it is in its rearward position, of a transverse bar for locking said longitudinal lever, a hook for engaging the rear end of said locking bar when the longitudinal lever is in its rearmost position, an electro-magnet in the circuit with the apparatus at the entrance to the next succeeding block, the armature of said electro-magnet being connected with said hook, whereby the hook will be disengaged from the locking bar when the train has passed out of said block, and means for forcing said lever I to its foremost position when said hook is disengaged from the locking bar.

7. In a railway signal, a longitudinal lever I having a beveled lug *i*, and means operated by a train entering the block for moving said lever rearward of a stand having an inclined surface engaging said beveled lug *i* whereby the end of the lever will be raised simultaneously with the rearward movement of said lever, means for locking said lever in its rearward position, means operated by the train passing out of said block for releasing said lever, and means for forcing said lever to its foremost position when released.

8. In a railway signal, a longitudinal lever I pivoted at its rear end, said lever being located at the entrance to a block, means operated by a train entering the block for moving said lever rearward, and means for raising the forward end of said levers simultaneously with the rearward movement thereof, of means for locking said lever in its rearward position, means operated by the train passing out of said block for releasing said lever, and means for forcing said lever in its foremost position when the same is released.

9. In a railway signal, the combination with

a visual signal located in the engineer's cab, an electro magnet, having its armature pivoted at one end and a hook at its opposite end, and a door having a projection adapted to be engaged by said hook of the armature and the door thereby held in position to cover the signal when the magnet is not energized, of means for energizing said magnet upon the entrance of a train into a block occupied by another train, whereby the armature will be attracted and the door released, thereby displaying the visual signal, as specified.

10. In a railway signal, the combination of a case located in the engineer's cab, a lamp in said case, a glass in front of said lamp, an electro-magnet having its armature pivoted at one end and its opposite end hook-shaped, a door having a projection adapted to be engaged by said hook-end of the magnet, means for energizing said magnet upon the entrance of a train into a block occupied by another, and thereby disengaging the armature from the door, and allowing the latter to drop and display the visual signal, with a projection *u'* on said door, a contact plate *v*; an alarm bell and a bell-operating mechanism in the circuit between said contact point and bell, whereby when the door has dropped its projection *u'* will be in contact with contact plate *v* and the circuit closed through the bell, substantially as described, whereby both a visual signal will be displayed and an audible alarm sounded in the engineer's cab if he enters a block occupied by another train, as specified.

11. In a railway signal, the combination with a lever I located at the entrance to a block, means for raising the same when a train enters the block, means for locking said lever in raised position while the train is in the block, means at the entrance to the succeeding block for releasing said lever when the train has left the block, and means for lowering said lever when the same is released, with a pivoted plate carried by the train and carrying a contact point, said plate being arranged to be elevated by said lever when the latter is in its elevated position, a contact point adjacent to the contact point on said plate, an electro-magnet in the engineer's cab, electrically connected with said contact point, the armature of said magnet being pivoted at one end and having a hook at its other end, a visual signal in the engineer's cab, and a door for normally covering said signal, said door having a projection engaged by the hook end of said armature, substantially as described and for the purposes specified.

12. In a railway signal, the combination with a lever I located at the entrance to a block, means for raising the same when a train enters the block, means for locking said lever in raised position while the train is in the block, means at the entrance to the succeeding block for releasing said lever when the train has left the block, and means for lowering said lever when the same is released,

with a pivoted plate, carried by the train and carrying a contact point, said plate being arranged to be elevated by said lever when the latter is in its elevated position, a contact  
5 point adjacent to the contact point on said plate, an electro-magnet in the engineer's cab, electrically connected with said contact point, the armature of said magnet being pivoted at one end and having a hook at its other end,  
10 a visual signal in the engineer's cab, a door for normally covering said signal, said door having projections located one above the other, the lower of said projections being normally engaged by said hook end of the arma-

ture, and the door thereby held in elevated position, an electric bell, and a contact plate in the circuit with said bell, said contact plate being arranged to be engaged by the upper of said projections on the door, all substantially as described and for the purposes set  
20 forth.

In testimony that I claim the foregoing I hereunto affix my signature this 28th day of November, A. D. 1891.

IRA L. GREEN. [L. S.]

In presence of—

CHARLES LARGE,  
M. E. HARRISON.