

(No Model.)

2 Sheets—Sheet 1.

C. C. VAN DER VALK.
ELECTRICALLY OPERATED RAILWAY BARRIER.

No. 586,578.

Patented July 20, 1897.

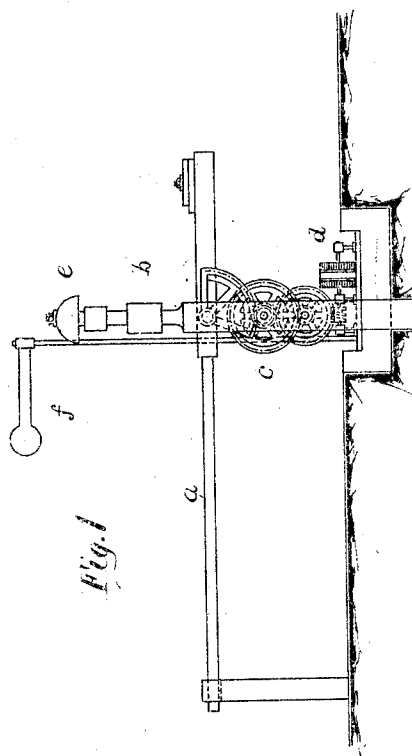


Fig. 1

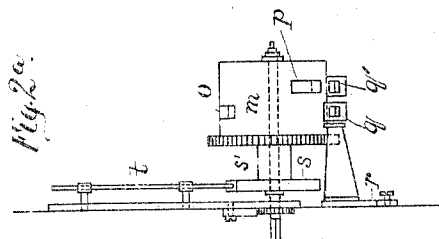


Fig. 2a

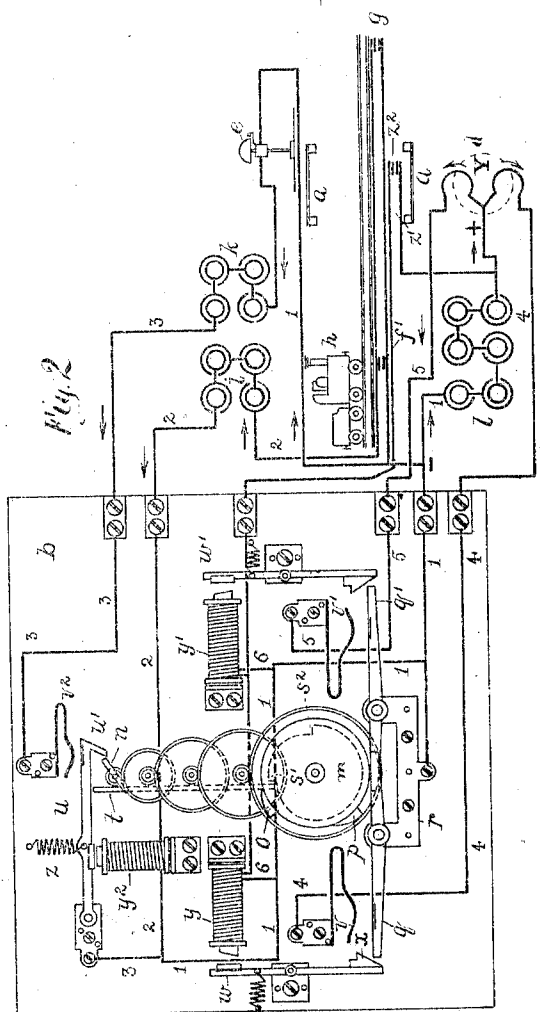


Fig. 2

Witnesses

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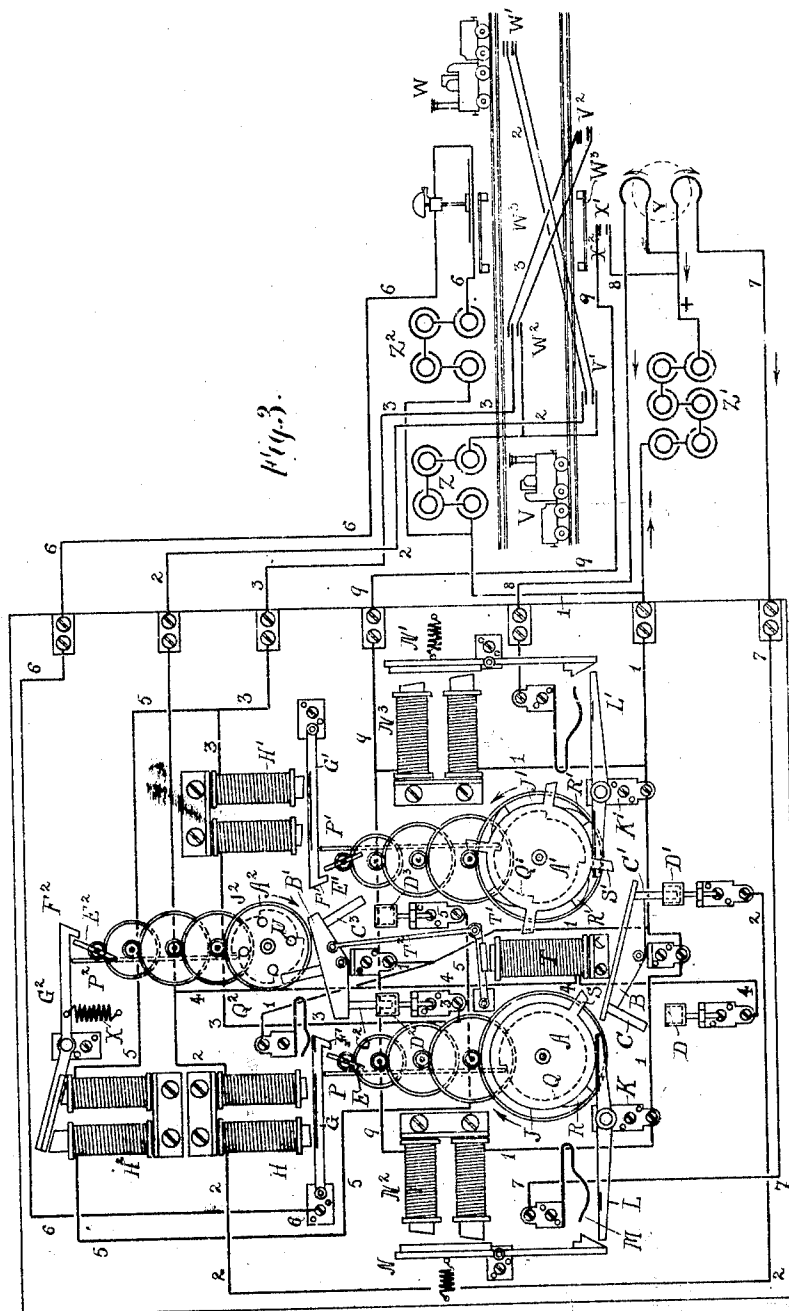
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2 Sheets—Sheet 2.

C. C. VAN DER VALK.
ELECTRICALLY OPERATED RAILWAY BARRIER.

No. 586,578.

Patented July 20, 1897.



Witnesses

William S. Brown,
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UNITED STATES PATENT OFFICE.

CHRISTIAEM CORNELIUS VAN DER VALK, OF HAARLEM, NETHERLANDS,
ASSIGNOR TO THE SYNDICAAT TOT EXPLOITATIE DER PATENTEN
C. C. VAN DER VALK, OF THE HAGUE, NETHERLANDS.

ELECTRICALLY-OPERATED RAILWAY-BARRIER.

SPECIFICATION forming part of Letters Patent No. 586,578, dated July 20, 1897.

Application filed September 10, 1896. Serial No. 605,377. (No model.)

To all whom it may concern:

Be it known that I, CHRISTIAEM CORNELIUS VAN DER VALK, a subject of the Queen of the Netherlands, residing at Haarlem, Netherlands, have invented an improvement relating to apparatus for automatically closing and opening by electrical agency the barriers of railway-level crossings, of which the following is a specification.

This invention relates to apparatus for automatically opening and closing the barriers or gates of railway-level crossings by means of electrical energy wherein such opening and closing is effected by the approaching and passing trains in such manner that the train on approaching the barrier effects the opening or closing of an electrical contact, whereby an electric circuit is broken or closed. By this means gearing is set in motion which closes the circuit of a working current that actuates an electromotor in such manner as to cause this to gradually close the barrier. When the barrier is closed, the motion of the electromotor is stopped by the breaking of its supply-circuit again. On the train passing beyond the barrier a second contact is opened or closed by the train, whereby the said gearing is again set in motion, producing a working current which actuates the same electromotor, but in the contrary direction, so as thereby to open the barrier again. When the barrier is opened, the electromotor is again brought to a standstill by the breaking of its working circuit. At the commencement of the closing of the circuit an audible signal is at the same time actuated by an electric current, and also a visible signal is turned by mechanical means from a direction at right angles to the line of rails to a direction parallel thereto.

The invention also serves in particular for the purpose of insuring, when, in the case of a railway with two or more lines of rail, two trains approach or pass away from a crossing in opposite directions, that the opening and closing of the barrier shall only be effected according to predetermined rules.

In the accompanying drawings, which form a part of this specification, Figure 1 is an elevation, partly in section. Fig. 2 is an elevation

showing in the left and central portions the mechanism employed to effect the movements of the barrier and in the right-hand portion, on a much smaller scale, a locomotive moving on the track and operating the requisite electric contact by depressing the track slightly by its weight, the track being intentionally elastic to allow of such slight motions. Fig. 2^a is an elevation showing certain parts viewed at right angles to the view in Fig. 2; and Fig. 3 is an elevation showing in the left and central portions the mechanism for a double-track railroad and in the right-hand portion, on a much smaller scale, two tracks and two locomotives moving in opposite directions thereon and each making the proper electrical connections by its gravity depressing the properly elastic track.

Similar letters and numerals of reference indicate corresponding parts in Figs. 1, 2, and 2^a.

I will first describe the invention with reference to Figs. 1, 2, and 2^a. In these figures the barrier-beam *a* is actuated by toothed gearing or barrier-train *c*, the motive force for this purpose being supplied by the electromotor *d*. Over the barrier-beam is arranged a box *b*, in which are contained the actual electromagnetic working parts. Over this box is arranged the electrical signal-bell *e*. This barrier-beam *a* is shown in the closed position, and the optical signal *f* is parallel to the line of rails, as a caution-signal to the persons desirous of crossing. It is therefore not visible to the driver of the train, who consequently understands from this that the barrier is closed.

The internal arrangement of the working box *b* is shown, by way of example, for a single-line railway at Figs. 2 and 2^a, in larger size. Fig. 2 also shows, diagrammatically, the position of the electromotor *d* for the two barrier-beams *a a* and of the signal-bell *e*. Furthermore, a diagram view of the approaching train *h* is shown, on a much smaller scale, which at the same time will open the contact *f* by its weight, for effecting the closing of the barrier-beam, and will afterward pass over the contact *g*, by means of which the commencement of the opening of the barrier-beam is started. There are also shown, diagram-

matically, the current-generator i , by which the wheel mechanism on the box b is actuated, the generator k , by which the signal-bell is sounded, and the generator l , by means of which the electromotor is driven.

On an axis that can be mounted on the back wall of the box b is a barrel m , containing a spring. (Not shown on the drawings.) This spring actuates the wheel mechanism that drives the vane n . The spring is wound up by the up-and-down motion of the barrier-beam a . The mode of transmitting this motion is not shown, as it may be effected in any ordinary or known manner. A simple arrangement consists in providing the arbor of the drum with an escapement-wheel designed to be positively rotated by an escapement-lever actuated by an armature vibrated by an electromagnetic make-and-break device included in the main or working circuit.

On the barrel m are two projections o and p , which on the rotation of the drum strike against the inner ends of the two conducting double-ended levers q and q' , which are carried by a conducting-holder r . On the axis of the barrel m is a cam-disk s , near the back wall of the box, which cam has two drops s' and s^2 . On this cam-disk bears a vertical rod t , guided by brackets on the back wall of the box and placed parallel thereto, which can strike with its upper end against the one-armed lever u when by the rotation of the disk s it is raised out of a drop s' or s^2 on the periphery thereof. This lever u has at its front end a downwardly-projecting beak u' , by means of which it can stop the rotation of the vane or flier n as soon as the rod t falls into one of the drops s' or s^2 .

Over the outer ends of the horizontal double-ended levers q q' , as also over the outer end of the one-armed lever u , are situated gentle contact-springs, which are respectively marked v , v' , and v^2 . To the right and to the left of the barrel m , near the side walls of the box, Fig. 2, are vertical two-armed levers w w' , mounted on central pivots and provided at their lower ends with beaks x and x' , on which rest the outer ends of the two-armed levers q and q' as soon as the inner ends thereof have been pressed down by the projections o and p .

The upper ends of the upright two-armed levers w and w' carry armatures, so that they can be attracted by the electromagnets y and y' , and the one-armed lever u also has an armature to be acted upon by the electromagnet y^2 .

The action of the apparatus is as follows: The electric current of the generator i passes through the line 1 2 to the electromagnet y^2 . This holds the lever u in position against the retracting force of the spring z , so that its beak u' stops the vane or flier n , whereby the wheels gearing with the barrel m are stopped. The contact f' , which, for example, is one thousand yards or more in front of the barrier-beam, is opened by the weight of the

approaching train h and the current passing to the electromagnet y^2 is broken, so that the lever u is no longer attracted, but is drawn away from the electromagnet by the spring z , and will consequently liberate the flier n from its beak u' and the spring of the barrel m will come into action. In consequence thereof the disk s , Fig. 2^a, is rotated and lifts the rod t out of the drop s' , and by means thereof it presses the lever u against the contact-spring v^2 . The electric current which passes through these parts and the line 1 3 to the generator k is thus closed and the signal-bell e is sounded.

The vane or flier n is so regulated that the barrel m performs a revolution in the time required.

When the barrel m has made about half a revolution, the projection o presses the inner end of the double-ended lever q downward, so that its outer end moves up past the beak x to become engaged thereby and be at the same time pressed against the contact-spring v to close the main circuit supplied by the generator l , the current of which passes through the line 1 4 to the electromotor d (see Fig. 1) and rotates this actively in the direction of the arrow, whereby the barrier is closed by means of the toothed gear c , Fig. 1. For the sake of simplicity the motor d in Fig. 2 is not represented in juxtaposition to the barrier.

On its descent the barrier-beam, shortly before it reaches its lowest position, touches a contact z' , (see Fig. 2,) and thereby closes a branch circuit of the generator l , the current of which passes through the line 1 6 to electromagnet y , which attracts the upright two-armed lever w , thereby releasing the lever q and breaking contact with the spring v and stopping the motion of the electromotor d . During this time the barrel m will have made three-fourths of a revolution and the rod t falls into the drop s^2 , so that the electromagnet y^2 can again attract the armature u . By this means the vane or flier n will be stopped, and consequently also the wheels of the barrel m , and at the same time the signal-bell will be stopped, as the contact v^2 is broken. The barrier-beam is now stationary and the train h passes over the crossing and approaches the contact g , which may be situated about three hundred yards or more beyond the barrier.

After the train has passed and opened the contact g the current passing to electromagnet y^2 is again interrupted, permitting the armature u to be again retracted by spring z in the manner described above, and the toothed gear and barrel m is again set in motion. The projection p on the drum m presses down the inner end of lever q' , so that its outer end rises past the beak x' to become engaged therewith and is at the same time pressed against the contact-spring v' . By this means the current of the generator l , which passes through the line 1 5 to the same

electromotor d , but in the direction opposite to the first, is closed and the latter is rotated in the contrary direction to that first described, whereby the barrier a is raised into the open position by means of the gearing c , Fig. 1. In rising the barrier-beam touches a second contact z^2 , which closes the branch circuit through 1 6 to the electromagnet y' , thereby attracting the lever w' . The lever q' is thus released and turns, breaking the circuit through 1 5, and the motion of the electromotor d is again stopped. During this time the barrel completes the last quarter of its revolution and the rod t falls into the drop s' , whereupon the armature u can again approach the electromagnet y^2 , and the beak u' will stop the flier n , thus putting the apparatus in readiness for the next following train.

In Fig. 3 is shown an arrangement for adapting the said apparatus for several lines of rail, the apparatus being so arranged that in case of two trains passing each other at or near a crossing the first train will close the barrier, but cannot open it again, such opening being only effected by the second train after it has also passed the crossing. In this arrangement the box with the working gear contains three sets of wheelwork A , A' , and A^2 , which in the example shown are actuated by working currents, of which A and A' serve to effect the circuit connections, the currents of which serve to effect the opening and closing of the barriers, while the mechanism A^2 serves to change the direction of current when required. Between the sets of wheels A and A' are two small tumbler-levers B and B' , the pins C C' and C^2 C^3 of which are adapted to dip either into the mercury-cups D D' or into the cups D^2 D^3 , as will be explained. Furthermore, the vanes or fliers E E' E^2 of the said three wheel mechanisms are stopped by the beaks F F' F^2 of the levers G G' G^2 in the same manner as described with reference to Fig. 2. These armatures are attracted by the three electromagnets H H' H^2 . The two-armed levers L L' , mounted on brackets K K' below the barrels J J' of the wheel mechanisms A A' , are, when their inner ends are depressed, brought into contact with the contact-springs M M' and are held by the lower beaks of the vertically-suspended levers N N' , the armatures of which may be attracted by the electromagnets N^2 N^3 .

The armature G of electromagnet H has above it a contact-spring O . The armatures G' G^2 have no contact-springs. These armatures G G' G^2 are raised by rods P P' P^2 by the action of cam-disks Q Q' Q^2 , which are fixed on the ends of the barrels of the wheel mechanisms A A' A^2 , the rod falling into drops on the said cam-disks, as described with reference to the first arrangement.

The inner end of the two-armed lever L is pressed down only by a single tappet R on the corresponding barrel, but the inner arm of the two-armed lever L' on the other side is

consecutively pressed down by four tappets R' . In a similar way the tumbler B is pressed down on the left side by only a single tappet S on the drum corresponding to the lever L , while on the other side the inner end of the lever L' is pressed down by four tappets S' on the corresponding drum.

Between the lower wheel mechanisms A A' is mounted an electromagnet T , the armature T' of which is connected by a rod T^2 with the tumbler B' . This tumbler is provided with a pin T^3 , against which the four pins U of the barrel of the wheel mechanism A^2 strike consecutively for pushing back the tumbler B' into the position shown on the drawings, if it has been previously drawn by rod T^2 so as to immerse the pin C^3 in the mercury-cup D^3 .

The train of cars represented by the engine V that arrives first by means of the flexibility of the line of rail presses the contact V' down and at a later period reaches the contact V^2 . In case the train W , moving on the other track in the opposite direction, arrives later it first depresses contact W' and then contact W^2 . The barriers W^3 W^3 on each side of the line of rails can be connected by chains or other means, so that only a single apparatus on one side for opening and closing is required, and only on one side are provided two contacts X' X^2 , by means of which branch circuits are closed on the opening or closing of the barrier, the currents of which effect the stopping of the electromotor Y .

The generator Z' effects the closing and opening of the barrier W^3 . The generator Z^2 causes the signal-bell Z^3 to be sounded, as described with relation to Fig. 2.

The optical signal and the winding up of the springs of the barrels are effected through the generator Z' by suitable mechanism. (Not shown.)

The mode of operation is as follows for the train arriving in the direction of the engine V : As soon as the train depresses the contact V' the current from generator Z is closed, which passes through the line 1 to tumbler B and thence through mercury-cup D' , through line 2, to electromagnet H , and then further through line 2 back to generator Z . By this current the electromagnet H attracts the armature G , whose beak F liberates the flier E , and the wheel mechanism A is set in motion by the spring of the corresponding barrel. By this means the rod P is raised by means of the disk Q and the armature-lever G is pressed tightly against the contact-spring O , which thus closes the circuit of the generator Z^2 , the current passing through the line 1 6 to the signal-bell Z^3 , which sounds until the barrier is closed.

As soon as the barrel J of the mechanism A begins to rotate, the tumbler B is pressed down by the tappet S , so that the pin C dips into the mercury-cup D , while the pin C' is withdrawn from the cup D' . The object of this change will be explained farther on. The barrel J continues to revolve and after

the lapse of a certain time, which depends upon the adjustment of the vane or flier E, the tappet R depresses the inner end of the two-armed lever L, whereby the outer end is brought into contact with the contact-spring M, and is held in that position by the beak of the lever N. In consequence thereof the circuit of generator Z' is closed, and the current passes through the line 1 7 to the electromotor Y, causing this to revolve in the direction of the lower arrow and by the proper gearing closes the barrier. It is intended by the diagram to show a motor capable of being revolved in opposite directions. Shortly before the barrier reaches its lowest position a branch circuit of the generator Z' is closed by contact X', the current passing through line 9 to electromagnet N², attracting armature N and passing through line 1 back to generator Z'. By the attraction of the armature-lever N the lever L is freed and turns so that the current to the electromotor Y is interrupted, and the latter is stopped, the barrier being now closed. When the barrel J has performed a complete revolution, the rod P will fall into the notch of disk Q and the armature G stops the flier E by means of the beak F, whereby the wheel mechanism is stopped.

When the train V passes beyond the crossing, it depresses a contact V², thereby closing the circuit of generator Z, the current of which passes through line 1 to the tumbler B', and thence through the mercury-cup D² and line 3 to electromagnet H' and through line 3 back to the generator Z. The latter magnet H' then attracts the armature G', so that the wheel mechanism A' can rotate because the beak F' liberates the flier E'. By the rotation of barrel J' the rod P' is raised and the inner end of the two-armed lever L' is pressed down by one of the four tappets R', so that its other end is pressed tightly against the contact-spring M', thereby closing the circuit in the generator Z', the current passing through line 4 8 to the electromotor Y, and in rotating it in the ordinary direction causes it to open the barrier. Shortly before this reaches its highest position it touches the second contact X², thereby closing a branch circuit of generator Z' through line 1 9 to electromagnet N³, which attracts the armature of lever N' and in releasing the lever L' breaks the circuit of the electromotor, which is thus stopped. The barrel J' of the wheel mechanism will have made one-fourth revolution during this operation, whereby one of the four tappets S' will cause the pin C' of tumbler B to dip into the mercury-cup D'—that is to say, causes the pin C to assume the position shown in Fig. 3 again. The rod P' then falls into one of the four drops of cam-disk Q' and the apparatus is ready for the next following train.

The above-described arrangement has also the effect that the train V, which has closed the barrier by means of the contact V', cannot open the same again on passing the contact V² if a second train W, passing on the

second line in the contrary direction, acts upon the contact W'. In such case the action is as follows: As set forth at the beginning of the description of Fig. 3, the barrel of the wheel mechanism A is at once put in action when the approaching train V depresses the contact V'. The tappet S will then at once cause the pin C to dip into the mercury-cup D. If now the oppositely-advancing train W should touch the contact W', the current of generator Z will be closed. The current of this circuit cannot pass through the line 1 2 to electromagnet H because the circuit has been broken by the withdrawal of pin C' from the mercury-cup D'. The current can, however, pass from the line 1 to tumbler B through pin C in mercury-cup D, and through line 4 to electromagnet T, and thence through the line 4 2 back to generator Z. The electromagnet T being thus excited, the armature T' is attracted and the tumbler B' is reversed by means of the rod T², whereby pin C³ is immersed in mercury-cup D³. The advancing train V now passes beyond the crossing to the contact V². The current of generator Z must now pass through the line 1 to tumbler B', thence through mercury-cup D³, through line 5, to electromagnet H², and then through lines 5 and 3 back to the generator Z. Evidently the wheel mechanism A' will not have come into action during that time because the electromagnet H' was not included in the current. Consequently the barrier remained closed, notwithstanding that the train V passed over contact V². On the other side the armature G² of the electromagnet H² will have been attracted, whereby the beak of the armature will have liberated the flier E² and the wheel mechanism A² will have come into action, causing its barrel to make a quarter-revolution. Previously, however, the attraction of the armature T' by means of the electromagnet T will have caused the upper pin T³ of the tumbler B' to press against one of the four pins U of the barrel J². On the further rotation of this barrel in the direction of the arrow one of these pins U presses the upper pin T³, and consequently the tumbler B', back into their original position, as shown. The connection with the mercury-cup D³ is broken and that with the cup D² is established again. The approaching train V has therefore passed over the entire crossing and contact V² without being able to open the barrier again which it had previously closed.

When at a later period the oppositely-moving train W passes over the crossing and contact W², the circuit will be closed through line 1 to tumbler B', thence through mercury-cup D² and through line 3 to electromagnet H', and again through line 3 back to the generator Z. The electromagnet H' attracts the armature G' and vane E' is liberated, causing wheel mechanism A' to be set in motion, and by the depression of lever L' by tappet R' the circuit of the electromotor Y is closed, so that this effects the opening of the barrier.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention.

The wheelwork, Fig. 1, which is driven by the electromotor, can be arranged underground and be protected against the traffic by an inclosing casing.

Two or more level crossings situated at short distances from each other may also be connected together in the same way, so that the barriers of all can be worked by a single apparatus, in which case the electromotor need only be slightly increased in power.

It will be obvious that instead of driving the barrels of the wheel mechanisms by springs they may be driven by weights.

I claim as my invention—

1. In apparatus for automatically opening and closing the barriers of a railroad-crossing, the combination with a barrier and its operating means, an electromotor and provision for limiting the period of the actuation of said means, a main or working circuit for the latter and an auxiliary circuit controlled by a railway-train to control said main or working circuit and preliminarily operate a warning-signal, substantially as herein specified.

2. In apparatus for automatically opening and closing the barrier of a railway-crossing, the combination with a barrier and its operating means including an electromotor and provision for limiting the period of the actuation of said means, a main or working circuit for actuating said means and an auxiliary circuit controlled by a moving train to control said main or working circuit and arranged to also preliminarily operate a signal visible to the engineer of the approaching train, substantially as herein specified.

3. In apparatus for automatically opening and closing the barriers of a railway-crossing, the combination with a barrier and its operating means, including an electromotor and provisions for limiting the period of the actuation of said means, a main or working circuit for actuating said means and an auxiliary circuit controlled by a moving train to control said main or working circuit, and arranged so as to operate a visible signal to turn the same from a position at right angles to the track to one parallel therewith, substantially as herein specified.

4. In apparatus for automatically opening and closing the barrier of a railway-crossing, the combination with a barrier and gearing for raising and lowering the same, of an electromotor for driving said gearing, contacts located at each side of the crossing, and circuit connections with mechanism controlling a working circuit through the electromotor, the arrangement being such that the main current will be first directed through the motor in one direction and then interrupted and thereafter automatically directed through the motor in a reverse direction and again interrupted, substantially as herein specified.

5. In apparatus for automatically opening

and closing the barrier of a railway-crossing, the combination with a movable barrier and gearing for raising and lowering the same, of an electromotor for driving said gearing, an independently-actuated set of gear-wheels normally held by an armature-detent, an electromagnet for said detent, a track-contact for controlling an auxiliary circuit including said electromagnet, and a preliminary signal, and a circuit-closer operated by said train for closing a main or working circuit for the said electromotor, substantially as herein specified.

6. In apparatus for automatically opening and closing the barrier of a railway-crossing, the combination with a barrier and gearing for raising and lowering the same, of an electromotor for driving said gearing and included in a main or working circuit, a spring-actuated set of gear-wheels normally held by an armature-detent and comprising a rotating part with projections, an electromagnet, auxiliary circuit and track contacts for permitting a train to successively move the detent and permit the spring-actuated set of wheels through its projections to close and briefly hold closed the main or working circuit to primarily drive the electromotor in one direction and thereafter reverse the current, substantially as herein specified.

7. In apparatus for automatically opening and closing the barrier of a railway-crossing, the combination with a barrier and gearing for raising and lowering the same, of an electromotor for driving said gearing and included in a main or working circuit, a spring-actuated set of gear-wheels normally held by an armature-detent and comprising a rotating part with projections, an electromagnet, auxiliary circuit and track contacts for permitting a train to successively move the detent and permit the spring-actuated set through its projections to close and briefly hold closed the main or working circuit to primarily drive the electromotor in one direction and thereafter reverse the current, together with circuit-closers such as z' and z'' , operated by the barrier for breaking the main circuit at the end of the descending and ascending movements of the barrier, substantially as herein specified.

8. In apparatus for automatically opening and closing the barrier of a railway-crossing, the combination with a barrier and gearing for raising and lowering the same, of an electromotor for driving said gearing and included in a main or working circuit, a spring-actuated train of gear-wheels normally held by an armature-detent and comprising a rotating part with projections, an electromagnet, auxiliary circuit and track contacts for permitting a railway-train to successively move the detent and permit the spring-actuated gearing through its projections to move a pair of pivoted levers to close and briefly hold closed the main or working circuit to primarily complete the main circuit through the motor in one direction and subsequently

in the other, armature-levers such as x and
 x' , for holding said circuit-completing levers,
electromagnets and suitable circuit connec-
tions with circuit-closers such as z' and z^2 , op-
5 erated by the barrier to release the circuit-
completing levers, substantially as herein
specified.

In testimony whereof I have hereunto set

my hand, at Rotterdam, Netherlands, this 27th
day of July, 1896, in the presence of two sub- 10
scribing witnesses.

CHRISTIAEM CORNELIUS VAN DER VALK.

Witnesses:

MARGARET REQUE,
SIGURD S. REQUE.